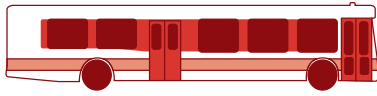


APPENDIX B





APPENDIX B

GREENHOUSE GAS MONITORING AND EVALUATION

BACKGROUND

The Global Warming Solutions Act of 2008 (GWSA) requires statewide reductions in greenhouse gas (GHG) emissions of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050. As part of the GWSA, the Executive Office of Energy and Environmental Affairs developed the Massachusetts Clean Energy and Climate Plan (CECP), which outlines programs to attain the 25 percent reduction by 2020—including a 7.6 percent reduction to be attributed to the transportation sector.

The Commonwealth's 13 metropolitan planning organizations (MPOs) are integrally involved in helping to achieve GHG emissions reductions mandated under the GWSA. The MPOs work closely with the Massachusetts Department of Transportation (MassDOT) and other involved agencies to develop common transportation goals, policies, and projects that will help to reduce GHG emissions levels statewide, and meet the specific requirements of the GWSA regulation, Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05). The purpose of this regulation is to assist the Commonwealth in achieving its adopted GHG emissions reduction goals by requiring the following:

- MassDOT to demonstrate that its GHG emissions reduction commitments and targets are being achieved
- Each MPO to evaluate and track the GHG emissions and impacts of both its Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP)
- Each MPO, in consultation with MassDOT, to develop and use procedures to prioritize and select projects for its LRTP and TIP based on factors that include GHG emissions and impacts

The Commonwealth's MPOs are meeting the requirements of this regulation through the transportation goals and policies contained in their 2016 LRTPs, the major projects planned in their LRTPs, and the mix of new transportation projects that are programmed and implemented through their TIPs.

The GHG tracking and evaluation processes enable the MPOs and MassDOT to identify the anticipated GHG impacts of the planned and programmed projects, and to use GHG impacts as criteria to prioritize transportation projects. This approach is consistent with the GHG emissions reduction policies that promote healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, bicycle, and pedestrian investments, as well as policies that support smart growth development patterns by creating a balanced multi-modal transportation system.

REGIONAL TRACKING AND EVALUATING LONG-RANGE TRANSPORTATION PLANS

MassDOT coordinated with MPOs and regional planning agencies to implement GHG tracking and to evaluate projects during the development of the LRTPs that were adopted in September 2011. This collaboration continued during the development of the LRTPs and amendments adopted in 2016, and for the TIPs produced for federal fiscal years (FFYs) 2016–19, 2017–21, 2018–22, 2019–23, and 2020–24. Working together, MassDOT and the MPOs have attained the following milestones:

- As a supplement to the 2016 LRTPs and Amendment One to the Boston Region MPO's LRTP, *Charting Progress to 2040*, the MPOs have completed modeling and developed long-range statewide projections for GHG emissions produced by the transportation sector. The Boston Region MPO's travel demand model and the statewide travel demand model were used to project GHG emissions levels for 2018, 2019, and 2020 No-Build (base conditions). These projections were developed as part of amendments to 310 CMR 60.05 (adopted in August 2017 by the Massachusetts Department of Environmental Protection) to demonstrate that aggregate transportation GHG emissions reported by MassDOT will meet established annual GHG emissions targets.
- All of the MPOs have discussed climate change, addressed GHG emissions reduction projections in their LRTPs, and prepared statements affirming their support for reducing GHG emissions as a regional goal.

TRACKING AND EVALUATING THE TRANSPORTATION IMPROVEMENT PROGRAM

In addition to monitoring the GHG impacts of projects in the LRTP that will add capacity to the transportation system, it also is important to monitor and evaluate the GHG impacts of all transportation projects that are programmed in the TIP. The TIP includes both the larger, capacity-adding projects from the LRTP and smaller projects, which are not included in the LRTP but that may affect GHG emissions. The principal objective of this tracking is to enable the MPOs to evaluate the expected GHG impacts of different projects and to use this information as criteria to prioritize and program projects in future TIPs.

In order to monitor and evaluate the GHG impacts of TIP projects, MassDOT and the MPOs have developed approaches for identifying anticipated GHG emissions impacts of different types of projects. Since carbon dioxide (CO₂) is the largest component of GHG emissions overall and is the focus of regulation 310 CMR 60.05, CO₂ has been used to measure the GHG emissions impacts of transportation projects in the TIP and LRTP.

All TIP projects have been sorted into two categories for analysis: 1) projects with quantified CO₂ impacts, and 2) projects with assumed CO₂ impacts. Projects with quantified impacts

consist of capacity-adding projects from the LRTP and projects from the TIP that underwent a Congestion Mitigation and Air Quality Improvement (CMAQ) program spreadsheet analysis. Projects with assumed impacts are those that would be expected to produce a minor decrease or increase in emissions, and those that would be assumed to have no CO₂ impact.

TRACKING AND EVALUATING THE TRANSPORTATION IMPROVEMENT PROGRAM

Travel Demand Model

Projects with quantified impacts include capacity-adding projects in the LRTP that were analyzed using the Boston Region MPO's travel demand model set. No independent calculations were done for these projects during the development of the TIP.

Off-Model Methods

MassDOT's Office of Transportation Planning provided spreadsheets that are used to determine projects' eligibility for funding through the CMAQ program. Typically, MPO staff uses data from projects' functional design reports, which are prepared at the 25-percent design phase, to conduct these calculations. Staff used these spreadsheets to calculate estimated projections of CO₂ for each project, in compliance with GWSA regulations. These estimates are shown in Tables B-1 and B-2. A note of "to be determined" is shown for those projects for which a functional design report was not yet available.

As part of the development of the FFYs 2020–24 TIP, analyses were done for the types of projects described below. A summary of steps performed in the analyses is provided.

Traffic Operational Improvement

For an intersection reconstruction or signalization project that typically reduces delay and, therefore, idling, the following steps are taken:

- Step 1: Calculate the AM peak hour total intersection delay (seconds)
- Step 2: Calculate the PM peak hour total intersection delay (seconds)
- Step 3: Select the peak hour with the longer intersection delay
- Step 4: Calculate the selected peak hour total intersection delay with improvements
- Step 5: Calculate the vehicle delay in hours per day (assumes peak hour delay is 10 percent of daily delay)
- Step 6: Input the emissions factors for arterial idling speed from the US Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES)
- Step 7: Calculate the net emissions change in kilograms per day
- Step 8: Calculate the net emissions change in kilograms per year (seasonally adjusted)

- Step 9: Calculate the cost effectiveness (first year cost per kilogram of emissions reduced)

Pedestrian and Bicycle Infrastructure

For a shared-use path that would enable more walking and biking trips and reduce automobile trips, the following steps are taken:

- Step 1: Calculate the estimated number of one-way trips based on the percentage of workers residing in the communities served by the facility and the communities' bicycle and pedestrian commuter mode share
- Step 2: Calculate the reduction in vehicle-miles traveled per day and per year (assumes each trip is the length of the facility and that the facility operates 200 days per year)
- Step 3: Input the MOVES emissions factors for the average commuter travel speed (assumes 35 miles per hour)
- Step 4: Calculate the net emissions change in kilograms per year (seasonally adjusted)
- Step 5: Calculate the cost effectiveness (first year cost per kilogram of emissions reduced)

Bus Replacement

For a program that replaces old buses with new buses that reduce emissions or run on cleaner fuel, the following steps are taken:

- Step 1: Input the MOVES emissions factors for the average bus travel speed (assumes 18 miles per hour) for both the old model year bus and the new model year bus
- Step 2: Calculate the fleet vehicle-miles per day based on the vehicle revenue-miles and operating days per year
- Step 3: Calculate the net emissions change in kilograms per year (seasonally adjusted)
- Step 4: Calculate the cost effectiveness (first-year cost per kilogram of emissions reduced)

Other Types of Projects

Calculations may be performed on the project types listed below; however, there are no projects of these types in this TIP:

- New and Additional Transit Service: A new bus or shuttle service that reduces automobile trips
- Park-and-Ride Lot: A facility that reduces automobile trips by encouraging high-occupancy vehicle (HOV) travel via carpooling or transit
- Alternative Fuel Vehicles: New vehicle purchases that replace traditional gas or diesel vehicles with alternative fuel or advanced technology vehicles

- **Anti-Idling Strategies:** Strategies that include incorporating anti-idling technology into fleets and using light-emitting diode (LED) lights on trucks for the purpose of illuminating worksites
- **Bike-share Projects:** Programs in which bicycles are made available for shared use to individuals on a short-term basis, allowing each bicycle to serve several users per day
- **Induced Travel:** Projects associated with a roadway capacity change that gives rise to new automobile trips
- **Speed Reduction Projects:** Projects that result in slower vehicle travel speeds and, therefore, reduced emissions
- **Transit Signal Priority Projects:** Technology at signalized intersections or along corridors that affect bus travel times
- **Truck Stop Electrification:** Provides truck drivers with necessary services, such as heating, air conditioning, or appliances, without requiring them to idle their engines

ANALYZING PROJECTS WITH ASSUMED IMPACTS

Qualitative Decrease or Increase in CO₂ Emissions

Projects with assumed CO₂ impacts are those that could produce a minor decrease or increase in emissions, but the change in emissions cannot be calculated with any precision. Examples include a bicycle rack installation, Safe Routes to School project, or transit marketing or customer service improvement. These projects are categorized as producing an assumed nominal increase or decrease in emissions.

No CO₂ Impact

Projects that do not change the capacity or use of a facility—for example, a resurfacing project that restores a roadway to its previous condition, or a bridge rehabilitation or replacement that restores the bridge to its previous condition—are assumed to have no CO₂ impact. More details about these projects, including a description of each project’s anticipated CO₂ impacts, are discussed in Chapter 3. The following tables display the GHG impact analyses of projects funded in the FFYs 2020–24 Highway Program (Table B-1) and Transit Program (Table B-2). Table B-3 summarizes the GHG impact analyses of highway projects completed in FFY 2019. Table B-4 summarizes the GHG impact analyses of transit projects completed in FFY 2019. A project is considered completed when the construction contract has been awarded or the transit vehicles have been purchased.

Table B-1
Greenhouse Gas Regional Highway Project Tracking

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO ₂ Impact (kg/yr)	GHG Impact Description
608229	Acton - Intersection and signal improvements at Kelley's Corner	Quantified	111,958	Quantified decrease in emissions from Complete Streets project
607748	Acton - Intersection and signal improvements on Route 2 and Route 111 (Massachusetts Ave) at Piper Rd and Taylor Rd	Qualitative		Qualitative decrease in emissions
609222	Arlington – Spy Pond Sediment Removal	Qualitative		No assumed impact/negligible impact on emissions
604123	Ashland - Reconstruction on Route 126 (Pond St) from Framingham town line to Holliston town line	Quantified	148,097	Quantified decrease in emissions from Complete Streets project
607738	Bedford - Minuteman Bikeway extension from Loomis St to the Concord town line	Quantified	21,098	Quantified decrease in emissions from bicycle and pedestrian infrastructure
608948	Bellingham - Franklin – Southern New England Trunk Trail (SNETT) Construction	Quantified	TBD	TBD
608887	Bellingham - South Main St (Route 126) - Douglas Dr to Mechanic St reconstruction (Route 140)	Quantified	24,363	Quantified decrease in emissions from Complete Streets project
608911	Belmont - Improvements at Wellington Elementary School (SRTS)	Qualitative		Qualitative decrease in emissions
608347	Beverly - Intersection improvements at 3 locations: Cabot St (Route 1A/97) at Dodge St (Route 1A), County Way, Longmeadow Rd and Scott St, McKay St at Balch St and Veterans Memorial Bridge (Route 1A) at Rantoul, Cabot, Water, and Front Sts	Quantified	582,422	Quantified decrease in emissions from traffic operational improvement
608348	Beverly - Rehabilitation of Bridge St	Quantified	387,153	Quantified decrease in emissions from Complete Streets project
606902	Boston - Bridge Reconstruction/Rehab, B-16-181, West Roxbury Parkway over MBTA	Qualitative		No assumed impact/negligible impact on emissions
604173	Boston - Bridge replacement, B-16-016, North Washington St Bridge over the Boston Inner Harbor	Qualitative		No assumed impact/negligible impact on emissions
606728	Boston - Bridge replacement, B-16-365, Bowker Overpass over Storrow Drive (eastbound)	Qualitative		No assumed impact/negligible impact on emissions

Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 2)

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608614	Boston - Bridge substructure repairs, B-16-179, Austin St over I-93 ramps, MBTA commuter rail and Orange Line	Qualitative		No assumed impact/negligible impact on emissions
606453	Boston - Improvements on Boylston St, from Intersection of Brookline Ave and Park Dr to Ipswich St	Quantified	1,920,790	Quantified decrease in emissions from Complete Streets project
607759	Boston - Intersection improvements at the VFW Parkway and Spring St	Qualitative		Qualitative decrease in emissions
608943	Boston - Neponset River Greenway (Phase 3)	Quantified	239,055	Quantified decrease in emissions from bicycle and pedestrian infrastructure
606226	Boston - Reconstruction of Rutherford Ave, from City Square to Sullivan Square	Quantified		LRTP project included in the statewide model
608197	Boston - Superstructure replacement, B-16-107, Canterbury St over Amtrak/ MBTA	Qualitative		No assumed impact/negligible impact on emissions
607888	Boston-Brookline - Multi-use path construction on New Fenway	Quantified	54,724	Quantified decrease in emissions from bicycle and pedestrian infrastructure
609090	Boston-Milton-Quincy - Highway lighting system replacement on Interstate 93, from Neponset Ave to the Braintree split	Qualitative		No assumed impact/negligible impact on emissions
608608	Braintree - Highway Lighting Improvements at I-93/Route 3 Interchange	Qualitative		No assumed impact/negligible impact on emissions
608482	Cambridge-Somerville - Resurfacing and related work on Route 28	Qualitative		No assumed impact/negligible impact on emissions
TBD	Canton - Bridge Replacement, C-02-042, Revere Court over East Branch Neponset River	Qualitative		No assumed impact/negligible impact on emissions
609053	Canton-Dedham-Norwood - Highway lighting improvements at Interstate 93 and Interstate 95/Route 128	Qualitative		No assumed impact/negligible impact on emissions
608484	Canton-Milton - Resurfacing and related work on Route 138	Qualitative		No assumed impact/negligible impact on emissions
608611	Canton-Milton-Randolph - Replacement and rehabilitation of the highway lighting system at the Route 24 and Interstate 93 interchange	Qualitative		No assumed impact/negligible impact on emissions

**Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 3)**

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608599	Canton-Sharon-Foxborough-Norwood-Walpole – Storm water improvements along Route 1, Route 1A, and Interstate 95	Qualitative		No assumed impact/negligible impact on emissions
608078	Chelsea - Reconstruction on Broadway (Route 107) from City Hall to Revere city line	Quantified	93,278	Quantified decrease in emissions from Complete Streets project
605287	Chelsea - Route 1 Viaduct rehabilitation (southbound/northbound) on C-09-007 and C-09-011	Qualitative		No assumed impact/negligible impact on emissions
608007	Cohasset - Corridor improvements and related work on Justice Cushing Highway (Route 3A) from Beechwood St to Henry Turner Bailey Rd	Quantified	5,849	Quantified decrease in emissions from Complete Streets project
BNI800	Community Transportation Program	Quantified	TBD	TBD
608495	Concord-Lexington-Lincoln - Resurfacing and related work on Route 2A	Qualitative		No assumed impact/negligible impact on emissions
608818	Danvers - Resurfacing and related work on Route 114	Qualitative		No assumed impact/negligible impact on emissions
608378	Danvers-Topsfield-Boxford-Rowley - Interstate maintenance and related work on Interstate 95	Qualitative		No assumed impact/negligible impact on emissions
607899	Dedham - Pedestrian improvements along Bussy St	Quantified	3,331	Quantified decrease in emissions from bicycle and pedestrian infrastructure
607901	Dedham - Pedestrian improvements along Elm St and Rustcraft Rd corridors	Quantified	14,046	Quantified decrease in emissions from bicycle and pedestrian infrastructure
608596	Essex - Superstructure replacement, E-11-001 (2TV), Route 133/Main St over Essex River	Qualitative		No assumed impact/negligible impact on emissions
607652	Everett - Reconstruction of Ferry St, South Ferry St and a portion of Elm St	Quantified	435,976	Quantified decrease in emissions from Complete Streets project
609257	Everett - Rehabilitation of Beacham St, from Route 99 to Chelsea city line	Quantified	4,038	Quantified decrease in emissions from Complete Streets project
608210	Foxborough-Plainville-Wrentham-Franklin – Interstate maintenance resurfacing work on Interstate 495	Qualitative		No assumed impact/negligible impact on emissions

Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 4)

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608480	Foxborough-Walpole - Resurfacing and related work on Route 1	Qualitative		No assumed impact/negligible impact on emissions
608228	Framingham - Reconstruction of Union Ave, from Proctor St to Main St	Quantified	-217,978	Quantified increase in emissions
608889	Framingham - Traffic Signal Installation at Edgell Rd and Central St	Quantified	233,257	Quantified decrease in emissions from Complete Streets project
609402	Framingham-Natick - Resurfacing and Related Work on Route 9	Qualitative		No assumed impact/negligible impact on emissions
TBD	Hamilton - Bridge Replacement, Winthrop Street over Ipswich River	Qualitative		No assumed impact/negligible impact on emissions
605168	Hingham - Intersection Improvements at Route 3A/Summer Street Rotary	Quantified	284,736	Quantified decrease in emissions from Complete Streets project
608498	Hingham-Weymouth-Braintree - Resurfacing and related work on Route 53	Qualitative		No assumed impact/negligible impact on emissions
606501	Holbrook - Reconstruction of Union St (Route 139), from Linfield St to Centre St and Water St	Quantified	4,097	Quantified decrease in emissions from Complete Streets project
607428	Hopedale-Milford - Resurfacing and intersection improvements on Route 16 (Main St), from Water St west to approximately 120 feet west of the Milford/Hopedale town line and the intersection of Route 140	Quantified	201,148	Quantified decrease in emissions from Complete Streets project
606043	Hopkinton - Signal and intersection improvements on Route 135	Quantified	1,298,625	Quantified decrease in emissions from Complete Streets project
607977	Hopkinton-Westborough - Reconstruction of Interstate 90/ Interstate 495 interchange	Quantified		LRTP project included in the statewide model
601607	Hull - Reconstruction of Atlantic Ave and related work	Quantified	6,586	Quantified decrease in emissions from Complete Streets project
605743	Ipswich - Resurfacing and related work on Central and South Main Sts	Quantified	4,356	Quantified decrease in emissions from Complete Streets project
609054	Littleton - Reconstruction of Foster St	Quantified	1,140	Quantified decrease in emissions from Complete Streets project

Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 5)

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608443	Littleton/Ayer - Intersection improvements on Route 2A at Willow Rd and Bruce St	Quantified	52,102	Quantified decrease in emissions from traffic operational improvement
609254	Lynn - Intersection Improvements at Two Intersections on Broadway	Quantified	73,291	Quantified decrease in emissions from traffic operational improvement
602077	Lynn - Reconstruction on Route 129 (Lynnfield St), from Great Woods Rd to Wyoma Square	Quantified	12,761	Quantified decrease in emissions from Complete Streets project
609252	Lynn - Rehabilitation of Essex St	Quantified	411,394	Quantified decrease in emissions from Complete Streets project
607477	Lynnfield- Peabody - Resurfacing and related work on Route 1	Qualitative		No assumed impact/negligible impact on emissions
609060	Lynnfield-Peabody-Danvers - Guide and traffic sign replacement on Interstate 95/Route 128 (Task 'A' interchange)	Qualitative		No assumed impact/negligible impact on emissions
604952	Lynn-Saugus - Bridge replacement, L-18-016=S-05-008, Route 107 over the Saugus River (AKA – Belden G. Bly Bridge)	Qualitative		No assumed impact/negligible impact on emissions
608275	Malden - Exchange St Downtown Improvement Project	Quantified	13,519	Quantified decrease in emissions from Complete Streets project
608146	Marblehead - Intersection improvements at Pleasant St and Village, Vine, and Cross St	Quantified	531	Quantified decrease in emissions from traffic operational improvement
608566	Marlborough - Improvements at Route 20 (East Main St) at Curtis Ave	Qualitative		Qualitative decrease in emissions
608467	Marlborough - Resurfacing and related work on Route 20	Qualitative		No assumed impact/negligible impact on emissions
608637	Maynard - Bridge replacement, M-10-006, carrying Florida Rd over the Assabet River	Qualitative		No assumed impact/negligible impact on emissions
608835	Medford - Improvements at Brook Elementary School	Qualitative		Qualitative decrease in emissions
608522	Middleton - Bridge Replacement, M-20-003, Route 62 (Maple Street) over Ipswich River	Qualitative		No assumed impact/negligible impact on emissions
608045	Milford - Rehabilitation on Route 16, from Route 109 to Beaver St	Quantified	-38,500	Quantified increase in emissions

Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 6)

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)		GHG Impact Description
607342	Milton - Intersection and signal improvements at Route 28 (Randolph Ave and Chickatawbut Rd)	Qualitative			Qualitative decrease in emissions
606635	Needham-Newton - Reconstruction of Highland Ave, Needham St and Charles River Bridge, N-04-002, from Webster St (Needham) to Route 9 (Newton)	Quantified	1,186,210		Quantified decrease in emissions from Complete Streets project
608610	Newton - Steel superstructure cleaning (full removal) and painting of N-12-055	Qualitative			No assumed impact/negligible impact on emissions
609066	Newton - Weston - Multi-Use Trail Connection, from Recreation Road to Upper Charles River Greenway including Reconstruction of Ped Bridge N-12-078=W-29-062	Quantified	TBD	TBD	
608866	Newton-Weston - Steel superstructure cleaning (full removal) and painting of 3 bridges: N-12-051, W-29-011, and W-29-028	Qualitative			No assumed impact/negligible impact on emissions
608609	Newton-Westwood - Steel superstructure cleaning (full removal) and painting of 2 bridges: N-12-056 and W-31-006	Qualitative			No assumed impact/negligible impact on emissions
608052	Norwood - Intersection and signal improvements at Route 1 (Providence Highway) and Morse St	Qualitative			Qualitative decrease in emissions
605857	Norwood - Intersection improvements at Route 1 and University Ave/ Everett St	Quantified	1,092,131		Quantified decrease in emissions from traffic operational improvement
606130	Norwood - Intersection improvements at Route 1A and Upland Rd	Quantified	72,964		Quantified decrease in emissions from traffic operational improvement
608567	Peabody - Improvements at Route 114 at Sylvan St, Cross St, Northshore Mall, Loris Rd, Route 128 interchange, and Esquire Dr	Qualitative			Qualitative decrease in emissions
609211	Peabody - Independence Greenway Extension	Quantified	36,651		Quantified decrease in emissions from bicycle and pedestrian infrastructure
609101	Peabody - Pavement preservation and related work on Route 128	Qualitative			No assumed impact/negligible impact on emissions

**Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 7)**

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608933	Peabody - Rehabilitation of Central St	Quantified	150,913	Quantified decrease in emissions from Complete Streets project
609058	Peabody to Gloucester - Guide and traffic sign replacement on Route 128	Qualitative		No assumed impact/negligible impact on emissions
608569	Quincy - Intersection improvements at Route 3A (Southern Artery) and Broad St	Qualitative		Qualitative decrease in emissions
608707	Quincy - Reconstruction of Sea St	Quantified	-30,437	Quantified increase in emissions
608208	Quincy-Milton-Boston - Interstate maintenance and related work on Interstate 93	Qualitative		No assumed impact/negligible impact on emissions
609396	Randolph - Milton - Resurfacing and related work on Route 28	Qualitative		No assumed impact/negligible impact on emissions
609399	Randolph - Resurfacing and related work on Route 28	Qualitative		No assumed impact/negligible impact on emissions
607305	Reading - Intersection signalization at Route 28 and Hopkins St	Quantified	7,088	Quantified decrease in emissions from traffic operational improvement
608205	Reading to Lynnfield - Guide and Traffic Sign Replacement on a Section of I-95 (SR 128)	Qualitative		No assumed impact/negligible impact on emissions
608743	Salem - Improvements at Bates Elementary School	Qualitative		Qualitative decrease in emissions
608817	Salem-Lynn - Resurfacing and related work on Route 107	Qualitative		No assumed impact/negligible impact on emissions
608079	Sharon - Bridge Replacement, S-09-003 (40N), Moskwonikut St over Amtrak/ MBTA	Qualitative		No assumed impact/negligible impact on emissions
608562	Somerville - Signal and Intersection Improvements on I-93 at Mystic Ave and McGrath Highway	Quantified	TBD	TBD
BNI570	Somerville-Medford - Green Line Extension Project - extension to College Ave with the Union Square spur	Quantified		LRTP project included in the statewide model
605342	Stow - Bridge replacement, Route 62 (Gleasondale Rd) over the Assabet River	Qualitative		No assumed impact/negligible impact on emissions

**Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 8)**

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
608255	Stow - Bridge Replacement, S-29-011, Box Mill Road over Elizabeth Brook	Qualitative		No assumed impact/negligible impact on emissions
608164	Sudbury - Bike path construction (Bruce Freeman Rail Trail)	Quantified	49,903	Quantified decrease in emissions from bicycle and pedestrian infrastructure
608895	Sudbury - Stow - Hudson – Mass Central Rail Trail Wayside	Quantified	TBD	TBD
607761	Swampscott - Intersection and signal improvements at Route 1A (Paradise Rd) at Swampscott Mall	Qualitative		Qualitative decrease in emissions
607329	Wakefield-Lynnfield - Rail Trail Extension, from the Galvin Middle School to Lynnfield/Peabody town line	Quantified	158,032	Quantified decrease in emissions from bicycle and pedestrian infrastructure
602261	Walpole - Reconstruction on Route 1A (Main St), from the Norwood town line to Route 27, includes W-03-024 over the Neponset River	Quantified	230,473	Quantified decrease in emissions from Complete Streets project
608564	Watertown - Intersection improvements at Route 16 and Galen St	Qualitative		Qualitative decrease in emissions
607777	Watertown - Rehabilitation of Mount Auburn St (Route 16)	Quantified	536,769	Quantified decrease in emissions from Complete Streets project
609102	Wenham-Manchester-Essex-Gloucester - Pavement preservation and related work on Route 128	Qualitative		No assumed impact/negligible impact on emissions
607327	Wilmington - Bridge replacement, W-38-002, Route 38 (Main St) over the B&M Railroad	Qualitative		No assumed impact/negligible impact on emissions
608929	Wilmington - Bridge replacement, W-38-003, Butters Row over MBTA	Qualitative		No assumed impact/negligible impact on emissions
608703	Wilmington - Bridge Replacement, W-38-029 (2KV), ST 129 Lowell St over I-93	Qualitative		No assumed impact/negligible impact on emissions
609253	Wilmington - Intersection Improvements at Lowell St (Route 128) and Woburn St	Quantified	494,197	Quantified decrease in emissions from Complete Streets project
608051	Wilmington - Reconstruction of Route 38 (Main St), from Route 62 to the Woburn City Line	Quantified	492,160	Quantified decrease in emissions from Complete Streets project
608791	Winchester - Improvements at Vinson-Owen Elementary School	Qualitative		Qualitative decrease in emissions

Table B-1
Greenhouse Gas Regional Highway Project Tracking (cont. 9)

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO₂ Impact (kg/yr)	GHG Impact Description
607244	Winthrop - Revere St Roadway Improvements	Quantified	252,816	Quantified decrease in emissions from Complete Streets project
604996	Woburn - Bridge replacement, W-43-017, New Boston St over MBTA	Quantified		LRTP project included in the statewide model
603739	Wrentham - Construction of Interstate 495/Route 1A ramps	Quantified	1,233,486	Quantified decrease in emissions from traffic operational improvement

Greenhouse Gas Regional Highway Project Tracking

CO₂ = carbon dioxide; GHG = greenhouse gas; kg = kilogram; LRTP = Long-Range Transportation Plan; TBD = to be determined; yr = year.

Table B-2
Greenhouse Gas Regional Transit Project Tracking

This table is under development. It will contain the GHG impact analyses of projects funded in the Transit Program.

Table B-3
Greenhouse Gas Regional Highway “Completed” Project Tracking

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO2 Impact (kg/yr)	GHG Impact Description	FFY of Contract Award
29492	Bedford-Billerica - Middlesex Turnpike improvements, from Crosby Dr north to Manning Rd, includes reconstruction of B-04-006 (Phase III)	Quantified	L RTP	L RTP project included in the statewide model	2017
604761	Boston - Multi-Use Trail Construction (South Bay Harbor), from Ruggles Station to Fort Point Channel	Quantified	767,491	Quantified decrease in emissions from bicycle and pedestrian infrastructure	2017
607309	Hingham- Reconstruction and related work on Derby St, from Pond Park Rd to Cushing St	Quantified	-113,400	Quantified decrease in emissions from Complete Streets project	2017
604810	Marlborough - Reconstruction of Route 85 (Maple St)	Quantified	589,680	Quantified decrease in emissions from Complete Streets project	2017
607754	Milton - Intersection and Signal Improvements at Granite Ave and Squantum St	Quantified		TBD	2017
602165	Stoneham - Signal and intersection improvements at Route 28/North St	Quantified	139,709	Quantified decrease in emissions from traffic operational improvement	2017
607999	Revere – Improvements at Garfield Elementary and Middle School (SRTS)	Qualitative		Qualitative Decrease in Emissions	2017
608004	Watertown - Safe Routes to School (Hosmer Elementary)	Qualitative		Qualitative Decrease in Emissions	2017
608003	Weymouth - Safe Routes to School (Pingree Elementary)	Qualitative		Qualitative Decrease in Emissions	2017
601630	Weymouth- Abington - Reconstruction and Widening on Route 18 (Main St), from Highland Pl to Route 139	Quantified	L RTP	L RTP project included in the statewide model	2017
604935	Woburn - Reconstruction of Montvale Ave, from Interstate 93 interchange to Central St (approximately 1,850 feet)	Quantified	98,885	Quantified decrease in emissions from Complete Streets project	2017
607732	Cochituate Rail Trail, Phase Two, Including Pedestrian Bridge, N-30-014, Over Route 9 and F-07-033=N-03-029 over Route 30	Quantified	62,441	Quantified Decrease in Emissions from Bicycle and Pedestrian Infrastructure	2018

MassDOT Project ID	MassDOT Project Description	GHG Analysis Type	GHG CO2 Impact (kg/yr)	GHG Impact Description	FFY of Contract Award
608013	Quincy - Intersection Improvements at Sea St and Quincy Shore	Quantified	701,528	Quantified decrease in emissions from traffic operational improvement	2018
608352	Salem - Canal Street Rail Trail construction (Phase 2)	Quantified	6,651	Quantified decrease in emissions from bicycle and pedestrian infrastructure	2018
607507	Wakefield - Bridge Deck Replacement, W-01-021 (2MF) Hopkins Street over I-95 / ST 128	Qualitative		Qualitative Decrease in Emissions	2018
606134	Boston- Traffic Signal Improvements on Blue Hill Ave and Warren St	Qualitative		Qualitative Decrease in Emissions	2019
608651	Braintree- Adaptive Signal Controls on Route 37 (Granite St)	Qualitative		Qualitative Decrease in Emissions	2019
605110	Brookline- Intersection and signal improvements at Route 9 and Village Square (Gateway East)	Quantified	67,056	Quantified decrease in emissions from Complete Streets project	2019
600518	Hingham - Intersection improvements at Derby St, Whiting St, and Gardner St	Quantified	-145,683	Quantified increase in emissions	2019
607133	Quincy - Superstructure Replacement, Q-01-039, Robertson St over I-93/US 1/SR 3	Qualified		No assumed impact/negligible impact on emissions	2019
604989	Southborough - Reconstruction of Main St (Route 30), from Sears Rd to Park St	Quantified	231,813	Quantified decrease in emissions from Complete Streets project	2019
608823	Wellesley- Newton- Weston - Pavement Resurfacing and Related Work on I-95	Qualitative		No assumed impact/negligible impact on emissions	2019

Greenhouse Gas Regional Highway “Completed” Project Tracking

CO₂ = carbon dioxide; GHG = greenhouse gas; kg = kilogram; LRTP = Long-Range Transportation Plan; yr = year

Table B-4 Greenhouse Gas Regional Transit “Completed” Project Tracking

This table is under development. It will summarize the GHG impact analyses of transit projects completed in FFY 2019.

