CALTRAIN 2019

Sustainability Report

Caltrain

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Acronym List

ACS	American Community Survey
APTA	American Public Transportation Association
BART	Bay Area Rapid Transit
CAP	criteria air pollutants
CalMOD	Caltrain Modernization Program
CARB	California Air Resources Board
CCAG	City/County Association of Governments of San Mateo County
CCE	Community Choice Energy
CNG	compressed natural gas
COA	Comprehensive Operational Analysis
CO_2	carbon dioxide
EMFAC	Emissions Factor Database
FY	fiscal year
JPB	Peninsula Joint Powers Board
GHG	greenhouse gas
kBTU	thousand British thermal units
kWh	kilowatt hours
MTC	Metropolitan Transportation Commission
$MTCO_2e$	metric tons of carbon dioxide equivalent
SamTrans	San Mateo County Transportation District
SFMTA	San Francisco Municipal Transportation Agency
TA	San Mateo County Transportation Authority
VTA	Santa Clara Valley Transportation Authority

Executive Summary

Caltrain is one of the largest commuter rail systems in the country based on ridership, and is in the midst of one of the biggest service changes in its history, preparing both to electrify train service and accommodate a rapidly growing ridership. By 2022, the first passengers will ride in locomotives that are no longer powered by diesel, but by electricity. At the same time, the number of passengers taking this service is expected to increase rapidly—Caltrain is planning to potentially accommodate demand that could reach 180,000 daily riders on by 2040—nearly triple its currently ridership of 65,000. Caltrain is committed to providing more trains more often, improving express service, serving more people and creating a more connected service corridor. To support these objectives, the Caltrain Board voted to adopt the Caltrain 2040 Business Plan in October 2019. The Plan sets a target for the railroad that ensures Caltrain can continue to meet the growing mobility needs of the region while making the best use of the many projects and investments planned and under construction along the corridor.

Ridership growth envisioned under the Caltrain Business Plan would eliminate 825,000 car trips and 110 metric tons of carbon emissions every day, and would put an estimated 5.5 lanes worth of commuter traffic onto Caltrain instead of the region's highways.

Increasing the system's environmental sustainability is a critical component of this Business Plan. Caltrain's first sustainability report was released in 2017, and since then Caltrain has continued to make significant strides toward fulfilling its vision to be a sustainable, equitable mobility leader. Caltrain's Sustainability Report is an evaluation of the agency's sustainability performance across all resource uses. Table 1 summarizes Caltrain's performance since the last report. **Caltrain's commitment to sustainability and to adopt best practices in resource management has enabled the agency to reduce net greenhouse gas (GHG) emissions by nearly 44% over the last two years.**

Caltrain has made these remarkable strides through a number of initiatives. First, in 2016, Caltrain's Board voted to proceed with enrollment in California's Community Choice Energy (CCE) program and, in 2017, voted to source 100% of Caltrain's eligible energy from renewable sources through CCE programs and available municipal utility programs. Second, Caltrain continues to increase the efficiency of light fixtures and other electric appliances at all facilities and has reduced electricity usage by approximately 7%.

Diesel use by revenue vehicles has also decreased over the last two years. Since 2016, Caltrain has achieved modest reductions in fuel use and has reduced consumption for diesel, gasoline and compressed natural gas. **Caltrain reduced diesel consumption by 7% over the last two years, resulting in a 7% decline in criteria air pollutants (CAPs).**

Caltrain's ridership over the last two years has remained relatively stable, with only about a 1% increase in passenger boardings. However, at the same time, the total number of train miles traveled has decreased slightly, meaning that Caltrain is moving more people than ever before while traveling fewer miles. The diesel trains that move Caltrain's customers account for 96% of all energy consumed by Caltrain; as the system electrifies, Caltrain's sustainability performance will significantly improve.

In April of 2018, Caltrain's continued achievements in sustainability were recognized with Silver level recognition by the American Public Transportation Association.

Table 1: Caltrain Sustainability Performance Summary FY2016 to FY2018

Indicator	Unit	2016	2017	2018	FY16 to FY18 Change
Greenhouse Gas Emissions					
Generated	MTCO$_2$e/year	49,291	48,187	45,278	-8.1%
Displaced/Avoided	MTCO$_2$e/year	-76,332	-61,772	-60,551	-20.7%
Net Total[1]	MTCO$_2$e/year	-27,040	-13,586	-15,273	-43.5%
Criteria Air Pollutant Emissions					
Generated	Tons	898	887	838	-6.7%
Displaced/Avoided	Tons	-471	-346	-311	-34.0%
Net Total	Tons	427	541	527	23.5%
Facility Energy Use					
Electricity	kWh	7,811,512	7,215,443	7,264,850	-7.0%
Natural Gas	Therms	7,770	8,145	8,017	3.2%
Total Facility Energy Use	kBTU	27,430,799	25,434,419	25,058,603	-8.6%
Revenue Fleet Vehicle Energy Use					
Diesel	Gallons	4,535,867	4,478,040	4,234,870	-6.6%
Gasoline	Gallons	99,882	105,150	99,406	-0.5%
CNG	GGE	9,069	8,204	6,324	-30.3%
Total Vehicle Energy Use	kBTU	639,773,567	632,359,954	597,873,380	-6.5%
Revenue Fleet Operations (train miles)[2]					
Train Miles	Miles	1,443,982	1,390,674	1,341,789	-7.1%
Train Revenue Miles	Miles	1,380,022	1,354,608	1,312,307	-4.9%
Ridership					
Service Population	People	3,569,522	3,573,797	3,614,716	1.3%
Passenger Miles Traveled[3]	Miles	490,734,443	408,157,122	411,267,970	-16.2%
Train Boardings	Trips	18,355,641	18,648,850	18,504,880	0.8%
Waste and Recycling					
Generated	Tons	583	583	591	1.4%
Diverted	Percentage or Percentage Points	72%	72%	73%	1 p.p.[4]
Water					
Consumed	Gallons	12,864,117	14,995,690	14,914,911	15.9%

Notes: Totals may not sum due to rounding.
[1]Net GHG emissions equal Caltrain's generated emissions minus emissions displaced by Caltrain
[2]All revenue fleet operations and ridership data exclude taxi/purchased demand services, which are not under the operational control of Caltrain
[3]Passenger Miles Traveled includes rail and shuttle service
[4]p.p. = percentage points

INTRODUCTION

About the San Mateo County Transit District

The San Mateo County Transit District ("the District") provides public transportation services within and outside of San Mateo County, California, a 455 square-mile area with a population of approximately 777,905. The District leads the planning, development and management of a multi-modal public transportation system that includes buses, trains, shuttles and paratransit services. The District is the managing agency operating three business units:

SamTrans

SamTrans delivers fixed-route bus, including express service, paratransit and shuttle services within San Mateo County. SamTrans currently operates 304 fixed-route revenue buses, 67 paratransit vehicles and administers a shuttle program. SamTrans has contracted with First Transit and MV Transportation to provide paratransit and some fixed-route services. SamTrans also sponsors shuttle service to and from Caltrain and BART stations.

Caltrain

Caltrain is a 77-mile-long heavy rail commuter rail service along the San Francisco Peninsula, serving thirty-two stations in three counties from San Francisco to Gilroy. Caltrain operates approximately 90 weekday trains, which include express, limited and local trains. In conjunction with employer and community partners, the Caltrain operates a shuttle service that serves as a vital link between the rail system, and work and community locations. Caltrain is owned and operated by the Peninsula Corridor Joint Powers Board (JPB), which is comprised of three member agencies: the District, the City and County of San Francisco, and the Santa Clara Valley Transportation Authority (VTA).

San Mateo County Transportation Authority

The San Mateo County Transportation Authority (TA) administers the countywide sales tax dedicated to transportation-related projects and programs in the County. San Mateo County has passed Measure A in 2004, a half-cent sales tax to support transportation and infrastructure investment. The TA is also responsible for administering 50% of Measure W, a half-cent sales tax measure approved by voters of San Mateo County in 2018. The other 50% is administered by the SamTrans.

The District partners with other agencies in delivering its services, such as City/County Association of Governments of San Mateo County (CCAG), the Bay Area Rapid Transit (BART), Valley Transportation Authority (VTA), San Francisco Municipal Transportation Agency (SFMTA or Muni), Metropolitan Transportation Commission (MTC), as well as Santa Clara, San Mateo and San Francisco Counties to promote regional and efficient regional transit.

About this Report

The District's sustainability program supports the District's ambitious efforts to improve the sustainability of its own operations by encouraging operational and policy changes that reduce resources, carbon emissions and improve sustainable practices among staff.

Sustainability is a key component of the District's vision to become a mobility leader that provides safe transportation choices that support a sustainable future. The District's Sustainability Policy, below, outlines six key commitments that support the operations of the agency.

Over 60% of San Mateo County's greenhouse gas emissions and over 40% of California's greenhouse gas emissions stem from surface transportation (all modes). Whether Californians choose to drive or take public transit is one of the most important sustainability choices they make every day. The sustainability program supports the District's goal of helping residents shift their mode of transportation to reduce on road greenhouse gas emissions and improve air quality.

The District is a founding signatory of the American Public Transportation Association's (APTA's) Sustainability Commitment. The Commitment provides a framework for transit agencies to manage sustainability within their agency, and includes a set of key performance metrics for tracking sustainability performance. In 2011, the District received the bronze APTA Sustainability Commitment Recognition for SamTrans operations, and in April 2018, APTA recognized both SamTrans and Caltrain with silver-level status for the agencies' continued achievements in sustainability.

San Mateo County
TRANSIT DISTRICT

The District's Sustainability Policy commits the District to:

- **Streamline business practices** to reduce waste and improve operational effectiveness;

- **Evaluate and improve** the long-term resource efficiency of facilities and equipment, including the life-cycle return on investment;

- **Educate and incentivize** employees to integrate sustainability practices into their work and their personal lives;

- **Encourage business partners** to incorporate sustainability practices into their own operations;

- **Measure the environmental impacts** of activities on an ongoing basis, and set and meet targets to reduce our impacts; and

- **Deploy sustainability**-themed programs that encourage the use of public transit and that support our local communities.

Report Purpose and Scope

This is the second sustainability report prepared for Caltrain, the first of which was prepared in 2017. The baseline year for both reports is FY2010, a standard that Caltrain adopted in 2017 in order to report under the APTA Sustainability Commitment. Baseline year data is shown in Table 3 as a shaded column for comparison.

This report was prepared to share data on Caltrain's FY2017 and FY2018 sustainability performance. This report includes information on key sustainability performance metrics and summarizes sustainability achievements as well as current and planned initiatives. This sustainability inventory and report focuses on facilities, commuter rail service and shuttle service under the operational control of Caltrain. This report does not include information for non-revenue vehicles and employee commuting, which are included in a separate sustainability inventory and report prepared for SamTrans operations. The greenhouse gases reported include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), and are presented in this report as metric tons of carbon dioxide equivalent ($MTCO_2e$).

This report addresses the following sustainability indicators:

- Greenhouse gas (GHG) emissions
- GHG displacement
- Criteria air pollutant emissions
- Energy use from revenue vehicles
- Energy use from facilities
- Water use
- Waste generation and diversion
- Train miles
- Unlinked passenger trips (boardings)
- Displaced or avoided customer trips

GHG emissions are reported by scope. Scope 1 includes all emissions directly emitted by Caltrain, Scope 2 includes all indirect emissions from purchased electricity or steam and Scope 3 includes all other indirect emissions.

Sustainability indicators are normalized by total Caltrain ridership based on total number of boardings. Boardings represent the number of times passengers board public transit vehicles. Normalizing by boardings enables Caltrain to evaluate improvements in vehicle productivity and operational efficiency.

Caltrain Ridership and Operations

Caltrain commuter rail serves over 65,000 riders each day along the San Francisco Peninsula Corridor. Caltrain continues to experience unprecedented ridership growth, underscoring its role as a key regional transportation provider. Caltrain ridership increased by nearly 75%, an increase of 8 million total passenger boardings, between FY2010 and FY2018. Caltrain's growth outpaced the population growth of the three counties Caltrain serves in the same period, which increased from 3.3 million people in FY2010 to over 3.6 million people in FY2018. By 2040, Caltrain forecasts that demand could increase by as much as 300%. Already, ridership demand is challenging the system, with many peak-hour trains operating near seating capacity. The agency works continuously to meet this demand by providing service options that balance system needs with community needs.

The Caltrain Business Plan 2040 Service Vision calls for fast and frequent service to be the standard on the line every day, all day. Service during peak hours would grow to a minimum of eight trains per direction per hour with increased off-peak and weekend services, and all day express service is under consideration. The vision would also expand the corridor's capacity by an additional 4 High Speed Rail trains per hour in each direction and connect Peninsula communities with future statewide high-speed rail service.

Figure 1 summarizes Caltrain's key service operation metrics and shows steady growth in the number of boardings and relatively little change in train miles traveled over the last 9 years. Between FY2017 and FY2018, Caltrain ridership as measured by number of boardings decreased slightly. Though the number of boardings and passenger miles traveled has increased significantly since FY2010, the train miles traveled by Caltrain's locomotives has not significantly increased, indicating that each locomotive is taking a greater number of passengers.

Figure 1: Caltrain Service Summary
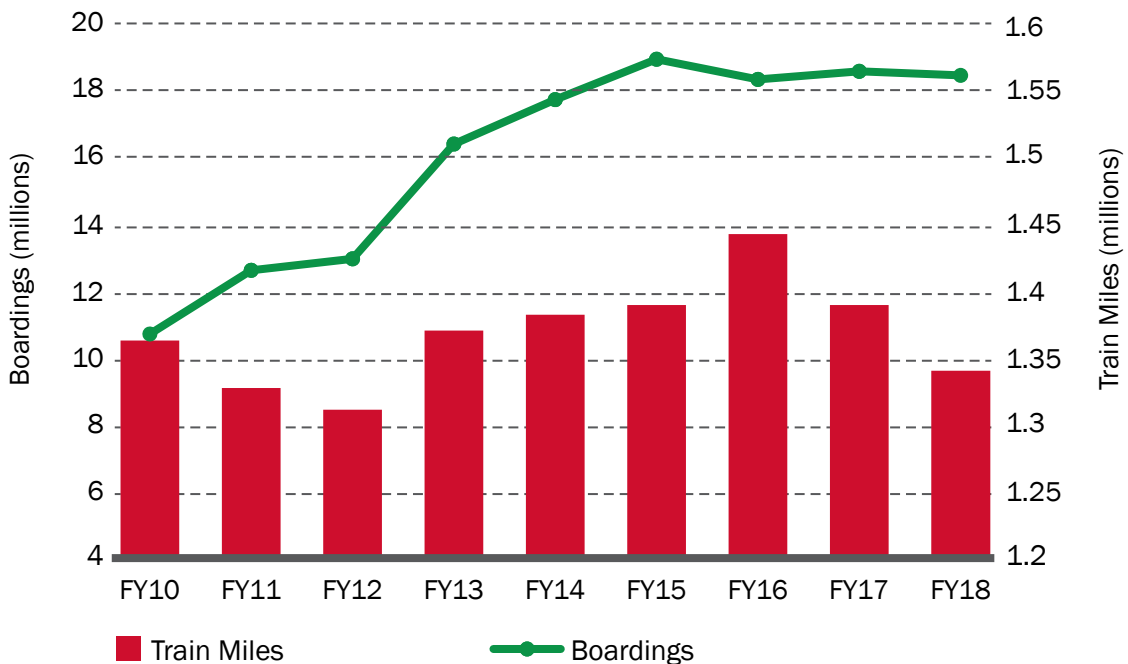
Note: Boardings exclude taxi/purchased demand services

CALTRAIN SUSTAINABILITY PERFORMANCE

Caltrain Achievements

CO_2 **-3%**

GHG emissions decreased by 3% compared to FY2010.

Between FY2010 and FY2018, despite a 74% increase in ridership, Caltrain generated 1,235 fewer metric tons of GHG.

-53%

Natural gas consumption decreased by 53% compared to FY2010.

Caltrain facilities used 8,875 fewer therms of natural gas in FY2018, equivalent to the energy use of 5.4 homes.

-1.4%

Diesel consumption decreased by 1.4% compared to FY2010.

Despite increasing ridership, Caltrain used 61,487 fewer gallons of diesel in FY2018 compared to FY2010, equivalent to removing 135 passenger vehicles from the road for a year.

Sustainability Programs

Caltrain Electrification

Caltrain electrification is a key component of the Caltrain Modernization Program and will electrify the corridor from San Francisco's 4th and King Caltrain Station to the Tamien Caltrain Station. Electrification improvements include converting diesel-hauled trains to high-performance electric trains that will deliver faster, more frequent and cleaner service to help the system accommodate rapidly increasing ridership demand. Caltrain reached a major milestone by breaking ground on construction in July 2017. Electrified service is expected to start in 2022.

Accommodating 5,500 Daily Bicyclists

Bicycling is a major mode of station access. Approximately 17% of passenger trips to and from a Caltrain station are made using a bicycle. Caltrain has the most extensive bicycle access program among passenger railroads in the U.S, and provides both on-board bike parking facilities in dedicated bike cars and wayside bike parking along the corridor. Today, the vast majority of Caltrain passengers accessing the system via bicycle bring their bikes on board, and current use of Caltrain's wayside bike parking facilities generally remains low. This highlights the importance of and need for last mile solutions.

The high demand for on-board bicycle parking, combined with the rapid and sustained ridership growth over the last decade, has created a challenge for Caltrain to accommodate parking for every bicycle during peak hours. Additionally, ridership is expected to increase substantially with the completion of electrification. Caltrain is working to improve bike access through the following actions:

- The new electric trains will provide one on-board bike space for every eight seats

- In November 2017, the JPB adopted a Bicycle Parking Management Plan to increase bike parking capacity at Caltrain stations

- Caltrain implemented the Bikes Board First program system-wide. This program allows riders with bicycles to board first onto the designated bike cars once existing passengers have debarked. During the pilot phase of the program, this saved more than a minute of boarding times during the peak commute hours.

Caltrain Sustainable Performance Summary

Table 2 summarizes Caltrain's FY2018 performance across eight sustainability indicators per boarding compared to FY2010. The percentage indicates the change in total resource consumption while the text below indicates the change per boarding.

Table 2: Sustainability Indicator Summary for FY2018 Compared to FY2010

Indicator	← Less Sustainable	More Sustainable →
	Percent Change between FY2010 and FY2018	Percent Change between FY2010 and FY2018
GHG Emissions Generated		→ 3% Decrease of 4.3 lbs per boarding
Net GHG Emissions		→ 267% Decrease of 1 pound per boarding
Energy Use in Facilities	14% ← No change in kBTU per boarding	
Energy Use in Revenue Fleet		→ 0.9% Decrease of 2.3 kBTU per boarding
Criteria Air Pollutants Generated		→ 1% Decrease of 0.1 pounds per boarding
Water Consumed		→ 27% 0.1 fewer gallons per boarding
Waste Generated[1]	3% ← No change in pounds per boarding	
Waste Diverted[2] (recycled/composted)	4 p.p. ←	

[1] Waste data was not available until 2014. As a result, waste performance is compared to 2014.
[2] Diversion is measured as the percent of total waste diverted from a landfill through recycling or composting. The diversion rate is not normalized by boarding.

Table 3 provides information on Caltrain's sustainability performance over the past nine years and the baseline year (FY2010).

Table 3: Caltrain Sustainability Indictor Areas

Indicator	Unit	Baseline: 2010	2011	2012	2013	2014
Greenhouse Gas Emissions						
Generated	$MTCO_2e$	46,513	46,860	47,319	47,491	46,206
Displaced/Avoided	$MTCO_2e$	-50,669	-49,800	-47,894	-63,914	-63,914
Net Total	$MTCO_2e$	-4,157	-2,942	-578	-12,350	-17,708
Criteria Air Pollutant Emissions[1]						
Generated	Tons	843	855	860	876	850
Displaced/Avoided	Tons	-572	-513	-451	-508	-485
Net Total	Tons	271	342	409	369	364
Facility Energy Use						
Electricity	kWh	6,373,038	6,234,204	6,227,954	6,629,336	6,853,474
Natural Gas	Therms	16,892	16,792	12,940	10,575	8,879
Total Facility Energy Use	kBTU	23,434,504	22,950,785	22,544,351	23,677,480	24,272,711
Revenue Fleet Vehicle Energy Use						
Diesel	Gallons	4,296,357	4,326,614	4,341,974	4,415,396	4,289,258
Gasoline	Gallons	79,167	81,372	91,519	80,417	86,886
CNG	GGE	0	0	0	11,329	14,441
Biodiesel	Gallons	0	0	28,915	17,953	7,057
Total Vehicle Energy Use	kBTU	603,202,318	607,656,290	614,749,682	623,229,610	605,534,578
Waste and Recycling						
Generated	Tons	NA [2]	NA [2]	NA [2]	NA [2]	576
Diverted	Percentage or Percentage Points	NA [2]	NA [2]	NA [2]	NA [2]	77%
Water						
Consumed	Gallons	NA [2]	NA [2]	NA [2]	NA [2]	20,443,528

Notes: Totals may not sum due to rounding. $MTCO_2e$ = metric tons of carbon dioxide equivalent; FY = fiscal year; kWh = kilowatt hours; kBTU = thousand British thermal units; CNG = compressed natural gas; GGE = gasoline gallon equivalent; NA = not available.
1 Includes ROG, NOX, CO, PM10, and PM2.5.
2 This data was either not available or incomplete. For the purposes of consistency with the rest of the inventory, GHG emissions from waste and water between FY2010 and FY2013 were assumed to be the same as data in FY2014.

Table 3: Caltrain Sustainability Indicator Areas, Continued

Indicator	Unit	2015	2016	2017	2018	FY10 to FY18 Change
Greenhouse Gas Emissions						
Generated	$MTCO_2e$	47,594	49,291	48,187	45,278	-2.7%
Displaced/Avoided	$MTCO_2e$	-76,232	-76,332	-61,772	-60,551	19.5%
Net Total	$MTCO_2e$	-28,637	-27,040	-13,586	-15,273	-267%
Criteria Air Pollutant Emissions[1]						
Generated	Tons	863	898	887	838	-0.6%
Displaced/Avoided	Tons	-521	-471	-346	-311	-45.7%
Net Total	Tons	342	427	541	527	94.6%
Facility Energy Use						
Electricity	kWh	7,533,223	7,811,512	7,215,443	7,264,850	14.0%
Natural Gas	Therms	7,158	7,770	8,145	8,017	-52.5%
Total Facility Energy Use	kBTU	26,420,052	27,430,799	25,434,419	25,058,603	6.9%
Revenue Fleet Vehicle Energy Use						
Diesel	Gallons	4,351,371	4,535,867	4,478,040	4,234,870	-1.4%
Gasoline	Gallons	97,424	99,882	105,150	99,406	25.6%
CNG	GGE	5,100	9,069	8,204	6,324	-
Biodiesel	Gallons	6,995	0	0	0	-
Total Vehicle Energy Use	kBTU	614,487,519	639,773,567	632,359,954	597,873,380	-0.9%
Waste and Recycling						
Generated	Tons	583	583	583	591	2.6%
Diverted	Percentage or Percentage Points	72%	72%	72%	73%	-4 p.p.
Water						
Consumed	Gallons	18,365,010	12,864,117	14,995,690	14,914,911	-27.0%

Notes: Totals may not sum due to rounding. $MTCO_2e$ = metric tons of carbon dioxide equivalent; FY = fiscal year; kWh = kilowatt hours; kBTU = thousand British thermal units; CNG = compressed natural gas; GGE = gasoline gallon equivalent; NA = not available.
1 Includes ROG, NOX, CO, PM10, and PM2.5.
2 This data was either not available or incomplete. For the purposes of consistency with the rest of the inventory, GHG emissions from waste and water between FY2010 and FY2013 were assumed to be the same as data in FY2014.

Caltrain GHG Inventory

Greenhouse gas emissions (GHGs) are primarily generated by burning fossil fuels. In the United States, transportation represents approximately 29% of all GHG emissions. In this inventory, emissions of carbon dioxide, methane and nitrous oxide are calculated into a carbon dioxide equivalent (CO_2e) according to their global warming potentials, which measures the pollutant's insulating effect (e.g., ability to warm the earth's atmosphere or greenhouse effect). Other GHGs, such as sulfur hexafluoride and refrigerants, are excluded from this inventory at this time, though they may be added in future inventories.

Caltrain generated approximately 48,187 metric tons of Scope 1, 2 and 3 CO_2e ($MTCO_2e$) in 2017 and 45,278 $MTCO_2e$ in 2018. To compare that figure to overall Bay Area transportation emissions, the Metropolitan Transportation Commission (MTC) estimated that approximately 23 million $MTCO_2e$ were emitted by gasoline and diesel cars, trucks, motorhomes and motorcycles in the 9-county San Francisco Bay Area in 2014.

Assuming that Caltrain passengers would have otherwise driven for their trip, we can estimate the amount of emissions that Caltrain displaces. Figure 2 shows a line graph of Caltrain's net GHG emissions, with generated and displaced emissions highlighted as bars for each fiscal year.

In this chart, displaced emissions are equal to the emissions avoided from passengers riding Caltrain instead of driving their personal cars. Despite a significant increase in ridership, Caltrain's generated GHG emissions have decreased by approximately 3% between FY2010 and FY2018. This is primarily a result of a decrease in train miles (and therefore, decreased diesel fuel consumption) in FY2017 and FY2018

Between FY2010 and FY2018

Net emissions declined by
11,116
$MTCO_2e$

Which is EQUAL to removing emissions from
2,360
passenger vehicles on the road

OR the amount of carbon sequestered by
13,083
acres of forests in one year

as well as Caltrain's increased use of renewable and GHG-free energy through participation in CCE programs. Caltrain's net emissions declined by nearly 11,200 $MTCO_2e$ between FY2010 and FY2018, or the equivalent emissions of 2,360 passenger vehicles or the amount of carbon sequestered by 13,083 acres of forests in one year.

Figure 3 shows the percent breakdown of sources contributing to the GHG emission generated by Caltrain operations in FY2018. The overwhelming majority of emissions are generated by diesel use in locomotives, which contributed approximately 96% of all GHG emissions.

Caltrain also reduced net GHG emissions per boarding by 116%, from -0.8 pounds to -1.8 pounds, when compared to FY2010.

Riding Caltrain instead of driving reduces regional GHG emissions.

FY2018 The average Caltrain passenger helps eliminate **1.8 pounds** of GHG emissions with each train trip.

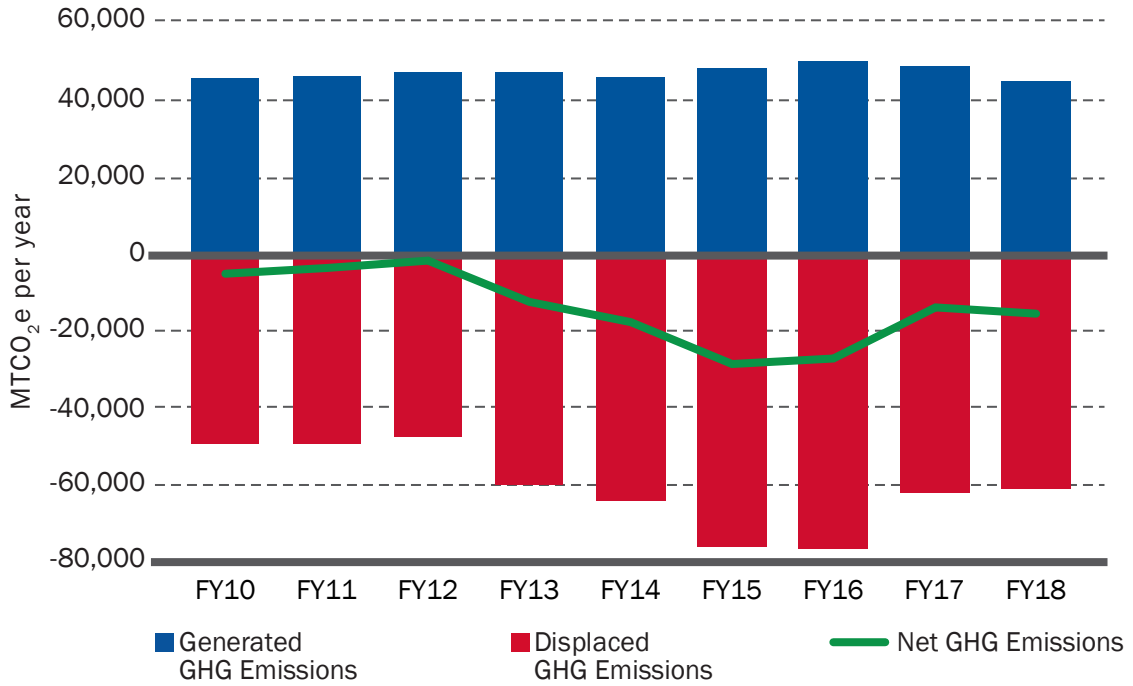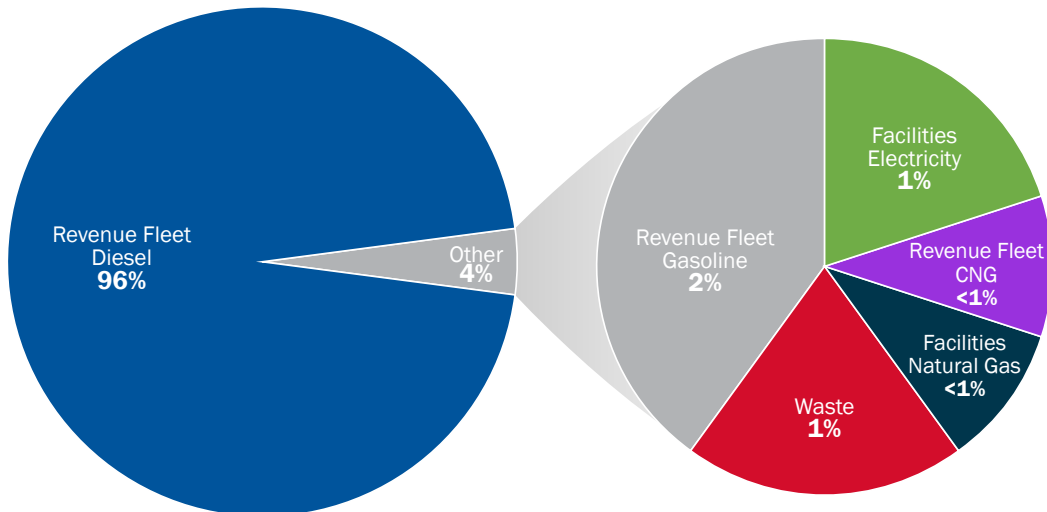## Figure 2: GHG Emissions – Generated, Displaced and Net

- Generated GHG Emissions
- Displaced GHG Emissions
- Net GHG Emissions

Figure 3: GHG Emissions by Source (FY2018 values)

Revenue Fleet Diesel **96%**

Other **4%**

Revenue Fleet Gasoline **2%**

Facilities Electricity **1%**

Revenue Fleet CNG **<1%**

Facilities Natural Gas **<1%**

Waste **1%**

Note: All values are rounded to the nearest whole number.

   Water represents less than 0.01% of emissions, and is too small to be shown in figure above.

Caltrain Criteria Air Pollutants

Criteria air pollutants (CAPs) include pollutants that cause smog, acid rain, and have been linked to negative health effects. CAPs are emitted from Caltrain vehicles that burn fossil fuels. However, Caltrain also displaces CAPs that otherwise would have been emitted if passengers had chosen to drive alone instead of taking public transit.

In Figure 4, the net reduction in CAPs is shown in a line graph, where the generated and displaced CAPs are shown in bars above and below the line. Displaced CAPs are equal to the CAPs that would have been generated if Caltrain passengers had instead chosen to drive rather than take public transit. Figure 5 shows the breakdown of sources contributing to the CAPs generated by Caltrain, where over 99% of CAP emissions are from locomotive diesel fuel use.

Despite increasing ridership and a reduction in Caltrain's generated CAPs, Caltrain net CAP emissions increased by nearly 100% between FY2010 and FY2018. This is largely caused by differences in technology between diesel locomotives and passenger vehicles combined with increasing efficiency of passenger vehicles. Once Caltrain electrification is completed CAP emissions will be dramatically reduced.

Figure 4: Criteria Air Pollutants - Generated, Displaced and Net
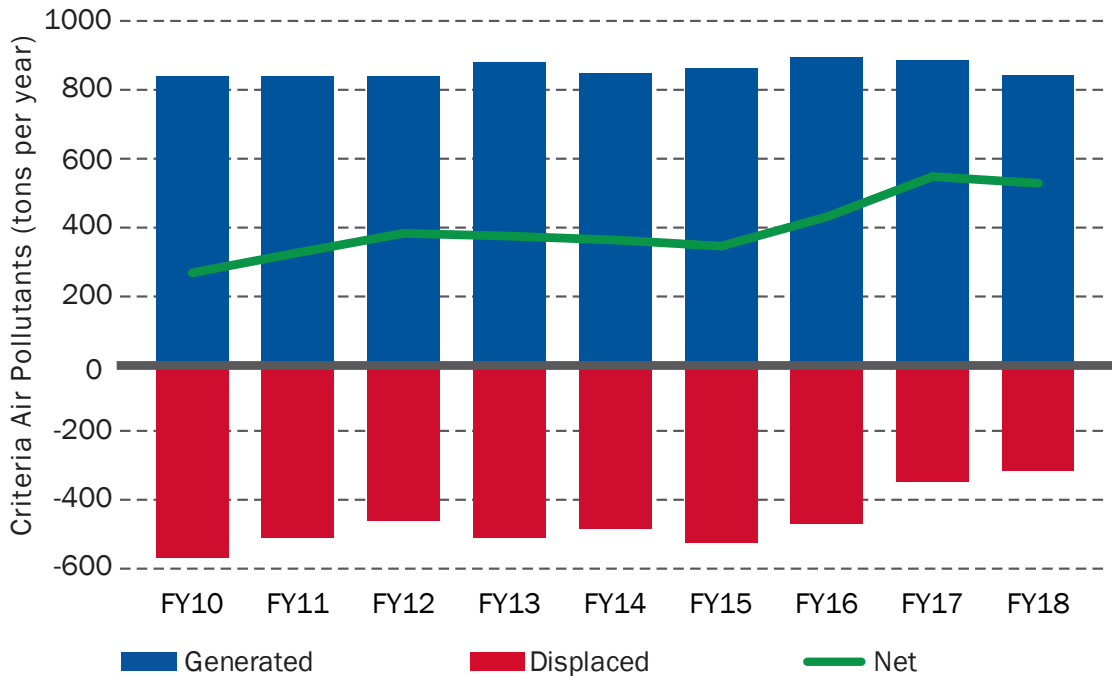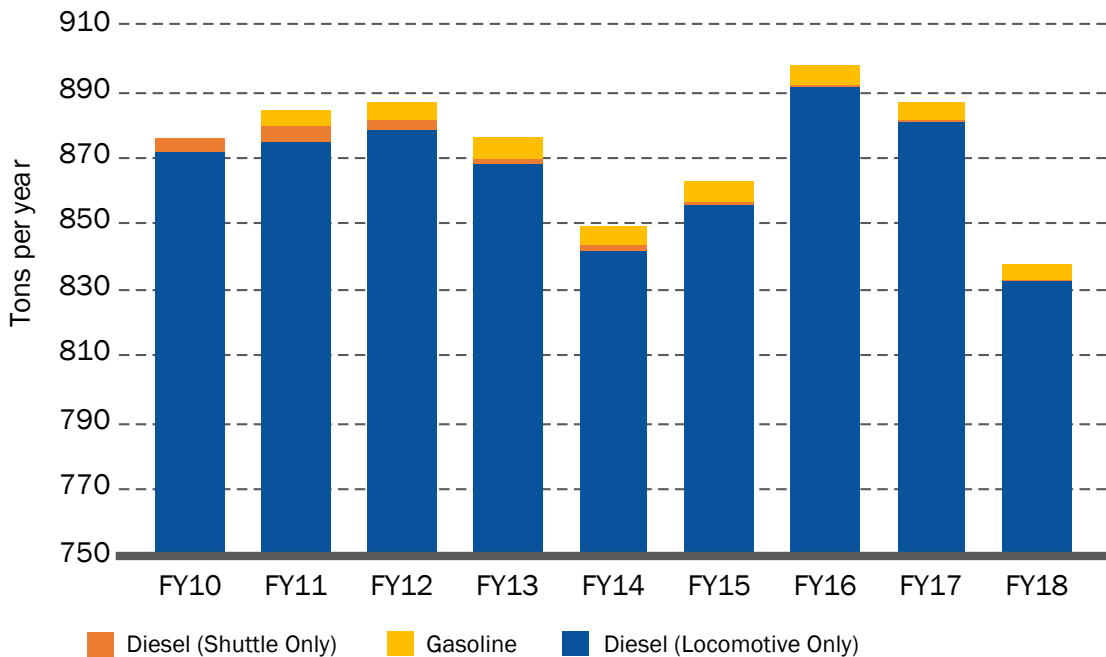

Figure 5: Criteria Air Pollutants - Emissions by Source Type

Note: CAP emissions from CNG and biodiesel are too small to be seen in this cart.

Caltrain Energy Use - Fleet

Caltrain's revenue vehicle fleet operates on diesel, gasoline, biodiesel and compressed natural gas (CNG). Currently, commuter rail (i.e., Caltrain trains) uses only diesel fuel, though modernization of the corridor will transition the fleet to electric vehicles. The transportation shuttle services used diesel, gasoline, biodiesel and CNG. Only ultra-low sulfur diesel is used in Caltrain operations, according to California fuel standards. Demand taxi and purchased transportation services are excluded from this sustainability and GHG inventory because they are not under the operational control of Caltrain.

Energy use by fleet vehicles makes up the majority of Caltrain's overall energy use, as measured in thousand British thermal units (kBTU). As shown in Table 3, diesel, gasoline, and CNG fuel combined comprise 96% of all energy consumed by Caltrain in FY2018.

As shown in Figure 6, diesel fuel in locomotives accounts for over 96% of the fuel used by Caltrain, with more than 4.2 million gallons consumed in FY2018. There was a notable increase in diesel fuel usage between 2015 and 2016 as a result of Caltrain adding additional trains to accommodate increased ridership. CNG and diesel-powered motor bus use declined significantly since FY2010, and no biodiesel buses were in operation in FY2018.

Figure 7 illustrates the fleet use per boarding and train mile between FY2010 and FY2018. Fleet energy use per boarding has declined by 43% between FY2010 and FY2018. Due to minimal additions to the revenue fleet operations amidst increasing ridership, fuel consumption per train mile has remained relatively steady.
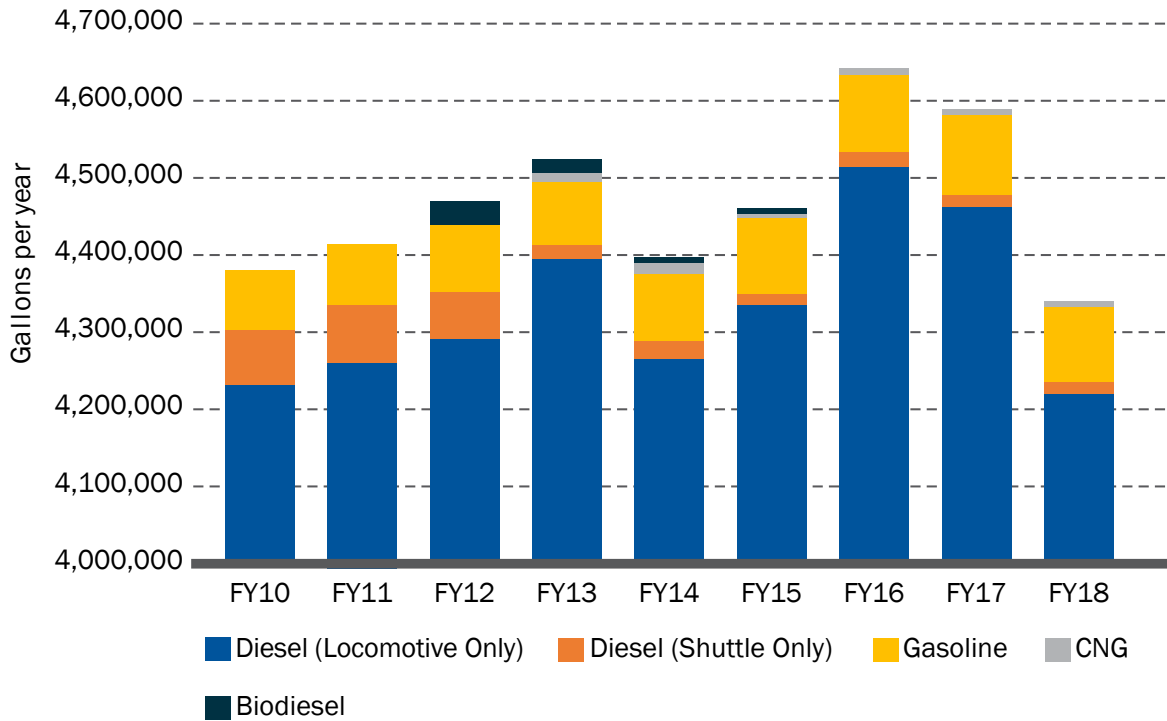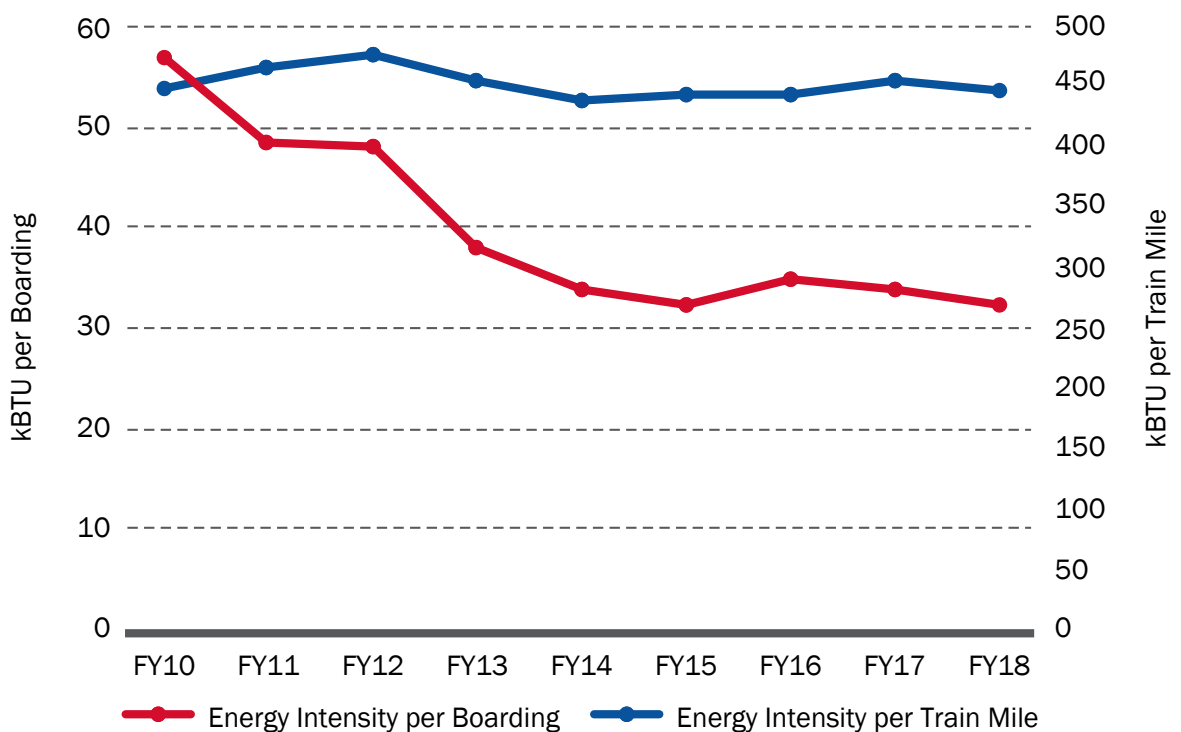
Figure 6: Fuel Use by Fuel Type

Legend:
- Diesel (Locomotive Only)
- Diesel (Shuttle Only)
- Gasoline
- CNG
- Biodiesel

Figure 7: Revenue Fleet Energy Use per Boarding and Train Mile

Legend:
- Energy Intensity per Boarding
- Energy Intensity per Train Mile

Caltrain Energy Use - Facilities

Currently, Caltrain uses electricity for lighting, equipment, and amenities at its stations, Centralized Equipment Maintenance and Operations Facility (CEMOF) and for signals along the right-of-way. Certain facilities also use natural gas for space heating. In addition, Caltrain and SamTrans both operate out of the Central Administrative Offices (Central) located located in San Carlos, California. Energy use and emissions associated with Central are included in the SamTrans inventory.

Energy use by facilities is a very small share of the total energy consumed by Caltrain, as measured in kBTU. Natural gas and electricity made up only 3% of Caltrain's total energy use in FY2018. During FY2018, Caltrain purchased nearly 7.3 million kWh of electricity and 8,000 therms of natural gas, equivalent to over 25 million kBTU for both resources.

Over the last six years, facility energy has increased, in large part a result of the increased use of wayside power at CEMOF and the Gilroy, San Jose Diridon, and San Francisco 4th and King stations (Figure 8). Wayside power or "hotel power" allows Caltrain to plug into electricity during key maintenance activities to minimize diesel fuel consumption and idling emissions. Natural gas use has gradually declined relative to electricity. Electricity usage will significantly increase while GHG emissions decrease as Caltrain pursues electrification and explores options to meet the state's electricity goal of 100% GHG-free sources by 2045.

Figure 9 illustrates the facility energy use per boarding and train mile between FY2010 and FY2018. Consistent with increased ridership during this time and a slower increase in facility energy use, facility energy use per boarding has declined by 39% between FY2010 and FY2018. Due to slight increase in facility energy use and the relatively constant fleet activity, the facility energy per train mile has increased by 9% between FY2010 and FY2018.
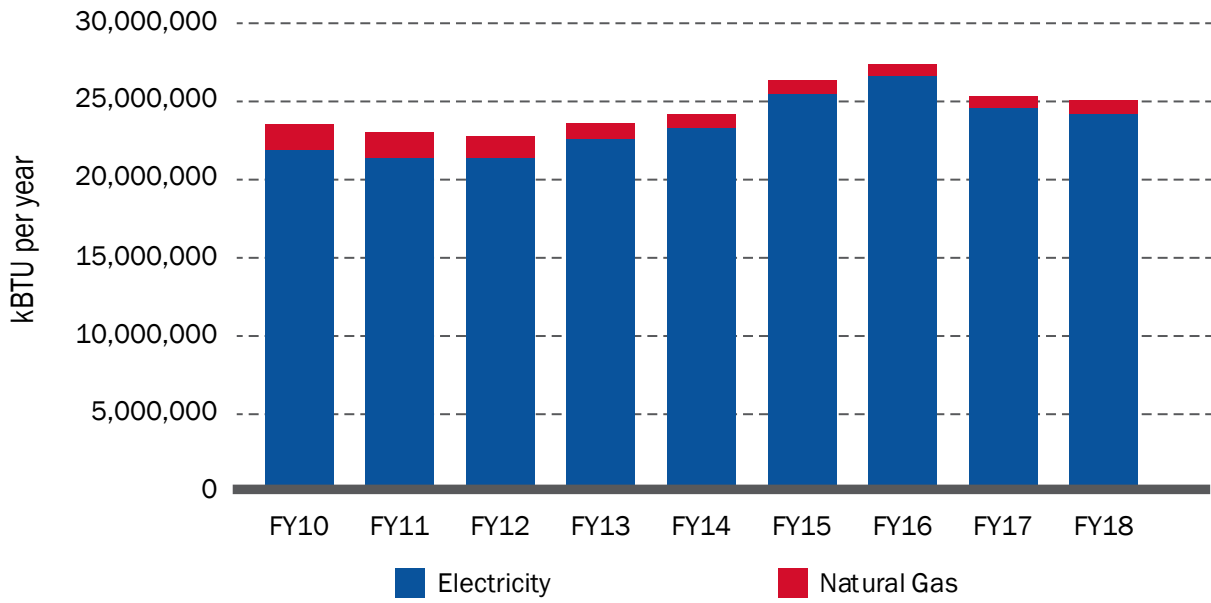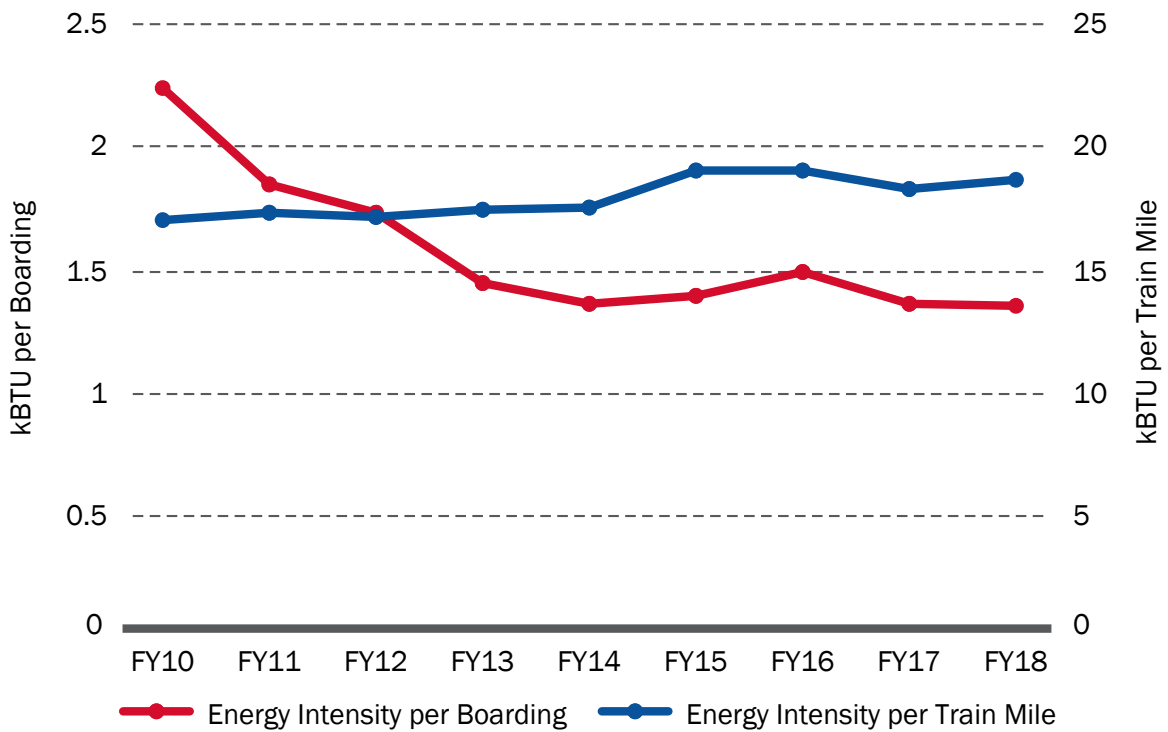
Figure 8: Facility Energy Use

Figure 9: Facility Energy Use per Boarding and Train Mile

Caltrain Water, Waste and Diversion

Water

Caltrain uses water for irrigation of outdoor landscaping at its stations, train washing at CEMOF and indoor uses such as passenger and employee restrooms and crew showers at select stations. Emissions are generated indirectly through the combustion of fossil fuels in electricity generation that provides electricity for water delivery, conveyance and treatment. Although Caltrain does not directly control these emissions, they are included in this inventory because any emissions are a consequence of Caltrain's use of the water.

Though the historic California drought was declared over in April 2017, Caltrain remains committed to implementing water-saving conservation measures, storm water management practices and eliminating water waste and reduce the flow of pollutants into our rivers, creeks, ponds, lakes and the San Francisco Bay. Caltrain installs green landscaping to filter pollutants out of storm water, removes trash and debris along the rail corridor and provides single-stream trash collection facilities on trains and in stations. Caltrain also conserves water at stations by planting drought-tolerant vegetation, covering plant beds with mulch to reduce evaporation and uses "smart" irrigation controllers that adjust watering schedules based on local temperature and rainfall.

As a result of water conservation measures, Caltrain reduced water consumption by 27% between FY2014 and FY2018 (Figure 10). Although Caltrain water consumption increased in FY2017 and FY2018 as drought restrictions were lifted, consumption remains far below FY2014 levels.

Waste and Diversion

Caltrain-generated waste consists of municipal waste from passengers (paper, food scraps, bottles and cans, other common recyclables) and employees (from typical office activities and select low-impact maintenance activities). Industrial maintenance waste (such as hazardous waste and large metal scrap recycling) and construction and demolition waste are not included in this inventory. Emissions from waste are generated as Scope 3 emissions and are included in this inventory.

The waste and diversion (recycling and composting) rates are estimated through invoices from Caltrain's waste service providers. In select cases, Caltrain's waste service provider is able to provide information on landfill, recycling and organics collection by weight. For all other cases, Caltrain assumes that all landfill, recycling and organics collection containers are 80% full when collected each week for the purposes of this inventory. As a result of improved data availability, Caltrain adjusted historical waste and diversion calculations.

Total composted waste and recycled waste remained relatively consistent. In FY2018, Caltrain's waste consisted of approximately 27% landfilled waste, 73% recycled and 0.5% composted (Figure 11).

Caltrain manages waste to ensure that it is easy for customers to dispose of waste efficiently. At the San Francisco station, Caltrain has triple-stream bins designated for recyclables, compostables and trash (landfill). These bins are clearly labeled and conveniently located throughout the station. At all other Caltrain stations, customers can place recyclables, food and trash in the same bin. Machinery and trained staff sort the contents of the bins offsite to ensure that waste is directed appropriately.

Figure 10: Water Consumption
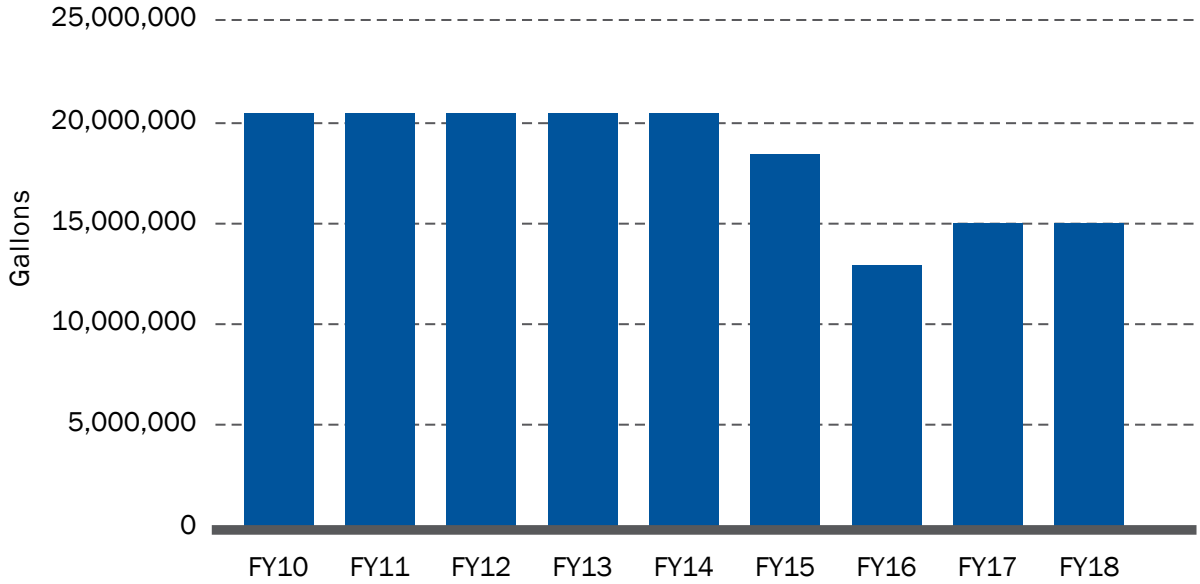
Note: Water consumption from FY2010 through FY2014 is assumed to be the same as FY2014 due to insufficient data

Figure 11: Waste Disposal by Type

■ Recycled Waste　■ Landfilled Waste　■ Composted Waste

— Diversion Rate
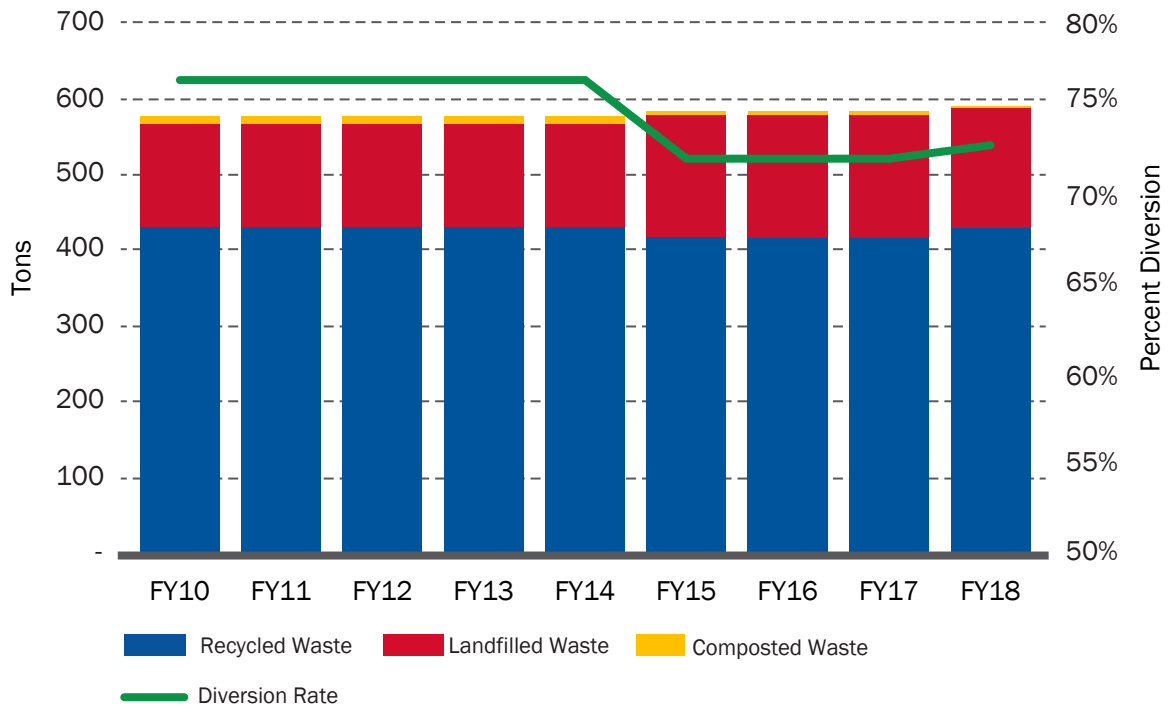
Note: Waste disposal from FY2010 through FY2014 is assumed to be the same as FY2014 due to insufficient data

CURRENT AND PLANNED INITIATIVES

Current and Planned Initiatives

Caltrain Electrification Project

The Caltrain Electrification Project will convert Caltrain's diesel operations to an electric system to dramatically reduce operational greenhouse gas emissions, reduce engine noise and help improve local and regional air quality all while increasing service and capacity for Caltrain customers. The first electric train arrived in late 2019 with passenger service anticipated in 2022.

Specific advantages of electrification include:

Improved Train Performance, Increased Ridership Capacity and Increased Service: Electrified trains can accelerate and decelerate more quickly, allowing Caltrain to run more efficiently and provide more frequent and faster service.

Reduced Engine Noise Emanating from Trains: Noise from electrified train engines is measurably lower than noise from diesel train engines.

Improved Air Quality and Reduced GHG Emissions: Electrified trains will produce substantially less air pollution even when the indirect emissions from electrical power generation are included.

Commitment to Renewable Energy

As of 2019, 100% of Caltrain's electricity is sourced from renewable and GHG-free energy sources. In November 2018, the Caltrain Board of Directors voted to expand the agency's use of renewable energy by partnering with the new Community Choice Energy (CCE) program in San Jose—San Jose Clean Power. Since 2016, Caltrain has procured 100% renewable energy from three CCE programs: Peninsula Clean Energy, Silicon Valley Clean Energy, and Clean Power SF. The agency also receives 100% renewable and GHG-free electricity from two municipal owned utilities: Silicon Valley Power and the City of Palo Alto. All of the energy providers have been chosen on the basis of reliability, cost and environmental benefits.

Transit-Oriented Development Policy

Transit-oriented development (TOD) consists of a mix of commercial, residential and recreational land uses surrounding a transit station. These dense, walkable areas increase transit ridership and decrease automobile use. Caltrain recently adopted a set of interrelated development policies including a Rail Corridor Use Policy (RCUP), TOD Policy and Station Management Toolbox. Caltrain's RCUP helps define how Caltrain right of way can be utilized; TOD policy defines its development principals and includes minimum thresholds for affordable housing, unit density, building height; and its Station Management Toolbox supports transparent development decision making based on data and performance targets.

Caltrain Peninsula Corridor Electrification Project groundbreaking ceremony.