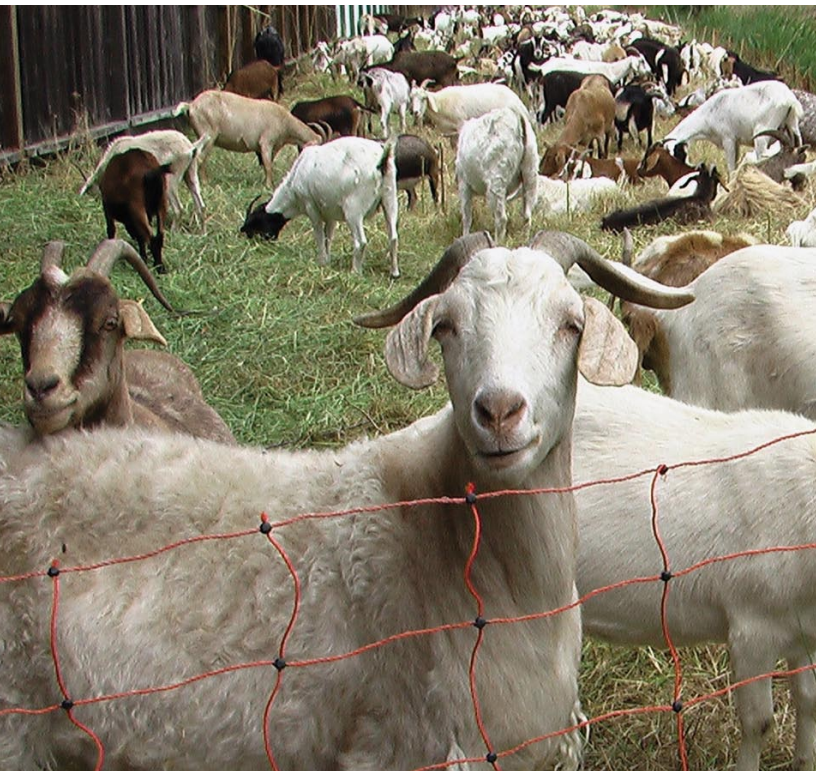
SFO

San Francisco International Airport

San Francisco International Airport
2007 Environmental Sustainability Report



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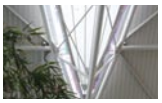

Cover Photos:

1. SFO's fully automated AirTrain departing from the International Terminal. AirTrain, primarily powered by hydroelectricity, significantly reduced pollutant and greenhouse gas (GHG) emissions at the Airport.
2. Compressed Natural Gas (CNG) fueling station. The majority of on-road alternative fuel vehicles at SFO operate on CNG, improving Airport air quality.
3. SFO uses a herd of goats to graze upland vegetated areas near a critical wetland habitat, thereby eliminating the use of power mowers and minimizing the risk of harm to native endangered species.
4. In March 2007, SFO became the first Airport in North America to test aircraft towing by Virgin Atlantic as a means to reduce CO_2 emissions from aircraft taxiing to the runway. If only 30% of departing flights are towed to the runway, 16,000 tons of CO_2 emissions could potentially be eliminated each year.

OFFICE OF THE MAYOR
SAN FRANCISCO

GAVIN NEWSOM

Message from Mayor Gavin Newsom

The people of San Francisco are firmly supportive of conserving the Earth's resources so that future generations of Americans and other peoples of the world may enjoy a prosperous life in a just, clean, and livable environment. The people and the government of the City and County of San Francisco have been pioneers in developing and implementing programs and practices that would lead to less intensive use of scarce resources and would make urban living and the quality of the urban environment sustainable and enjoyable. To this end all City Departments have been tasked to develop and implement meaningful sustainability programs. The goal of these programs consists of demonstrable reductions in resource use, elimination of discarded and hazardous waste by recycling all valuable materials, enhancement of economic opportunity for all citizens of San Francisco, and promotion of cultural and social programs that contribute to the betterment of life in our City.

San Francisco International Airport is a pivotal enterprise in our City government and an engine of economic growth for the San Francisco Bay Area. Our Airport has been rated the best in the country in providing a pleasant and efficient service to air travelers. The Airport strives to reduce resource use, promote waste recycling, contribute to our cultural enjoyment, and promote social diversity in its work force.

This report is a systematic documentation of SFO's ongoing sustainability efforts and provides a blueprint for enhancing and monitoring these programs as we move forward.

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Xeriscape feature at SFO

Sustainability Committee

John L. Martin	Airport Director
Jackson Wong	Chief Operating Officer
Ivar Satero	Deputy Airport Director, Design and Construction
Ernie Eavis	Deputy Airport Director, Facilities Department
Kandace Bender	Deputy Airport Director, Public Relations
Sam Mehta	Manager, Environmental Services

SFO Airport Commission

Linda Crayton
Vice President

Caryl Ito

Eleanor Johns

Richard Guggenhime

1. SFO's Commitment to Sustainability

A message from Airport Commission President Larry Mazzola and Airport Director John L. Martin

San Francisco International Airport's (SFO) mission is to be the airport of choice for passengers, for airlines, and for the industry. The Airport strives daily to provide a safe, secure, customer-friendly, and economically-sound facility.

The Airport views environmental sustainability efforts as an integral part of this mission and is committed to reducing its contribution to global warming, to improving air and water quality, to reducing noise impacts, and to preserving natural resources.

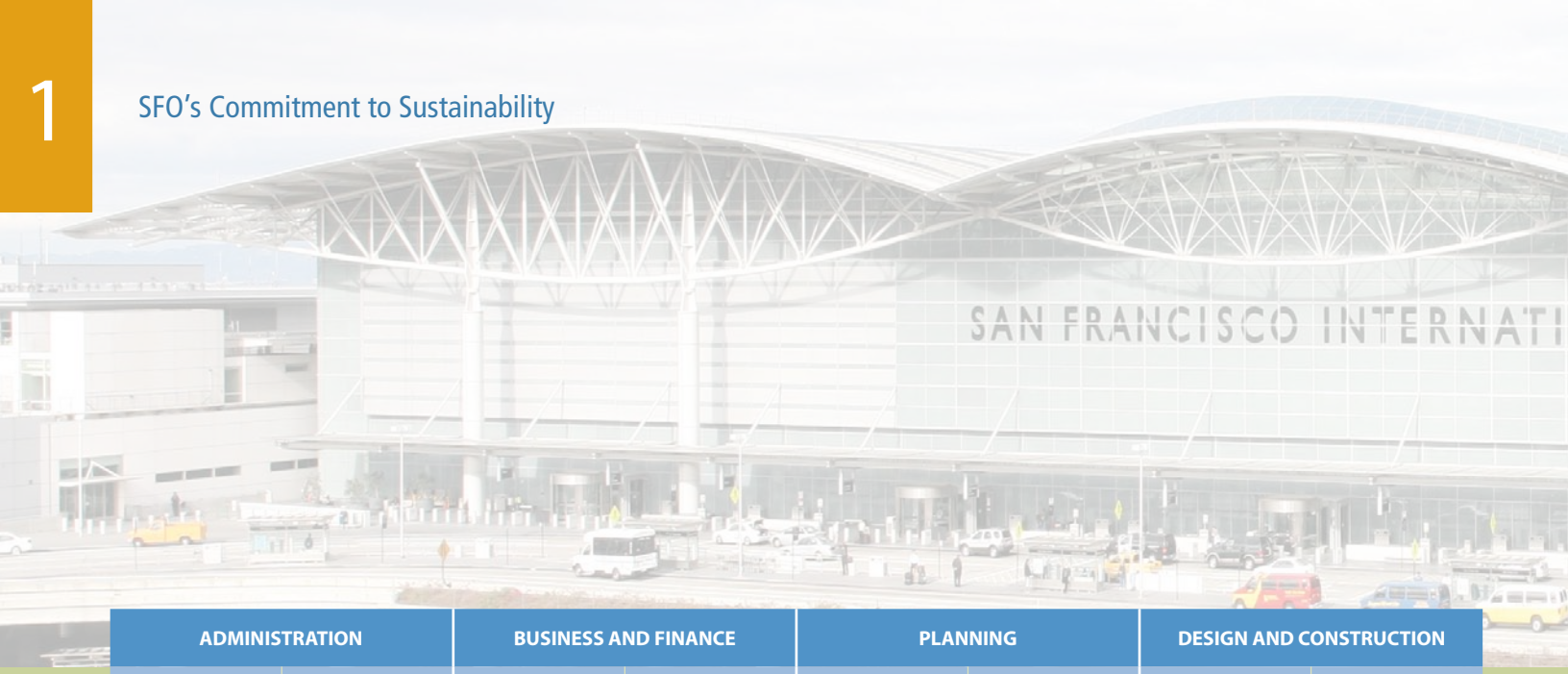
SFO has met many milestones in environmental achievements and in resource conservation in the past several years, including:

- Mitigation of noise impact in the surrounding communities through sound insulation of homes in the Bay Area and by working continuously with airlines on flight schedules and aircraft types.
- Conversion of traditional light fixtures to energy efficient fixtures resulting in 3.5 million kWh of electrical energy savings per year.
- Installation of 2,000 square feet of solar panels with an additional 50,000 square feet of panels currently under design and construction.
- Construction of two compressed natural gas dispensing facilities that enable refueling of clean natural gas powered vehicles operated by the Airport, tenants, and various transportation service providers.
- Conversion of all Airport operated shuttle buses to biodiesel use, saving 35,000 gallons of diesel fuel per year.
- Construction of a $37 million state–of–the–art sanitary wastewater treatment facility, enabling the Airport to consistently meet or exceed regulatory requirements for discharge of treated wastewater into San Francisco Bay and plans to upgrade the industrial wastewater treatment plant.
- Construction of storm water runoff detention ponds with a combined capacity of 8.6 million gallons for storage and treatment of "first-flush" runoff, thereby enhancing the water quality of the Bay.
- Implementation of various recycling initiatives, which have resulted in the diversion of more than 89% of solid waste generated at the Airport, including construction and demolition debris, from landfills for the last three years.

We believe that these and other achievements are just the beginning of our sustainability efforts. The Airport staff is now engaged in examining all facets of our operations. Using best management practices, SFO will develop, monitor, and regularly review specific and measurable targets for activities and programs that help achieve and exceed regulatory compliance requirements and improve environmental performance. This report is a first step in laying out our policy and the means to implement it.

Larry Mazzola
President

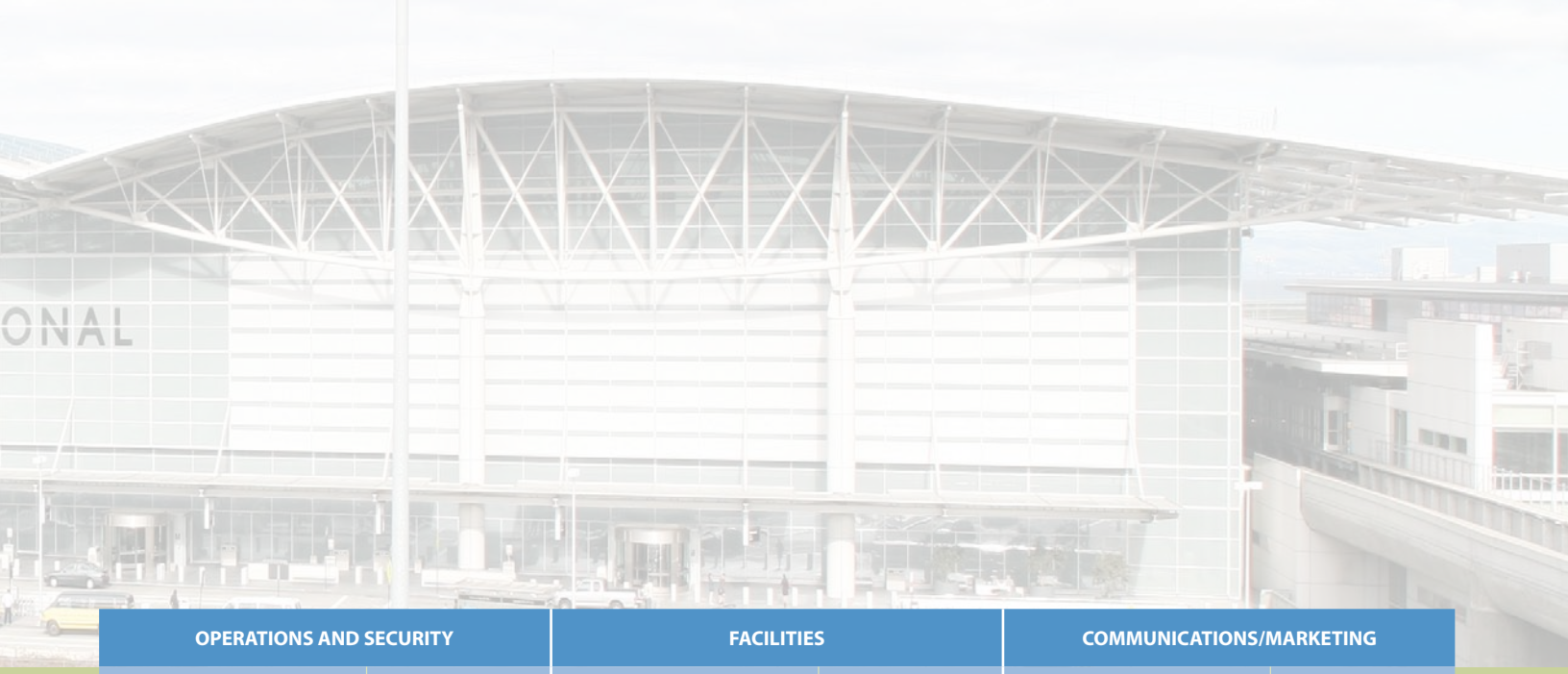
John L. Martin
Airport Director



ADMINISTRATION		BUSINESS AND FINANCE		PLANNING		DESIGN AND CONSTRUCTION	
Function	**Sustainability Element**	**Function**	**Sustainability Element**	**Function**	**Sustainability Element**	**Function**	**Sustainability Element**
Procurement		Parking Management		Facilities Planning		Design	
Reprographics		Life Cycle Costs Management		Environmental Impact Assessment		Construction	
Information Technology				Natural Resources Management		Environmental Services	
Safety and Health						AirTrain	
Medical Services						Transportation Engineering Services	

Sustainability at SFO by Department

SFO integrates environmental sustainability efforts into its operations on a daily basis and through all of its Airport Departments. The Commission encourages all Airport employees to search for viable and economical means and methods to minimize the impact of Airport operations on the environment. Airport Departments are committed to identifying measures that would lead to substantive environmental benefits. This table shows the various sustainability initiatives in which Airport Departments are involved.



OPERATIONS AND SECURITY		FACILITIES		COMMUNICATIONS/MARKETING	
Function	**Sustainability Element**	**Function**	**Sustainability Element**	**Function**	**Sustainability Element**
Aircraft Apron Operations		Architectural/Engineering		Noise Abatement	
Ground Service Equipment Management		Facilities Maintenance & Operation		Public and Community Outreach	
Spill Response		Water Supply/Quality Control		Education/Training	
		Electricity/Gas Resource Use			
		Wastewater Treatment/ Stormwater Management			
		Solid Waste Management			

Sustainability Elements

- Climate Change/Global Warming
- Energy Conservation/Renewable Energy
- Air Quality Enhancement
- Noise Abatement
- Water Conservation/Water Quality Enhancement
- Natural Resources Management
- Solid Waste Reduction and Recycling
- Hazardous Material and Waste Management and Remediation
- Green Buildings and Facilities


10L
10R
19L
19R
28L
28R
1L
1R


SAN FRANCISCO INTERNATIONAL


UNITED AIRLINES

2. SFO Profile

San Francisco International Airport (SFO) is the premier airport serving Northern California, located on San Francisco Bay 14 miles south of the City. SFO covers approximately 5,200 acres with about 2,700 acres developed for Airport use and approximately 2,500 acres remaining as natural tidelands. This chapter provides a description of the land uses, activity levels, awards received, and environmental issues at SFO.

SFO's Mission

SFO's mission is to be recognized as the world leader in setting the standard for:

- Safety and security,
- Customer service and satisfaction,
- Community relations,
- Environmental commitment,
- Quality of facilities, and
- Financial vitality.

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 12 functional classes: terminal complex, non-terminal airline support, airline maintenance, general aviation, air freight, airport support, commercial, administration/office, transportation, miscellaneous facilities, parking facilities, and roads.

San Francisco International Airport.

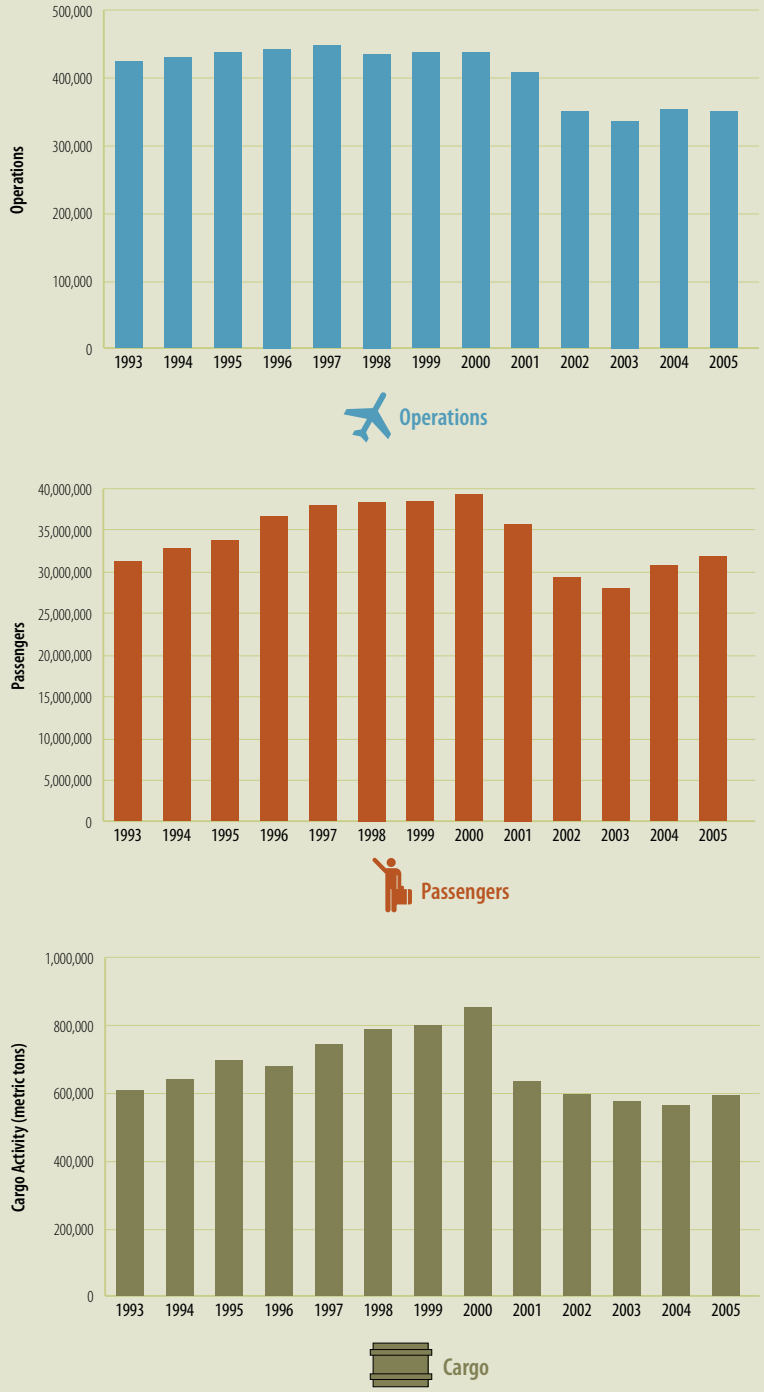
Airside Land Uses

SFO currently maintains four intersecting runways: two parallel east-west runways and two parallel north-south runways. All four runways are paved and 200 feet wide. The east-west Runway 28R/10L is 11,870 feet long; its parallel Runway 28L/10R is 10,600 feet long. The north-south Runway 1R/19L is 8,901 feet long; its parallel Runway 1L/19R is 7,100 feet long. The majority of aircraft landings occur on Runways 28R/28L and the majority of the takeoffs occur from Runways 1R/1L.

Landside Land Uses

Prior to 2001, the existing passenger terminals covered approximately 6 million square feet. In 2001, the Airport completed the construction of a Master Plan that added more than 5 million square

Operations, Passengers, and Air Cargo Tonnage at SFO



Source: FAA Terminal Area Forecast for SFO. **www.apo.data.faa.gov/main/taf.asp**; SFO Airport Commission

feet of new landside improvements including a new International Terminal, two new boarding areas, a new Airport people-mover (AirTrain), a new multi-modal connection for Bay Area Rapid Transit (BART) and AirTrain, various other office/administrative space, airline maintenance support, and air cargo, as well as parking, roadway, and other transportation-related improvements.

Other Airport facilities support public service functions and airport operations. These facilities include airport administration, airport engineering, building and field maintenance, crash/fire/rescue facilities, and utilities, as well as aircraft fueling, airport police, commercial enterprises, and rental car facilities.

Activity Levels

Aircraft Operations, Passenger Activity Levels, and Cargo Shipment

In 1997, aircraft operations (aircraft takeoffs or landings) peaked at 436,700 annual operations and was stable for the following four years, then it dipped sharply after the events of September 11, 2001. The number of passengers flying to or from SFO was 39.3 million in 2000, dropping to 28.0 million in 2003 and gradually increasing to 31.8 million passengers in 2005.

As fuel costs, competition for passengers, and environmental impacts have increased, aircraft operations have become more efficient. Aircraft load factors are the highest ever on record in the U.S., with domestic flights operating at 76% of capacity and international flights operating at 82% of capacity.

Cargo shipment at SFO peaked at 853,000 metric tons in 2000, dropping to 563,000 metric tons in 2004, but rebounding to 591,000 metric tons in 2005.

History

Dedicated on May 7, 1927, the Mills Field Municipal Airport of San Francisco was built by the City and County of San Francisco as a dirt runway for pioneering aircraft. In the ensuing 80 years, SFO became one of the world's premier international airports handling more than 31 million passengers and more than 591,000 metric tons of air cargo in 2005.

On July 16, 1927 looking north towards San Bruno Mountain from the ridge of Hangar no. 1, San Francisco's first municipal airport terminal sat alone on the barren landscape between a dirt road to the west and freshly graded airstrip to the east.

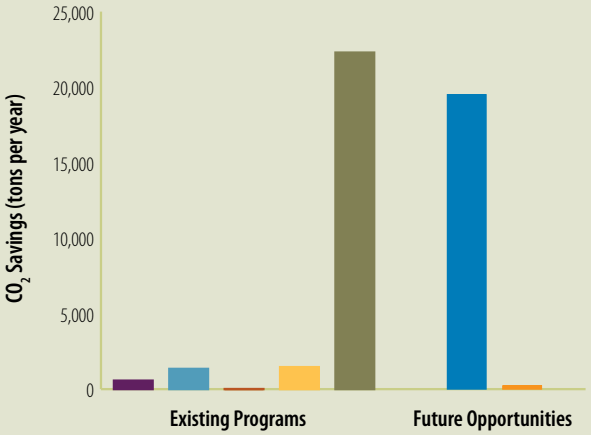
San Francisco's first airport administration building followed a simple and compact plan. The bay window at the back looked out on the airfield and could be considered the first "control tower."

The airfield passenger loading area and hangar in 1939.

The August 27, 1954, dedication of the new San Francisco International Airport Terminal Building began a three-day celebration. Forty-three airplanes were exhibited for the opening, including the military Boeing B-47E Stratojet, a prelude to the Jet Age.

Courtesy William T. Larkins

Ongoing & Future CO_2 Emissions Reduction Initiatives



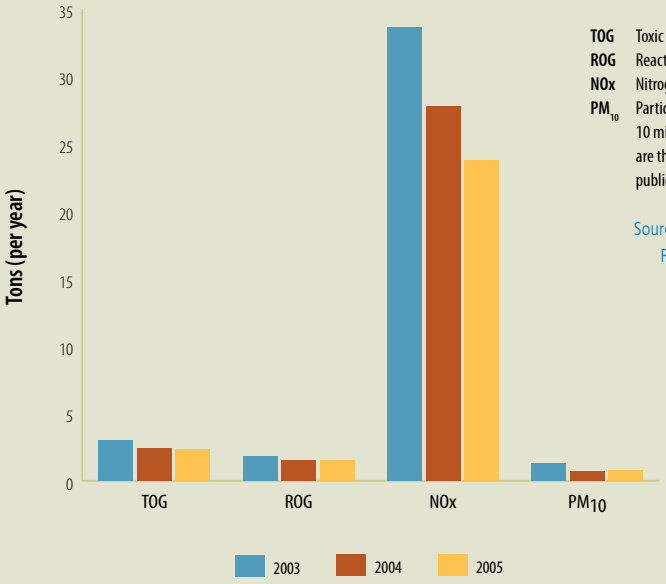
Note: The following CO_2 emission reductions are not reflected in the chart:

- **Existing Programs** bullets recycling, BART and HOVs, biodiesel use, PC-Air and 400 Hz power, paper use reduction, and water use reduction.
- **Future Opportunities** fleet conversion to CNG/ Hydrogen, bus conversions to CNG, and aircraft towing.

- AirTrain (HOV, hydroelectric power)
- Indoor Lighting Energy Savings Program
- Solar Panels on Jason Yuen Architectural/Engineering Building
- Conversion of Vehicles to CNG
- Recycling*
- Future Implementation of Energy Audit Recommendations
- New Solar Panels on Terminal 3

* Calculated using EPA WAste Reduction Model (WARM): **www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html**

Estimated Historical Annual Air Pollutant Emissions from Stationary Sources



TOG Toxic Organic Gases
ROG Reactive Organic Gases
NOx Nitrogen Oxides
PM_{10} Particulate Matter less than 10 microns in diameter, which are the greatest concern to public health

Source: California Air Resources Board

SFO Environmental Indicators

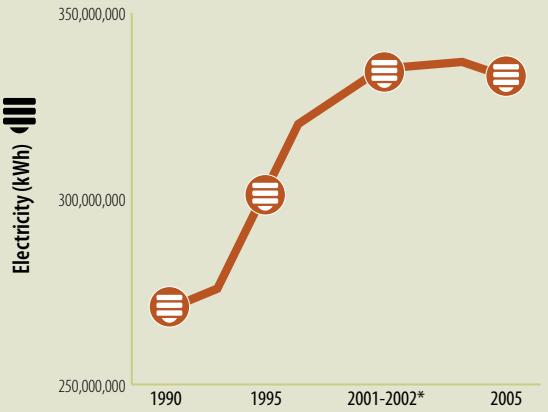
Global Warming/Climate Change

The City and County of San Francisco, which includes the Airport, has successfully certified its greenhouse gas (GHG) emissions inventory with the California Climate Action Registry, becoming the first city in the United States to earn the Registry's distinction of Climate Action Leader™. Currently, a number of GHG emissions reduction programs are underway at SFO (see **Chapter 3, *Climate Change/ Global Warming***). As shown in the graph to the left, the Airport expects to further reduce its GHG emissions by up to 20,000 tons per year in the near future.

Air Quality

SFO has an extensive air quality enhancement program addressing aircraft emissions and ground service equipment (GSE), cars, and buses driving to and from the Airport, and fuel and energy use at the Airport. SFO's success in improving air quality is demonstrated by significant steps taken to reduce emissions from these mobile sources. Emissions from stationary sources (such as emergency power generators) have remained relatively stable from 2003 to 2005, while NO_x emissions have declined.

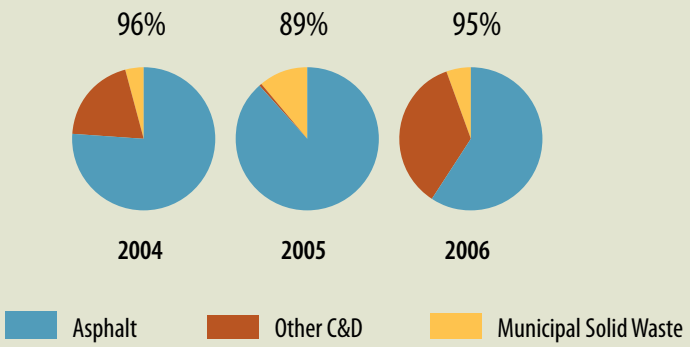
Historical Electricity Consumption



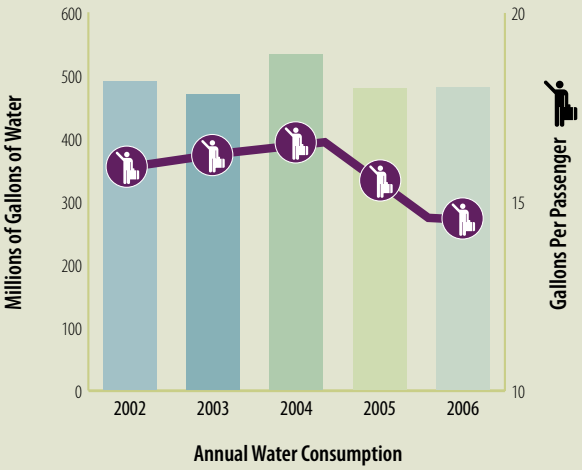
Note: Includes tenant consumption

* 12 month fiscal year from July 1, 2001 to June 30, 2002

Solid Waste Recycling Rates (2004-2006)



Total Airport Water Use and Use by Passengers



Energy Conservation / Renewable Energy

Most of the electricity suppled to SFO is derived from hydroelectric power generation. The graph at left depicts historical SFO electricity consumption since 1990. The sharp rise in consumption in 2001-2002 can be attributed to the opening of the new International Terminal and related facilities. To counter this recent increase in electricity consumption, SFO conducted an energy audit to improve energy efficiency at the Airport.

Solid Waste Recycling

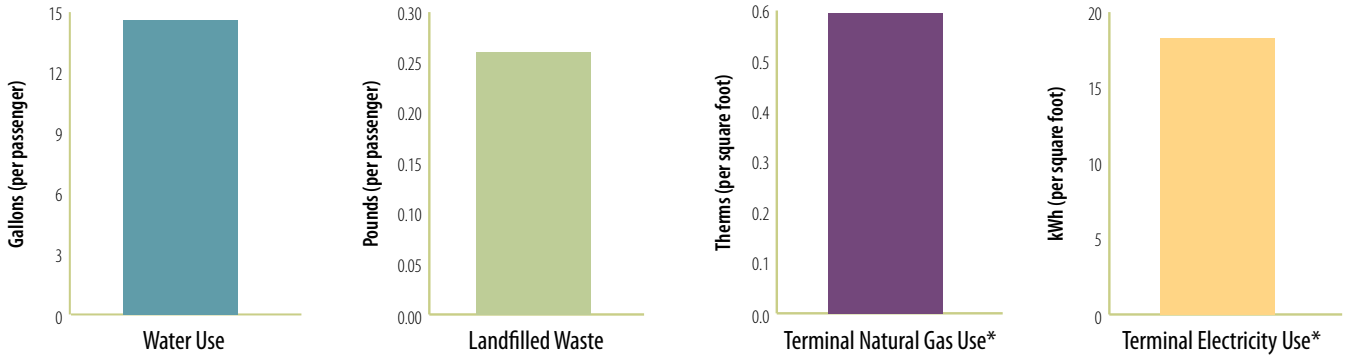
SFO operates the largest recycling program in San Mateo County. The Airport is currently recycling a minimum of 50% of all collected municipal solid waste. In the past three years, SFO has recycled and diverted from landfills a minimum of 89% of the combined solid waste stream, including construction and demolition wastes (C&D). SFO's success in solid waste recycling is demonstrated in the adjacent graphic. The decrease in the recycling rate in 2005 can be accounted for by limited construction activities during that year.

Water Conservation and Water Quality Enhancement

The water conservation program launched by SFO in the 1990s featured automatic shutoff fixtures in nearly every public restroom. The continued success of this program is demonstrated by water use reductions per passenger. Wastewater generated at the Airport is treated on-site at the state-of-the-art sanitary wastewater treatment plant and the industrial wastewater treatment plant. Discharges from these plants in 2006 met or exceeded the quality standards established in the National Pollutant Discharge Elimination System Permits issued for the two plants by the San Francisco Bay Area Regional Water Quality Control Board.

SFO Key Environmental Metrics (2005)

* Only terminal area, a common metric to all airports, is reported.



Noise Abatement

Through SFO's efforts, the number of people living in areas that experience significant aircraft noise dropped from 35,100 in 1976 to 3,298 at the beginning of 2000, a 91% decrease. This area, as defined by the 65 decibel (dB) Community Noise Equivalent Level (CNEL), had also been significantly reduced from 2.2 square miles in 1986 to less than one square mile in 1999. The noise metric used by the Airport and State of California, CNEL, traditionally weights both evening and late-night noise more heavily to account for the added disturbance caused by such noise. At present, through offers of sound insulation and avigation easements, SFO has been able to eliminate incompatible land uses within the noise impact area. Incompatible land uses include schools, hospitals, and day care centers, which could be adversely affected by excessive noise, as defined in Title 21 of the California Code of Regulations. Through its noise insulation program, SFO became the first major airport in California to eliminate all incompatible land uses within the State 65 CNEL noise contour and to operate without a variance.

Hazardous Materials and Waste Management and Remediation

Between 1992 and 2006, the Airport and its tenants carried out an extensive program of site investigation, characterization, and remediation of contaminated soil and groundwater to protect human health and safety, and to prevent the degradation of environmental resources in and around the Airport. The cost of this program was more than $55 million. SFO closely monitors any release of fuels or other contaminants, treats contaminated groundwater prior to disposal, and disposes of contaminated soil in permitted landfills.

Natural Resources Management

Over the years, as mitigation for its Master Plan construction projects, SFO has mitigated 32 acres of on-Airport fill by upgrading 558 acres of wetlands and tidal marshes (including the creation of 84 acres of new wetland) throughout the Bay Area, committing more than $20 million to this effort. Currently, the Airport is investigating the development of additional wildlife habitat at various locations in the Bay Area.

SFO was honored with the 2004 Eagle Award from the International Air Transport Association in recognition of outstanding performance in providing value for money, continuous improvement, and a high level of airline customer satisfaction.

"The management of San Francisco Airport is a model of the spirit of partnership that our industry needs."
- Giovanni Bisignani, IATA Director General and CEO

Airport Excellence Awards

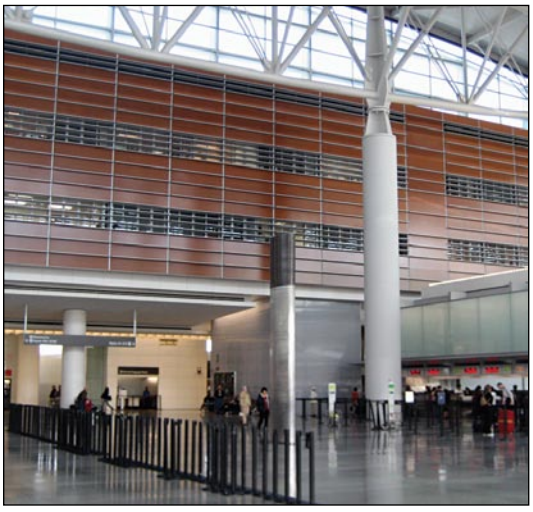
Over the years SFO has received a number of awards reflecting excellence in service, superior facilities, and diligence in environmental achievements. A sampling of these awards is shown below.

- Best Airport in North America Award, CityBlock.com, 2006
- Best Airport in United States Award, Executive Travel Magazine, 2005
- Certified Forest Products Council, Certified Sustainable Product Use Award, 2003
- Honored for Clean Vehicle Policy by Natural Gas Coalition at 9th Annual Achievement Awards, October 2001
- Saluted by Secretary of Transportation Norman Y. Mineta for Leadership in Usage of Alternative Fuel Vehicles, May 2001
- "Clean Air Hero" Award from the American Lung Association was received by SFO Senior Transportation Planner Roger Hooson for work to improve air quality, April 2001
- Governor's Office of Environment, Excellence in Environmental Achievement Award, 1998
- San Mateo County Economic Development Association, Environmental Action Award of Excellence, September 1998
- Airport Council International, Environmental Excellence Award, 1998

Green Buildings and Facilities

The Airport has taken major steps in implementing resource-efficient building principles. All new buildings are required to have low-flow restroom fixtures and automatic-shutoff valves to conserve water. Lighting improvements include replacement of existing fixtures with lamps that produce more light with less energy. All technical specifications for new and remodeled buildings include requirements for recycling construction waste and demolition debris. SFO has an extensive array of sustainable design features in its award-winning International Terminal.

The International Terminal Building features a variety of green building design principles, including abundant natural light.




Mustang Sally
Air-born November 2003
BOEING 747-400
virgi
STOP

3. Climate Change/Global Warming




All City Departments, including the Airport, must play a significant role in reducing the City's contributions to greenhouse gas (GHG) generation. Because carbon dioxide (CO_2) is the most prominent GHG in the atmosphere, it is commonly used as the metric for measuring GHG emissions (other GHG emissions are typically converted to "equivalent CO_2"). This chapter describes current and planned activities to reduce GHG emissions at the Airport.

Policy

Climate change and global warming are issues of significant concern to SFO management. In keeping with the City's pledge, the Airport is committed to reducing GHG emissions.

Goals

The following goals are established by SFO to address global warming concerns:

- Minimize the use of fossil fuels for meeting the energy needs of the Airport by using cleaner sources of energy and by developing new solar and possibly wind power sources.
- To the extent practicable, procure manufactured products made with a relatively lower contribution to global warming.
- Actively participate in meeting the City's goal of reducing GHG emissions to 20% below 1990 levels by 2012, more aggressively than the state-mandated 2020 target.

Aircraft being towed a portion of the way to its departure runway as part of Virgin Atlantic's successful aircraft towing trial carried out in late March, 2007.

Federal/State/Local Mandates

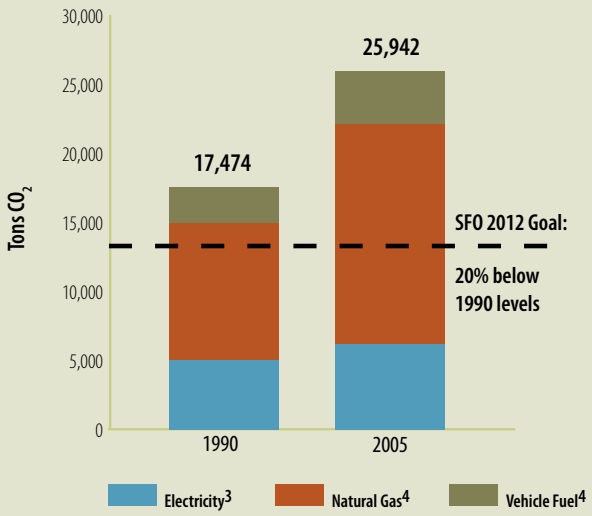
Climate Action Plan

The City and County of San Francisco, the San Francisco Public Utilities Commission (SFPUC), the International Council for Local Environmental Initiatives (ICLEI), and Local Governments for Sustainability jointly developed the San Francisco Climate Action Plan in 2004. The plan establishes the goal of reducing GHG emissions to 20% below 1990 emission levels by 2012; projects the potential impact of global warming on the region; and outlines specific actions in key areas of transportation, solid waste management, energy efficiency, and renewable energy use. The plan also presents steps to aid the City in reducing its emissions.

Global Warming Solutions Act

On September 27, 2006, Governor Schwarzenegger signed Assembly Bill 32 (AB 32), the Global Warming Solutions Act, which requires reducing California's GHG emissions to 1990 levels by 2020. This legislation represents the first enforceable state-wide program in the U.S. to cap all GHG emissions from major

Estimated SFO CO_2 Emissions in 1990 and 2005

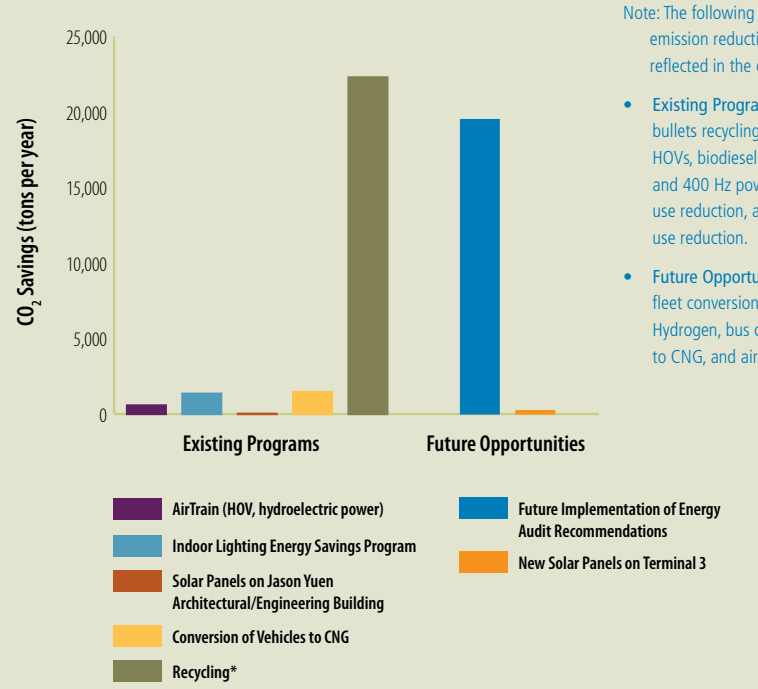


Source: 2005 information based on data collected for the City and County of San Francisco California Climate Action Registry certification. 1990 data is from the baseline inventory conducted for the SF Climate Action Plan.

Note: Data contained here are estimates. Differences in reporting for 1990 data and 2005 data may affect results.

See table notes at end of chapter.

Impact of Ongoing & Future CO_2 Emissions Reduction Initiatives



Note: The following CO_2 emission reductions are not reflected in the chart:

- Existing Programs: bullets recycling, BART and HOVs, biodiesel use, PC-Air and 400 Hz power, paper use reduction, and water use reduction.
- Future Opportunities: fleet conversion to CNG/ Hydrogen, bus conversions to CNG, and aircraft towing.

* Calculated using EPA WAste Reduction Model (WARM): **www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html**

industries and impose penalties for failure to comply with this goal. It requires the California Air Resources Board (ARB) to establish a program for statewide GHG emissions reporting and monitoring, and to enforce compliance with this program. AB 32 also requires ARB to develop regulations and market mechanisms to reach GHG emissions goals. Mandatory caps will be imposed in 2012 for significant sources and other sources will be gradually regulated thereafter to meet the 2020 goals.

Where Are We Now?

Airport operations generate various types of GHGs directly from the use of fossil fuel products, such as diesel fuel, gasoline, and natural gas, and indirectly from the consumption of electricity at the Airport.

The estimated reduction in CO_2 emissions from ongoing and future SFO programs are shown in the adjacent graph.

What Have We Accomplished?

California Climate Action Registry

The City and County of San Francisco, including the Airport, has successfully certified its GHG emissions inventory with the California Climate Action Registry, becoming the first city in the United States to earn the Registry's distinction of Climate Action Leader™. San Francisco is now publicly and voluntarily reporting its GHG emissions under this rigorous registry program. Measuring GHG emissions is a key step in determining how to prioritize climate change initiatives.

The California Climate Action Registry is a non-profit public/private partnership that serves as a voluntary GHG registry to protect, encourage, and promote early actions to reduce GHG emissions. SFO, a City agency, is one of over 100 major companies, cities, government agencies, and non-governmental

organizations to measure and publicly report their GHG emissions through the Registry. Organizations that are willing to meet the accounting standards and third-party certification requirements of the Registry demonstrate their serious intent to address climate change. The Registry has been widely recognized as the gold standard for public reporting of GHGs **(www.climateregistry.org)**.

Zero Emissions 2020 Plan

SFO is participating in the City's Zero Emissions 2020 Plan, which commits the City to developing a clean air plan for public transit. In coordination with San Francisco Municipal Railway (MUNI), "Zero Emissions 2020" focuses on the purchase of cleaner transit buses, including hybrid diesel-electric buses.

AirTrain

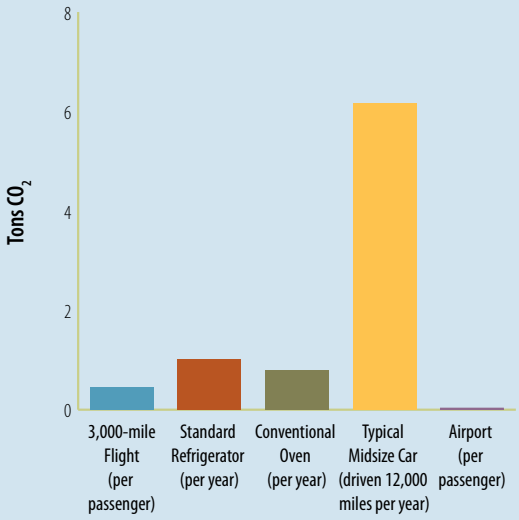
In 2003, SFO inaugurated service on AirTrain, an automated people mover that links the Airport terminals, parking garages, and rental car center. Use of AirTrain, powered primarily by hydroelectricity, dramatically reduced CO_2 and other air pollutant emissions at SFO by eliminating 200,000 shuttle bus trips from the terminal loop annually, preventing the release of approximately 565 tons of CO_2 into the atmosphere each year.[1]

Bay Area Rapid Transit (BART)

As described in **Chapter 5, *Air Quality Enhancement***, completion of the BART extension to SFO in 2003 has resulted in significant reductions in vehicle travel to and from SFO by arriving and departing passengers. BART ridership was 215,000 passengers per month in 2005, and assuming an average automobile road trip of 25 miles per passenger, the BART extension to SFO avoided approximately 64.5 million miles of vehicle travel in the San Francisco Bay Area, resulting in an estimated reduction of 28,947 tons of CO_2 emissions in 2005.[2]

Comparing CO_2 Emissions

Every person's daily activities - from cooling one's house to driving to the supermarket - result in CO_2 emissions that can be calculated. The following graph places the Airport CO_2 emissions in context:



Sources: Mileage and fuel-efficiency statistics compiled by the Environmental Protection Agency; U.S. Department of Energy, 2001 Residential Consumption Survey; Lawrence Berkeley National Laboratory; Conniff, R (2005) Counting Carbons, Discover Magazine, Vol. 26, No.8

"Equivalent CO_2" (eCO_2) is a unit that allows emissions of different GHGs to be added together. For example, one ton of methane (a more potent GHG than CO_2) is equivalent to 21 tons of CO_2.

Source: Climate Protection Campaign, accessed 03/13/07, **www.climateprotectioncampaign.org**

Virgin Atlantic Aircraft Towing Trial

In March 2007, Virgin Atlantic, SFO, Boeing, and FAA jointly conducted the first aircraft towing trial in North America. In this trial, an aircraft was towed from its gate closer to the runway, reducing the time that the engines of the aircraft were running on the taxiway. The goal of the test was to gather data on the feasibility of the aircraft towing program. Virgin Atlantic is preparing the report of the test, but preliminary calculations showed that 595 lbs of jet fuel were saved and 1,709 lbs of CO_2 emissions were prevented without causing delays or congestion. This program has the potential to dramatically reduce CO_2 emissions from aircraft taxiing: if only 30% of departing flights use this protocol, 16,000 tons of CO_2 emissions could potentially be eliminated each year. The Airport will conduct further study on this promising program.

Other Initiatives

SFO has joined the Sustainable Silicon Valley (SSV) organization, which is a multi-stakeholder collaborative initiative with the aim of producing significant environmental improvement and resource conservation in Silicon Valley. **(http://www.sustainablesiliconvalley.org).**

SFO has committed to a variety of other initiatives to reduce its GHG emissions through energy use reduction, increased use of renewable energy, general air emission reduction strategies, and the incorporation of green building principles in SFO building and facility designs. More information on these programs, including specifics on GHG emissions reduction, can be found in the following sections:

- **Chapter 4, *Energy Conservation and Renewable Energy*,**
- **Chapter 5, *Air Quality Enhancement*, and**
- **Chapter 11, *Green Buildings and Facilities*.**

1 Assumes a shuttle bus trip of 3 miles with a fuel efficiency of 10 miles per gallon and a CO_2 conversion factor of 8.55 kg/gallon of fuel (California Climate Action Registry [June, 2006] General Report Protocol, Version 2.1). AirTrain uses 5.4 MWh of primarily hydroelectricity each year, emitting only 0.2 tons of CO_2.

2 Assumes an average fuel efficiency for a light-duty vehicle at 21.0 mpg and a CO_2 conversion factor of 8.55 kg/gallon of fuel. This calculation does not include CO_2 emissions generated from the 1.5-mile BART extension to the Airport.

3 Electricity is supplied by Hetch Hetchy Water and Power system (HHWP) and is predominately generated by hydropower. The emission factor for HHWP in 2005 was 38.14 tons of CO_2/GWh and the same factor was applied to 1990 electricity data in order to facilitate comparison. Airport Commission-specific 1990 electricity usage was extrapolated from total airport commission and tenant electricity usage in 2005 by assuming the ratio of Airport Commission to Tenant electricity usage was the same in 1990 as in 2005.

4 For comparison purposes, natural gas, gasoline and diesel CO_2 emission factors from the California Climate Action Registry were applied to the 1990 data (these factors vary slightly from those used in the SF Climate Action Plan Inventory).

SFO Certifies its Greenhouse Gas Inventory with the California Climate Action Registry

Dear Melissa and the City and County of San Francisco Greenhouse Gas Inventory Team,

I am writing to inform you that we have reviewed your certified 2005 GHG emissions inventory and found it meets the standards of our General Reporting Protocol version 2.1 and Power/Utility Reporting Protocol version 1.0. We are pleased to accept your emissions report into the California Climate Action Registry. For completing this effort, we award you status as a Climate Action Leader. The 2005 entity-level emissions report is now available to the public at **www.climateregistry.org/CARROT/public/reports.aspx.**

Congratulations on completing the reporting and certification processes!

We commend you for your hard work in gathering and calculating the necessary information, and we commend your organization for your participation in this voluntary program. As you know, you are the Registry's only City and County member, and the first local government to report and certify your GHG inventory.

Robyn Camp
Program Director
California Climate Action Registry
www.climateregistry.org

[excerpt from email received by SFO]

4. Energy Conservation and Renewable Energy

Courtesy of: Katherine Du Tiel/SFPUC

Energy conservation and the use of renewable energy yield multiple environmental benefits including slowing climate change by reducing greenhouse gas (GHG) generation and improving air quality. SFO maximizes these benefits through procurement of energy from hydroelectric sources, provision of clean fuel infrastructure at the Airport, and use of alternative sources of power for facilities and equipment, as described in this chapter.

Policy

SFO shall reduce energy use to the maximum extent practicable and seek to utilize clean and renewable energy sources.

Goals

- Reduce overall power use by maximizing energy efficiency.
- Enhance the use of energy supplies based on renewable, environmentally sound resources to the maximum extent practicable.
- Minimize GHG and ozone-depleting emissions associated with energy use at the Airport.

Federal/State/Local Mandates

Assembly Bill (AB) 1007

AB 1007 requires the California Energy Commission to prepare a state plan no later than June 30, 2007, to increase the use of alternative fuels in California (Alternative Fuels Plan).

Resource Efficient Building Ordinance (REB)

The City's REB mandates that energy-efficient fluorescent lights, ballasts, and exit signs must be used at the time of equipment installation or replacement. In addition, automatic timers or light sensors must be used with all new and replacement exterior lighting. See **Chapter 11, *Green Buildings and Facilities***, for additional information on this ordinance.

Where Are We Now?

SFO obtains electricity from the San Francisco Public Utilities Commission (SFPUC) and natural gas through the California Department of General Services, Natural Gas Division and Pacific Gas and Electric Company (PG&E). Most of the electricity supplied to SFO is derived from hydroelectric power generation. The sources of energy for vehicles and equipment include electricity, gasoline, compressed natural gas (CNG), propane, and biodiesel.

Solar Panels Atop the SFO Jason Yuen Architectural/ Engineering Building
Use of this solar-generated energy resulted in the reduction of 8.6 tons of equivalent CO_2 emissions in 2005.[6]

Compressed Natural Gas

CNG is used as a substitute for gasoline or diesel fuel. It is made by compressing methane gas (CH_4) extracted from natural gas. In light duty applications, air exhaust emissions from CNG vehicles are much lower than those from gasoline-powered vehicles. Smog-producing gases, such as CO and NO_X are reduced by more than 90% and 60%, respectively, and CO_2, a greenhouse gas, is reduced by 30 to 40%.[5]

SFO has built two CNG fueling stations that are available for use by airport and non-airport patrons. The two fueling stations feature 15 fast fill hoses supplying 95,000 gasoline equivalent gallons of CNG per month to Airport and public users including commercial vans, hotel courtesy shuttles, taxicabs, and on- and off-Airport parking shuttles. To date, 350 diesel and gasoline-powered vehicles have been replaced with CNG models resulting in savings of 1.15 million gallons of gasoline and diesel fuel per year. In 2006, gross CO_2 emissions reduction associated with the CNG facility totaled 1,460 tons.

"[CNG] is great for the environment; great for air quality. It is so important right now… With gasoline resources being depleted, [CNG] is very important."
–Abdi Mohammed, City Cab driver

5 Alternative Fuels Data Center Natural Gas Benefits, Energy Efficiency and Renewable Energy, U.S. Department of Energy. (10/13/04) Accessed 03/13/2007 at **www.eere.energy.gov/afdc/altfuel/gas_benefits.html**. Last updated 10/13/2004.

2005 Airport Commission Energy Consumption	
Electricity	13.5 million kWh/month
Natural Gas	225 thousand therms/month
Gasoline	14,900 gallons/month
Diesel	5,050 gallons/month
Biodiesel	1,208 gallons/month
CNG	95,000 gasoline gallons equivalent/ month (Includes SFO and other users)

In addition to Airport energy consumption, 65 million gallons per month of jet fuel were delivered to aircraft in 2005.

What Have We Accomplished?

SFO is actively implementing energy conservation programs in conjunction with the SFPUC and the Federal Aviation Administration (FAA). In 2006, SFO saved 5.36 million kWh as a result of energy efficiency projects. Examples of energy conservation programs are described below.

Solar Energy Program

The Airport has installed 2,000 square feet of solar panels on the roof of the Jason Yuen Architectural/ Engineering Building, with a 20 kW capacity, generating 22,300 kWh annually. The power generated by the solar panels is fed into the Airport's power grid, resulting in a reduction of 8.6 tons of equivalent CO_2 emissions each year.[6] In conjunction with the SFPUC, installation of 50,000 square feet of solar panels has begun on the roof of Terminal 3 to further augment solar power generation at the Airport. Upon completion, this project is estimated to produce 560 MWh of electricity per year and reduce equivalent CO_2 emissions by 215 tons per year.[6]

Indoor Lighting Energy Saving Program

Over the past several years, SFO has implemented an indoor lighting improvement program in which incandescent light bulbs have been replaced by energy efficient fluorescent bulbs resulting in an annual saving of 3.5 million kWh of electrical energy, or a reduction of 1,344 tons of equivalent CO_2 emissions in 2006. Future program efforts are expected to result in additional savings of 0.4 million kWh per year or a reduction of 154 tons of equivalent CO_2 emissions per year.[6]

Energy Saving Fluorescent Light in use in Garage G.

Electric Charge Infrastructure and Low Emission Vehicles

The Inherently Low Emission Airport Vehicle (ILEAV) Pilot Program was authorized in April 2000 as part of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR-21). The ILEAV program provided participating airports an opportunity to evaluate various types of mobile and stationary low-emission technologies and to assess the actual performance of these technologies in the airport environment.

SFO was one of 10 airports selected by the FAA for an ILEAV grant in 2001 and received a $2 million award to implement low-emission vehicles and infrastructure at the Airport. Working closely with Airport tenants, this pilot project resulted in:

- Deployment of four natural gas-powered remote parking facility shuttle buses,
- Deployment of 30 electric vehicle fast chargers,
- Deployment of 54 electric aircraft ground service equipment (GSE) including vehicles, and
- Retrofit of 83 gasoline-powered GSE vehicles to propane.

Electric Vehicle Charging at the Airport

As part of the ILEAV program, SFO installed 30 electric vehicle fast chargers and deployed 54 electric GSE.

Renewable Energy Sources

Electricity for both the Airport (including AirTrain) and tenant facilities is supplied by the Hetch Hetchy Water and Power system (HHWP), which is a conglomerate of dams, hydroelectric plants, reservoirs, aqueducts, pipelines, and transmission lines operated by the SFPUC. Water flows by gravity through 150 miles of pipelines, and tunnels from the crest of the Sierras to San Francisco. As the water flows, HHWP puts it to work turning the turbines in four hydroelectric power stations and generating approximately 1.6 billion kWh of renewable energy each year. Hundreds of miles of transmission and distribution lines transmit the electricity from the power stations in the mountains to the San Francisco Bay Area. The Airport consumes 13.5 million kWh per month predominantly from this source. When compared to CO_2 emissions from

Benefits of Using Compact Fluorescent Light Bulbs (CFLs)

- **Efficient:** CFLs are four times more efficient and last up to 10 times longer than incandescent light bulbs. A 22-watt CFL produces about the same light output as a 100-watt incandescent light bulb. CFLs use 50 to 80% less energy than incandescent light bulbs.
- **Less Expensive:** Although costing more initially , CFLs cost less in the long run because they use 1/3 the electricity and last up to 10 times as long as incandescent light bulbs. Due to their longevity, CFLs do not have to be changed as frequently (an advantage in hard-to-reach places) and serve to reduce labor costs.
- **Reduces Air and Water Pollution:** Replacing a single incandescent bulb with a CFL will keep a half-ton of CO_2 out of the atmosphere over the life of the bulb. If everyone in the U.S. used energy-efficient lighting, 90 average size power plants could be retired. Saving electricity reduces CO_2 emissions, sulfur oxide, and high-level nuclear waste.
- **High-Quality Light:** Newer CFLs give a warm, inviting light instead of the "cool white" light of older fluorescent lights. They use rare earth phosphors for excellent color and warmth. New electronically-ballasted CFLs do not flicker or hum.
- **Versatile:** CFLs can be applied nearly anywhere that incandescent lights are used. Energy-efficient CFLs can be used in recessed fixtures, table lamps, track lighting, ceiling fixtures, and porch lights.

Source: Energy Efficient Lighting (n.d.) Retrieved March 14, 2007 at **www.eartheasy.com/live_energyeff_lighting.htm#1c**

a plant using fossil fuels, such as from the Western Systems Coordination Council (WSCC) , this represents a reduction of 56,050 tons of CO_2 emissions per year.[6]

Energy Audit

In February 2007, SFO completed a preliminary Energy Audit in cooperation with the SFPUC. The effort was part of SFPUC's Clean Energy Clean Air Program to reduce operating costs and improve energy efficiency at the Airport. Implementing recommendations from this audit could result in savings of 37 million kWh of electricity per year and 897,000 therms of natural gas per year, yielding a reduction in CO_2 emissions of 19,500 tons per year. This would represent 53% of San Francisco's municipal Climate Action Plan CO_2 reduction goal achieved by energy efficiency . These environmental benefits would be equivalent to planting 16,250 acres of forest or taking 3,100 cars off the road.[7] Other benefits to be derived from implementing the audit recommendations include improving the reliability of lighting and air conditioning equipment, reducing maintenance costs, and improving air quality.

6 Assumes an emissions conversion factor of 384 tons equivalent CO_2/GWh. This is based on the WSCC annual average for 2006. This coefficient is used by ICLEI for California and by the San Francisco Climate Action Plan. This is being used for reporting the overall greenhouse gas emissions reduction effect of energy efficiency and renewable projects in San Francisco (municipal and community) and will be used for all other reporting. This coefficient will change as the state resource mix changes and will be updated annually.

7 City and County of San Francisco Public Utilities Commission Power Enterprise (2007) Energy Efficiency Project Status Report, Preliminary Energy Audit Results.

Hetch Hetchy Water and Power system dam.

Courtesy of: Katherine Du Tiel/SFPUC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5. Air Quality Enhancement

SFO has implemented a comprehensive air quality enhancement program, addressing air quality impacts from aircraft emissions and associated ground service equipment, cars and buses driving in and around the Airport, and fuel and energy use at the Airport. As air emissions are closely linked to ozone and greenhouse gas generation, SFO's air quality enhancement initiatives not only benefit the health of the local community but also help to reduce global warming. The air quality benefits of transportation system improvements are described in this chapter.

Policy

SFO shall continue to encourage the use of public transit, and, to the maximum extent practicable, require the use of increasingly efficient vehicles and engines, and the use of clean fuels.

Goals

- Use alternative clean fuels such as compressed natural gas (CNG), propane, biodiesel, and electricity for vehicles and equipment.
- Retrofit existing diesel-powered vehicles and equipment to reduce emissions.
- Reinforce SFO's 2000 Clean Vehicle Policy that requires 100% clean vehicle use by 2012 where practicable.
- Develop staged intermediate air quality enhancement goals for Airport tenants and commercial entities serving the Airport.
- Minimize air emissions by increasing the use of clean energy sources, developing additional solar energy supplies, and evaluating the possible use of wind power.

Federal/State/Local Mandates

The emission sources at the Airport are regulated by federal, state, or regional agencies depending on the type of source.

California Air Resources Board

Established in 1967, the California Air Resources Board (ARB) regulates pollutant emissions to the atmosphere, conducts research into the causes of and solutions to air pollution, and systematically addresses the serious problems caused by motor vehicles, which are the major cause of air pollution in the state. The ARB is a department of the California Environmental Protection Agency and regulates all emission sources at the Airport with the exception of aircraft engines. The U.S. EPA regulates pollutant emissions from aircraft engines.

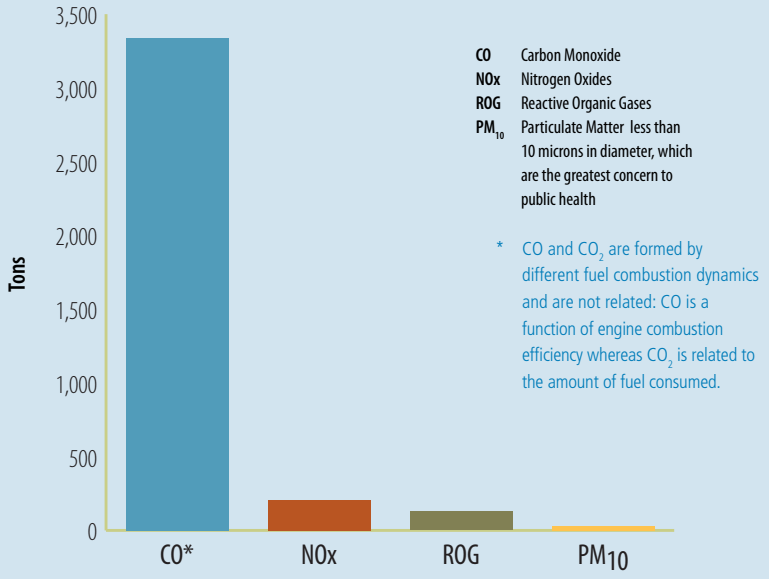
CNG Dispensing Station
SFO has the largest publicly accessible CNG refueling complex in northern California.

BART Extension

"BART was very helpful. Really easy to use and really efficient to get downtown. I always look for the most economical means of traveling from airports."
– BART passengers traveling to catch their flight after a vacation in San Francisco.

Completion of the BART extension to SFO in 2003 has resulted in significant reductions in vehicle travel to and from SFO. BART ridership was 215,000 passengers per month in 2005. Assuming an average automobile road trip of 25 miles per passenger, the BART extension to SFO resulted in an estimated reduction of 64.5 million miles of vehicle travel in the San Francisco Bay Area in 2005. The air emission reductions that resulted from reduced vehicle travel are shown below.

2005 Gross Air Emission Reductions from BART Extension to SFO



Bay Area Air Quality Management District

In 1992, the Bay Area Air Quality Management District (BAAQMD) adopted Regulation 13 that mandates that large employers implement programs to increase average vehicle occupancy for commute trips to reduce traffic congestion, improve air quality, and reduce energy consumption.

In 1996, the California State Legislature enacted a law prohibiting air districts and local agencies from requiring employers to implement employee trip reduction programs. This legislation superseded Regulation 13; however, SFO's Trip Reduction Rule is retained voluntarily because the Airport Commission and staff are committed to implementation of SFO's Transit-First Policy. Moreover, the Trip Reduction Rule program remains as a key environmental mitigation measure for SFO's terminal expansion program.

Clean Air Vehicle Policy

SFO's Clean Air Vehicle Policy, adopted in 2000, was not mandated by federal or state regulations or by local ordinance. However, implementation of the Clean Air Vehicle Policy is consistent with the goals and objectives of the City and County of San Francisco and the BAAQMD to improve regional air quality. The Policy states that 100% of vehicles in applicable fleets should be powered by clean fuels by the year 2012, assuming clean air vehicles are available, reliable, and economical.

Resource Efficient Building Ordinance (REB)

The City's REB mandates that indoor air quality maintenance plans must be prepared for new construction and major renovation projects. Construction contracts must require the prevention of moisture contamination, and the removal of building materials contaminated by moisture, overseen by an independent industrial hygienist. See **Chapter 11, *Green Buildings and Facilities***, for additional information on this ordinance.

Where Are We Now?

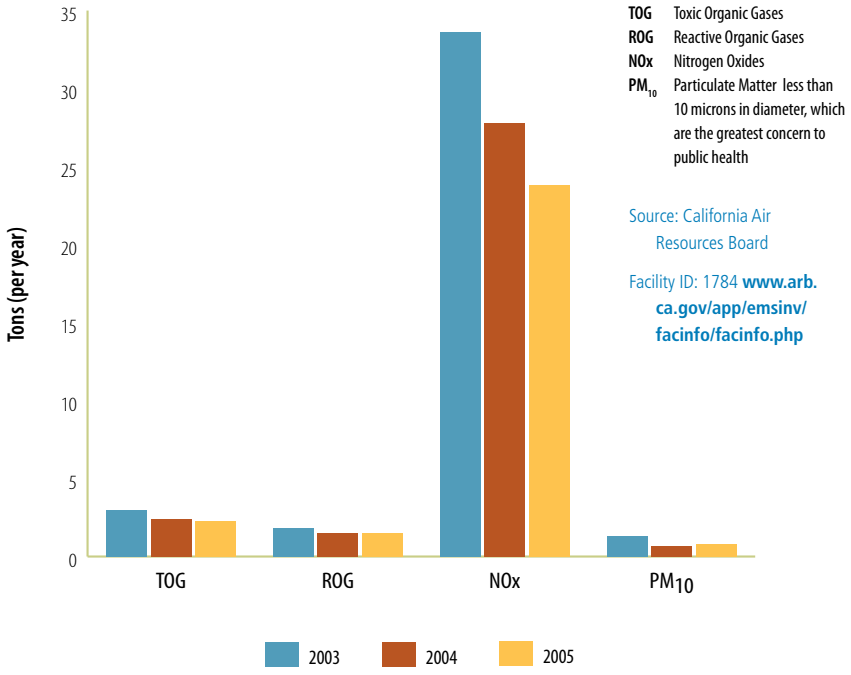
Air Emissions

Air quality conditions in the San Francisco Bay Area are in compliance with the federal and state standards except for ozone and particulate matter. For these air quality parameters the Bay Area is designated by the U.S. EPA as a non-attainment area, requiring the submittal of an implementation plan by the state to bring the area into compliance with the standards. ARB is currently drafting the latest implementation plan for submittal to the U.S. EPA.

Emission Inventory Results

Current air pollutant emissions from the various stationary sources at the Airport, excluding the tenant operations, are summarized below.

Estimated Historical Annual Air Pollutant Emissions from Stationary Sources



What Have We Accomplished?

SFO's comprehensive air emission reduction program addresses the many sources of air emissions: aircraft ground service equipment, on-Airport operations such as refueling and heating/cooling, and cars and other vehicles accessing the Airport.

Key ground transportation-related air quality improvement program elements include:

- High Occupancy Vehicle (HOV) Ground Access Improvement program,
- Transit-First program,
- Employee Trip Reduction program,
- Clean Air Vehicle Program/Alternative Fuels program, and
- Airside Operations and Facility Improvement program.

HOV Ground Access Improvement

- **AirTrain:** As described in **Chapter 3, *Climate Change/ Global Warming***, SFO inaugurated service on AirTrain in 2003. AirTrain eliminated 200,000 shuttle bus trips from the terminal loop annually, reducing both traffic congestion and the emissions created by traditionally fueled vehicles.
- **Bay Area Rapid Transit (BART):** BART began serving SFO in 2003, connecting the Airport with downtown San Francisco, the Peninsula and much of the East Bay. Customers using the BART system are able to exit the Airport BART station and walk directly to the international airline ticket counters or connect to AirTrain (one level up at a shared AirTrain/ BART Station) to reach the domestic terminals.
- **Caltrain:** A BART cross-platform connection to Caltrain at the Millbrae station provides direct access from the Peninsula's key rail route to the Airport terminals.

Transit-First Program

SFO is a leader among U.S. airports in the use of shared ground transportation for Airport access. SFO's Transit-First Policy promotes the use of public and private HOV for traveling to the Airport. This results in improving regional intermodal ground access between the Airport and regional rail, bus, and waterborne transit systems. The Transit-First Policy gives priority to public and private high occupancy transportation modes. This policy is designed to reduce traffic congestion and maximize the convenience of shared transit. The 2006 Air Passenger Survey indicated that 47% of air passengers used public transportation in the form of BART, Caltrain, SamTrans, door-to-door vans, taxis, limousines, charters, or Airporter bus service to access the Airport. SFO intends to sustain this high level of public transit use and to continue the development and implementation of additional innovative and environmentally responsible programs in this arena.

A portion of SFO's CNG-powered bus fleet awaiting deployment.

Employee Trip Reduction Program

In 1993, SFO added a "Trip Reduction Rule" to the Airport's official Rules and Regulations aimed at reducing employee trips to the airport in single occupancy vehicles. The Trip Reduction Rule met the requirements of BAAQMD Regulation 13 and also complied with a development agreement between SFO and the surrounding communities relating to SFO's Master Plan for Terminal Expansion.

More than 18,000 people work at SFO on a round-the-clock schedule. SFO's Employee Trip Reduction Program includes the following elements:

- New employees are notified of the Airport's Trip Reduction Rule.
- SFO conducts a biennial survey of all employees regarding their commuting habits.
- SFO requires that all employers with 100 or more employees based at SFO appoint an Employee Transportation Coordinator (ETC), and prepare and implement a Trip Reduction Program.
- Ground transportation information is provided at information booths in the terminals and through a public media campaign and curbside program.
- Financial incentive programs are in place for the use of some types of public transport by SFO employees.

Clean Air Vehicle Program/Alternative Fuel Program

SFO adopted a Clean Air Vehicle Policy in 2000. Aggressive target dates were set for the clean vehicle transition. The policy mandated that 50% of the vehicles in applicable fleets at SFO use clean fuels by 2005 and 100% by 2012. Clean fuels used in this program include CNG, propane, electricity, and biodiesel. The fleets subject to this policy include hotel and parking courtesy shuttles, door-to-door vans, taxis, and airline crew shuttles, among others. On the airfield, vehicles such as baggage tractors, belt loaders, and aircraft pushback tractors are powered by clean fuels.

CNG Fueling Station

"[CNG] definitely means cleaner air. Especially where I work [at the Airport], reduced air emissions are good."
–Arthur Lubag, Contractor, using one of the Airport's two CNG fueling stations.

The Airport met the 2005 goal for hotel and parking courtesy shuttle vehicles and public transit, and expects to meet the 2012 goal for door-to-door vans and other categories of regulated vehicles. In 2003, the entire category of rental car shuttles was virtually eliminated and replaced with the nearly zero emission AirTrain system. The lack of replacement vehicle acquisition funds following the events of September 11, 2001 prevented the 2005 goal from being reached in certain categories such as Airport-owned vehicles.

SFO is progressing in its clean vehicle transition with the assistance of regional, state and federal grant funding. The Airport has secured $6 million in vehicle acquisition incentives from the BAAQMD, San Francisco Bay Area Metropolitan Transportation Commission, and San Francisco County Transportation Authority for vehicles operating to and from the Airport. Most of this funding has been spent for commercial passenger transportation services at SFO. These services use vehicles that accumulate high mileage and contribute significant reductions in emissions when powered by alternative fuels. The Air District typically pays the total cost, or a significant portion of the cost, of converting a vehicle from conventional fuel to CNG. In addition, $1 million has been secured from the FAA for conversion of airfield vehicles, infrastructure, and on-Airport shuttles.

Financial Incentives

The Airport also uses financial and non-financial incentives to encourage alternative fuel use by fleet operators, including preferential trip fees for courtesy shuttles and "head of the line" privileges for CNG taxicabs. Incentives for hotel courtesy vehicle trip reduction have cut miles traveled by these vehicles by one-third. The Airport levies high fees on those operators that do not comply with the requirements of the Clean Vehicle Policy.

SFO encourages airlines to replace diesel-powered aircraft ground support equipment with electric- or propane-powered equipment. It promotes the use of 400 Hz gate power and pre-conditioned air instead of conventionally-fueled ground power units and aircraft auxiliary power units. The Airport also offers a pre-tax deduction service to employees who opt to purchase monthly passes on BART, Caltrain, or other Bay Area public transit alternatives.

FAA ILEAV Pilot Program

In 2001, SFO was selected as one of 10 airports around the country to participate in an innovative program to improve air quality by encouraging the use of alternative fuel vehicles.

The Inherently Low-Emission Airport Vehicle (ILEAV) program has substantially reduced ozone and carbon monoxide emissions at airports located in non-attainment areas. The program is estimated to have eliminated 1,100 tons of ozone pollutants and 2,300 tons of carbon monoxide emissions per year in the San Francisco Bay area alone. Under the ILEAV program,

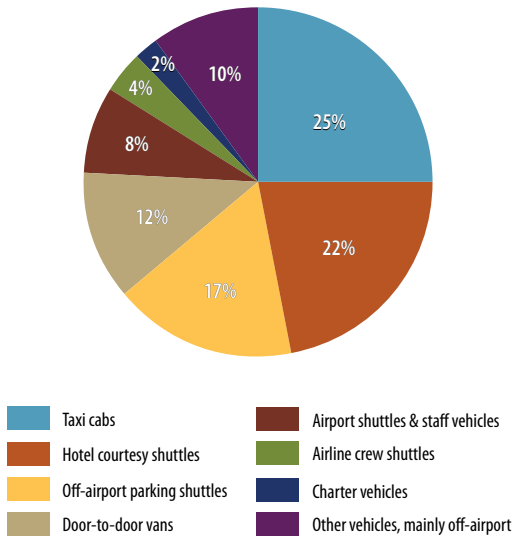
One of three electric vehicle recharging units available for public use in International Garage G.

the U.S. Department of Transportation (DOT) provided 50% of the cost of low-emission vehicles as well as the cost of construction of refueling and recharging stations, up to a total of $2 million for each airport. SFO used its funds to acquire 142 low-emission vehicles and airfield equipment, including baggage tugs, belt loaders, and on-road vehicles, and 30 new electric charge ports.

Alternative Fuel Infrastructure and Equipment

- **Compressed Natural Gas:** The majority of on-road alternative fuel vehicles at the Airport operate on CNG. To facilitate the CNG shift, SFO established the largest public access CNG refueling complex in Northern California. At these facilities, natural gas supplied by Pacific Gas and Electric (PG&E) pipelines is compressed to 4,500 pounds per square inch. The combined fueling stations feature 15 fast fill hoses supplying 95,000 gasoline-equivalent gallons of CNG per month to customers. Trillium USA and Clean Energy operate the two fueling stations. To date, more than 400 diesel and gasoline-powered vehicles have been replaced with CNG models, resulting in savings of 1.15 million gallons of gasoline and diesel fuel per year. In 2006, gross CO_2 emissions reduction associated with the CNG facility totaled 1,460 tons. CNG vehicle CO_2 emissions are about 30% less than gasoline vehicle emissions per mile traveled.
- **Electric Vehicles**: SFO's Clean Air Vehicle Policy extends to airfield vehicles and equipment. The move to electrify ground service equipment vehicles started more than a decade ago. Approximately 1,000 non-road capable vehicles access the Airfield. Of this total, about 270 electric vehicles are in use, resulting in savings of 500,000 gallons of diesel fuel per year.
- **Hybrid-Electric Vehicles:** Taxi fleets are expanding their use of hybrid-electric cars, and the Taxi Commission is currently developing a policy on this issue. There are now 35 hybrid-electric cabs and about 130 CNG cabs in the City fleet. Hertz and Fox Rent-a-Car have a limited number of hybrid-electric vehicles for rent, including the Toyota Prius. The number of hybrid-electric vehicles for rent is expected to increase significantly in the future.
- **Biodiesel Use:** Since 2001, SFO has gradually retrofitted diesel-engine parking shuttle buses to use B-20 soy-derived biodiesel (20% soy fuel, 80% diesel fuel). Currently all 19 Airport-owned shuttle buses are using the B-20 biodiesel with diesel fuel savings of 35,000 gallons per year.
- **Electric Vehicle Charging Stations:** Three electric vehicle recharging units are located in International Garage G and are available for public use.
- **Hydrogen-CNG Blend:** Hydrogren-CNG blend (HCNG) has been tested in modified vehicles by

CNG Fuel Demand by Operator Type



Two SFO electric-powered vehicles, charging while not in use.

the U.S. Department of Energy. SFO, in conjunction with the San Mateo City/County Association of Governments, is exploring the use of a hydrogen-CNG blend for use in internal combustion engines. This would further reduce CO_2 emissions beyond the reduction achievable by CNG use alone. The blend would be dispensed from a special pump at one of SFO's CNG stations.

Clean Air Vehicle Program Successes

Clean air vehicle use substantially reduces traditional vehicle emissions. Despite the post-2001 air traffic downturn which seriously delayed vehicle replacements in many cases, SFO has met the conversion targets for public transit vehicles, hotel courtesy shuttles, off-Airport parking shuttles, and aircraft ground support equipment. The Airport is working with the Taxi Commission to further expand alternative fuel use by taxis. By 2012, SFO plans to replace 100% of conventional vehicles with clean air vehicles, where viable clean fuel options are available.

Clean Fuel Vehicle Count

By the end of 2007, the number of vehicles using CNG, propane, electric and other alternate fuels at SFO is anticipated to be as follows:

- 100 highway coaches (filtered exhaust diesel),
- 23 transit buses (11 CNG, 12 filtered exhaust diesel),
- 160 minibuses (135 CNG, 25 filtered exhaust diesel),
- 100 door-to-door, charter, and Courtesy Vans (CNG),
- 200 taxicabs (165 CNG, 35 hybrid-electric),
- 15 limousines (hybrid-electric),
- 30 rental cars (hybrid-electric),
- 400 airfield vehicles (230 electric, 170 propane),
- 36 Airtrain rail cars (electric),
- 110 BART cars for Airport line (electric), and
- 63 staff and utility vehicles (29 CNG, 28 electric, 6 hybrid-electric as of February 2007, with plans to add 48 new CNG vehicles by January 2008).

There are an estimated 2,500 limousines and 1,000 charter vehicles that visit SFO infrequently that will be encouraged by SFO to use alternative fuels or clean air vehicles as the respective products become commercially available. Including limousine and charter vehicles, there are approximately 6,500 permitted commercial passenger-carrying vehicles in the SFO fleet.

Airside Operations and Facility Improvements

Over the past several years SFO has implemented a number of measures to achieve efficient use of natural resources and to reduce the production of waste products and emissions, including the modification of operating procedures and the use of technologically-advanced equipment.

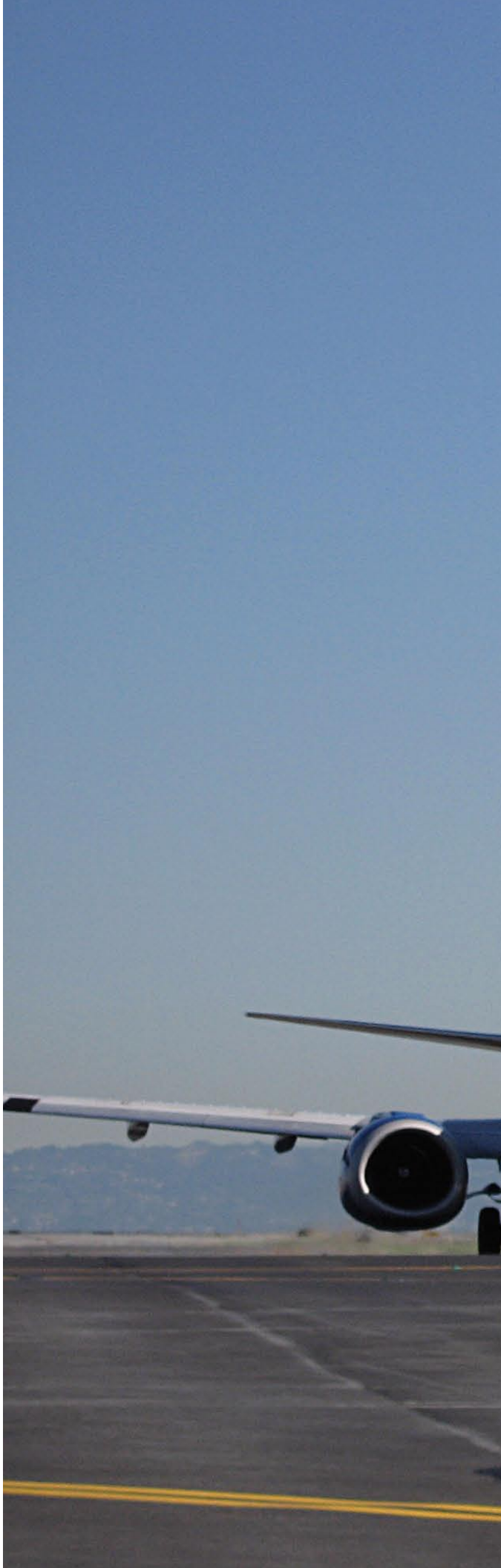
Procedures employed by aircraft operators can reduce fuel consumption and emissions associated with aircraft ground operations. SFO does not currently have any mandatory programs requiring fuel efficiency or emission reduction operations by air carriers. However, most airlines have internal policies aimed at reducing fuel consumption that also result in associated reductions in air emissions. SFO encourages airlines and ground service equipment operators to institute environmentally and economically beneficial operational procedures, such as:

- Single-engine taxiing of aircraft,
- Airside alternative fuel infrastructure,
- Conversion to clean fuel ground service equipment,
- Route planning, altitude selection, and reduced fuel loading for aircraft weight control, and
- Towing aircraft between terminals and runways.

Airside Alternative Fuel Infrastructure

SFO has installed ground based energy supply and service facilities to curtail the use of auxiliary power systems for aircraft electricity and air conditioning:

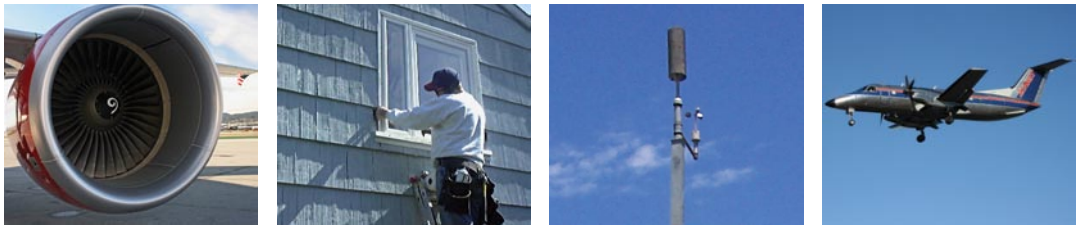
- 400 Hz Ground Power is provided at International Terminal Gates and at numerous gates at Boarding Areas B, E, and F to reduce the use of aircraft auxiliary power units.
- Procurement and use of portable Ground Power Units (GPUs) by Airport tenants is encouraged by the Airport when Ground Power is not available at the gate.
- Pre-conditioned air is provided at International Terminal Gates to reduce use of aircraft auxiliary power units.
- It is Airport Policy to include installation of pre-conditioned air and 400 Hz power at all new facilities.



Aircraft stationed at a gate using SFO-supplied pre-conditioned air.
SFO provides pre-conditioned air at International Terminal Gates to reduce use of aircraft auxiliary power units and minimize air emissions.

Aircraft taxiing to its departure runway.
To reduce air emissions, SFO encourages airlines and pilots to use only one engine when taxiing.

6. Noise Abatement



Through an aggressive home insulation program, San Francisco International Airport became the first major airport in California to reduce its state-defined noise impact area from more than 15,000 residences to zero.

SFO installed its first noise monitoring system in 1975. Today, the system consists of 29 noise monitoring sites located in communities surrounding the Airport. Current technology enables not only the monitoring of noise levels, but also the ability to correlate noise events and complaints with individual flight operations and aircraft types. In 1983, SFO became the first airport in the country to prepare a comprehensive noise abatement and land use compatibility plan. By conducting a Federal Aviation Regulation (FAR) Part 150 Noise Study SFO was an early recipient of noise compatibility funds. These funds were used to implement a Noise Insulation Program serving more than 13,000 homes. This chapter describes the Airport's efforts to reduce the impacts of noise.

SFO Air Traffic Control (ATC)

In order to reduce noise impacts for southern San Mateo County residents, SFO successfully worked with ATC to achieve a 1,000-foot increase in altitude for arriving aircraft, thereby reducing noise impacts on nearby residents.

Policy

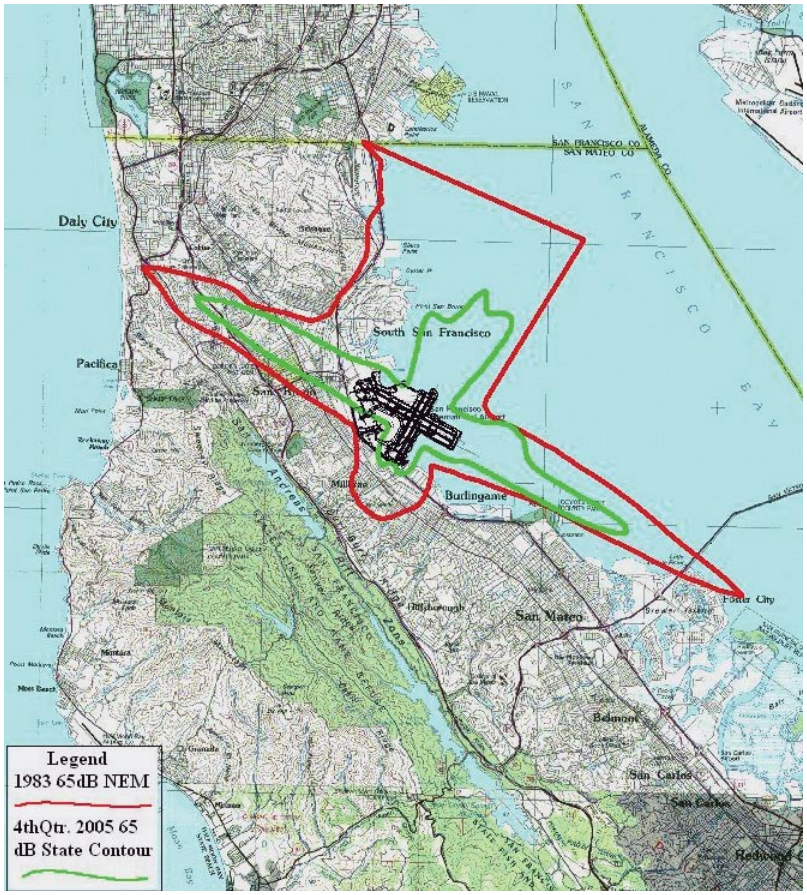
SFO shall continue to reduce noise impacts on the surrounding communities by encouraging the use of quieter aircraft and advanced final approach procedures by airlines, as well as by other means within the control of the Commission.

Goals

- Provide information regarding aircraft operations to the general public.
- Provide technical support to the San Francisco International Airport/Community Roundtable.
- Serve as the focal point for community outreach in its efforts to reduce the impacts of aircraft noise on the surrounding communities.
- Implement innovative technologies to better serve the communities impacted by aircraft noise so that SFO continues to serve as a national leader in aircraft noise abatement programs.

Land Use Compatibility with Aircraft Noise

The FAR Part 150 designates noise compatibility areas by land use. Residences are considered compatible with Airport noise if the Community Noise Equivalent Level (CNEL) is below 65 dB. If a residential home is sound insulated, its compatibility threshold is raised to 70 dB. Commercial land uses are compatible with CNEL of 80 dB or below. The noise metric used by SFO and the State of California, CNEL, gives both evening and late night noise a heavier weight to account for the added disturbance caused by such noise.



This figure shows the estimated 1983 and 2005 65 dB aircraft noise contours, demonstrating a significant reduction in noise impact around SFO.

Federal/State/Local Mandates

California Code of Regulations Title 21, Subchapter 6

This mandate describes noise standards by defining metrics terminology and requirements regarding compatible land use. SFO has been designated by San Mateo County as a "Noise Problem Airport" requiring noise monitoring and the filing of a quarterly noise report with the State Division of Aeronautics.

Where Are We Now?

For more than 20 years, SFO has been a national leader in noise reduction programs and policies. Through these efforts, the number of people living in the 65 dB CNEL contour, the area defined as experiencing significant aircraft noise, had dropped from 35,100 in 1976 to 3,298 at the beginning of 2000, a 91% decrease. Today, through offers of sound insulation and avigation easements, SFO has been able to eliminate all incompatible land uses, as defined in Title 21 of the California Code of Regulations, within the noise impact area. Consequently, SFO became the first major airport in California to succeed in eliminating all incompatible land uses within the State 65 dB CNEL contour and to operate without a variance.

Noise impact of aircraft overflights are shown in the adjacent figure which depicts the estimated 1983 and 2005 65 dB aircraft noise contours around the Airport. Due to its geographic location and the landing and takeoff patterns at SFO, most of the aircraft noise impact occurs over the Bay with a small portion of the 65 dB CNEL contour overlapping the municipal areas of San Bruno and South San Francisco.

What Have We Accomplished?

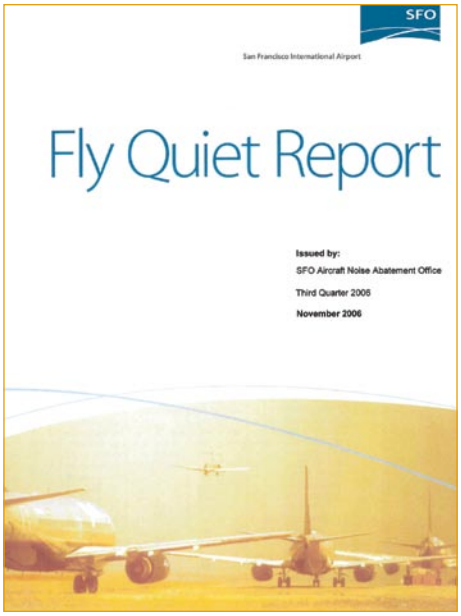
The Noise Abatement Office is responsible for implementing a comprehensive Aircraft Noise Abatement Plan and for identifying noise reduction

The Fly Quiet Program and the Jon C. Long Fly Quiet Awards

San Francisco International Airport's Fly Quiet Program is an Airport Community Roundtable initiative implemented by the Aircraft Noise Abatement Office. The purpose of this program is to encourage individual airlines to operate as quietly as possible at SFO. The program promotes a participatory approach in complying with noise abatement procedures and objectives by grading an airline's performance and by making the scores available to the public via newsletters (**www.flyquietsfo.com**), publications, and public meetings. Fly Quiet encourages implementation of new noise abatement initiatives by recognizing and publicizing active participation.

Jon C. Long
Noise Abatement Officer,
SFO Noise Abatement Office, 2000-2003

Mr. Long joined SFO as the Noise Abatement Officer in 2000. Mr. Long brought his unique management style to SFO, creating a successful dynamic within the Noise Office, with the citizens of San Mateo and San Francisco Counties, and with the San Francisco International Airport/Community Roundtable. With a background in noise abatement at Sacramento International Airport and extensive experience as a pilot in the Air Force, Mr. Long's career spanned many aspects of noise abatement and aviation. Mr. Long worked tirelessly on implementing the Fly Quiet Program at SFO. His dedication to this project is evident in its success. After his untimely passing in June 2003, the Annual Noise Abatement Awards, issued by the Airport/ Community Roundtable to qualifying airlines, are named in his honor.



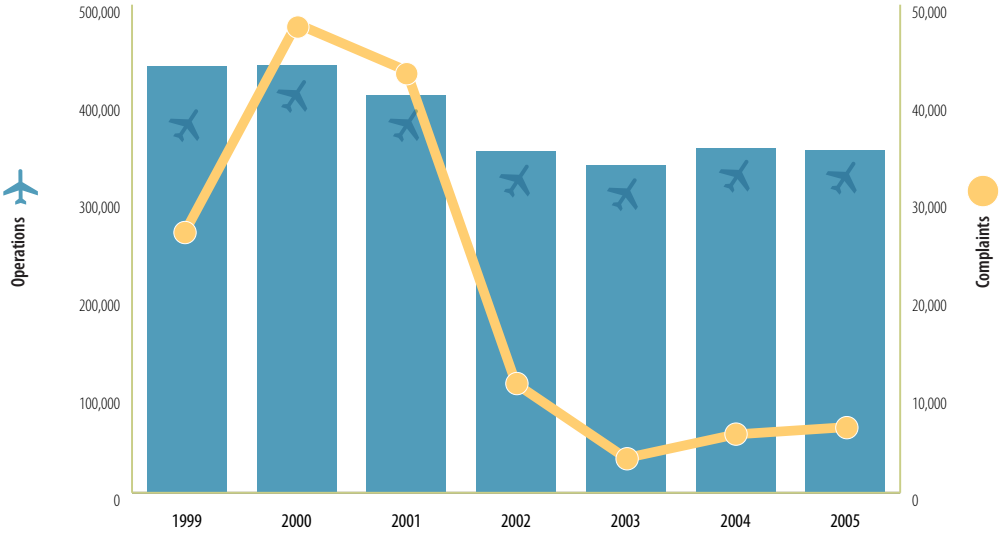
initiatives. The Office works collaboratively with the Federal Aviation Administration's (FAA) ATC tower and the airlines to reduce nighttime noise and explore innovative final approach procedures (such as gliding) for minimizing noise generation.

The Fly Quiet Program

This initiative, implemented by the Aircraft Noise Abatement Office, encourages individual airlines to operate as quietly as possible at SFO. The program promotes a participatory approach in complying with the noise abatement procedures. As part of the program the Airport staff generates a Fly Quiet Report, which provides airline scores on the following elements:

- Fleet noise quality,
- Exceedances of allowable noise levels,
- Nighttime preferential runway use,
- Shoreline departure frequency,
- Gap departure quality, and
- Foster City Arrival Rating.

SFO Operations vs. Noise Complaints (1999-2005)



These quarterly Fly Quiet Reports are available for viewing at **www.flyquietsfo.com/FactsSheets.htm.**

Noise Complaint Program

The SFO Noise Abatement Office maintains a database of all complaints received regarding noise nuisance from nearby communities. These complaints are used to research the aircraft flight operations leading to the complaints. The data derived are then shared with aviation industry professionals to develop operational changes that could reduce or eliminate the nuisance conditions.

Aircraft Noise Monitoring System

SFO maintains a state-of-the-art permanent noise monitoring system to keep track of noise levels in communities around the Airport. SFO has deployed 29 noise monitoring stations located around the Bay Area. Information produced from the Noise Monitoring System is central to the operations of the Aircraft Noise Abatement Office, which installed a new Aircraft Noise Monitoring System in 2006, replacing the previous monitoring system which had been in operation for over 20 years. The enhanced system allows the staff to correlate noise events and complaints to individual flight operations and aircraft types and includes new digital noise monitoring and additional noise monitors in San Mateo County communities. In addition, the system provides more technical information for enhanced data analysis and real-time collection of aircraft flight track data. Live flight movement and aircraft paths are available for viewing at **live.airportnetwork.com/sfo.**

Taking an Aggressive Approach on Nighttime Operations

SFO was one of the first airports in the country to begin a FAR Part 161 study (Notice and Approval of Airport Noise and Access Restrictions) to reduce aircraft noise during nighttime hours. Although this study was not completed, it resulted in a voluntary reduction of nighttime operations by airlines.

San Francisco International Airport/Community Roundtable

The San Francisco International Airport/Community Roundtable is one of the longest established community-based airport noise mitigation organizations in the country, and is an example of neighborhood groups working cooperatively with the Airport and the aviation industry to reduce noise impacts.

Established in 1981, the Roundtable's 45 representatives and alternates are elected officials representing the City and County of San Francisco and San Mateo County, as well as advisory members, airline chief pilots, and FAA staff. SFO Airport Director John L. Martin and his staff support and attend these monthly meetings, at which public discussion focuses on airport noise abatement activities.

More information on the San Francisco International Airport/Community Roundtable can be found at **www.sforoundtable.org.**

Noise Abatement
Sound insulation being installed in a house within the 65 dB CNEL noise contour.

SFO Noise Monitor
The Airport has 29 noise monitors located around the Bay Area.

Coordination with FAA Air Traffic Control

By working with the FAA ATC, SFO has been able to suggest changes to the approach and departure procedures in order to reduce noise impacts for southern San Mateo County residents. SFO successfully worked with ATC to achieve a 1,000-foot increase in altitude for arriving aircraft. Additionally, an increase of altitude for transpacific arrival routes from 6,000 to 8,000 feet above Mean Sea Level over the communities near the Woodside navigational aid resulted in a higher flight altitude over the entire southern San Mateo County area, thereby reducing aircraft noise over the community.

Noise Reduction Feasibility Study

San Francisco International Airport's Aircraft Noise Abatement Office is working with the Boeing Company, the FAA, and United Airlines on "Oceanic Tailored Arrivals" (OTA) to reduce noise from arriving flights from the Pacific Rim.

Trials of the procedure were made in August/September, 2006 and December, 2006/January, 2007, and the data are now being evaluated. The strategy is based on a simple concept: a gliding aircraft with engines at near idle is quieter than an aircraft changing altitudes and engine thrust multiple times during an approach.

Airlines are excited about the concept of OTA because it could save fuel, ensure more accurate arrival times, and potentially simplify the final approach following a long (12+ hours) trans-Pacific flight. Air traffic controllers believe the OTA will assist them in planning ideal descents and improve efficiency during high traffic periods. Communities along the arrival routes would also benefit because the aircraft flying an OTA would operate at reduced power and with few or no drag-inducing and noise making surfaces (flaps, speed brakes, and landing gear) deployed. Air pollution would also be reduced by reducing fuel use.

7. Water Conservation and Water Quality Enhancement

Water conservation makes existing freshwater supplies from the Sierra Nevada mountains and the Alameda and Peninsula watersheds go further and protects the natural state of watersheds. Using less water also relieves pressure on wastewater treatment facilities and reduces energy consumption for water heating or cooling. Water conservation also contributes to habitat protection and generates cost savings. Wastewater treatment and stormwater runoff management at the Airport contribute to the enhancement of water quality in the lower San Francisco Bay where these effluents are discharged. Both water conservation initiatives and water quality protection are discussed in this chapter.

Policy

SFO shall minimize potable water use by deploying water efficient equipment and facilities and shall contribute to improving water quality in the lower San Francisco Bay through state-of-the-art wastewater treatment and enhanced stormwater management.

Goals

- Maximize water conservation and minimize water use and waste.
- Strive to expand the use of the treated wastewater for landscaping irrigation and gray water uses, thereby reducing the demand for potable water.
- Enhance the management of stormwater runoff and non-stormwater discharges to the Bay.
- Discharge treated wastewater that meets or exceeds regulatory standards.

A high level of wastewater treatment protects the Bay and the natural resources surrounding the Airport.

Federal/State/Local Mandates

Clean Water Act

Established in 1972, the Clean Water Act prohibits the discharge of pollutants to the waters of the United States without a permit. National Pollutant Discharge Elimination System (NPDES) Permits are required for the discharge of treated wastewater from the Airport's two treatment plants. The Airport maintains current permits for these facilities. Management of stormwater runoff at the Airport is also regulated under the NPDES Permit issued for the Industrial Wastewater Treatment Plant.

The San Francisco Bay Area Regional Water Quality Control Board is the local agency that issues the NPDES permits and establishes the required treatment levels for domestic and industrial wastewater and best management practices (BMPs) to improve the quality of stormwater runoff generated at the Airport.

Resource Efficient Building Ordinance (REB)

The City's REB mandates that new and replacement toilets cannot consume more that 1.6 gallons of water per flush and new and replacement showerheads cannot consume more than 1.5 gallons per minute. See ***Chapter 11, Green Buildings and Facilities***, for additional information on this ordinance.

Where Are We Now?

Water Use

Some 479 million gallons of water were used by the Airport in 2006, almost 15 gallons per passenger. This water use includes facility cleaning and food service, as well as restrooms in the Terminals.

Wastewater

SFO discharged an average of 640,000 gallons per day of treated sanitary wastewater and 630,000 gallons per day of treated industrial wastewater into lower San Francisco Bay in 2006. The wastewaters were treated in the Airport's sanitary and industrial wastewater treatment plants and the discharges met or exceeded the quality standards established in the NPDES Permits issued for the two plants by the San Francisco Bay Area Regional Water Quality Control Board.

Stormwater

Runoff from areas where industrial activities are located is diverted to four detention ponds with a combined capacity of 8.6 million gallons. Runoff collected in these ponds is pumped to the industrial wastewater treatment plant for treatment before being discharged to the Bay. Any excess runoff generated by continuing or consecutive storm events is discharged directly to the Bay. A significant portion of annual stormwater runoff from industrial areas, especially the first flush of each storm, is captured for treatment. Stormwater runoff from a small area at the Airport flows into bioswales (grassy channels) before being discharged to a wetland area.

Stormwater runoff from a small area at the Airport flows into bioswales before being discharged to a wetland area.

What Have We Accomplished?

Water Conservation

Since the early 1990s, SFO has been implementing an aggressive water conservation program, including automatic shutoff fixtures in nearly every public restroom. In addition, all new buildings are required to have low-flow restroom fixtures and automatic shut-off valves to conserve water.

Water Reuse

Currently, the Airport uses treated wastewater for the irrigation of all landscaping at the Sanitary and Industrial Wastewater treatment plants. The Airport plans to evaluate the use of reclaimed water for toilet flushing in new buildings and for irrigation of additional landscaping.

Wastewater Treatment

SFO operates two separate wastewater treatment plants: a Sanitary Wastewater Treatment Plant and an Industrial Wastewater Treatment Plant. The sanitary wastewater treatment plant, named the Mel Leong Treatment Plant, provides secondary

treatment for sanitary wastewater from the terminal restrooms, aircraft blue waters, aircraft hangars, restaurants, shops and other Airport facilities. In 2005, the Airport completed a new $37 million state-of-the-art Sequential Batch Reactor (SBR) treatment unit and other upgrades to the Mel Leong Treatment Plant. The plant has a design treatment capacity of 2.2 million gallons per day.

The Industrial Wastewater Treatment Plant treats wastewater from industrial sources at the Airport and the first flush of stormwater runoff collected in the storm drain system from developed areas of the Airport.

The Airport is currently planning to upgrade the Industrial Wastewater Treatment Plant. Two options under consideration are to maintain a separate industrial wastewater treatment plant or to pre-treat the industrial wastewater in the existing plant and then process the flow through the new SBR unit at the sanitary wastewater treatment plant. With either option, the Airport is working towards combining the separate permits into a single wastewater discharge permit to reduce redundancies in regulatory compliance reporting.

The Airport is meeting the treatment goals for both wastewater treatment plants by managing these plants at maximum attainable efficiency for the treatment technologies used in these facilities.

Stormwater Treatment

A key element of the Airport's Stormwater Pollution Prevention Plan (SWPPP) to minimize the discharge of pollutants in stormwater runoff was the voluntary construction of storm runoff detention ponds with 8.6 million gallons of combined capacity. The first flush of the runoff from each storm event is collected over most of the developed areas of the Airport and is stored in these detention basins. The stored runoff is then pumped to the Industrial Wastewater Treatment Plant where it undergoes secondary treatment before being discharged to the Bay. The Airport constructed these detention basins voluntarily to protect the quality of water in the Bay. The Airport has also developed stormwater pollution prevention requirements for industrial and construction activities. For all Airport and tenant construction projects, a SWPPP must be submitted during the permitting process. These SWPPPs are reviewed for completeness by the Stormwater Pollution Prevention (SWPP) staff, and revisions to

The upgraded state-of-the-art Mel Leong Treatment Plant has a design capacity of 2.2 million gallons per day and is primarily used to treat sanitary wastewater generated at the Airport.

the plans are requested as appropriate. Construction activities are regularly monitored by SWPP staff to ensure that BMPs are employed for the prevention of stormwater pollution at each site. The industrial elements of the SWPPP cover all non-construction activities at the Airport and provide BMPs for preventing stormwater pollution at each site. The BMPs include general maintenance, hazardous materials storage practices, clean-up of minor leaks and spills of petroleum products or other chemicals, street sweeping, runway surface scrubbing, etc. The SWPP staff conduct routine inspections of all Airport facilities to ensure compliance with BMPs. Citations and warning letters are issued by the staff if any deficiencies in the BMPs are observed at a site. The site is then revisited to ensure that corrective measures have been implemented.

The NPDES permit for the Industrial Wastewater Treatment Plant includes specific provisions for visual observation of all stormwater outfalls during storm events and during dry weather conditions. Sampling and analysis of stormwater discharges at each outfall is also required during two major storm events in each wet season.

Native vegetation planted around the Mel Leong Treatment Plant is irrigated with treated wastewater.

One of many automatic shut-off faucets the Airport uses to conserve water.

Advantages of Low-Flow Plumbing Fixtures

In 1995, the National Energy Policy Act mandated the use of toilets that use no more than 1.6 gallons of water per flush. Since then, low-flow plumbing fixtures including toilets, faucet aerators, and showerheads have been developed that save substantial amounts of water compared to conventional fixtures while providing the same utility.

Low-flow toilets use a maximum of 1.6 gallons of water per flush compared with about 3.5 gallons of water used by a standard toilet. Low-flow shower heads use about 2½ gallons of water per minute compared to between 4 and 5 gallons per minute used by conventional heads. Low-flow faucet aerators can cut the water usage of faucets by as much as 40% from 4 to 2½ gallons per minute. Both of these plumbing fixtures are used widely at SFO.


MEL LEONG
TREATMENT PLANT
DANGER

8. Natural Resources Management




SFO property includes appreciable acreage of seasonal wetlands, freshwater marsh, tidal salt marsh, and mud flats. These resources provide habitat for a wide variety of vegetative communities and terrestrial and aquatic wildlife. For example, wildlife populations in the area include the endangered San Francisco Garter Snake and the threatened California Red-Legged Frog. Both in daily operations and during planning and implementation of development projects, SFO strives to preserve local natural resources and, when possible, to explore opportunities for improving natural habitats and managing wildlife populations while ensuring the safe operations of the Airport, as described in this chapter.

Policy

SFO shall work in partnership with local, State, and Federal agencies to protect habitat on Airport property and on Airport land West of Bayshore, while ensuring the safe operation of the Airport.

Goals

- Preserve existing wetlands' biological resources at the Airport.
- Protect and restore viable existing remnant natural ecosystems on Airport property.

Federal/State/Local Mandates

Endangered Species Act

The Endangered Species Act provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the U.S. or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for Listed Species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize Listed Species, and contains exceptions and exemptions. A small area of undeveloped SFO property currently contains habitat for the San Francisco Garter Snake (endangered) and the California Red-Legged Frog (threatened). In addition, California Clapper Rail (endangered) habitat has been identified adjacent to the north end of the Airport.

Wildlife Hazard Management Plan

Federal Aviation Regulation Part 139.337 requires airports to prepare a Wildlife Hazard Management Plan and secure approval for the plan from the Federal Aviation Administration. In recognition of

A herd of goats is used to graze overgrown and undesirable invasive vegetation in a critical habitat area, to reduce fire hazards to adjacent homes without posing potential harm to the native endangered Garter Snake.

As part of SFO's Wetland Mitigation Program, the Millbrae Bayfront Park was expanded.

the potential risk of serious aircraft damage or the loss of human life that could result from a wildlife strike, greater emphasis is being placed on preparing airport Wildlife Hazard Management Plans that effectively address the potential aircraft safety hazards.

Habitat management is a critical element in any airport hazard management program. Non-woody or herbaceous vegetation accounts for the majority of wildlife habitat at most airports. SFO's Wildlife Hazard Management Plan has a vegetation management component to address this issue. SFO's Wildlife Hazard Management Plan is currently being updated.

Where Are We Now?

As mitigation for its Master Plan construction projects, SFO has improved more than 558 acres of wetlands and tidal marshes throughout the Bay Area, committing more than $20 million to this effort.

What Have We Accomplished?

Wetland Mitigation Program

Past construction projects have required conversion of some of the wetland areas to Airport uses. In such cases, SFO has implemented off-site mitigation measures by procuring and restoring private wetlands or by funding the re-establishment of wetlands on public property.

Wetland mitigation projects include the restoration of Mountain Lake Park in partnership with the San Francisco Department of Recreation and Parks, and the Golden Gate National Recreation Area. Together with the Golden Gate National Parks Conservancy, SFO contributed $3 million for restoring 18 acres of tidal marsh at Crissy Field at the Presidio. Other initiatives have included the following projects:

- The India Basin Hunters Point Recreation Project plans to restore up to 3.4 acres of tidal marsh.
- The Millbrae Bayfront Park project added to the existing park.
- At the Oliver Brothers Salt Ponds, SFO and the Hayward Area Recreation and Park District restored and enhanced 324 acres of wetlands at a cost of more than $1.3 million.
- In Palo Alto, SFO worked with the City to restore 7.2 acres of tidal marsh.
- At Outer Bair Island, SFO and the California Department of Fish and Game created 42 acres of wetlands and enhanced 140 acres of existing wetlands.
- SFO plans to create 12 acres of new wetlands in the Hunters Point area in San Francisco, in conjunction with the California Department of Parks and Recreation and the California State Parks Foundation.

Biologists have observed an increase in the Garter Snake population on Airport-owned habitat.

Research Support

In recent years SFO has funded a number of environmental studies, such as a study of Pacific Herring Spawning in San Francisco Bay, the development of an inventory by the California Academy of Sciences of San Francisco Bay specimens, and biological surveys of species present in tideland areas around the Airport.

Vegetation Management/Habitat Protection

In the wetland area west of the Bayshore Freeway, which is a habitat for the San Francisco Garter Snake and the California Red Legged Frog, SFO has implemented an innovative approach to vegetation management which reduces the use of heavy equipment in a fragile habitat. Maintenance of this area involves reducing overgrown and invasive vegetation to reduce the risk of fire to neighboring residential areas. Historically, the Airport used work crews with sickles for this task, as the presence of endangered San Francisco Garter Snakes makes the use of power mowers infeasible. More recently, a herd of goats has been used to graze in areas that need to be cleared. Goats are effective in removing such weeds and vegetation as yellow star thistle, coyote brush, Scotch broom, and Himalayan Blackberry bush. A herd of about 400 animals can clear an acre a day depending on the type of vegetation.

Together with the Golden Gate National Parks Conservancy, SFO contributed $3 million to restore 18 acres of tidal marsh in San Francisco.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&
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9. Solid Waste Reduction and Recycling




SFO operates the largest recycling program in San Mateo County, an example of the Airport's commitment to reducing solid waste. From the airlines to the terminals, from the construction site to the reprographics department, this chapter outlines the innovative and proven ways the Airport uses to maximize recycling of all waste products.

Policy

SFO shall minimize the generation of solid waste from operations and shall recycle the collected waste products to the maximum extent practicable.

Goals

- Minimize the generation of solid waste from operations.
- Recycle the collected waste products to the maximum extent practicable with a goal to recycle 75% of solid waste by 2010.

"I recycle at school all the time. Here too." - Mother and daughter Minoo and Mehri Rose Sadri

SFO has initiated a pilot program for separating various recyclable materials at the point of generation. In 2006, SFO recycled 54% of its municipal solid waste, contributing to the 95% of total solid waste recycled that year.

Federal/State/Local Mandates

Recycling program objectives are based on the mandates established in the California Integrated Waste Management Act (AB 939) and in the City and County of San Francisco Resource Conservation Ordinance.

California Integrated Waste Management Act (AB 939)

In 1989, the Integrated Waste Management Act (Assembly Bill 939) was passed because of the increase in the solid waste stream and the decrease in available landfill capacity. The California Integrated Waste Management Board (CIWMB) was established pursuant to this Act, along with a disposal reporting system with CIWMB oversight, and facility and program planning procedure. AB 939 mandates a reduction of waste being disposed: jurisdictions were required to meet diversion goals of 25% by 1995 and 50% by the year 2000. AB 939 also established an integrated framework for program implementation, solid waste planning, and solid waste facility and landfill compliance.

Resource Conservation Ordinance

In an effort to conserve natural resources and landfill space, the Resource Conservation Ordinance (RCO) directs SFO and all departments of the City and County of San Francisco to maximize the purchase of recycled products, reduce their waste, and divert as much solid waste from landfills as possible. To help achieve these objectives, the RCO sets standards for the procurement of products and requires City departments to submit a resource conservation plan and annual waste diversion reports. Additionally, the RCO requires each City department to designate at least one person who would be responsible for ensuring compliance with the ordinance.

Trash collected at the Airport is separated and recycled at an off-site recycling facility. Currently SFO is implementing a pilot on-site source separation program.

A pilot program for separating food wastes from non-food wastes at Airport restaurants was initiated in 2006. SFO supplied the color-coded and labeled containers and dedicated food waste storage bins to selected concessionaires.

Recycled material separated and compacted; ready for shipment at the Sunset Scavenger Recycling Company, which recycles the solid waste collected at SFO.

Additionally, the Board of Supervisors and Mayor Newsom passed two resolutions strengthening the Resource Conservation Ordinance. The 75% Waste Diversion Goal for City Departments Resolution sets a goal of 75% waste diversion by 2010 and calls on City Departments to serve as a model for the rest of San Francisco. The City Composting Resolution urges City Departments with food service operations to purchase compostable food serviceware and participate in the food scraps composting program.

Resource Efficient Building Ordinance (REB)

The City's REB mandates that adequate, accessible, and convenient space must be provided for the collection, storage, and disposal of recyclable materials. In addition, all discarded fluorescent lamps must be recycled. REB also mandates that new construction and major renovation projects must develop and implement a plan to minimize construction and demolition debris disposal, and maximize the reuse and recycling of materials. See **Chapter 11, *Green Buildings and Facilities***, for additional information on this ordinance.

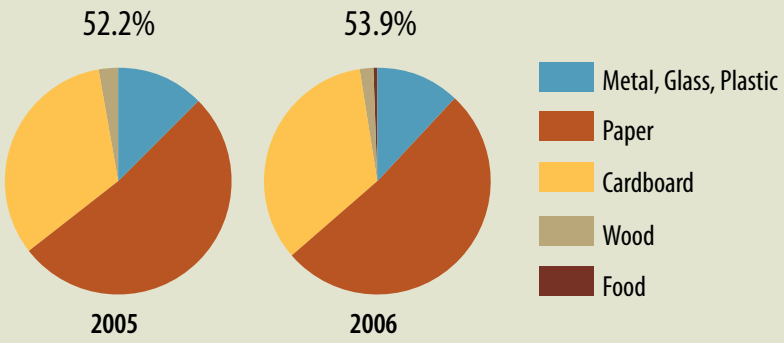
Where Are We Now?

Solid Waste Generation

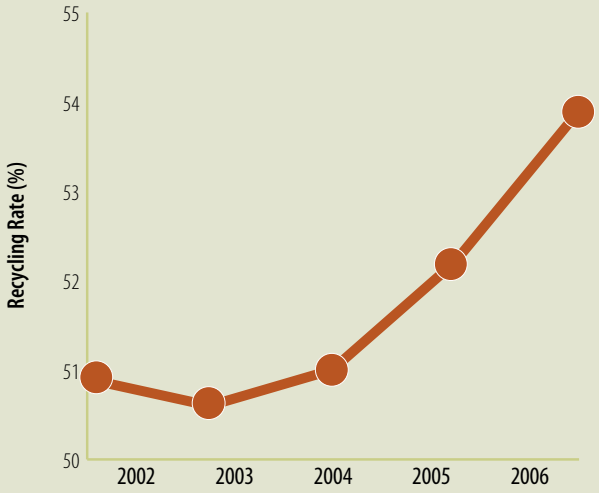
Solid waste is generated by Airport operations, airline and other tenant activities, demolition and construction projects, and ongoing airport improvement projects. SFO provides containers around the Airport for use by passengers and tenants. The waste material is transferred to on-site dumpsters and compactors that are hauled to an off-site processing facility. All solid waste is sorted by material type into recyclable or compostable components either at the Airport or at the off-site facility and the remaining solid waste is disposed of in a municipal landfill.

- Over 50% of solid waste hauled by a private contractor was recycled at off-site facilities in 2005.
- 100% of concrete/asphalt debris was recycled in 2005.
- 89% of solid waste was diverted from landfill in 2005.
  - Initiative launched to achieve over 75% demolition waste recycling and the goal was surpassed.

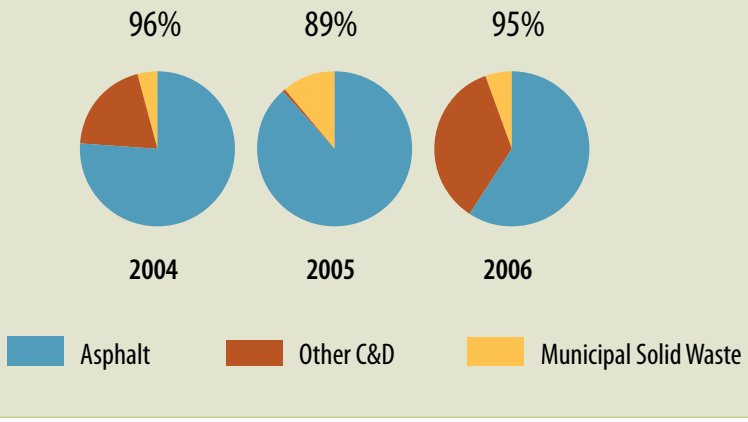
Municipal Solid Waste Recycling Rate*



Municipal Solid Waste Recycling Rate (2002-2006)*



Overall Landfill Diversion Rate*



* All three graphs show recycling as a % of total waste generated.

- Solid Waste separation/reduction initiatives:
  - Pilot program initiated for food/trash waste separation at concessionaires.
  - Pilot program initiated for reducing paper towel use in bathrooms.
  - Pilot program initiated for separating various solid waste types at the point of generation.

SFO's success in recycling and reducing waste is demonstrated by the graphics at left.

Recycling also reduces CO_2 emissions as reused material requires less energy to extract, transport, and process. In 2006, SFO's recycling initiatives saved 22,289 tons of equivalent CO_2.[8]

What Have We Accomplished?

SFO's Solid Waste Reduction

SFO has a highly successful solid waste collection program. SFO recently initiated several pilot programs aimed at improving the efficiency of solid waste separation at the source and increasing the percentage of recycled construction and demolition waste at the Airport. Various facilities such as the Reprographics Department have developed specialized recycling programs aimed, for example, at reducing generation of paper and cardboard wastes.

Solid Waste Collection and Recycling

The Airport's contract with the solid waste collection contractor requires the recycling of various waste streams at the off-site processing facility. All waste that is deposited in the Airport terminal trash cans is disposed into on-site waste compactors. The hauler transports the compactor to the off-site transfer facility where the recyclable materials are recovered from the waste. The Airport's hauler uses a CNG-powered refuse truck funded with grant money secured by the Airport.

Old Boarding Area A Demolition Project
In this project, 23,200 tons of demolition waste (81% of total waste) was recycled.

The Airport is currently recycling a minimum of 50% of collected municipal solid waste. SFO aims to achieve an overall recycling rate of 75% or more by 2010.

Food Waste Separation

A pilot program for separating the food wastes from non-food wastes at Airport restaurants was initiated in 2006. SFO supplied color-coded and labeled containers and dedicated food waste storage bins to selected concessionaires. In 2006, 18.3 tons of food waste was collected and composted. Based on the success of these measures, SFO is currently expanding this program to all food concessionaires.

Paper Towel Use Optimization

A pilot program for optimizing the use of paper towels in bathroom facilities at the International Terminal Building was initiated in 2006. The purpose of this program is to assess the effectiveness of new paper towel dispensers at reducing the wasteful use of this resource. The new paper towel system dispenses a limited amount of paper for each use.

SFO employs a number of waste-reducing strategies, including the posting of signs on paper towel dispensers to encourage resource conservation.

If the results of the pilot program show a reduction in paper towel use, then the program could be expanded Airport-wide in the future. Other waste reduction strategies include the posting of signs on paper towel dispensers in all other bathroom facilities asking users, "Please conserve natural resources. Take only what you really need."

On-Site Source Separation

A pilot program is also being initiated for collecting various solid waste streams in separate containers at the Airport terminals. In this program, three distinct trash cans are provided at each location for use by the public for disposing of cans and bottles, newspaper, and all other types of trash. The cans are color-coded and are labeled clearly on the top and on two sides of each can. Data collected in the pilot program will be analyzed to assess the effectiveness of source separation and determine whether the program should be expanded Airport-wide.

Enhancement of Construction and Demolition Waste Recycling

The City's Policy calls for recycling a minimum of 65% of non-hazardous construction and demolition waste generated at City construction projects. SFO

is experimenting with recycling more than 75% of the waste generated at Airport's demolition projects. At a recently completed abatement/demolition project at old Boarding Area A in Terminal 1, the Airport achieved a recycling level of 81%. The results of this program at ongoing demolition projects will be reviewed to establish the maximum attainable recycling goal for future Airport construction and demolition projects.

Wastewater Treatment Plant Waste Reduction

In 2006, SFO initiated waste reduction strategies to deal with sludge that is produced as a residual of the Wastewater Treatment Plant processes. During that year, 68 tons of anaerobically digested sludge was dried on sand beds prior to being disposed of in a sanitary landfill in order to reduce volume and weight of the sludge transported and disposed of in landfills. In addition, 103 tons of sludge was dewatered and delivered to a composting facility.

Soy-based Ink Can Used by the SFO Reprographics Department

Soy-based inks emit less volatile organic compounds during the printing process, they are renewable, are biodegradable in landfills, and are less toxic than petroleum-based inks.

8 CO_2 emissions savings were calculated using EPA's WAste Reduction Model (WARM), available at **www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html.**

Reprographics Department Sustainability Practices

The Airport's Reprographics Department has played a significant role in reducing the use of reprographics resources while continuing to serve the needs of the Airport. The actions taken by this Department are highlighted below.

- The Airport is in the process of reducing the number of copier machines by 12% Airport-wide. This reduction will result in savings in the use of chemicals and electricity.
- 90% of all paper used by Reprographics and all other Airport departments contains 30% post-consumer recycled paper. This includes Airport stationery such as letterheads, envelopes and business cards, as well as reports, manuals, brochures, and day-to-day reproduction of documents.
- Nearly all of Airport engineering and architectural contracts and bid documents are reproduced on CDs and issued to contractors. This program reduces the use of paper for this procedure by 95%.
- Airport sections submit work orders for reprographics services electronically, eliminating the need for hard-copy work orders.
- The use of CDs and electronic work orders has significantly reduced the Airport's paper inventory.
- Where possible, the Reprographics Department uses soy-based ink, a renewable resource that emits less volatile organic compounds than traditional inks.

10. Hazardous Material and Waste Management and Remediation




As described in this chapter, SFO's Hazardous Material and Waste Program is aimed at managing the generation, storage, and disposal of hazardous material and waste by both the Airport and by Airport tenants. SFO's environmental management efforts also include a material substitution program through which the Airport uses non-hazardous materials in lieu of hazardous materials where feasible, a program for the identification and abatement of asbestos and lead-based paint, and a program for reducing the use of pesticides, insecticides, and herbicides. The remediation aspect of the hazardous waste management program includes identification of any soil, groundwater, or surface water contamination at the Airport and characterization and abatement of such contaminated materials.

Policy

SFO shall strive to reduce the use of hazardous materials and promote their reduced usage with the airlines and tenants. SFO will seek to improve overall environmental quality through cleanup and restoration efforts focused on soil and groundwater contamination caused by accidental spills or leaks of fuel products or other chemicals.

Goals

- Strive to eliminate hazardous materials use and hazardous waste generation.
- Strive to eliminate or minimize the release of any hazardous materials to the environment.
- Maintain a record of all hazardous materials used for Airport operations, ensure that adequate training is provided for proper handling of such materials, and procure non-hazardous materials substitutes, when practicable.
- Seek to prevent pest problems and to manage pests while minimizing the impact of any pesticides used on human health and the environment.

Federal/State/Local Mandates

In 1965, to encourage environmentally sound methods for disposal of household, municipal, commercial, and industrial refuse, Congress passed the first federal law to require safeguards on these activities, the Solid Waste Disposal Act. Congress amended this law in 1976 by passing the Resource Conservation and Recovery Act (RCRA).

One of the bullet traps at the Police Training Facility operated by the San Francisco Police Department at SFO. In 2005, the Airport constructed two state-of-the-art bullet traps to retrieve and recycle the spent lead bullets.

As more information about the health and environmental impacts of waste disposal became available, Congress revised RCRA in 1980 and in 1984. The 1984 amendments are referred to as the Hazardous and Solid Waste Amendments. RCRA is divided into sections called Subtitles. Subtitles C and D set forth a framework for the U.S. Environmental Protection Agency's (EPA's) comprehensive waste management program.

EPA's Subtitle C program establishes a regulatory framework for managing hazardous waste from generation until ultimate disposal. EPA's Subtitle D program establishes a system for managing solid (primarily non-hazardous) waste, such as household waste. RCRA also regulates underground storage tanks (USTs) that store petroleum or certain chemical products under Subtitle I. Requirements exist for the design and operation of these tanks and the development of systems to prevent accidental spills. At the Airport, underground tanks are used mainly for storing petroleum products. California has adopted laws and regulations paralleling the federal RCRA legislation.

Soil and Groundwater Cleanup

The soil and groundwater cleanup program is carried out in compliance with the cleanup standards developed by the San Francisco Bay Area Regional Water Quality Control Board (RWQCB) under the authority of state and federal laws dealing with hazardous material handling, removal, remediation and disposal as described above.

Hazardous Materials Management

Preparation and implementation of hazardous materials business plans, including the management of above-ground and underground chemical and petroleum storage tanks, fall under the jurisdiction of various counties by delegation from the State Legislature. The Airport has prepared and submitted hazardous materials business plans to the San Mateo County Department of Environmental Health for all underground and above-ground fuel storage tanks, and for handling of other hazardous materials used in routine operations.

Integrated Pest Management (IPM)

The San Francisco Board of Supervisors passed an ordinance in October 1996, resulting in a change to Chapter 39 of the Administrative Code, mandating that City Departments and contractual users of City Property adopt policies that promote non-chemical approaches to pest management and to reduce or eliminate the use of pesticides by following IPM guidelines.

Where Are We Now?

Various types of hazardous waste are generated at the SFO from ongoing operations and from asbestos abatement, soil remediation, and/or groundwater remediation projects, and are managed according to state and federal guidelines.

What Have We Accomplished?

Hazardous Waste Management

Between 1992 and 2006, the Airport and its tenants carried out an extensive program of site investigation, characterization, and remediation of contaminated soil and groundwater to protect human health and safety and to prevent the degradation of environmental resources in and around the Airport. Implementation of most of the soil and groundwater remediation program coincided with the implementation of the Airport's Master Plan program that culminated in the construction of the new International Terminal Building, the AirTrain, BART connection, new parking garages, and new roadways at the Airport. The environmental clean-up program included the removal and treatment or disposal of approximately

Hazardous Waste Materials Disposed or Recycled in 2005	
Material	**Quantity**
Solid Hazardous Waste (Recycled)	31,279 pounds
Liquid Hazardous Waste (Recycled)	4,217 gallons
Anti-freeze (Recycled)	175 gallons
Vehicle Batteries (Recycled)	150 pieces
Contaminated Soil	4,955 tons

500,000 tons of contaminated soil and more than 20 million gallons of contaminated groundwater at a cost of more than $55 million. Work continues in areas of the Airport requiring additional monitoring, remediation, and/or investigation.

In addition to remediation activities, the Airport has undertaken extensive installation of state-of-the-art jet fuel supply pipelines and hydrant fuel pits in the airfield. Old fuel pipelines that were suspected of leakage have been abandoned and in some terminals have been replaced with tanker truck deliveries. The Airport is also undertaking a program of gradual decommissioning of abandoned fuel pipelines. Recently, more than 18,000 feet of abandoned pipelines, with diameters ranging from 4 to 22 inches, were evacuated and then filled with cement slurry in a demolition project at Terminal 1 at a cost of more than $600,000.

Hazardous Material Management

All Airport departments using hazardous materials in the course of their routine activities are required to prepare a Hazardous Materials Business Plan for submittal to San Mateo County. The business plans include a detailed list of the type and quantities of hazardous materials used, method of storage, method of use, number and capacity of storage tanks, emergency response plan, record keeping procedure, and records of staff training sessions. San Mateo County staff perform periodic inspections of hazardous materials storage, record keeping, and handling operations at the Airport.

Hazardous Waste Materials Disposal

Hazardous substances generally consist of materials with chemical and physical properties that may pose a hazard to human health or the environment when improperly handled, stored, disposed, or otherwise managed. Discarded fluorescent light fixtures, light ballasts, and computer monitors contain hazardous materials and must be properly handled. These wastes are collected for recycling in a program managed by the City's Health Department. Used oil products and other petroleum wastes are generated in the Airport's Mechanical Shops, and paint residues and paint thinner wastes are generated in the Paint Shops. These products are recycled either by the Airport or by the Health Department. Hazardous building materials such as asbestos-containing materials and lead-based paint could be found in the older Airport buildings. These types of wastes could be generated during various construction activities and are disposed of in permitted landfills. Other hazardous wastes such as vehicle and general-purpose batteries are collected for recycling.

Soil and Groundwater Remediation

Jet fuel is stored in a number of above-ground tanks and is pumped through underground pipelines to the various terminals. Gasoline and diesel fuels are also stored at the Airport in above-ground and underground tanks, and are pumped to end users through underground pipes. Accidental releases, leaks, or spills of these hazardous materials could pose environmental and/or health and safety risks. In partnership with the tenants and the RWQCB, SFO has established a rigorous program for management of contaminated soil and groundwater. Contaminated soil excavated during construction or maintenance activities is generally removed for

Containment trailer with controlled access and fire protection equipment safely stores hazardous materials.

off-site disposal in permitted landfills. Contaminated groundwater pumped from construction excavations is generally treated at special purpose treatment units or at the Airport's Industrial Wastewater Treatment Plant. To-date, this program has achieved compliance with soil and groundwater clean up standards developed by the San Francisco Bay Area RWQCB throughout most of the Airport.

Material Substitution Program

The Airport is an active participant in the San Francisco Department of the Environment's Environmentally Preferred Purchasing Program. This program seeks to minimize the purchase of products containing hazardous ingredients by the City and County of San Francisco departments for custodial services, fleet maintenance, and facility maintenance, in favor of alternate products that pose less risk to City employees and the public.

This program follows the City-adopted Precautionary Principle, which uses the best available science to identify cost-effective measures that would prevent harm if a practice poses threats to human health or may cause serious environmental damage. The Airport promotes the use of non-hazardous alternatives to hazardous materials where possible. A program for the identification and abatement of asbestos-containing materials and lead-based paint, and a program for reducing the usage of pesticides, insecticides and herbicides have also been implemented. The cleaning products used by the Airport's custodial staff are free of volatile organic compounds (VOC). In addition, the floor finishing products used by the Airport's custodians contain low levels of VOCs.

Material Safety Data Sheets are reviewed to exclude harmful products before they are introduced.

Through the Injury and Illness Prevention Program, communication and training regarding hazardous chemicals, hazardous waste, and stormwater pollution prevention are provided annually to supervisors on all shifts. SFO continues to collaborate with employees to seek environmentally safe solutions as better technology and products become available.

Integrated Pest Management Program

To comply with the City's IPM Ordinance, the Airport Commission adopted an IPM policy and directed the Airport Staff to prepare an IPM plan in 1997. SFO published its first IPM plan in April 1998. With the use of alternative, less toxic methods, SFO reduced the use of pesticides and herbicides by approximately 82% on a weight basis between 1996 and 2001. However, pesticide use is currently on the rise because SFO has significantly expanded the landscaped areas in recent years. San Mateo County Mosquito Abatement District applies various mosquito larvicides to marshland on Airport property under contract with SFO. In addition, various Airport tenants carry out pest control operations on their leaseholds on an as-needed basis. The needed increase in pesticide use, however, has been moderated by the IPM program.

Bullet Recycling

The San Francisco Police Department operates a Police Training Facility with a practice shooting range at SFO. In 2005, the Airport constructed two state-of-the-art bullet traps for the facility. In 2006, close to 7 tons of spent lead bullets were retrieved and recycled from the traps.

Spent bullets and cartridges embedded in the bullet traps made from recycled tires. In 2006, SFO retrieved and recycled 7 tons of spent lead bullets.

11. Green Buildings and Facilities

SFO is committed to developing green buildings and to operating its facilities in ways that conserve energy, water resources, and other natural resources. From the award-winning International Terminal to an extensive recycling program and alternative fuels program, SFO focuses on best practices to improve and operate the Airport in a resource-efficient and sustainable manner.

Green buildings and supporting infrastructure that minimize the use of resources, reduce harmful effects on the environment, and create healthier environments for people make both environmental and economic sense. Green buildings are facilities designed, constructed, renovated, and operated in an environmentally responsible and energy-efficient manner. The Airport's green building initiatives are described in this chapter.

Policy

Airport facilities, where practicable, shall be designed, constructed, and rehabilitated to make use of sustainable materials and green building techniques, seeking compliance with Leadership in Energy and Environmental Design (LEED™) Silver certification. SFO shall incorporate sustainability and life cycle cost analysis into current and future planning, design, construction, operations, and maintenance of facilities.

SFO's 2.5 million square-foot International Terminal Building was designed based on green building principles.

Goals

- Follow the U.S. Green Building Council's (USGBC) LEED™ sustainable design principles for all new and remodeled buildings and facilities.
- Establish proven programs with baseline performance standards, from which operations can be tracked and monitored.

Federal/State/Local Mandates

Title 24, Part 6, of the California Code of Regulations

The Energy Efficiency Standards for Residential and Nonresidential Buildings were established in 1978 in

response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. California's building efficiency standards (along with those for energy efficient appliances) have saved more than $56 billion in electricity and natural gas costs statewide since 1978. It is estimated the standards will save an additional $23 billion by 2013. The current standards are available at **www.energy.ca.gov/title24**.

Resource Efficient Building Ordinance (REB)

The City and County of San Francisco's REB Ordinance went into effect in July 1999, creating Chapter 7 of the City's Environment Code. The objective of this ordinance is to provide healthy buildings for employees and visitors, increase energy and water use efficiency, minimize building construction and operation costs, and reduce the negative environmental impacts of conventional construction, demolition, and operation of buildings. The REB Ordinance establishes a minimum environmental standard for municipal facilities in the following areas:

- Water conservation,
- Energy conservation,
- Indoor air quality,
- Storage of recyclables, and
- Construction and demolition debris management.

San Francisco Green Building Ordinance.

Effective September 2004, the San Francisco Green Building Ordinance specified that construction projects greater than 15,000 square feet should achieve a minimum LEED™ rating of Silver.

USGBC/LEED™

SFO has endorsed the USGBC's LEED™ Green Building Rating System, which is a consensus-based national standard for developing high performance, sustainable buildings. Members of the USGBC, representing all segments of the building industry, developed LEED™ and continue to contribute to its evolution.

For more information, go to **www.usgbc.org**

Where Are We Now?

The Airport has taken major steps in implementing the resource efficient building requirements. All new buildings are specified to have low-flow restroom fixtures and automatic-shutoff valves to conserve water. Lighting improvements include replacement of existing fixtures with lamps that produce more light with less energy. All technical specifications for new and remodeled buildings include requirements for recycling construction waste and demolition debris.

CNG Dispensing Pump Stations

SFO's two CNG fueling stations offer 15 fast-fill refueling hoses supplying 95,000 gasoline gallons equivalent per month to commercial vans, hotel courtesy shuttles, taxicabs, and both Airport and off-Airport parking shuttles.

Solar Power Panels

SFO has installed 2,000 square feet of solar panels on the roof of the Jason Yuen Architectural/Engineering Building. These solar panels have a capacity to generate 20 kW of energy. The generated power is fed into the Airport's power grid.

In conjunction with the San Francisco Public Utilities Commission, SFO has begun installing more than 50,000 square feet of solar roofing panels on Terminal 3 to produce clean energy. A utility inverter would convert the direct current generated by the panels to the alternating current used at the Airport, augmenting the Airport's power source.

What Have We Accomplished?

Recent projects at SFO have focused on utilizing the latest technologies and products available to create a more environmentally sensitive facility. SFO's new International Terminal is a model of energy efficient design and is exemplary in its use of sustainable products.

International Terminal Building

The 2.5 million square foot San Francisco International Terminal houses 24 aircraft gates, expanded ticket counter space, increased baggage handling and expanded U.S. customs facilities to expedite passenger traffic. SFO developed the International Terminal following the principles of LEED™.

The International Terminal unique features include:

Sustainable Products

The interior of the International Terminal Building contains 21,000 square feet of Forest Stewardship Council (FSC) certified cherry wood paneling on the huge wall above the departure lobby. The wall is one of the world's largest installations of veneer from certified, well-managed forests.

Native Plants

Ground landscaping for the International Terminal Building is comprised of native plants and trees grown specifically in Bay Area nurseries for SFO.

Energy Management and Control System

The International Terminal Building's overall design is 30% more efficient than required under Federal law (Title 24 – Nonresidential Building Energy Standards). A computerized system monitors and adjusts energy usage in the International Terminal Building to ensure optimum energy efficiency.

Energy Conservation

Elements of the energy conservation system include:

- High-Performance Glazing: insulated, laminated, ceramic-coated glass minimizes heat loss and maximizes daylight entry into the building.
- Enhanced Daylight: the terminal features a roof design with ample skylights that significantly reduces the need for electric light sources.
- Energy-Efficient Fixtures:
  - Plumbing fixtures are low-flow in compliance with California Title 24 energy standard requirements. Fixtures are sensor controlled to automatically dispense tempered water when needed and turn off when not used, thus saving water and heating energy, and
  - High-efficiency fluorescent lighting reduces energy consumption.
- Efficient Entryways: revolving doors at west entrances provide an air lock, reducing heat loss.
- Optimized Ventilation: displacement ventilators cool only the occupied strata of public space.
- Outside Air Economizer: An air conditioning system that uses cooler outside air 60% of the time, thereby reducing power consumption at the central heating and cooling power plant, and the amount of energy used in the terminal.

The interior space of the main hall in the International Terminal features an FSC-certified cherry wood wall.

- System Optimization: an Energy Management and Control System monitors and adjusts all systems to maintain optimum efficiency. Overall, the building's design is 30% more energy efficient than a typical building of its type.

Variable Flow Chilled and Hot Water Systems

Chilled and hot water distribution pumps are equipped with variable frequency drives to modulate the water output in proportion to building cooling and heating demands, only when the cooling load cannot be met by the outside air economizer control, thus realizing a savings in pumping energy.

Pre-Conditioned Air System

Cooling is provided for aircraft docked at the boarding gates thereby eliminating the need for the use of aircraft auxiliary power units (APU).

400 Hz Ground Power System

400 Hz power is provided to aircraft docked at the boarding gates. The combination of pre-conditioned air and ground power systems provides significant air quality benefits by eliminating the emissions that would result from the use of the aircraft's APUs.

Forest Stewardship Council-Certified Wood Award

In recognition of the Airport's large-scale public use of FSC-certified wood, the non-profit Certified Forest Products Council (CFPC) presented its first-ever "Certified Wood Award" to SFO and its architects Skidmore, Owings & Merrill, Del Campo & Maru, and Michael Willis & Associates. The award read as follows: "We commend San Francisco International Airport and its architects for their leadership in specifying and purchasing wood from FSC-certified, well-managed forests," said David Ford, president of the Certified Forest Products Council, a non-profit organization committed to the conservation, protection, and restoration of the world's forests. "Through their choice of certified wood, the airport and its architects have sent a clear message that San Francisco knows how to support the conservation, protection, and restoration of the world's forests, which is exactly what the people of this progressive city want."

The FSC was formed in 1993 by an alliance of concerned businesses, environmentalists, labor and community groups, and scientists to set international standards for forest stewardship and to accredit legitimate forest certifiers worldwide. Certification is only awarded to forestry operations that pass a stringent, voluntary, independent audit by an accredited team of scientists and forestry professionals. The wood is tracked during the entire manufacturing process to ensure that it came from a certified forest.

	Sched	Status
	1:10p	On Time
3244	2:40p	On Time
	4:10p	On Time
	12:00p	12:49p
	3:00p	On Time
	3:15p	On Time
	12:30p	At Gate
	12:30p	At Gate
3248	2:45p	On Time
	2:27p	On Time
2010	12:05p	Departed
3244	2:40p	On Time
2028	12:30p	Closed
2084	3:20p	On Time

Appendix: SFO By the Numbers

Activity Levels

Operations, Passengers, and Air Cargo Tonnage at SFO			
	Operations	Passengers	Cargo
1993	423,404	31,277,246	607,105
1994	430,380	32,792,126	639,886
1995	436,907	33,774,694	696,318
1996	442,281	36,694,498	697,408
1997	447,117	38,009,428	743,328
1998	435,008	38,410,896	786,874
1999	431,434	39,500,000	842,000
2000	416,640	40,300,000	853,000
2001	353,104	33,900,000	634,000
2002	314,636	30,800,000	595,000
2003	298,360	28,800,000	574,000
2004	315,212	32,200,000	563,000
2005	313,158	32,800,000	591,000

Energy

SFO Historical Electricity Consumption (kWh)*					
1990	1995	2001-2002**	2003	2004	2005
265,241,990	272,703,823	317,033,701	331,916,000	333,744,000	325,849,000

* Includes tenant consumption

** 12 month fiscal year from July 1, 2001 to June 30, 2002

2005 Airport Commission Energy Consumption	
Electricity	13.5 million kWh/month
Natural Gas	225 thousand therms/month
Gasoline	14,900 gallons/month
Diesel	5,050 gallons/month
Biodiesel	1,208 gallons/month
CNG	95,000 gasoline gallons equivalent/month*

* Includes commercial vehicles serving the Airport. Consumption of gasoline, diesel, and biodiesel reported in this table only includes Airport Commission use and on-Airport Shuttle Bus uses.

Carbon Dioxide Emissions

Prepared by:
Melissa Capria, Climate Action Coordinator, Dept. of Environment

Source:
2005 information based on data collected for CCSF California Climate Action Registry certification, 1990 data is from the baseline inventory conducted for the SF Climate Action Plan.

Note:
Data contained here are estimates, differences in reporting for 1990 data and 2005 data may affect results.

Summary of SFO Carbon Dioxide Emissions in 1990 and 2005 (calendar year)

	1990		2005	
Electricity	**amount**	**unit**	**amount**	**unit**
Airport Commission	131,435,000[1]	kWh	161, 467,000	kWh
Airport Commission CO_2	5,013	Tons	6,158	Tons
Total Tenant & Commission Usage	265,241,990	MWh	325,849,000	kWh
Total Tenant & Commission CO_2	**10,116**	**Tons**	**12,428**	**Tons**

Note: total usage include both Airport Commission and tenant electricity supplied by HHWP and is predominately hydropower. The emissions conversion factor for HHWP in 2005 was 76.28 lbs. of CO_2/MWh, the same factor was applied to 1990 electricity data in order to facilitate comparison.

1 Airport Commission-specific 1990 electricity usage was extrapolated from total Airport Commission and tenant electricity usage in 2005 by assuming the ratio of Airport Commission to Tenant electricity usage was the same in 1990 as in 2005.

	1990		2005	
Natural Gas	**amount**	**unit**	**amount**	**unit**
Airport Commission Usage	1,700,000	Therms	2,725,748	Therms
Airport Commission CO_2	9,918	Tons	15,903	Tons
Total CO_2	**9,918**	**Tons**	**15,903**	**Tons**

Note: no data on tenant natural gas use available. For comparison purposes natural gas CO_2 emission factors from the California Climate Action Registry were applied to the 1990 data (these factors vary slightly from those used in the SF Climate Action Plan inventory).

	1990		2005	
Vehicle Fuel*	**amount**	**unit**	**amount**	**unit**
General Fleet Diesel Usage	93,175	Gallons	52,897	Gallons
General Fleet Diesel CO_2	946	Tons	537	Tons
General Fleet Gasoline Usage	166,583	Gallons	147,170	Gallons
General Fleet Gasoline CO_2	1,570	Tons	1,387	Tons
General Fleet CNG Usage	N/A		11,691	Gallons gasoline equivalent
General Fleet CNG CO_2			80	Tons
General Fleet Propane Usage	4,126	Gallons	N/A	
General Fleet Propane CO_2	28	Tons		
Total General Fleet CO_2	**2,543**	**Tons**	**2,004**	**Tons**
SFO Shuttle CNG Usage	N/A		51,553	Gallons gasoline equivalent
SFO Shuttle CNG CO_2			390	Tons
SFO Shuttle Diesel Usage	N/A		134,459	Gallons
SFO Shuttle Diesel CO_2			1,476	Tons
SFO Shuttle Gasoline Usage	N/A		1,157	Gallons
SFO Shuttle Gasoline CO_2			11	Tons
Total Shuttle CO_2	**N/A**		**1,877**	**Tons**

* fleet diesel figure includes 4,009 gallons of red dye diesel used in non-fleet machinery.

Note: for comparison purposes gasoline and diesel CO_2 emission factors from California Climate Action Registry were applied to the 1990 data (these factors vary slightly from those used in the SF Climate Action Plan inventory).

	1990	2005
Total Airport CO_2 Emissions	**17,474**	**25,942**

Air Quality

Estimated Historical Annual Stationary Source Air Pollutant Emissions at SFO (Tons per Year)							
	TOG	ROG	CO	NOx	SOx	PM	PM_{10}
2003	3	1.8	10.7	33.6	0.9	1.4	1.3
2004	2.4	1.5	7.4	27.8	0.4	0.7	0.7
2005	2.3	1.5	6.7	23.8	0.4	0.8	0.8

TOG Toxic Organic Gases
ROG Reactive Organic Gases
CO Carbon Monoxide
NOx Nitrous Oxide
SOx Sulfur Oxide
PM Particulate Matter
PM_{10} Particulate Matter less than 10 microns in diameter, which are the greatest concern to public health.

Source: California Air Resources Board

Water Resources

Annual Water Consumption at SFO	
	Millions of Gallons
2002	491
2003	470
2004	533
2005	479

Total SFO Water Use per Passenger	
	Gallons per Passenger
2002	15.9
2003	16.3
2004	16.6
2005	14.6

Average Daily Wastewater Flows at SFO (2006)			
Monthly Daily Average Flows (MGD)	Sanitary (W.Q.)	Industrial (I.W.)	TOTAL
January	0.63	0.96	1.59
February	0.58	0.68	1.26
March	0.69	0.80	1.49
April	0.68	0.79	1.47
May	0.69	0.59	1.28
June	0.70	0.55	1.25
July	0.67	0.53	1.20
August	0.66	0.47	1.13
September	0.60	0.56	1.16
October	0.60	0.46	1.06
November	0.61	0.53	1.14
December	0.62	0.67	1.29
Average Daily Flow (MGD)	0.64	0.63	1.28
Total Annual Flow (MG)	235	231	466

MGD Million Gallons per Day

Solid Waste Reduction and Recycling

Solid Waste Recycling (2002-2006)				
Solid Waste (in tons)	**2002**	**2004**	**2005**	**2006**
Metal, glass, and plastic	440	480	595	609
Paper	1,826	1,890	2,437	2,612
Cardboard	1,103	1,013	1,540	1,713
Wood	89	108	126	107
Food	N/A	N/A	N/A	18
Total Recycled	3,459	3,490	4,700	5,059
Total Refuse	3,336	3,356	4,301	4,335
Total Waste	6,794	6,846	9,000	9,394
% Diverted From Landfill	51	51	52	54

Recycled Construction and Demolition Waste			
	2004	**2005**	**2006**
Asphalt	67,800 tons	37,500 tons	56,552 tons
Other C&D	50 tons metal	780 cy metal	1,020 cy metal
	17,500 tons pcc	390 cy wood	930 cy wood
			33,775 tons soil

cy cubic yards
pcc portland cement concrete

Hazardous Material and Waste Management and Remediation

Hazardous Waste Materials Quantities Generated at SFO in 2005	
Waste Type	**Annual Quantity**
Paint and Solvents	130 gallons
Transite Pipe and Asbestos Containing Materials	540 lbs
Waste Oil	3,920 gallons
High Intensity Discharge Lamps	780 lbs
Fluorescent Lamp Bulbs	18,109 lbs
PCB-Containing Fluorescent Light Ballasts	6,990 lbs
Cathode- Ray Tube Computer Monitors	2,550 lbs
Alkaline Batteries	1,350 lbs
Lead Acid Batteries	635 lbs
Mace and Pepper Sprays	95 lbs
Grease	230 lbs
Naphthalene and Mineral Spirits	165 gallons
Miscellaneous Cleaner and Floor Wax	2 gallons
Antifreeze	175 gallons
Tires	1,164 pieces
Contaminated Soil	4,955 tons

Hazardous Waste Materials Disposed or Recycled in 2005	
Material	**Quantity Recycled**
Solid Hazardous Waste (Recycled)	31,279 lbs
Liquid Hazardous Waste (Recycled)	4,217 gallons
Contaminated Soil	4,955 tons
Anti-freeze (Recycled)	175 gallons
Vehicle Batteries (Recycled)	150 pieces

1 SFO First Initiatives

Virgin Atlantic Towing Trial

In March 2007, SFO became the first airport in North America to test aircraft towing by Virgin Atlantic as a means to reduce CO_2 emissions from aircraft taxiing to the runway. If only 30% of departing flights are towed to the runway, 16,000 tons of CO_2 emissions could potentially be eliminated each year.

Greenhouse Gas Certification

The City and County of San Francisco, which includes the Airport, has successfully certified its greenhouse gas (GHG) emissions inventory with the California Climate Action Registry, becoming the first city in the United States to earn the Registry's distinction of Climate Action Leader™. A number of GHG emissions reduction programs are underway at SFO **(see Chapter 3, Climate Change/ Global Warming)**.

Noise Programs

In 1983, SFO became the first airport in the country to prepare a comprehensive noise abatement and land use compatibility plan. Through its noise insulation program, SFO became the first major airport in California to eliminate all incompatible land uses within the State 65 CNEL noise contour and to operate without a variance.

SFO was also one of the first airports in the country to begin a FAR Part 161 study (Notice and Approval of Airport Noise and Access Restrictions) to reduce aircraft noise during nighttime hours.

FSC-Certification

In recognition of the Airport's large-scale public use of Forest Stewardship Council (FSC)-certified wood, the non-profit Certified Forest Products Council (CFPC) presented its first-ever "Certified Wood Award" to SFO and its architects Skidmore, Owings & Merrill, Del Campo & Maru, and Michael Willis & Associates.

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