



CARBON FOOTPRINT REPORT

Calendar Year 2013



Contents

INTRODUCTION _____ 3

METHODOLOGY _____ 3

2013 TOTAL CARBON EMISSIONS _____ 5

HISTORICAL TRENDS _____ 5

2013 CARBON EMISSIONS BY SOURCE _____ 6

 ELECTRICITY USE _____ 6

 FLEET FUEL USE _____ 9

 NATURAL GAS USE _____ 11

 EMPLOYEE AIR TRAVEL _____ 12

REFERENCES _____ 13

APPENDIX _____ 14

Cover photos (left to right):
Electricity wires at a PWB facility; PWB dump trucks; Operating engineer at PWB pump station

Introduction

The Portland Water Bureau (PWB) has been calculating its carbon footprint since 2007 as part of ongoing work to reduce the environmental impact of PWB operations and to control electricity and fuel costs. PWB also calculates its carbon footprint to better understand the bureau's contributions to meeting the City of Portland's climate action goals. The City of Portland and Multnomah County are guided by the 2009 **Climate Action Plan** which established an objective for city bureaus to reduce carbon emissions by 50 percent by 2030, and 80 percent by 2050, compared to 1990 levels. **City of Portland Resolution No. 36749** directs bureaus to implement the Climate Action Plan.

The purpose of the report is to continue to:

- Identify the best methods to collect, report, and confirm data on carbon emissions
- Measure progress and evaluate trends in emissions and energy use
- Determine which operations and functions have the highest carbon impact, and assess opportunities for future emissions reductions
- Share information with employees about environmental impacts and mitigation opportunities

Metric Tons of Carbon Dioxide Equivalent (CO₂e)

1 metric ton of CO₂e is the unit of measure for all greenhouse gas emissions. Quantities of other greenhouse gases are converted into CO₂e units using global warming potentials established by the Intergovernmental Panel on Climate Change (IPCC).

The report Appendix highlights additional information about PWB operations, and is modeled after Standard Disclosures from the Global Reporting Initiative's **G4 Sustainability Reporting Guidelines**. Former PWB carbon footprint reports are available from the **Sustainable Operations** webpage.

Methodology

PWB's 2013 carbon footprint was calculated using methodologies from The Climate Registry's **General Reporting Protocol (GRP), Version 2.0**. The Climate Registry (TCR) sets consistent and transparent standards to calculate, verify and publicly report greenhouse gas emissions. Many public agencies and water utilities report as **TCR members**. While PWB is not a TCR member and does not report to the TCR registry, the bureau is voluntarily committed to providing accurate reporting of carbon emissions. PWB uses TCR's *General Reporting Protocol* methodologies to convert units of electricity, fuel, and natural gas consumed into metric tons of carbon dioxide equivalent (CO₂e).

PWB records how data is collected and calculated in a Carbon Footprint Data and Methods document and associated spreadsheets. The 2013 carbon footprint follows the same methodologies as previous years, but uses updated 2014 default emission factors from TCR and updated global warming potentials (GWPs) for methane and nitrous oxide from the IPCC Fourth Assessment Report (2007).

TCR does not provide a calculation methodology for air travel emissions. As in previous years, PWB used the U.S. EPA's 2008 **Climate Leaders** method which calculates emissions per passenger mile traveled. This approach is widely-used for calculating air travel emissions.

PWB uses a carbon emissions baseline year of 2007 against which it compares annual emissions. PWB selected 2007 as a baseline for two reasons. First, PWB's emissions calculations only extend back to 2007. Second, PWB's carbon emissions are highly influenced by groundwater use, which can vary year to year. Groundwater use was high (1.87 billion gallons) in 2007, accounting for 20% of total carbon emission in that year. Therefore PWB is able to factor in variable groundwater use in future years by using 2007 as a baseline year.

Carbon emissions from the following sources are included in this report (Figure 1):

Scope 1 (direct emissions):

- Biodiesel, diesel, and gasoline fuels for vehicles and heavy machinery

Scope 2 (indirect emissions):

- Electricity for buildings and pump stations
- Natural gas for heating in buildings

Scope 3 (indirect emissions):

- Fuel for employee air travel

A variety of significant emissions sources are excluded because the data are not readily available:

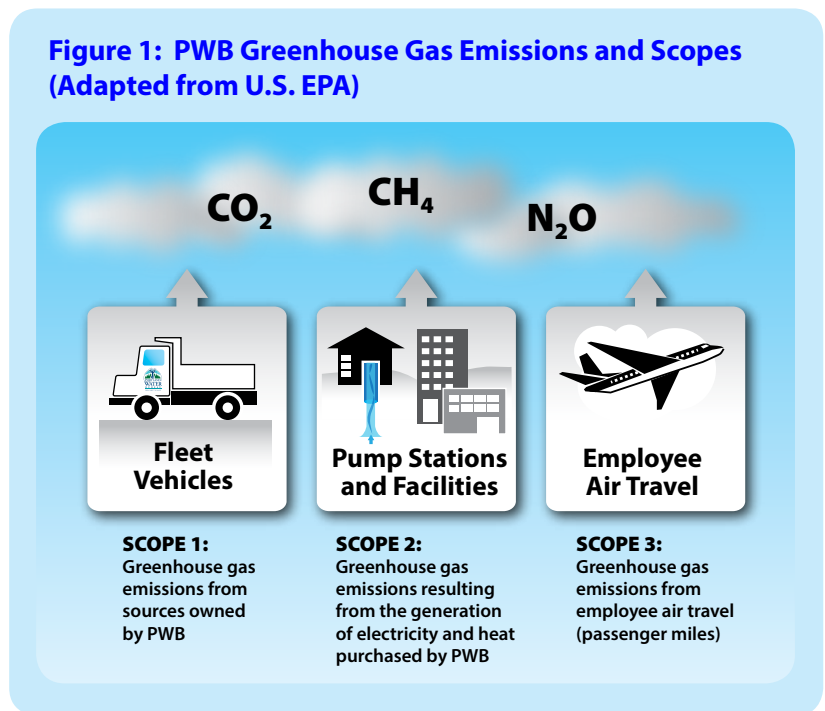
Scope 1:

- Fugitive emissions, e.g HVAC systems, refrigeration, aerosols containing hydrofluorocarbons (HFCs)
- Emissions from propane tanks

Scope 3:

- Emissions from employee commuting
- Supply chain emissions (emissions from services such as solid waste collection and disposal; emissions from the manufacture, delivery, and disposal of purchased material [e.g. paper, pipe, concrete, chlorine gas]; and emissions from contracted construction work).

Figure 1: PWB Greenhouse Gas Emissions and Scopes (Adapted from U.S. EPA)



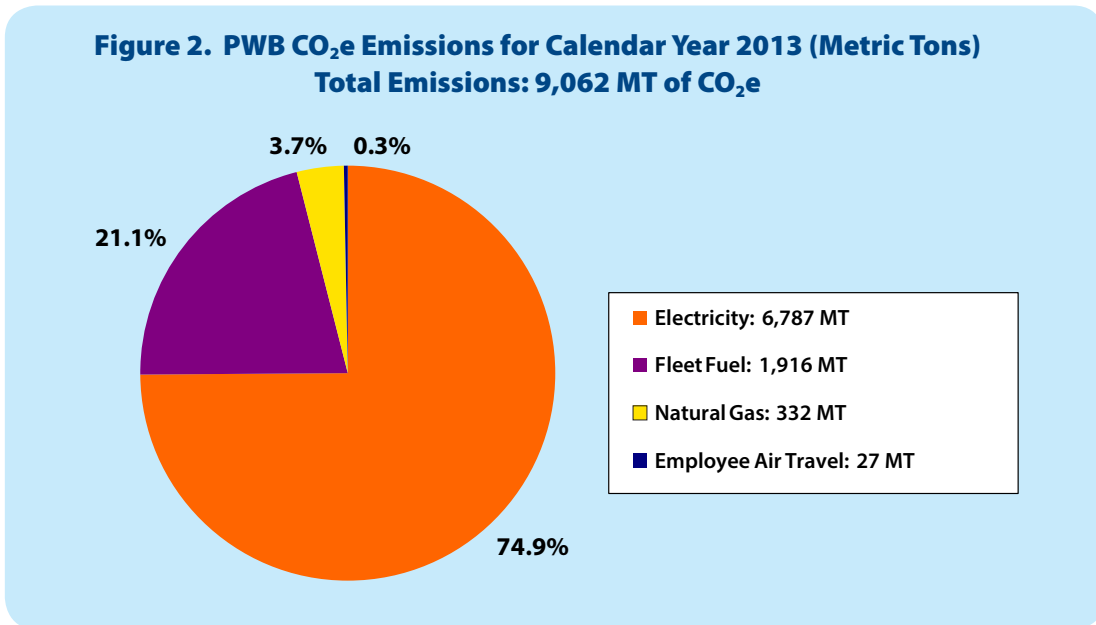
Scope 3 Supply Chain Emissions

PWB has been following the development of tools that calculate Scope 3 supply chain emissions. Available tools include the Economic Input Output Life Cycle Assessment (EIO-LCA) model designed by Carnegie Mellon University, and the more regionally-specific and consumption-based emissions inventory developed by Oregon's Department of Environmental Quality (DEQ). PWB understands that Scope 3 emissions can often be much higher than an organization's Scope 1 & 2 emissions and therefore are an important part of a carbon footprint. However, the econometric tools mentioned above are still at a relatively coarse resolution and are most accurately applied across broad categories of commodities and supplies to provide a general overview of supply chain emissions. PWB will continue to monitor developments and will assess if such a tool could be used for PWB's carbon footprint calculation in the future.

2013 Total Carbon Emissions

PWB’s total calculated emissions for 2013 were 9,062 metric tons of CO₂e, a 35 percent decrease from 2007 baseline emissions. According to the City of Portland’s forthcoming Climate Action Plan update, total per capita emissions for Multnomah County were 10 metric tons of CO₂e in 2012. Using this ratio, PWB’s 2013 emissions were equivalent to the average emissions from 906 Multnomah County residents.

Figure 2 illustrates PWB’s 2013 emissions by source. The emissions distribution is as follows: electricity (74.9 percent), fleet fuel (21.1 percent), natural gas (3.7 percent), and employee air travel (0.3 percent). All four sources of emissions were lower in 2013 than 2007 baseline emissions.



Historical Trends

Table 1 depicts PWB’s energy and fuel use trends by source for 2010-2013. Table 2 shows associated carbon emissions compared to a 2007 baseline.

Table 1. PWB Energy and Fuel Use

Energy and Fuel Use Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Electricity (kWh) ^a	27,727,113	19,236,332	23,335,253	22,520,834	18,173,351
Fleet Fuel (gallons) ^b	286,407	220,290	239,557	242,105	224,338
Natural Gas (therms) ^c	65,914	60,299	64,024	67,707	62,441
Employee Air Travel (air miles)	577,237	246,122	322,974	212,965	98,833

^a kWh is kilowatt hours
^b Fleet fuel includes B5 & B20 biodiesel, and E10 gasoline
^c Natural gas is used solely for heating

Table 2. PWB CO₂e Emissions

CO ₂ e Emissions (MT) by Source	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Electricity	11,420	8,036	9,138	8,411	6,787
Fleet Fuel	2,117	1,375	1,976	2,078	1,916
Natural Gas	352	329	357	360	332
Employee Air Travel	111	48	55	36	27
Total	14,000	9,788	11,526	10,885	9,062

2013 Carbon Emissions by Source

The following sections compare PWB’s 2013 carbon emissions by source against the 2007 baseline.

Electricity Use

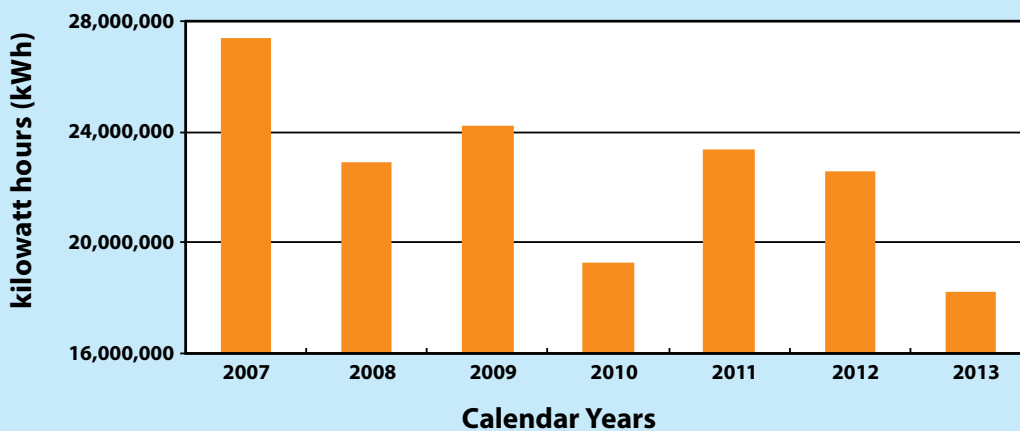
PWB’s annual carbon emissions rise or fall primarily based on the amount of electricity used. PWB has approximately 250 electricity accounts (with two electricity providers) for facilities and pump stations. These facilities use electricity to pump groundwater; send water from reservoirs to storage tanks for customers at higher elevations; and power lighting, air conditioning, and other electrical equipment.

Similar to previous years, electricity use in 2013 continued to generate the majority (74.9 percent) of PWB’s emissions. However, electricity-related carbon emissions were 41 percent lower in 2013 compared to the 2007 baseline (Table 3 and Figure 3).

Table 3. PWB Electricity Use and CO₂e Emissions

Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Electricity (kWh)	27,335,981	19,236,332	23,335,253	22,520,834	18,173,351
CO ₂ e Emissions (MT)	11,420	8,036	9,138	8,411	6,787

Figure 3. PWB Electricity Use, Calendar Years 2007-2013



The significant decline in electricity-related emissions from 2007 to 2013 can be partially attributed to energy reduction and efficiency measures that PWB has implemented over the past few years. Such measures involved installing more efficient pumps at pump stations and efficient lighting in buildings. In addition, groundwater use (which is the largest single contributor to PWB's electricity use) accounted for 21 percent of total emissions in 2007, and only four percent in 2013 (Table 4), thereby resulting in lower electricity-related emissions.

Groundwater from the **Columbia South Shore Well Field** is used if the Bull Run watershed experiences turbidity events, if summer supply needs to be supplemented, and during an annual maintenance run to ensure equipment will operate when needed. As shown in Table 4, groundwater pumping varies from **year to year**. PWB pumped 30 million gallons for an annual maintenance run in 2013, compared to 1,870 million gallons in 2007.

Table 4. Electricity Use & Emissions from Groundwater Pumping

Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
GW Pumped for Water Supply (MG) ^a	1,870	28	1,320	1,075	30
Electricity (kWh)	6,953,454	972,971	5,653,653	4,460,452	902,795
CO ₂ e Emissions (MT)	2,905	406	2,214	1,666	337
Percentage of Total Carbon Emissions	21%	4%	19%	15%	4%

^a MG is million gallons

Energy and CO₂e per Million Gallons of Water Produced

PWB's predominantly **gravity-fed water system** uses less energy per unit of drinking water compared to other water utilities. The U.S. Environmental Protection Agency (EPA) estimates an average of 0.0015 kWh per gallon to convey surface water in the U.S. (EPA, 2008). This estimate includes pumping raw water, filtration, treatment, and distribution. PWB's estimate for 2013 was 0.0005 kWh per gallon, one-third of the EPA estimate. PWB emitted 0.25 metric tons of CO₂e per million gallons of water produced in 2013 (Table 5).

Table 5. PWB CO₂e Emissions per Million Gallons of Water

Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
PWB CO ₂ e Emissions (MT)	14,000	9,788	11,526	10,885	9,062
Total Water Produced (MG)	37,068	35,971	35,371	35,720	35,802
Bull Run Water (MG)	35,198	35,943	34,020	34,645	35,772
Groundwater (MG)	1,870	28	1,320	1,075	30
CO₂e Emissions (MT/MG)	0.38	0.27	0.33	0.30	0.25

Renewable Energy Certificates

Portland City Council Resolution 36983 directed City bureaus to purchase 100% renewable power. PWB recently purchased the equivalent of 17,803 megawatt hours (MWh) of ‘Green-e’ certified Renewable Energy Certificates (REC) to comply with the resolution. Green-e certification is the highest standard for independent and verified RECs.

A REC represents the property rights to the environmental, social, and other nonpower qualities of renewable electricity generation (**EPA Green Power Partnership**). A REC, and its associated attributes and benefits, can be sold separately from the underlying physical electricity (electrons) generated from a renewable power source. The amount of RECs purchased was based on PWB’s actual electricity use in Fiscal Year 2012-2013, minus electricity generated by PWB’s solar and micro-hydro facilities, and an additional five percent subtraction for renewable energy generated by PWB’s power providers, PGE and Pacific Power.

Renewable Energy Generation

The City of Portland’s **Green Building Policy** requires on-site renewable energy systems at all new City-owned facilities, as practical or as required by the **State of Oregon**. PWB’s Sustainability Action Plan also articulates a goal for the bureau to achieve and maintain a capacity of over 400 kW of renewable energy, including solar and micro-hydro facilities.

PWB has installed, or helped to install, over 322 kW of renewable energy (Table 6). Most recently a 7.92 kW solar array was mounted on the roof the new Powell Butte Interpretive Center to provide energy to buildings at the site. PWB obtained a \$7,920 incentive from the Energy Trust of Oregon for this project.

The City, through the **Bureau of Hydroelectric Power**, owns two large hydropower facilities at the Bull Run dams. These facilities are operated by PGE, and generated almost 60 million kWh of renewable hydropower in 2013 (Table 7). This hydropower contributes to the region’s renewable energy mix.

Table 6. Renewable Energy Capacity	Energy Generation Capacity (kW)
Groundwater Solar on the Slough Array ^a	268
Groundwater Treatment Building Solar Array ^b	10
Meter Shop Solar Array ^c	12
Powell Butte Solar Array ^d	8
Vernon Micro-Hydro Turbine ^e	25
Total	323
PWB Renewable Goal	400

^a Generating since December 2009 - This array is owned by a third-party.
^b Generating since May 2012
^c Generating since June 2010
^d Generating since December 2013
^e Generating since September 2012

Table 7. Hydropower Generation

Hydropower Facility	CALENDAR YEARS			
	2010	2011	2012	2013
PHP Powerhouse No. 1 (kWh)	556,121,000	54,900,000	65,745,000	54,063,000
PHP Powerhouse No. 2 (kWh) ^a	44,372,000	40,088,000	35,404,000	5,845,000
Total Hydropower Generated (kWh)	100,493,000	94,988,000	101,149,000	59,908,000

^a The decrease in 2013 hydropower production for Powerhouse No. 2 was due to the construction of a selective intake structure in Reservoir 2 to comply with water temperature requirements for fish in the Bull Run river. During construction, the North Tower water intake (which passes water through Powerhouse No. 2) was shut down for most of 2013, resulting in lower power generation for the year.

Fleet Fuel Use

The amount of maintenance and construction work that takes place in a given year influences the number of vehicle miles traveled and the amount of fuel used. PWB vehicles drove over 1.5 million miles in 2013 and used 224,338 gallons of fuel. Table 8 breaks down miles driven and fuel used by vehicle class. Heavy-duty trucks traveled the most miles and consumed the most fuel.

Table 8. Miles Traveled, Fuel Used, and Inventory by Vehicle Class

Vehicle Class	Miles ^a	Gallons	# of Vehicles
Heavy-duty trucks ^b	682,589	124,183	137
Light-duty trucks & vans	469,196	50,133	107
SUVs	305,938	17,739	42
Passenger vehicles & minivans	99,674	3,777	24
Non-odometer vehicles & External fuel tanks ^c	N/A	28,506	65
Total	1,557,397	224,338	375

^a Miles traveled by vehicles with broken odometers are not included, but fuel use from these vehicles is included. Only 17 vehicles had broken odometers in 2013.

^b Heavy construction equipment is categorized with heavy-duty trucks and/or non-odometer vehicles, depending on equipment.

^c Includes equipment that does not accumulate miles (e.g. backhoes & external fuel tanks), which are different from vehicles with broken odometers.



PWB dump trucks, used for maintenance and construction, consume the most fuel in the fleet.

Figure 4 and Table 9 show that total fleet fuel use in gallons decreased in 2013 compared to the 2007 baseline, and associated fuel use carbon emissions were nine percent lower. Table 9 also shows that PWB reduced the amount of pure biodiesel (B99) used over the past few years. This change occurred due to engine problems caused by B99 in certain vehicle models. PWB still uses biodiesel blends (B5 and B20, which are comprised of 5 and 20 percent pure biodiesel, respectively). The bureau is also focusing on driver behavior and on purchasing more efficient vehicles where market conditions and costs allow.

Figure 4. PWB Fuel Use (2007-2013)

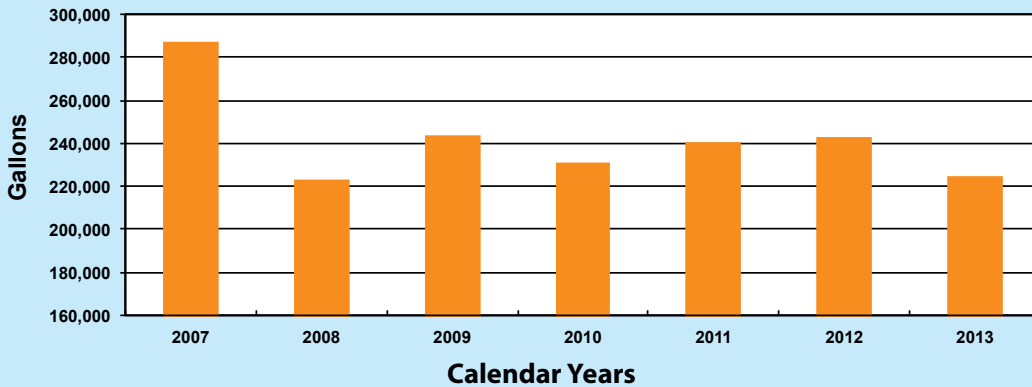


Table 9. PWB Fleet Fuel Use (Gallons) and CO₂e Emissions

Fuel Type	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Diesel (ULSD) ^a	69,315	112,258	131,953	145,838	133,546
Gasoline (E10) ^b	154,146	81,967	72,913	69,889	66,310
Biodiesel (B99)	62,946	35,923	34,691	26,378	24,482
Total Gallons	286,407	230,148	239,557	242,105	224,338
Total CO₂e Emissions (MT) ^c	2,117	1,375	1,976	2,078	1,916

^a ULSD is ultra-low sulfur diesel

^b Gasoline contains 10% ethanol (E10)

^c 269 MT of biofuel CO₂ were emitted in 2013 from the use of B99 biodiesel and E10, in addition to the 1,916 metric tons of fuel CO₂e. CO₂ emissions from biofuels are reported separately from fossil fuel emissions based on international greenhouse gas protocols (see 2012 Carbon Footprint Report for more detail).



Because the workhorses of the fleet are large dump trucks and service trucks, which consume a lot of fuel, PWB sustainability and fleet staff worked with dump truck and construction equipment operators in 2013 to reduce fuel use and idling where feasible. Not only does idling waste fuel and money, it also has significant human health and environmental impacts. Reducing idling will continue to be a key part of managing fuel emissions for PWB over the next few years.

PWB Fleet Manager Tom Dufala works with vehicle operators to operate vehicles more efficiently.

Natural Gas Use

PWB’s 2013 natural gas use was lower than the two previous years (Figure 5) and resulted in an eight percent decrease in carbon emissions compared to the 2007 baseline (Table 10). Two main events contributed to the 2013 decrease in gas use: a large gas furnace at the bureau’s Groundwater Pump Station malfunctioned and stopped using gas for a period of time; and a new, more efficient gas water heater was installed at the bureau’s Interstate facility.

Figure 5. PWB Natural Gas Use (2007-2013)

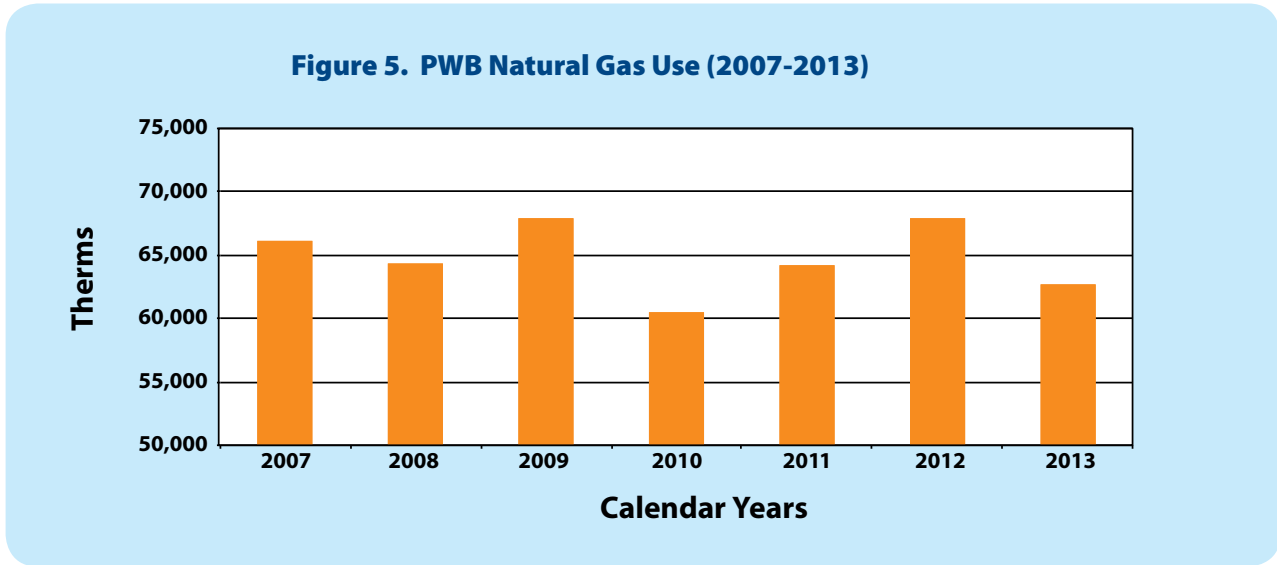


Table 10. PWB Natural Gas Use and CO₂e Emissions

Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Natural Gas (Therms)	65,914	60,299	64,024	67,707	62,441
CO ₂ e Emissions (MT) ^a	360	329	357	360	332

^a The 2007 and 2012 reports used different methodologies and emissions factors which is why carbon emissions in those two years are the same, but natural gas therms are different. PWB has used TCR’s methodology since 2011.

Employee Air Travel

PWB air travel carbon emissions contribute only a small amount (less than one percent) of total bureau emissions. However it is worth noting that the 2013 air miles traveled were significantly less than the baseline (Figure 8), and associated emissions were only 25 percent of what they were in 2007 (Table 11). The main reason for this decrease is reduced staff travel and training budgets.

Figure 6. PWB Air Miles Traveled (2007-2013)

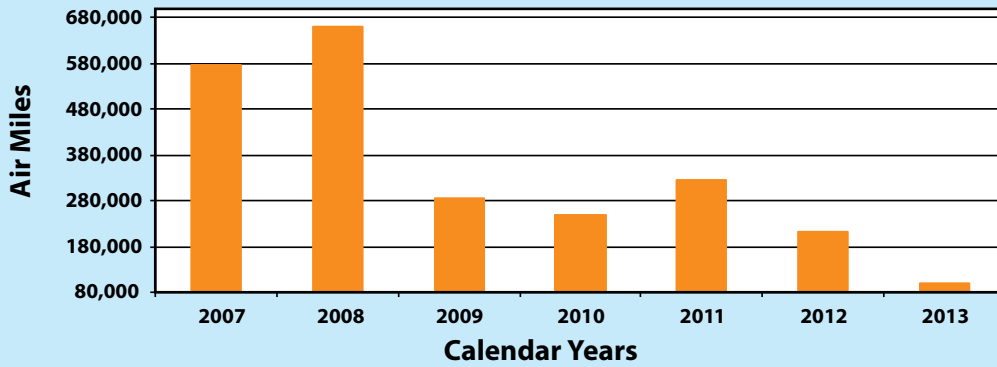


Table 11. PWB Employee Air Travel in Miles and CO₂e Emissions

Category	CALENDAR YEARS				
	Baseline 2007	2010	2011	2012	2013
Air Miles ^a	577,237	246,122	322,974	212,965	98,833
CO ₂ e (MT)	111	48	55	36	27

^a PWB air miles may be slightly under-represented in 2013 and other previous years due to how air mile reports are compiled by PWB's travel agency.

Employee Commuting & Work Related Transit Use

Although Scope 3 carbon emissions from employee commuting are not included in the carbon footprint, PWB tracks employee commute trends by monitoring the City-sponsored Trip Reduction Incentive Program (TRIP). TRIP offers subsidized transit tickets or carpool parking, as well as quarterly incentives to employees who bike or carpool. Participation in the program has remained steady (around 40 percent) over the past four years (Table 12). PWB provides information to employees about the program, and encourages alternative transportation to reduce the bureau's commuting emissions.

Table 12. PWB TRIP Program Participation

Category	CALENDAR YEARS			
	2010	2011	2012	2013
TriMet/C-Tran pass (bus, MAX, streetcar)	196	178	199	168
Carpool	20	11	6	11
Bike/walk incentive	49	50	58	65
Total	265	239	263	244
Total Employee Participation (%)^a	42%	39%	43%	42%

^a 2013 percent participation is based on 575.5 FT & PT PWB employees in FY 12-13

PWB also continues to offer free transit passes for work-related travel to reduce emissions (Table 13).

Table 13. Work-Related Transit Use

Category	CALENDAR YEARS			
	2010	2011	2012	2013
Portland Building TriMet Tickets Distributed	193	193	123	178
Interstate TriMet Tickets Distributed	66	168	198	268
Total TriMet Tickets Distributed^a	259	361	321	466

^a Interstate tickets are all-day passes, so one pass is counted twice for a round trip (# of all-day passes was 134).

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Appendix

This appendix is modeled after the Standard Disclosures from the Global Reporting Initiative's current [G4 Sustainability Reporting Guidelines](#). PWB reports information based on the Organizational Profile from these guidelines to provide context about PWB size and operation.

Name of organization

Portland Water Bureau, City of Portland, Oregon

Sustainable Operations and Sustainability Vision

A fundamental aspect of PWB's mission is to be a responsible steward of the public's fiscal and natural resources. Through [sustainable operations](#), the bureau saves energy, reduces costs, eliminates waste and becomes more efficient. PWB's Sustainability Vision and Energy Management Charter are included in the 14-15 [Sustainability Action Plan](#).

Primary products, services, and markets served

PWB produces drinking water from a surface water supply (the [Bull Run Watershed](#) located in the Mt. Hood National Forest), and a secondary backup groundwater supply (the [Columbia South Shore Well Field](#)). The well field consists of 27 groundwater wells that pump water from three aquifers located in a five square-mile area on the south shore of the Columbia River.

Operational structure of the organization, including main divisions

Employees are organized into seven groups: Administration, Customer Service, Engineering, Finance and Support Services, Maintenance and Construction, Operations, and Resource Protection and Planning.

Number of employees in 2013

575.5 employees, including full and part-time employees

Location of organization's headquarters

PWB operates out of two main facilities, the Portland Building in downtown Portland, and the Interstate facility located 2.4 miles from the Portland Building on the east side of the Willamette River. The majority of PWB employees work out of these two facilities.

Number of buildings and properties owned or managed

The bureau owns, and has developed asset management plans for, 50 facilities, 38 pump stations, several reservoirs, and numerous valves, wells, conduits, distribution mains, hydrants, roads, service lines, meters, tanks and transition mains. PWB's assets are valued at \$7.6 billion.

Number of vehicles operated in 2013

375 vehicles

Significant changes during the reporting period (such as location of or changes in operations, including facility openings, closings, and expansions)

During 2013 construction was underway for a new 50 million gallon reservoir at Powell Butte, a new 25 million gallon reservoir at Kelly Butte, a 1.3 million gallon Forest Park Low Tank Reservoir, and two new LEED NC Gold buildings as part of the Interstate Renovation Project.

Quantity of products or services provided (water)

During FY 2012-2013, PWB produced an average of 101 million gallons of drinking water per day (Table A-1).

Table A-1. Total Annual System Production Data

Category	FISCAL YEARS			
	09-10	10-11	11-12	12-13
Average Daily Production in MGD ^a	101	98	97	101

^a MGD is million gallons per day

Breakdown of sales

Retail customers: In FY 2012-2013, PWB directly served 182,900 retail customers, including single and multifamily residential customers, and commercial and industrial accounts.

Wholesale customers: In FY 2012-2013, PWB’s wholesale customers served an estimated population of 372,000.

Average water use per retail customer

During FY 2012-2013, residential customers used an average of 55 gallons per capita per day. Commercial and industrial customers used an average of 1,350 gallons per service per day (Table A-2).

Table A-2. Average Water Use for Residential and Commercial Accounts

Category	FISCAL YEARS			
	09-10	10-11	11-12	12-13
Residential Customers (gallons per capita) ^{a, b}	60	55	55	55
Commercial, Industrial, Institutional Accounts ^{c, d}	1,410	1,350	1,380	1,350

^a Residential includes only people living in single family or multifamily buildings and excludes people living in hospitals or institutions.

^b Fiscal year retail population numbers for all years have been updated based on PSU Population and Research Center forecasts.

^c Average daily consumption per service in gallons

^d Adjusted to exclude fire line services

^e Data from Portland Water Bureau FY 13-14 Demand and Consumption Information

For more information contact:

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Email: kavita.heyn@portlandoregon.gov

Or visit the PWB Sustainable Operations webpage:

<http://www.portlandoregon.gov/water/sustainableoperations>

Nick Fish, Commissioner

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1120 SW Fifth Avenue, Room 600

Portland, Oregon 97204-1926

Information: 503-823-7404

www.portlandoregon.gov/water

