

MBTA SUSTAINABILITY REPORT

Spring 2014



INBOUND
TRAINS

EXPERIENCE THE
DIFFERENCE



PRINTED ON RECYCLED PAPER



ENVIRONMENTAL MANAGEMENT & SUSTAINABILITY POLICY

SUSTAINABILITY

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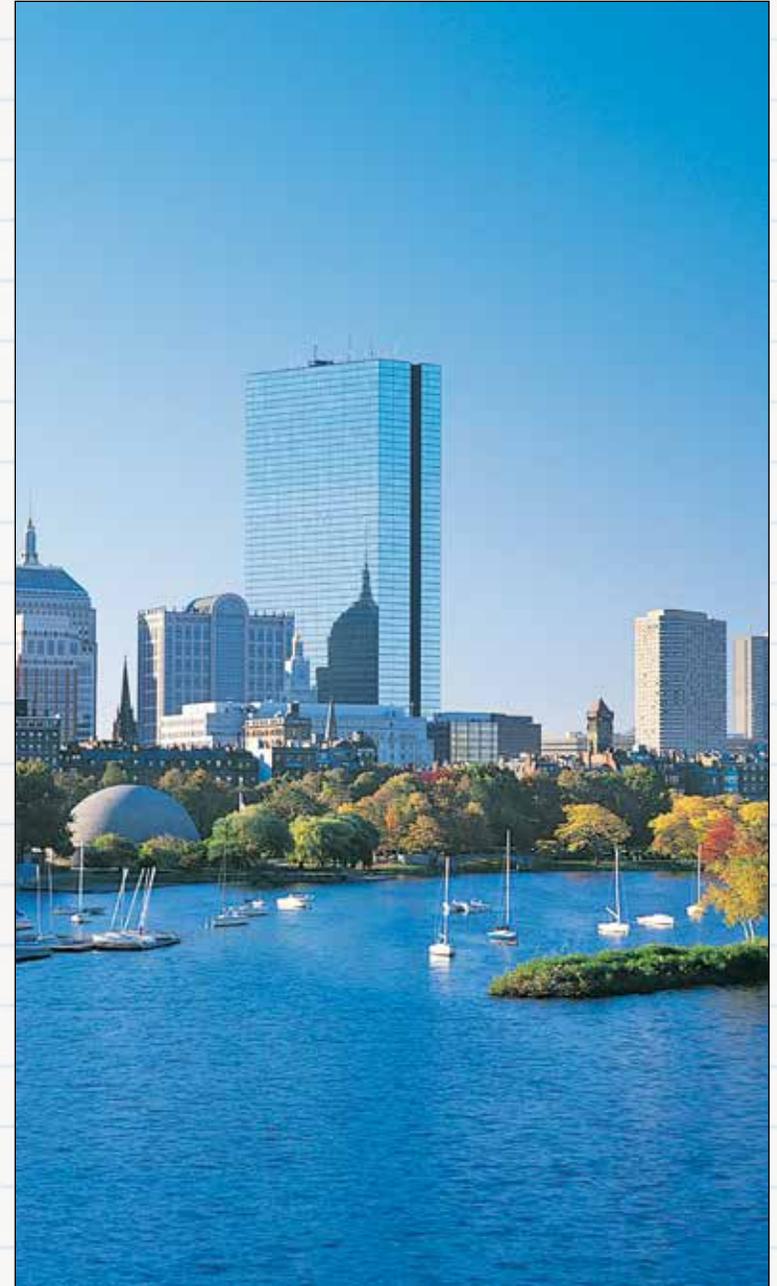
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GUIDING PRINCIPLES

1. The MBTA will meet or exceed applicable environmental laws and regulations.
2. The MBTA will manage its operations to be a good neighbor in the communities it serves and to avoid or minimize impacts to the environment.
3. The MBTA will manage its operations to avoid or minimize environmental impacts on the human health and safety of its employees.
4. The MBTA will ensure that environmental, social, and economic considerations are included in its design, construction, procurement, and operational business planning processes.
5. The MBTA will establish and monitor environmental objectives and implement the best management practices to ensure improved performance.
6. The MBTA will seek the commitment of all employees to environmental stewardship through communication, training, and support of employee leadership.
7. The MBTA will foster sustainable use of natural resources by promoting pollution prevention, water reduction, energy management, recycling, re-use, and re-purposing of materials, and waste reduction management opportunities.
8. The MBTA will collaborate with other organizations to achieve shared environmental goals.
9. The MBTA will review its environmental performance to identify opportunities for continual reduction of its carbon footprint as well as reduction of its consumption of natural resources.
10. The MBTA will seek to implement emerging technologies that present innovative and tangible environmental, social, and economic benefits to its transportation service delivery.

Beverly A. Scott, Ph.D.
General Manager and MassDOT Rail & Transit Administrator





In May 2012, the MBTA signed the American Public Transportation Association (APTA) Sustainability Commitment Pledge. APTA's Sustainability Commitment is a voluntary program for transit agencies and other organizations involved in public transportation to join and pledge their commitment to sustainability. The basic premise as stated in the commitment is *"preserving the environment, being socially responsible, and maintaining economic viability, with an overall contribution to quality of life."*



Transit agencies that sign the APTA Sustainability Pledge commit to instituting procedures, policies, and programs designed to quantify their level of continuous improvements in the areas of water, energy, and fuel consumption, reduction in greenhouse gas emissions, increased recycling, and decreased waste generations, as well as other areas within their organization. Signers are rated based upon an evaluation system that qualifies their level of implementation from Bronze, to Silver, to Gold, and finally Platinum. Each level represents a bigger commitment and thus a greater reduction in critical environmental categories such as greenhouse gas emissions.

The core commitment to sustainability starts with the men and women who work on the front lines at the Authority and continues all the way to the highest levels of the organization, including the Governor, the members of the MBTA Board of Directors, Secretary of Transportation, and the MBTA's General Manager. The primary goal of the Authority is to strive for sustainable operations, not just on the environmental front, but as an ongoing strategic relationship with the communities it serves. Governor Deval Patrick stated during the introduction of the Massachusetts GreenDOT initiative, *"By making this commitment, MassDOT has declared its contribution to creating a clean energy economy for Massachusetts. In the coming years, we will see the results in smarter growth, cleaner vehicles, and jobs devoted to building a lower carbon transportation system."*

In the MBTA's first submittal under the APTA Sustainability Program, the MBTA was able to reach a higher standard of compliance by achieving the "Gold" Recognition Level.

(TOP) MBTA RED LINE CROSSING THE LONGFELLOW BRIDGE

Acknowledgments

This report was prepared by the MBTA's Environment Department, and specifically through the hard work of Tim Lasker, Sustainability Specialist, Sean Donaghy, Environmental Intern (Boston University, 2014), and Evan Hazelett, Sustainability Researcher. The MBTA Marketing and Communications Department was very helpful in selecting photos and graphics. In addition, the MBTA would like to thank the staff at the Central Transportation Planning Staff (CTPS) for its work in developing travel demand forecasts as well as Kyle Bell at the American Public Transit Association (APTA) for his help on using the APTA Sustainability Metrics.

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SUSTAINABILITY – INTRODUCTION



Fifth-Largest Transit System in the Country

Every year almost 400 million trips, totaling 1.85 billion passenger miles, are taken on the MBTA. This movement of people across Eastern Massachusetts results in significant environmental benefits to our region, and to all Massachusetts residents—whether they ride the MBTA or not.

The MBTA's primary goal is to move people around the Boston metropolitan area. At the same time, the MBTA is evaluating its operations to ensure an environmentally friendly transit system with sustainable growth. The MBTA transit system affects our environment, and it is critical that we understand the impact it has on the communities it serves.

In 2012, the MBTA signed the American Public Transit Association's (APTA) Sustainability Pledge. A commitment to sustainability is now part of the MBTA's long-term goals and will remain a part of the MBTA's planning. The environmental and sustainable performance at the MBTA has improved dramatically over the last few years. The MBTA has many projects under way to improve sustainability, including reducing water consumption, installing renewable energy sources, promoting sustainability in community-outreach programs, and retrofitting outdated facilities to be more efficient.



(TOP) WELLINGTON STATION ON THE ORANGE LINE
(BOTTOM RIGHT) SILVER LINE AT SOUTH STATION
(BOTTOM LEFT) BLUE LINE AT MAVERICK STATION



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SUSTAINABILITY INTRODUCTION

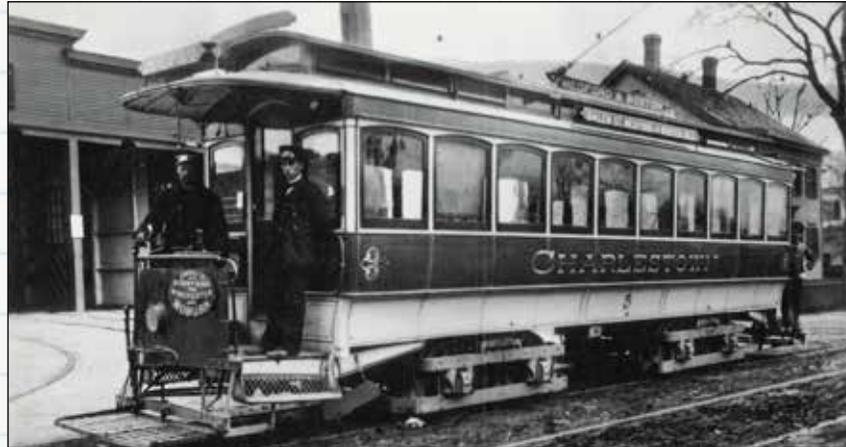
The MBTA...Always a Part of Boston

Public transportation first emerged in the city in 1631, when Boston was a peninsula connected to the mainland by a narrow strip of land, and ox carts were used to transport freight. In March 1895, groundbreaking began on creating the first subway in the country. Since the subway's opening on September 1, 1897, the MBTA has continued to grow, setting its highest ridership totals in 2012 of over 1.36 million trips per day.

The MBTA transit system consists of 1,193 miles of track and 270 stations in Massachusetts and Rhode Island. It employs over 6,000 people, and uses contractors that run the Commuter Rail and paratransit systems. The average person within the MBTA's service area will take approximately 78 trips in 2012, and collectively those riders will travel over 75 million vehicle miles. The MBTA rider is more likely to live in higher-density, walkable areas, which have a much smaller carbon footprint compared to people who live in less dense, automobile-dependent areas. The greenhouse gas reduction that results from high ridership makes the MBTA an essential service to improving the carbon efficiency of the Boston metropolitan area.

With an increased focus on sustainable communities, the facilitation of low-impact, high-density living will become crucial to the environment and the economy. It is important that the MBTA plans sustainably to help Massachusetts adapt, mitigate, and reverse the effects of global climate change.

(RIGHT) HISTORIC PHOTOS COURTESY OF THE BOSTON PUBLIC LIBRARY



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Moving Forward...GreenDOT

The MBTA is working with the Massachusetts Department of Transportation's (MassDOT) other divisions (Highway Division, Registry of Motor Vehicles, Aeronautics, and the Office of Transportation Planning) to implement the GreenDOT initiative, which launched in June 2010. GreenDOT is a comprehensive program for sustainability that spans all transportation agencies with the primary goals of:

- ◆ Reducing greenhouse gas emissions.
- ◆ Promoting the healthy transportation options of walking, bicycling, and public transit.
- ◆ Supporting smart growth development.

GreenDOT is a tool that enables the MBTA to focus more on reducing its environmental impact, as well as offering methods to increase its environmental benefits to the communities it serves. In combination with the APTA Sustainability Commitment, the MBTA is able to assess its progress to a greener tomorrow. This report outlines the environmental impacts and benefits of the MBTA, as well as recently completed and ongoing projects designed to improve sustainability at the MBTA.

(RIGHT) COMMUTER RAIL STATION IN SOUTHBOROUGH, MA

GreenDOT Implementation Plan

Goals:

- Air**
 - ◆ Reduce greenhouse gas emissions
 - ◆ Improve statewide air quality
- Energy**
 - ◆ Consume less energy
 - ◆ Increase reliance on renewable energy
- Land**
 - ◆ Minimize energy + chemicals used in maintenance
 - ◆ Enhance ecological performance of MassDOT impacted land
- Materials**
 - ◆ Improve life-cycle impacts of investments
 - ◆ Purchase environmentally preferred products
 - ◆ Build green facilities for MassDOT
- Policy Planning + Design**
 - ◆ Design a multi-modal transportation system
 - ◆ Promote healthy transportation + livable communities
 - ◆ Triple mode share of bicycling, transit + walking
- Waste**
 - ◆ Achieve zero solid waste disposal
 - ◆ Reduce all exposure to hazardous waste
- Water**
 - ◆ Use less water
 - ◆ Improve ecological function of water systems



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Key Metric	Baseline Year (FY2009)		Goal for FY2012		Current Year (FY2012)		Goal Met?
	Unit	Value	% Change	Value	% Change	Value	
Water Usage	Gallons/UPT	0.39	-5%	0.371	-31%	0.27	✓
GHG Emissions	Kg CO ₂ e/UPT	1.11	-10%	0.999	-23%	0.85	✓
GHG Savings	Kg CO ₂ e/PSA	5.26	5%	5.523	10%	5.76	✓
Energy Use	BTUs/UPT	14,404.01	-10%	12,963.609	-13%	12,546.46	✓
Recycling	As % of Total Waste	0.05	5%	0.053	12%	0.06	✓
Ridership	UPT/PSA	75.51	2%	77.020	4%	78.28	✓
Non-MBTA Vehicle Miles Traveled	VMT/PSA	11,339.77	-2%	11,112.975	-5%	10,789.64	✓
Operating Expense	\$/UPT	3.33	-2%	3.263	-2%	3.25	✓

Environment – Community – Economy

At the MBTA, sustainable transportation means meeting the needs of this generation without compromising the ability of the next to meet their environmental, social, and economic needs. As part of the MBTA's increased focus on sustainability, and with the help of APTA sustainability standards, a comprehensive data-tracking system was put in place to measure the environmental impacts of the MBTA. The reporting process brought several key metrics to the forefront, allowing for in-depth analyses from a few simple numbers.

Since signing the APTA Sustainability Pledge in 2012, the MBTA has collected numerous data points in the eight key metric categories listed in the chart above. The story that these numbers tell is one of great improvement over the last four years. Since the 2009 baseline was established, the MBTA has reduced water consumption by 31% per passenger trip, well above its 5% reduction goal. The MBTA has also reduced energy usage per passenger trip by 13%, and improved greenhouse gas savings by 10% in just three years. Recycling has also increased by 12%. Passenger trips per capita in our service area of operation, or annual trips per person within our service area, have also increased by 4% since more people are riding the MBTA more often.

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ENERGY — OVERVIEW



Energy Use and Conservation

The MBTA is one of the single-largest energy consumers in New England, consuming over 4.93 billion BTUs in 2009 alone. A large amount of energy is required to move over 400 million people across 1.8 billion passenger miles.

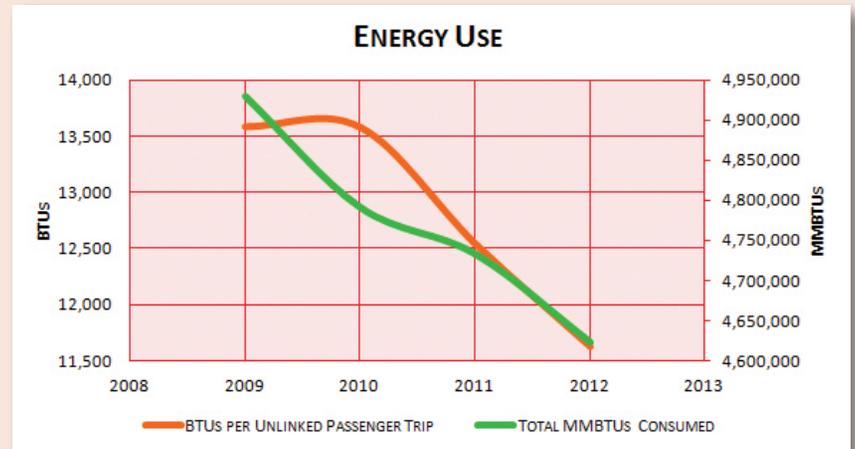
Considering the MBTA services 9.6% of Massachusetts transportation trips on less than 2% of the total Massachusetts transportation energy consumption, it is actually a very efficient system.

Given the amount of money the MBTA spends on energy, and the unpredictability of future energy prices, the MBTA has started to re-evaluate how it consumes energy and its energy sources. By improving energy efficiency, not only is the MBTA lowering the cost to run the system, it is also eliminating greenhouse gas emissions.

Over the last four years, the MBTA has made it a goal to improve efficiency through upgrading equipment. By doing so, the Authority is able to carry more people using less energy, resulting in a reduction in total energy consumption of 4.5% across the board and a reduction of 12.9% in total energy consumption per passenger trip.

In 2012, the MBTA consumed five billion BTUs, which was 200 million BTUs less than the previous year. Conserving energy is not only good for the environment, but also for the MBTA's bottom line.

(MIDDLE) DUDLEY STATION WITH OLD HIGH-PRESSURE SODIUM LIGHTING
(BOTTOM) DUDLEY STATION WITH NEW INDUCTION LIGHTING



ENERGY — ONGOING PROJECTS



Conservation Projects

The MBTA is continually investigating opportunities to conserve energy. The MBTA understands that replacing outdated rolling stock, vehicles, and buildings with new and efficient equipment will have a very positive impact on energy conservation. At the same time, it is focusing on cost-effective projects that have a smaller capital investment, with a faster return on investment (ROI).

Lighting Retrofits

The MBTA has been replacing old incandescent, high-intensity-discharge and outdated fluorescent lighting with new energy-efficient fluorescents and LED lighting. To date, these replacements have saved 19.6 billion kWh of energy use. Over 10,700 light fixtures have been replaced across the entire system with savings of \$1,15 million annually. In some cases the ROI is less than a year.

Train-Signal Retrofits

The MBTA is also undertaking a systemwide retrofit of old incandescent train-signal lights. These light bulbs would typically be replaced every six weeks; with over 1,500 signals across the network, that would require a massive cost for parts and labor. By replacing these old bulbs with newer LED technology, the MBTA is able to increase the lifespan of these signals to six to eight years. These light bulbs also consume about 1/12 the energy of incandescent bulbs. Both the labor and energy savings will add up to over \$1 million over the next three years.

(TOP) RECYCLING SIGN AT EVERETT BUS FACILITY
(BOTTOM) TRAIN SIGNAL WITH UPGRADED LED LIGHTS AT WELLINGTON STATION



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ENERGY — PLANNED PROJECTS



Monitoring Energy Consumption

In order to better focus on potential energy savings, the MBTA is using enhanced technology to track current energy consumption and create a baseline by which project savings can be monitored. This technology enables the MBTA to monitor specific buildings and pieces of equipment so it can identify the most advantageous locations to retrofit and replace equipment with more energy-efficient models.

Third Rail Heaters

Due to cold New England winters, our third rail must be heated to melt snow and allow the rail to transfer electricity more efficiently. These heaters are very outdated and require a large amount of electricity to power. They are turned on in late fall and remain on until the spring, running 24/7. The MBTA plans to install efficient units that are remotely controlled based on actual weather conditions. It is estimated that there would be a savings of over 39.8 million kWh and \$3.4 million annually in electricity costs.

GREEN FACT

The MBTA's Energy Efficiency Program has saved \$4.43 million in the last three years and will continue to save \$1.3 million annually in reduced electricity costs.

(TOP) GOV. DEVAL PATRICK ANNOUNCING THE COMMONWEALTH CLEAN ENERGY INVESTMENT PROGRAM, A NEW FINANCING PLAN THAT ENABLES THE COMMONWEALTH TO LAUNCH ENERGY-EFFICIENCY AND RENEWABLE ENERGY PROJECTS AT DOZENS OF STATE BUILDINGS
(BOTTOM) MBTA RED LINE TRAIN IN SNOW



WATER MANAGEMENT — OVERVIEW



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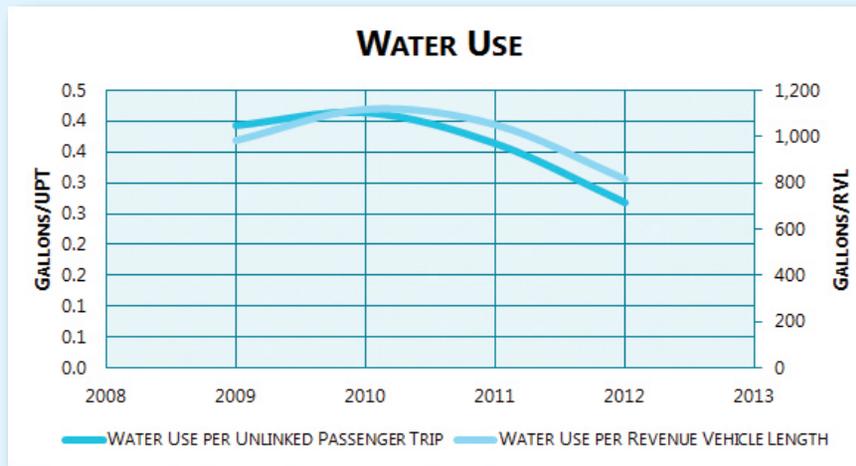
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Water Use and Conservation

Every year the MBTA consumes a tremendous amount of water. The MBTA is committed to conserving water to reduce its overall consumption. Using 142 million gallons in 2009 as a baseline, the MBTA was able to decrease its overall water consumption by over 36 million gallons by 2012, a 25% decrease. The MBTA water use per passenger trip was 0.39 gallons in 2009 and 0.27 gallons by 2012, a 31% decrease. Water use per vehicle mile traveled had a similar decrease of about 26%. Both metrics were influenced by the MBTA's decrease in overall water consumption as well as an increase in ridership.

Water conservation measures at the MBTA are not only good for the environment but are cost effective. By saving millions of gallons of fresh water per year, the Authority has saved almost \$600,000 since 2009.

The MBTA has made great strides in water management since 2009, but it is always looking for ways to use less water and cut its expenses.



GREEN FACT

In 2009, the Authority used over 142 million gallons—enough water to fill Fenway Park to the height of the Green Monster almost two times.

(TOP) TRAIN WASH AT ORIENT HEIGHTS MAINTENANCE FACILITY ON THE BLUE LINE



WATER MANAGEMENT — ONGOING PROJECTS

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Bus Wash Water Conservation Pilot

The MBTA seeks to conserve water in its bus wash at Charlestown Bus Garage, a large facility housing over 200 buses. In six months, the MBTA saved over 300,000 gallons of water, a 38% reduction in water used per bus. If this program is expanded to all MBTA bus garages, the predicted financial savings will be over \$60,000 annually. This program also reduces the amount of soap and particulate-rich water produced by the bus wash that escapes the system. Conserving this precious natural resource is also vital to natural ecosystem processes.

Storm Water Pollution Prevention Plans

MBTA parking lots and maintenance yards have large paved areas that collect storm water. It is the MBTA's responsibility to ensure that harmful chemicals such as petroleum products and other materials that collect on these paved areas do not enter our water system. These impacts to our natural ecosystem affect the health of our rivers, streams, and the ocean, and the riparian and marine life that live within these water bodies. Limiting our storm water discharge also prevents the degradation of our region's recreational water bodies, like the previously polluted Boston Harbor.

Green Roofs at Assembly Square and Orient Heights Stations

The green roofs at these stations will collect rainwater that can then be consumed by the green roof plants. The result being less water enters the storm drains, putting less stress on the region's storm water infrastructure.



(TOP) MBTA CNG BUS FLEET
(MIDDLE) GREEN ROOF ON THE NEW ORIENT HEIGHTS STATION
(BOTTOM) MONATIQUOT BRIDGE PROJECT IN WEYMOUTH ADDRESSES BOTH ENVIRONMENTAL CONCERNS AND RAILROAD STABILITY BY ALLOWING A SLOPE TO BE BUILT THAT PROVIDED PLANTINGS AND HABITAT ALONG THE UPPER RIVER BANK AND PROTECTED THE BOTTOM OF THE SLOPE FROM EROSION



WATER MANAGEMENT — PLANNED PROJECTS



Monitoring System

The MBTA plans to establish a water-use monitoring system that enables a comprehensive breakdown of water use to provide a better picture of what the Authority is doing well and where it needs improvement.

Water Reclamation and Conservation

The MBTA plans to integrate water-reclamation systems and conservation measures into all new construction projects to ensure consumption reductions for years to come. There are plans under way to install a green roof and water-reclamation system at the production maintenance facility along the Green Line Extension Project. The MBTA is also investigating green roof viability on older facilities' roofs. The water collected by these roofs may be used to clean platforms and other areas of the facility instead of using potable water. Green roofing has also become a viable way to help manage storm water.

GREEN FACT

The MBTA restored 4.74 acres of salt marsh in Scituate to compensate for the land use change of the Greenbush Line. To date, 85% of the land area has been recolonized by native marsh species.

(TOP) SCITUATE SALT MARSH AFTER RECLAMATION FOR THE GREENBUSH COMMUTER RAIL LINE
(BOTTOM) NEWBURYPORT COMMUTER RAIL LINE



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The Fifth-Largest Transit Authority

The MBTA is investigating, tracking, quantifying, and ultimately eliminating or reducing sources of greenhouse gas emissions. The MBTA collected data for total energy consumption from 2009 to 2012 and calculated the emissions from each type of energy source.

MBTA Baseline Uses Nine Sources

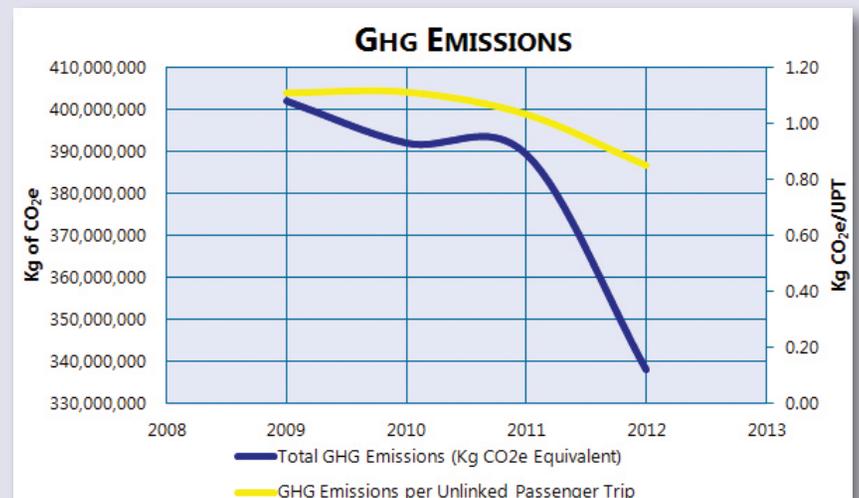
The MBTA uses nine carbon-based or carbon-emitting energy sources including electricity, compressed natural gas (CNG), steam, diesel fuel, and jet fuel. In 2009, the MBTA emitted over 400 million kilograms of greenhouse gas into the atmosphere. The MBTA has been actively enhancing its energy efficiency and eliminating excess greenhouse gas emissions, achieving a 23.2% reduction in greenhouse gas per passenger trip between 2009 and 2012. This is a reduction of over 123 million lb. of greenhouse gas.

The MBTA is the Only Transit Authority that Operates Six Transit Modes:

bus, trolley, Light Rail, Heavy Rail, Commuter Rail, and Inner Harbor Ferry. Therefore it is important to analyze each mode separately for greenhouse gas emissions. In addition to our energy management programs underway, such as our station lighting upgrades, the MBTA works to increase ridership to help us to decrease the greenhouse gas emissions per passenger, thus increasing our overall energy efficiency.



(TOP) CABOT YARD RED LINE MAINTENANCE FACILITY



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Alternative Energy Solutions

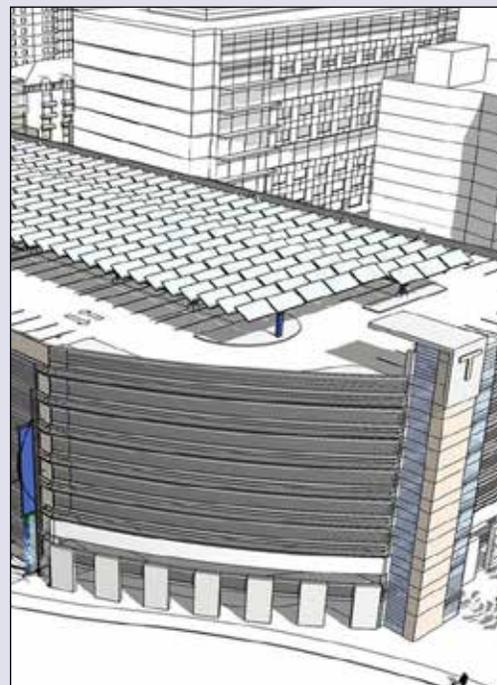
The MBTA is tracking all forms of greenhouse gas emissions including buses, subways, and maintenance facilities. The MBTA is constantly working to increase energy efficiency by replacing old light bulbs, retrofitting vehicles, and updating old equipment. Since 2012, the MBTA has purchased 20% of its electricity from renewable, carbon-free sources.

Wind

In 2012, the MBTA completed construction of a 100kW wind turbine in Kingston, MA, which produces 100% of the energy used on site at the Commuter Rail yard. The Authority will soon install a 750kW wind turbine at Bridgewater Station. This energy, when not fully utilized by the MBTA, will be net metered back to the grid, offsetting some greenhouse gas emissions at other MBTA facilities.

Solar Arrays

The MBTA has a Power Purchase Agreement (PPA) with a third-party company that will install a 2.4MW solar power farm at the Readville Yard, and 0.35MW on top of the Wonderland Station Garage. The MBTA will buy a minimum of 1.7MWh annually for the next 20 years at a slightly higher fixed rate. The MBTA has also installed a 100kW solar array on the roof of the recently renovated Orient Heights Station, supplying up to 20% of the total energy consumption of the facility.



(TOP) MAP OF READVILLE YARD OF PROPOSED AREA FOR SOLAR ARRAYS
(BOTTOM LEFT) DRAWING OF SOLAR ARRAYS ON TOP OF WONDERLAND PARKING GARAGE IN REVERE, MA
(BOTTOM RIGHT) WIND TURBINE AT KINGSTON COMMUTER RAIL LAYOVER FACILITY

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Fuel Cell Bus Project

The Northeast Advanced Vehicle Consortium received an Federal Transit Administration grant and is working with the MBTA to prototype a hydrogen fuel cell bus.

The Next Bus Study

The MBTA is engaged in an extensive research project in new bus technologies. These include hybrid, electric, and more efficient compressed natural gas (CNG).

New Red and Orange Line Cars

The MBTA will be purchasing new rolling stock for the Orange and Red lines. These cars will have regenerative braking and LED lighting, and are more energy efficient.

More Renewable Energy

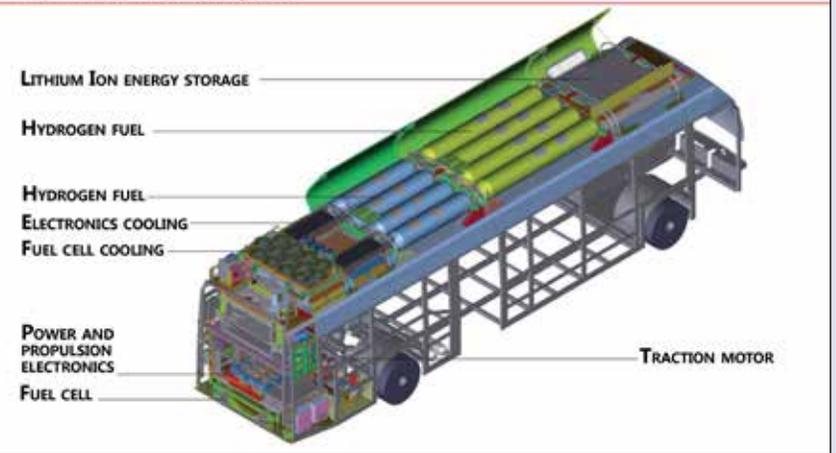
By continuing to pursue opportunities for power purchase agreements (PPAs) when appropriate, the MBTA hopes to have 25% of its total energy consumption to be from renewable energy sources by 2020.

Sustainable Design

The MBTA is incorporating environmentally sustainable design standards into all of its new design and construction projects using the Leadership in Energy and Environmental Design (LEED) as a guide for green design. These design standards focus on energy efficiency, water management, renewable energy, land use, selection of sustainable materials, recycling, etc. The Hingham Ferry Terminal will begin construction in 2015 and will meet LEED Gold certification. The building will include geothermal heating, an efficient carbon-free heating system, and many other sustainable features. As the MBTA gains experience with new carbon neutral-technologies, it plans to implement them across its system.

(TOP) RENDERING OF A HYDROGEN FUEL CELL BUS
(MIDDLE/BOTTOM) RENDERINGS OF THE HINGHAM INTERMODAL FERRY TERMINAL

Fuel Cell Bus Layout



AIR – GREENHOUSE GAS SAVINGS – OVERVIEW



Greenhouse Gas Reduction

Although the MBTA does have a significant carbon footprint, no other organization reduces as much greenhouse gas in Massachusetts. Its ability to reduce greenhouse gas output stems from three elements: mode shift, congestion relief, and transit-supported land use.

Mode Shift

Mode shift results in greenhouse gas reductions from people riding public transit instead of driving their cars. The MBTA is much more energy and greenhouse gas efficient than personal vehicles: each MBTA trip saves 12.7 lb. of greenhouse gas emissions when compared to driving alone.

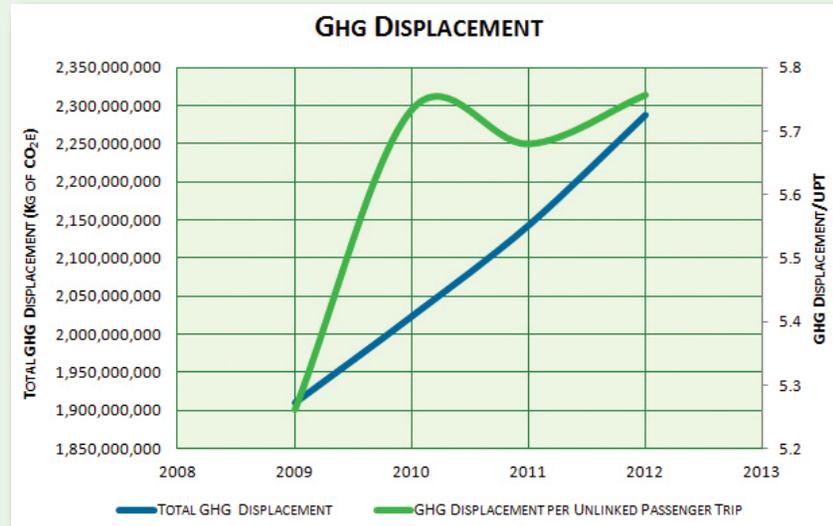
Congestion Relief

Greenhouse gas automobile emission rates increase at lower speeds and while idling in traffic. Increasing public transit ridership reduces traffic congestion. This means personal vehicles on the road travel faster, thereby emitting fewer greenhouse gas emissions.

Land Use

The MBTA's extensive public transit network supports dense land use patterns. Residents in the greater Boston area are able to live and work closer together as a result. This density leads to increased rates of walking, biking, and public transit use. People also travel shorter distances and may not own a car at all.

(BOTTOM LEFT) HUBWAY BIKE STATION OUTSIDE SOUTH STATION
(BOTTOM RIGHT) MBTA BUS IN DOWNTOWN BOSTON



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The Savings

In 2012, the MBTA prevented the emission of 5 billion lb. of greenhouse gases—a decrease of 20% from 2009. These savings were due to customers using transit instead of automobiles (mode shift), congestion relief, and transit supportive land use in the Boston area. Greenhouse gas savings of this magnitude are the equivalent of three Cape Wind projects—the critically important offshore wind turbine farm proposed for Nantucket Sound off Cape Cod.

GREEN FACT

The emissions avoided by the MBTA are equal to the emissions associated with the energy consumed by 83,468 homes, or the CO₂ saved by planting nearly 56 million tree seedlings and letting them grow for 10 years.



(TOP PHOTOS) COURTESY OF FEDERAL TRANSIT ADMINISTRATION
ILLUSTRATING ROADWAY CONGESTION RELIEF RESULTING FROM
SWITCHING FROM CAR TO TRANSIT
(BOTTOM) RED LINE CROSSING THE CHARLES RIVER ON THE
LONGFELLOW BRIDGE



AIR – GREENHOUSE GAS SAVINGS – ONGOING PROJECTS



Increasing Ridership

The MBTA is working with MassDOT and the Boston Metropolitan Planning Organization (MPO) to increase ridership and decrease the amount of cars on the road and vehicle miles traveled annually. Under the guidance of the MassDOT's *Triple the Mode Share* campaign, the MBTA's goal is to increase biking, walking, and transit use in Massachusetts.

Increasing ridership is a difficult task, but through community outreach programs and working with the MassDOT, Boston's MPO, and cities and towns, the MBTA is preparing for an increase in ridership for years to come.



Electric Vehicle Charging Stations

Thirty electric vehicle charging stations have been installed in parking lots across the MBTA network. These stations give priority parking spaces and free charges to people with electric vehicles, and have prevented over 32,956 lbs. of greenhouse gas.



(TOP) GREEN LINE PARK STREET STATION
 (BOTTOM LEFT) ELECTRIC VEHICLE CHARGING STATION AT ALEWIFE GARAGE
 (BOTTOM RIGHT) MOTORPERSON ON THE ORANGE LINE

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AIR – GREENHOUSE GAS SAVINGS – PLANNED PROJECTS

Transit and Land Use

A large portion of greenhouse gas savings comes from land use changes. Enabling people to live and work in high-density, walkable areas reduces the carbon footprint of everyone in the MBTA's service area. Therefore, expanding the transit network to include more people in its service area, and providing them with walking access to a transit system, would reduce greenhouse gas emissions.

There are many other projects that are analyzing the MBTA's service routes and ridership to better use its resources to accommodate the greatest number of commuters. Increasing efficiency along with outreach programs to increase ridership and make the MBTA more accessible will allow the MBTA to continue to provide environmental benefits for Massachusetts and prevent the production of billions of pounds of greenhouse gas a year.

GREEN FACT

Every time a person rides the MBTA, he or she prevents an average 12 lb. of greenhouse gas from being emitted into the atmosphere. This is the energy equivalent required to completely charge your smartphone over 3,000 times.

(TOP) NEW YAWKEY STATION, THE MBTA'S FIRST NET-ZERO ENERGY STATION

(BOTTOM LEFT) WONDERLAND GARAGE

(BOTTOM RIGHT) OPENING OF NEW COPLEY STATION



RECYCLING & WASTE – OVERVIEW



Waste Management

The MBTA generates a significant amount of waste material each day, both from its operations and maintenance programs, as well as waste generated by its customers. Due to the large and diverse nature of the MBTA's facilities, there are many types of material waste to manage and dispose of properly.

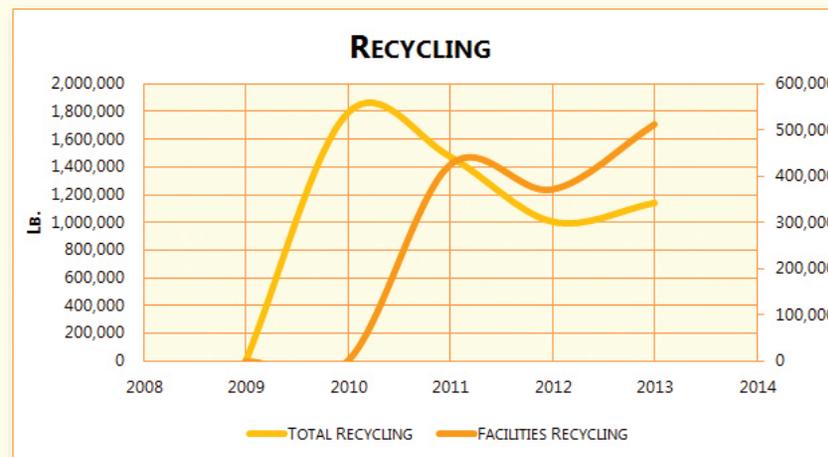
In 2009, the MBTA implemented a comprehensive tracking system to track all its sources of waste. The MBTA has increased its focus on minimizing waste and increasing recycling. Like the energy program, the waste management program has resulted in savings to the operating budget. By removing items that were costly to dispose of and recycling them at a greatly reduced cost, the MBTA has saved on expenses. There are many programs across the MBTA's facilities that are designed to control waste and contamination and increase recycling and reuse.



GREEN FACT

Contract Administration at the MBTA, through its transition from paper to electronic documentation, has already saved an estimated 2 million pages of letter-size paper; if stacked one sheet on top of another, this would be three times taller than the Bunker Hill Monument (663 feet).

(TOP) SINGLE STREAM RECYCLING AT THE CABOT BUS MAINTENANCE FACILITY



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Single Stream Recycling

In 2010, the MBTA started a pilot program for single stream recycling at three of its facilities. This pilot was so successful that the MBTA has expanded it to all its facilities in under a year. The MBTA now separates and recycles all its recyclable materials, including metal, light iron, cardboard, paper, and air conditioners. The MBTA also recycles other appliances, propane tanks, batteries, and electronic wastes (such as televisions and computers and other miscellaneous recyclable waste)—in total over 425,000 lb. in 2011.

Since the inception of the recycling program, the MBTA has recycled over 1.25 million lb. of waste through the end of fiscal year 2013, saving more than \$125,000 over the last three years in disposal costs.

Aerosol Propellant Disposal

The MBTA also has a systemwide aerosol propellant disposal initiative. All aerosol cans contain some form of propellant, usually propane or butane, that are considered hazardous waste and must be disposed of properly. By puncturing these cans and transferring the contents to a 55-gallon tank, the MBTA is able to properly dispose of the contents and recycle the metal.



(TOP) AEROSOL CANS
(MIDDLE) ELECTRONIC WASTE
(BOTTOM) SEGREGATED WASTE STREAMS (ALL RECYCLED AT VARIOUS MAINTENANCE FACILITIES)

RECYCLING & WASTE – ONGOING PROJECTS

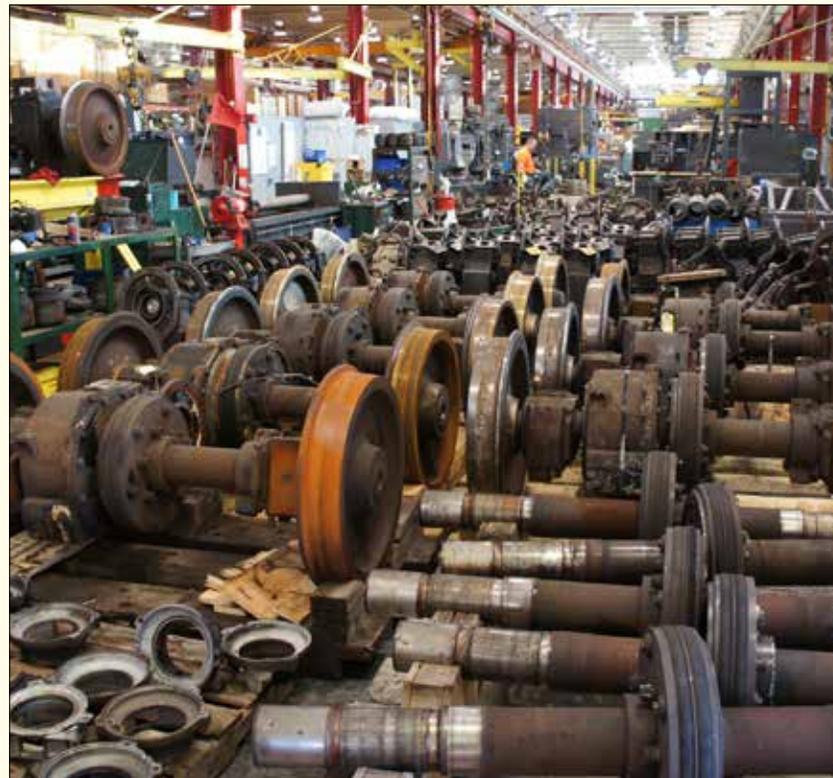


Recycling of Subway Trains

The Blue Line is one of four subway lines on the MBTA, and stretches from Wonderland Station in Revere to Bowdoin Station near Beacon Hill in downtown Boston. In 2007, the MBTA started to replace the older cars on the Blue Line with more energy-efficient Siemens-manufactured stainless steel trains, and completed the transition in 2012.

For the disposal of the retired fleet the MBTA set up a program that more effectively deals with the materials not used, and generates revenue from valuable items such as metal. First, the MBTA recovers all usable assets, e.g., electric generators, air conditioners, the wheel mechanisms (trucks), and reuses salvaged items on the Orange Line cars for repairs. After removing all usable assets and environmentally dangerous products such as mercury thermostats, the trains are dismantled in an environmentally approved way.

In addition, the MBTA has started to recycle old Green Line cars in the same fashion. Instead of paying to scrap these cars, the program has generated \$4,700 since the MBTA started recycling.



(TOP) WASTE COLLECTION FOLLOWING PROPER RULES FOR DISPOSAL
(BOTTOM) RECLAIMED WHEEL TRUCKS AT THE EVERETT TRAIN FACILITY

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RECYCLING & WASTE – ONGOING PROJECTS

Construction Project Waste

The MBTA has a number of initiatives it will implement going forward, including increasing its recycling-to-waste ratio, specifically that of construction projects. In conjunction with the MassDOT, under the GreenDOT initiative, the MBTA plans to reuse and recycle 65% of construction waste by 2015, increasing to 80% by 2020. Currently, the Green Line Extension (GLX) project plans to recycle or reuse 80% of construction waste. The MBTA also plans to reuse or compost 90% of landscaping waste by 2015.

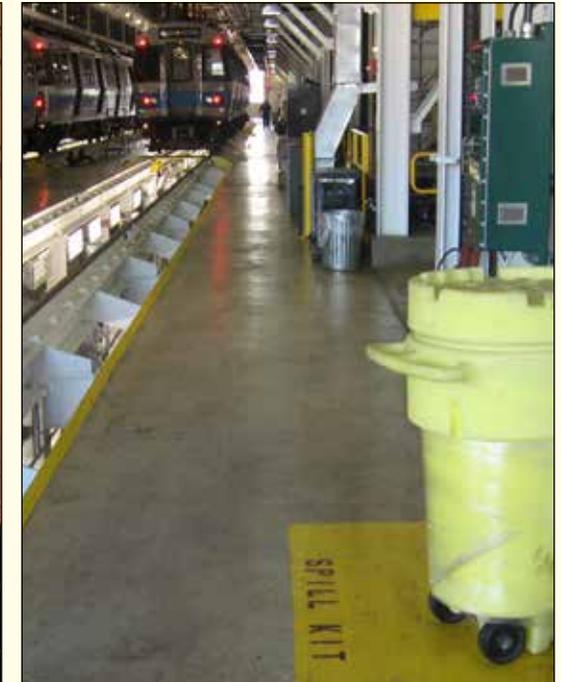
With an increased focus on recycling and salvaging materials that would otherwise have been scrapped, specifically construction and demolition debris, the MBTA can make significant progress in reducing waste that heads to landfills or incinerators, thus promoting a far more sustainable waste stream. Construction waste programs that have been initiated will bring significant value to the MBTA, its customers, and the community at large.



GREEN FACT

Over 4,000 tons of soil was recycled from the Littleton Station construction project. It required 320 truckloads to move the soil off-site.

(TOP) LITTLETON COMMUTER RAIL STATION CONSTRUCTION
(BOTTOM, LEFT AND RIGHT) SPILL KITS AT ORIENT HEIGHTS BLUE LINE MAINTENANCE FACILITY



RECYCLING & WASTE – ONGOING PROJECTS



Community Recycling Program

The MBTA has expanded its recycling programs to include community participation. Since 2012, every spring and fall the MBTA sponsors recycling events within local communities across its network.

The MBTA has held 14 community recycling events since the Fall of 2012. The events were in Salem (twice), East Boston, Kingston, Revere (twice), Watertown (twice), Ashland (twice), Andover, Newburyport, Wellington Station in Medford, and Wachusett Mountain. These events are held by the MBTA as a public service so residents can get rid of items that are prohibited from being sent to landfills. The events have collected 33,195 pounds of TVs and a total of 323,000 pounds of items.

Newspaper Recycling

Additionally, the MBTA has set up newspaper recycling bins on its station platforms, enabling its commuters to recycle their newspapers. To date, the MBTA has recycled over 4.12 million lb. of newspaper from its stations.

Cell Phones for Soldiers

In 2012, the MBTA started to collect old cell phones for the charity Cell Phones for Soldiers. Since the MBTA started working with the charity, it has collected in excess of 3,500 cell phones and 3,000 chargers, which translates into over 38,000 minutes of free phone time for soldiers overseas.

(TOP LEFT) SALEM (TOP RIGHT) REVERE COMMUNITY RECYCLING EVENTS
 (MIDDLE RIGHT) NEWSPAPER RECYCLING BIN AT DOWNTOWN CROSSING
 (BOTTOM) CELL PHONE COLLECTION BOX AT NORTH STATION



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COMMUNITY – HEALTH – OVERVIEW

Public Transit and Public Health

Public transit improvements and more transit-oriented development can provide large but often overlooked health benefits. People who live or work in communities with high-quality public transportation tend to drive significantly less and rely more on alternative modes of transportation (walking, cycling, and public transit). This results in less traffic, fewer accidents, and lower pollution emissions, as well as increases physical fitness and mental health.

In 2012, the Metropolitan Area Planning Council prepared a Health Impact Assessment that examined the annual health costs the region would realize if there were major cuts in transit service. The report concluded that less transit service would "carry significant human and financial costs, resulting in avoidable loss of life and preventable hospitalizations and accidents. In addition, the changes would contribute to our widespread obesity problem, and would isolate hundreds of households from basic health care resources." The MBTA participates in the Healthy Transportation Compact along with the Massachusetts Executive Office of Health and Human Services, Executive Office of Energy and Environmental Affairs, the Mass Department of Public Health, and the MassDOT. The compact is designed to facilitate transportation decisions that balance the needs of all transportation users, expand mobility, improve public health, and support a cleaner environment.

Pedal & Park

The MBTA now has an extensive Pedal & Park program that includes two types of facilities for its bike-riding customers. There are 50 bicycle canopy facilities at a number of stations on all subway lines, Commuter Rail, and bus facilities. In addition, there are nine bike cages that are high-quality storage facilities with locked doors and surveillance cameras that provide a very secure space.

(TOP) PEDESTRIANS IN BOSTON PUBLIC GARDEN
(BOTTOM) PEDAL & PARK AT ALEWIFE STATION



COMMUNITY – RIDERSHIP – OVERVIEW



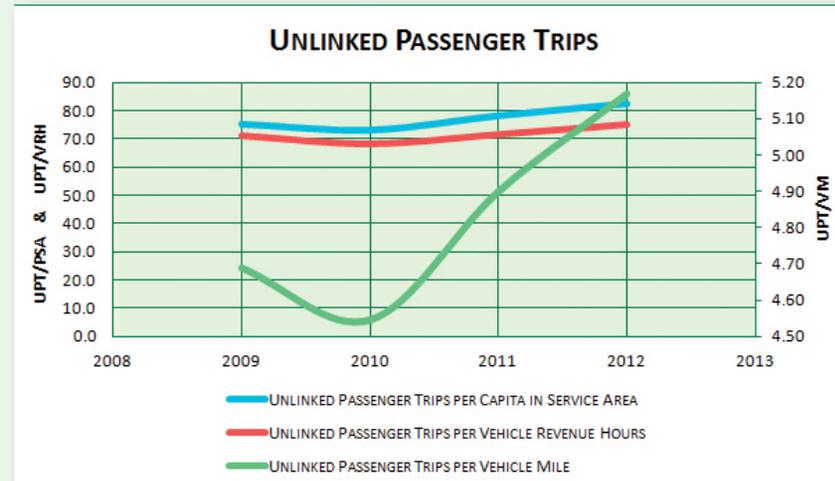
Increasing Ridership

Ridership is the true indicator of how well any transit network works. Increased ridership brings with it economic and environmental benefits such as getting people to travel cost effectively, and therefore there will be fewer people on the roads.

Understanding the reasons behind the decision commuters often make to drive personal vehicles instead of riding the MBTA is a challenging task, yet is essential to increasing ridership. Getting more people off the road and using public transit will help the MBTA improve upon almost every key sustainability metric it is tracking—fewer greenhouse gas emissions per rider, greater greenhouse gas savings, and less energy consumption per rider.

The MBTA has increased ridership by over 45 million trips per year since 2010. The MBTA has also increased the average number of trips an individual in its service area will take annually from 75.51 in 2009 to 78.28 in 2012, an increase of over 4%. In addition, the MBTA has increased the number of passenger trips per vehicle revenue mile and vehicle revenue hour. This means an MBTA vehicle now carries more passengers per hour and more passengers per mile of operation, making the system much more energy efficient.

(MIDDLE) NORTH STATION ON THE ORANGE LINE
(BOTTOM) MBTA BUS OPERATOR



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Green Line Extension (GLX) Project

The MBTA is extending the Green Line from Lechmere, through Somerville, to Tufts University in Medford, providing rapid transit service to one of the most densely populated communities in the country, thereby adding more than 40,000 riders per day to the Green Line, giving customers direct access to downtown and the Back Bay.

Fitchburg Commuter Rail Improvements

This project will make improvements to the MBTA's longest Commuter Rail line, which will allow for more trains to run faster and carry more customers from communities northwest of Boston. This project is being done in conjunction with the Wachusett Extension Project, which will extend service to the Wachusett Mountain area. The MBTA expects to see ridership greatly expanded due to these improvements.

Fairmont Corridor Upgrades

Running from South Station to Readville, the Fairmont Line ran through Boston's urban neighborhoods but did not stop and serve these residents. The MBTA upgraded the existing stations, made improvements to increase train speeds, and added three new stations strategically located at Four Corners, Talbot Avenue, and Newmarket (adjacent to the South Bay Shopping Center). A fourth station at Blue Hill Avenue is currently being designed, and construction will begin shortly.

The station locations were designed to provide a higher-quality transit service and to be "walk-to" stations for neighborhood residents along the corridor.



(BOTTOM) FITCHBURG COMMUTER RAIL GROUND BREAKING



COMMUNITY – RIDERSHIP – PLANNED PROJECTS



Changing Mode Share

The Boston metropolitan area has the third-highest mode share of walking, biking, and transit travel in the country. The MassDOT believes it can be even greater and has announced a goal of tripling the mode share. As part of the MassDOT, the MBTA is working in conjunction with other state agencies and regional transit authorities (RTAs), to increase ridership. Increasing public transit ridership is critically important for achieving the Commonwealth's goal (set forth in the Global Solutions Warming Act) of reducing greenhouse gas emissions by 80% from 1990 levels by 2050. This will require substantial capital investments into the transit agencies, including the MBTA and RTAs.

Transit-Oriented Development

The MBTA and MassDOT's Transit-Oriented Development program encourages construction of housing and commercial properties located near a transit network access point. An example of this is the new Assembly Station in Somerville that will support Assembly Row, a new 50-acre site that will have 1.75 million sq. ft. of office space, 880,000 sq. ft. of retail space, 2,100 of housing units, and a 200-room hotel. When completed, this area will be the largest new transit-oriented development project in the region.



(TOP) MINUTEMAN BIKE TRAIL (PART OF THE MBTA'S RAILS-TO-TRAILS PROGRAM)

(BOTTOM) SITE OF NEW ASSEMBLY STATION AND NEW TRANSIT-ORIENTED DEVELOPMENT IN SOMERVILLE, MA (BY PERMISSION FROM FEDERAL REALTY INVESTMENT TRUST, ASSEMBLY ROW)

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A Global Issue

The MBTA is a local and national leader in promoting sustainable practices and mitigating the effects of climate change.

In 2013 alone, global greenhouse gas production reached an all-time high of 39 billion tons of greenhouse gas. According to the EPA's social costs of carbon estimates, just 2013's emissions will cost the global economy \$1.48 trillion in damages from the effects of global warming. The United States alone emitted 5.4 billion metric tons of greenhouse gas in 2012 at a cost of approximately \$206 billion incurred by 2015—that's about a \$37 cost per metric ton of emissions.

The MBTA is fully committed to reducing greenhouse gas emissions and curbing climate change. The Authority will continue to improve its energy efficiency and accessibility, as well as reduce greenhouse gas emissions, water consumption, and waste—all contributing to a sustainable and resilient system. Making the MBTA's service reliable and available for more and more passengers, and streamlining its operations for a more efficient and more modern transit system, are critical to its growth. It is a primary goal of the MBTA to continue reducing its collective footprint now and well into the future.

(RIGHT) THE FIRST OF 40 NEW HSP46 DIESEL-ELECTRIC PASSENGER LOCOMOTIVES. THE ENGINE MEETS EPA TIER 3 EXHAUST EMISSIONS STANDARDS. THE LOCOMOTIVE'S TECHNOLOGY ALLOWS FOR GREATER HAULING POWER, LESS WASTED ENERGY AND REDUCED MAINTENANCE COSTS COMPARED TO OLDER DC TECHNOLOGY



CHAMPIONS OF SUSTAINABILITY @ THE MBTA



Every day, each one of the more than 6,000 men and women at the MBTA strive to provide safe, accessible, dependable, clean, and affordable transportation to our valued customers. As a result, each one makes a major contribution to the environmental benefits to our region and to the Massachusetts residents. The following are some examples of these Sustainability Champions at the MBTA.



James Christian – Supervisor of Signal Maintenance – Installed 1,500 LED signal lights by the end of 2012 which will save the MBTA over \$1 million in three years.



Michael Donaghy – Manager of Energy Efficiency – Managed more than 56 light conversion installations, and has saved the MBTA over \$2.73 million since its inception, and more than 8.76 million kWh of energy.



Richard Hart – Assistant Superintendent Clean Maintenance Systems – Launched the newspaper recycling program at all MBTA subway stations.



Linda Laracy – Foreperson, Wireperson – Manages the Single Stream Recycling effort at the Everett shops.



Tracey Kauffman – Deputy Director of Corporate Safety, Assurance and Control – Developed a unified training program for worker safety to protect employees from hazardous materials on the job site.



Kevin Arouca – Supervisor Lynn Garage – Manages the Lynn maintenance facility and oversees the EMS program on a daily basis to assure the safety of his workers.



Tom Nee – Director of Design and Construction – Oversaw the design and construction of the MBTA's new sustainable design efforts at the Assembly Station, Orient Heights Station, and Government Center Station projects.



Kim Dobosz – Project Manager – Oversaw the implementation of the new stormwater and soil management techniques used on the Fitchburg and Wachusett projects.



Tom Daly – Manager of Environmental Compliance – Oversees the MBTA's Environmental Management System (EMS) and trains all new employees on the program.



Erik Scheier – Project Director for Operations – Oversaw the MBTA's expansion of the bike parking program, including the development of the new Pedal & Park facilities.



Bob McLaughlin – Environmental Engineer – Manages all of the MBTA's wastewater treatment systems to ensure compliance with water pollution standards and limits.



Sorrenia Dillon – Marketing Promotions Coordinator – Managed the MBTA's participation in Earthfest since 2011, and from 2003 to 2011 the MBTA's participation in the Boston Marathon Expo.

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Kingston, MA Wind Turbine Dashboard



The following link is to a real-time dashboard for the MBTA's Kingston Wind Turbine:

<http://northernpower.kiosk-view.com/kingston>





Sustainability Report Acronyms

CO₂e – Carbon Dioxide Equivalent: a unit that represents the Global Warming Potential of all greenhouse gas emissions in terms of their carbon dioxide equivalent weight or volume, typically measured in kilograms or metric tons.

UPT – Unlinked Passenger Trip: a normalization factor that represents the number of unique trips taken on a single transit mode (i.e., Green Line, Red Line, Orange Line, 1 Bus, etc.) within the MBTA system, regardless of the number of stops traveled (e.g., taking the Green Line two stops and switching to the Blue Line for three stops equals two UPTs).

VMT – Vehicle Miles Traveled: a normalization factor that represents the number of vehicle miles traveled for whichever transit mode is currently being discussed.

BTU – British Thermal Unit: a standard unit of energy, equal to about 1,055 joules.

kg – Kilogram: the base unit of mass in the International System of Units, equal to 1,000 grams.

kW – Kilowatt: a standard unit of power or rate of energy consumption, equal to a 1,000W or a 1,000 J/s. Similarly, one MW or megawatt is 1,000kW.

kWh – Kilowatt-hour: a standard unit of energy, representing the number of kilowatts consumed per hour. Similarly one MWh or megawatt-hour is 1,000kWh.

PSA – Per Capita in Service Area of Operation: a normalization factor representing the number of residents living in the geographical area served by the MBTA.

GHG – Greenhouse Gas: a term used to broadly represent all greenhouse gases as a collective; they are CO₂ (carbon dioxide), CH₄ (methane), N₂O (nitrous oxide).

PPA – Power Purchase Agreement: a contract to purchase energy from an independent third party who installs alternative energy-generating systems on the purchaser’s property.

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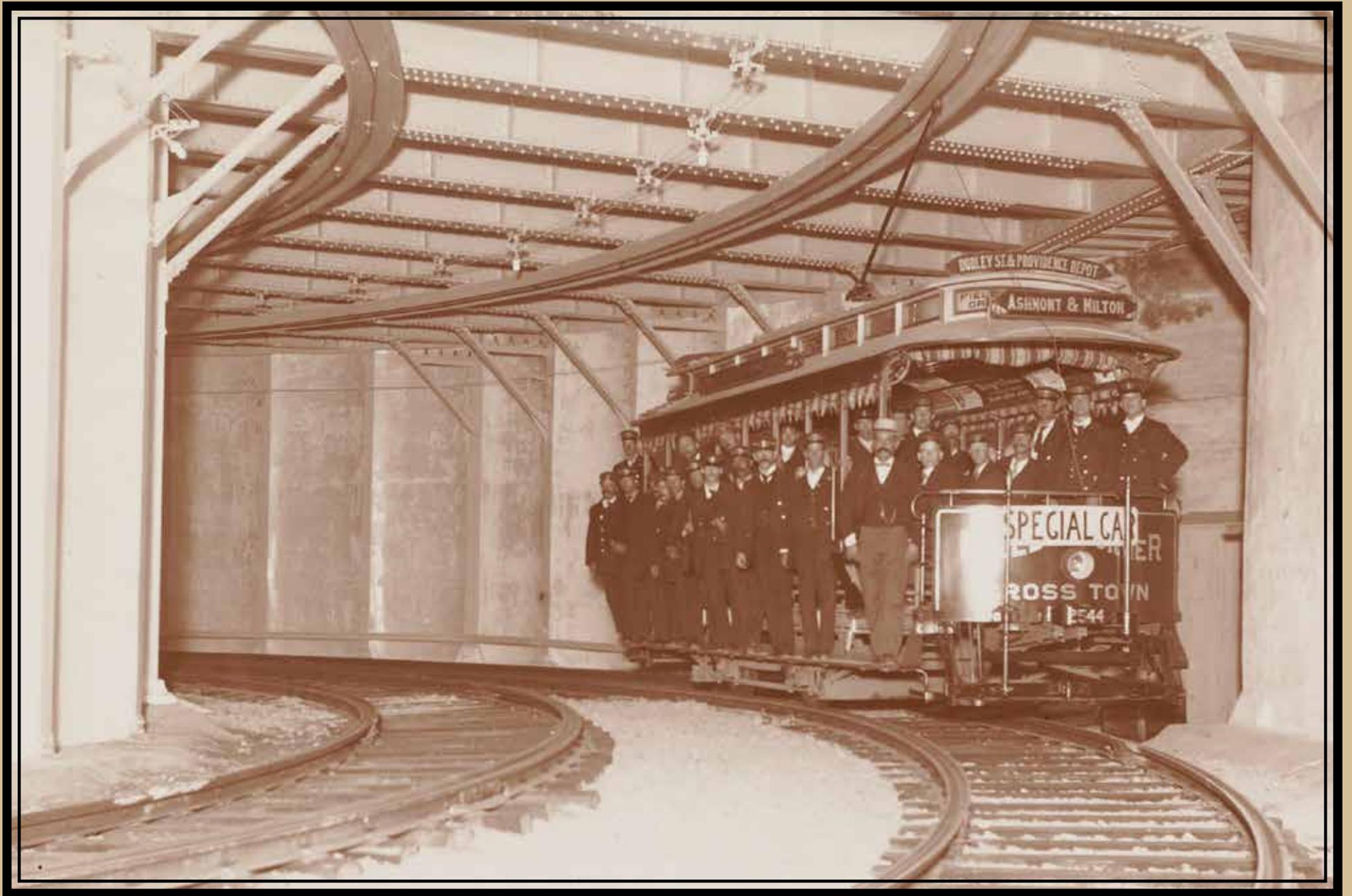
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(BACK COVER)

PHOTO COURTESY OF THE BOSTON PUBLIC LIBRARY



THE FIRST AMERICAN SUBWAY

September 1, 1897