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**Environment & Climate
Change**





ENVIRONMENTAL AND CLIMATE CHANGE

Introduction

Environment and climate change are important areas of consideration for transportation planning. The Montachusett Region needs to help protect and minimize negative impacts from our transportation system to its many areas of environmental value and its air, water, soil and wildlife. Along with environmental protection, the Montachusett Region hopes to reduce transportation's contributions to greenhouse gases emissions which contribute to global climate change. This chapter will discuss the current and future activities the Montachusett Region is undertaking to protect its environment and reduce greenhouse gas emissions.

As required by the federal transportation authorizing legislation known as SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users) and Federal Highway Administration (FHWA) guidance and regulations, Regional Transportation Plans "must include a discussion of types of potential environmental mitigation activities at the plan level ..." and "must be developed in consultation with federal, tribal state wild life, land management and regulatory agencies." This chapter will discuss environmental mitigation activities which were developed with regard to policies and priorities of federal and state regulatory agencies thus fulfilling the SAFETEA-LU requirement.

Areas of Environmental Value

The Montachusett Region contains many areas of environmental value such as Areas of Critical Environmental Concern (ACEC), priority habitat for rare species, vernal pools, protected and recreation open space, agricultural protected areas, wetlands, wellhead protection and watershed protection areas, BioMap core and living water core habitats. To identify areas where there might be potential areas of conflict or concern between areas and habitats of environmental value and major infrastructure projects in the region, environmental Geographic Information Systems (GIS) data layers were mapped with the infrastructure projects. The following table describes the datasets that were used in conducting this environmental analysis. These GIS data layers are available through MassGIS data center.



Environmental Data Layer in the Maps	Brief Description (For more details visit MassGIS Web Site at www.mass.gov/mgis/laylist.htm)
DCR: Areas of Critical Environmental Concern (December 2003)	The Areas of Critical Environmental Concern (ACEC) datalayers provide digital polygon and line boundaries for areas that have been designated ACECs by the Secretary of Environmental Affairs. Areas of Critical Environmental Concern (ACECs) are places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources . These areas are identified and nominated at the community level and are reviewed and designated by the state's Secretary of Environmental Affairs. ACEC designation creates a framework for local and regional stewardship of these critical resource areas and ecosystems. ACEC designation also requires greater environmental review of certain kinds of proposed development under state jurisdiction within the ACEC boundaries.
NHESP Priority Habitats for Rare Species (December 2006)	The Priority Habitats of Rare Species datalayer contains polygons representing the geographic extent of Habitat of state-listed rare species in Massachusetts based on observations documented within the last 25 years in the database of the Natural Heritage & Endangered Species Program (NHESP). Priority Habitats are the filing trigger for proponents, municipalities, and other stakeholders for determining whether or not a proposed project must be reviewed by the NHESP for compliance with the Massachusetts Endangered Species Act (MESA).
NHESP: Certified Vernal Pools (September 2006)	<p>This datalayer contains points for all vernal pools that have been certified by the Natural Heritage & Endangered Species Program (NHESP) according to the Guidelines for Certification of Vernal Pool Habitat (MA Division of Fisheries & Wildlife, 2000).</p> <p>Vernal pools are small, shallow ponds characterized by lack of fish and by periods of dryness. Vernal pool habitat is extremely important to a variety of wildlife species including some amphibians that breed exclusively in vernal pools, and other organisms such as fairy shrimp, which spend their entire life cycles confined to vernal pool habitat. Many additional wildlife species utilize vernal pools for breeding, feeding and other important functions. Certified vernal pools are protected if they fall under the jurisdiction of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00). However, the certification of a pool only establishes that it functions biologically as a vernal pool. Certification does not determine that the pool is within a resource area protected by the Wetlands Protection Act. Certified vernal pools are also afforded protection under the state Water Quality Certification regulations (401 Program), the state Title 5 regulations, and the Forest Cutting Practices Act regulations.</p>
MassGIS: Protected and Recreational Open Space (January 2007)	The MassGIS Protected and Recreational OpenSpace data comprise a set of related data layers that represent parklands, forests, golf courses, playgrounds, wildlife sanctuaries, conservation lands, water supply areas, cemeteries, school ball fields, and other open land that may be classified as protected and/or recreational in use . The areas depicted on the map are only the protected in perpetuity Open Spaces.
MassGIS: Chapter 61 Land (January 2007)	Massachusetts General Laws Chapter 61 is designed to encourage the preservation and enhancement of the Commonwealth's Agricultural and Horticultural, Recreational and Forestry Open Lands by Tax reductions.
DCR Open Space Land	Open Spaces owned by DCR
DEP Wetlands 1:12,000 (December 2006)	The Wetlands Protection Act [Massachusetts General Laws (MGL) Chapter 131, Section 40] protects wetlands and the public interests they serve , including flood control, prevention of pollution and storm damage, and protection of public and private water supplies, groundwater supply, fisheries, land containing shellfish, and wildlife habitat. These public interests are protected by requiring a careful review of proposed work that may alter wetlands.



Environmental Data Layer in the Maps	Brief Description (For more details visit MassGIS Web Site at www.mass.gov/mgis/laylist.htm)
DEP: Wellhead Protection Areas :Zone II and IWPA (January 2007)	<p>Wellhead protection areas are important for protecting the recharge area around public water supply (PWS) groundwater sources.</p> <ul style="list-style-type: none"> - A Zone II is a wellhead protection area that has been determined by hydro-geologic modeling and approved by the Department of Environmental Protection's (DEP) Drinking Water Program (DWP). - In cases where hydro-geologic modeling studies have not been performed and there is no approved Zone II, an Interim Wellhead Protection Area (IWPA) is established based on DEP DWP well pumping rates or default values. <p>Certain land uses may be either prohibited or restricted in both approved (Zone II) and interim (IWPA) wellhead protection areas.</p>
DCR: Watershed Protection Act	<p>The Watershed Protection Act (WsPA) regulates land use and activities within critical areas of the Quabbin Reservoir, Ware River and Wachusett Reservoir watersheds for the purpose of protecting the quality of drinking water. Administered by the Division of Water Supply Protection (formerly the MDC Division of Watershed Management), WsPA applies only in towns in DCR watersheds.</p> <p>Two areas are protected in different ways under the WsPA. Within 400 feet of the reservoirs and 200 feet of tributaries and surface waters (the "Primary Protection Zone"), any alteration is prohibited. "Alteration" includes a variety of activities, such as construction, excavation, grading, paving, and dumping. Generation, storage, disposal or discharge of pollutants is also prohibited in the Primary Zone. Between 200 and 400 feet of tributaries and surface waters, and on land within flood plains, over some aquifers, and within bordering vegetated wetlands (the "Secondary Protection Zone"), certain activities are specifically prohibited. These include storage, disposal or use of toxic, hazardous, and certain other materials; alteration of bordering vegetated wetlands; more dense development; and other activities. See 350 CMR 11.04 for a complete list. More info : http://www.mass.gov:80/dcr/waterSupply/watershed/wspa.htm</p>
NHESP BioMap Core Habitat (June 2002)	<p>Core Habitat is one of two datalayers resulting from the BioMap biodiversity mapping project. The Core Habitat layer depicts the most viable habitat for rare species and natural communities in Massachusetts. Using a variety of data sources, primarily field data, ancillary literature, and color-infrared aerial photographs, Natural Heritage and Endangered Species Program scientists delineated Core Habitat polygons</p>
NHESP Living Waters Core Habitats (November 2003)	<p>Living Waters Core Habitats is one of two datalayers resulting from the Living Waters project (see also the NHESP Living Waters Critical Supporting Watershed datalayer description). Core Habitats represent lakes, ponds, rivers, and streams that are important for the protection of freshwater biodiversity in Massachusetts. Natural Heritage and Endangered Species Program biologists delineated Core Habitats for rare aquatic species and exemplary aquatic habitats using Natural Heritage Element Occurrences along with other field data sets.</p>

Within the RTP a number of projects and recommendations have been identified to address various issues and concerns throughout the communities of the Montachusett Region. Project recommendations range from relatively “small scale” improvements, upgrading existing traffic signals, installation of proper signage, etc. to larger “major infrastructure” projects. Projects of this type are typically defined as having a “significant cost that would not normally be expected to be included in an MPO’s target component of the Transportation Improvement Program” (refer to the Financial Element of the RTP for a further discussion on major infrastructure projects from a cost perspective). For the purposes of this environmental consultation discussion however, major infrastructure projects were identified as not only having a significant cost but also a scope or magnitude that could likely effect or impact various environmental features in the Region. In addition to those projects with a cost estimate associated with them, a number of projects are identified as needing further study. These projects are less defined in terms of limits or improvement strategies and are more conceptual in nature, however, it is anticipated that future projects will result from their review and analysis.



The following is a list of projects listed in the 2012 through 2015 Transportation Improvement Program (TIP) as well as “Major Infrastructure” projects listed within the Regional Transportation Plan that were evaluated as part of this environmental review.

FFY	Project ID	Location	Project Description	Total Estimated Cost
2014	400102	Athol	Bridge Replacements, Br# A-15-009 Chestnut Hill Avenue (Route 32) Over The Miller's River & A-15-012 Over The B&M Rr	\$1,620,000
2013	606008	Athol/Petersham	Resurfacing & Related Work On Route 32, From 1 Mile North Of Route 101 To Route 2	\$2,954,567
2014	602621	Fitchburg	Resurfacing Of Route 31 (Ashby State Road), From John Fitch Highway Northerly To Scripture Road, Includes F-04-023	\$2,203,200
2012	605216	Lancaster	Reconstruction On Route 70 (Lunenburg Road) At Old Union Turnpike	\$2,147,258
2013	605392	Lancaster	Intersection Improvements @ Five Corners: Route 110 (Bolton Road, High Street Extension), Center Bridge Road, Old Common Road	\$1,027,189
2013	603514	Leominster	Bridge Replacement, L-08-014, Whitney Street Over The Monoosnoc Brook	\$2,585,032
2012	605104	Leominster	Bridge Reconstruction, L-08-024, Route 12 Over Route 2 (Eb & Wb)	\$8,050,000
2012	605391	Leominster	Intersection & Signal Improvements At Merriam Avenue And Lindell Avenue	\$538,582
2014-2015	605651	Leominster	Reconstruction On Route 13, From Hawes Street To Prospect Street	\$6,330,987
2012	605773	Leominster	Superstructure Replacement, L-08-028, Hamilton Street Over Route 2	\$5,978,914
2012	604175	Royalston	Bridge Replacement, R-12-004, Northeast Fitzwilliam Road Over The Lawrence Brook	\$1,559,649
2015	604515	Royalston	Bridge Replacement, R-12-006, North Fitzwilliam Road Over Lawrence Brook	\$1,308,608
2015		Sterling	I-190	\$10,823,904
2012-2013	604917	Templeton	Reconstruction Of Baldwinville Road, From Route 202/68 To Patriots Road (Approx. 3 Miles)	\$5,357,811
2013	602587	Westminster	Bridge Replacement, W-28-017, Route 12 (Ashburnham Road) Over Phillips Brook	\$1,497,600
2013	604439	Winchendon	Multi-Use Trail Construction (North Central Pathway - Phase V) Includes W-39-023, W-39-024 & W-39-028	\$1,959,202
Major Infrastructure	97201	Fitchburg Leominster Westminster	Rte. 2 - Oak Hill Rd. to Vicinity of Damon Rd. - Reconstruction	\$20,000,000
2012		Fitchburg Westminster	Wachusett Station	\$65,000,000
2012		Leominster	North Leominster MBTA Garage	\$7,500,000
Major Infrastructure		Athol	Route 2 at South Athol Rd. - New Interchange	
Major Infrastructure		Ayer	Construction of Parking Facility at Ayer Station	
Major Infrastructure		Leominster	Route 2 exit 32 on/off ramps improvements	
Major Infrastructure		Ayer to South Acton	Fitchburg Line Improvements	



Environmental Layers Potentially Impacted in the Montachusett Region													
City	Project	NHESP Certified Vernal Pools	NHESP Priority Habitats of Rare Species	DEP Approved Wellhead Protection Area (Zone II)	DEP Interim Wellhead Protection Area (IWPA)	DEP Wetlands	Permanently Protected Open Space (MassGIS)	Chapter 61 Land (Agricultural, Recreation, Forestry)	Areas of Critical Environmental Concern	DCR Quabin/Ware and Wachusett/Sudbury Watershed Section Open Space Lands	Watershed Protection Act (Primary and Secondary Protection Zone)	NHESP Living Waters Core Habitats	NHESP BioMap Core Habitat
Ayer	Intersection of Main St./Park St. - Parking Facility Construction												
Fitchburg Leominster Westminster	Rte. 2 - Oak Hill Rd. to Vicinity of Damon Rd. - Reconstruction		X			X	X	X					
Leominster	Route 13 from Hawes St. to Prospect St. - Reconstruction												
Leominster	Bridge Reconstruction, L-08-024, Route 12 Over Route 2 (EB & WB)												
Athol	Route 2 at South Athol Road - New Interchange					X		X					
Ayer to South Acton	Fitchburg Line Improvements		X	X	X	X	X	X	X				
Leominster	North Leominster Commuter Rail Garage					X							



Littleton	Commuter Rail Parking Improvements and Platform						X						
Fitchburg Westminister	Wachusett Station and Layover Facility					X		X					
Athol Petersham	Resurfacing & related work on Route 32 from 1 Mile North of Rt 101 to Rt 2A		X		X	X	X	X					
Fitchburg	Resurfacing of Route 31 (Ashby State Road), from John Fitch Highway Northerly to Scripture Road		X			X	X						
Templeton	Reconstruction of Baldwinville Road, from Route 202/68 to Patriots Road (Approx. 3 Miles)					X							
Athol	Bridge Replacements, Br# A-15-009 Chestnut Hill Avenue (Route 32 over the Miller's River & A-15-012 over the B&M RR		X		X								
Leominster	Superstructure Replacement, L-08-028, Hamilton Street over Route 2												



Westminster	Bridge Replacement, W-28-017, Route 12 (Ashburnham Road) over Phillips Brook		X										
Leominster	Intersection & Signal Improvements at Merriam Avenue and Lindell Avenue						X						
Lancaster	Reconstruction on Route 70 (Lunenburg Road) At Old Union TPK.				X				X				
Winchendon	North Worcester County Bikepaths - Multi-Use Trail Construction (North Central Pathway - Phase V) Includes W-39-023, W-39-024 & W-39-028					X	X						
Lancaster	Intersection Improvements @ Five Corners: Route 110 (Bolton Road, High Street Extension), Center Bridge Road, Old Common Road		X	X		X	X		X				X



Leominster	Bridge Replacement, L-08-014, Whitney Street Over the Monoosnoc Brook					X							
Royalston	Bridge Replacement, R-12-004, Northeast Fitzwilliam Road Over the Lawrence Brook					X	X						X
Royalston	Bridge Replacement, R-12-004, Northeast Fitzwilliam Road Over the Lawrence Brook					X	X						X

Once these major infrastructure and environmental datasets were identified and compiled, a map was generated to determine areas of overlap. These overlaps would then indicate possible environmental areas of concern or conflict between the projects and environmental datalayers. Please refer to the maps at the end of this chapter.

To assist in the analysis process, it was necessary to establish a buffer around the major infrastructure projects. For those projects that were linear in nature, i.e. along Route 2 or the Commuter Rail Line, a 400 foot buffer from the project centerline was used. For the identified vernal pools, a 200 foot buffer was created and at locations such as intersections or interchanges, a buffer was established that encompassed the crossing as well as auxiliary lanes.

After all features had been mapped and buffers created, a matrix was generated that identified each individual project and the environmental data layer or feature it contacted. The matrix was intended to indicate where potential areas of concern or conflict might exist between the project and the environment and not as a measure of impact, i.e. no attempt was made to determine the size or the severity of impact. If a project were to fall within environmentally critical areas than the project would be reviewed more closely to see if it would have a negative or positive impact on the area. This information would be reflected in the Transportation Evaluation Criteria (TEC) scoring process.

Air Quality Conformity

A complete discussion related to air quality and the state's efforts to attain and maintain air quality conformity standards, as determined by federal guidelines and regulations, is contained within the Conformity chapter of this RTP.

Water

Along with areas and habitats of environmental value, the Montachusett Region has many water bodies which can be adversely affected by paved roads and the transportation system. Stormwater runoff from roads and other impervious surfaces can adversely result in low water quality. Many of the water bodies in the Montachusett Region are negatively impacted by contaminated stormwater runoff. Pollution from noxious aquatic plants, nutrients, turbidity, organic enrichment/low dissolved oxygen, metals, priority organics and pathogens can be caused by stormwater runoff.

The Commonwealth keeps track of which waterways that are contaminated and by which pollutant. In the Montachusett Region, many of its water bodies are impaired for designated uses such as for public water supply, protection of fish, shellfish, and wildlife, and for recreational, agricultural, industrial, and navigational purposes. Please refer to the maps at the end of this chapter that highlight region's waterbodies and their impairments. The maps show Category 4 or 5 waterbodies from the Massachusetts Year 2008 303d Integrated List of Impaired Waters in the Montachusett Region.

To understand the integrated list and waterbody categories, the “*2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report*” states the following:

The categories represent varying levels of use attainment, ranging from Category 1, where all designated water uses are met, to Category 5, where impairment by pollutants requires a Total Maximum Daily Load (TMDL) to correct.

The listing categories are as follows:

- Category 1: Waters attaining all designated uses
- Category 2: Waters where some, but not all, designated uses are met. Attainment status of the remaining designated uses is unknown because data are insufficient to categorize a water body consistent with the state’s listing methodology
- Category 3: Waters for which there are insufficient or no data and information to determine, consistent with the State’s listing methodology, if designated uses are met
- Category 4: Waters impaired for one or more designated use but not needing a TMDL. States may place these waters in one of the following three subcategories:
 - Category 4A: TMDL is approved
 - Category 4B: Expected to meet all designated uses within a reasonable timeframe (three years)
 - Category 4C: Not impaired by a pollutant
- Category 5: Waters impaired for one or more designated uses by any pollutant

Category 5 includes waters shown to be impaired as the result of biological assessments used to evaluate aquatic life use even if the specific pollutant is not known unless the state can demonstrate that non-pollutant stressors cause the impairment or that no pollutant(s) causes or contribute to the impairment. Category 5 constitutes the Section 303(d) list that EPA will approve or disapprove under the CWA.

Total Maximum Daily Load (TMDL) identifies allowable pollutant loads to a water body from both point and non-point sources that will prevent a violation of water quality standards. A TMDL also includes a margin of safety to ensure protection of the water. A TMDL is designed to reduce pollutant loads to impaired waters and enable these waters to meet water quality standards.

Storm Water Pollution Reduction Project

Low Impact Development (LID) helps mitigate water pollution from nonpoint sources. Nonpoint source water pollution comes from many diffuse sources such as rainfall or snowmelt moving over and through the ground. As the storm water runoff moves, it picks up and carries away natural and human-made pollutants, depositing them into lakes, rivers, wetlands, coastal waters and ground waters. This type of pollution is different than water pollution from industrial or sewage treatment plants (point source pollution). LID mitigates nonpoint source water pollution by capturing stormwater and rainfall on site, filtering it through

vegetation and letting it soak into the ground before entering the water table. LID is a group of land use development techniques that allows stormwater to be dealt with at its first infiltration.

The general purpose of LID bylaws/ordinances is to require that the amount and quality of stormwater runoff from new development or redevelopment is equal to or better than pre-development conditions using low impact techniques. Four communities out of the 22 that make-up the Montachusett Region already have LID bylaws or regulations in their municipalities (Ashburnham, Shirley, Westminster, and Winchendon). Through the Storm Water Pollution Reduction Project in the Montachusett Region's Millers River Watershed Area, over the next two years, we are anticipating that seven more communities will have LID bylaws/ordinances. Enacting these bylaws/ordinances, we anticipate that potential additional water pollution from new development and redevelopment will be mitigated.

One way the Montachusett Region is attempting to mitigate nonpoint source water pollution, in particular, is through the Storm Water Pollution Reduction Project in the Montachusett Region's Millers River Watershed Area. This project is being funded through Environmental Protection Agency's (EPA) Section 319 Nonpoint Source Pollution Grant Program. The Montachusett Regional Planning Commission (MRPC) has been awarded these funds to provide Low Impact Development (LID) education and planning assistance to write LID Bylaws/Ordinances. LID education is being provided to the following communities: Ashburnham, Athol, Gardner, Hubbardston, Petersham, Phillipston, Royalston, Templeton, Westminster and Winchendon. LID bylaw/ordinance writing assistance is being provided to Athol, Gardner, Hubbardston, Petersham, Phillipston, Royalston and Templeton.

Soil

Brownfields Site Assessments

One of the ways to encourage people to drive less and avoid sprawl is to compact development, but some properties cannot be redeveloped due to soil contamination. By making facilities and needed services closer together, this leads to drivers making fewer trips and decreasing their vehicle miles traveled. To increase development in downtowns and in places where development has already accrued with the right infrastructure that have soil contamination, they need to be assessed and cleaned. MRPC is writing and obtaining grants to assess brownfield properties that can be reused and revitalized for infill development which will support compact development and smart growth.

Since 1998 the MRPC has been awarded \$750,000 in Brownfields Site Assessment grant funds from the Environmental Protection Agency assisting with the redevelopment of six sites and the ongoing redevelopment of another eight properties. Forty (40) documents have been prepared by the MRPC's consultant (TRC Environmental Solutions) documenting the level of environmental contamination on 24 properties in eight of MRPC's communities. MRPC's latest grant award from EPA in May 2007 was for \$200,000 to complete 14 Phase I and two Phase II Environmental Site Assessments. MRPC continues to apply for site assessment grants for

brownfield sites within the Montachusett Region. These brownfield assessments are the first step in brownfield clean-up and can eventually lead to soil decontamination.

Critical Wildlife Corridors

The Montachusett Region has rare species and wildlife that needs to be protected. One way to do this is through the enhancement or development of corridors for wildlife migration around and through the major highway and road network should be considered in the development of projects. Route 2 crosses between two Areas of Critical Environmental Concern, the Squannassit-Petapawag and the Central Nashua River Valley. A small corridor connection exists between the ACEC’s but is impacted by Route 2, which subsequently impacts wildlife traveling through the area. Two methods to address this issue include:

1. Improved Route 2 Crossings/Underpasses – Whenever new transportation projects are implemented there needs to be further analysis on wildlife movement by means of road crossings and underpasses.
2. Bottomless Culverts – Bottomless culverts offer an excellent opportunity to provide stream simulation and encourage aquatic organism and fish passage. Bottomless culverts are typically arch culverts with no bottom section.

Common Types of Wildlife Crossing Structures



www.wildlifecrossings.info

Category	Definition	Shape	Typical Material
Wildlife crosses UNDER the traffic.			
Wildlife Underpass: Culvert	Animals pass under an intersecting roadway through a culvert. A culvert is a conduit covered with embankment around the entire perimeter. It may or may not convey water. Small conduits for amphibians are sometimes called <i>tunnels</i> .		
Box Culvert	Culvert has four sides, including bottom. Sometimes square or rectangular corrugated metal pipe culverts without bottoms are called box culverts, but in this toolkit they are referred to as bottomless culverts. Box culverts maybe be arranged in a horizontal series of small culverts to form multiple chambers.	 Square or Rectangular Multiple Chamber	Precast concrete cast-in-place concrete wood
Culvert (Continuous)	Culvert is continuous in circumference. The lower portion may or may not be buried. Sometimes simply called <i>pipe</i> . European badger culverts are sometimes called <i>ecopipes</i> . Slotted drain culverts are continuous except for a break in the upper portion.	 Slotted Drain Circular Pipe-Arch Elliptical (Squash Pipe)	Corrugated metal pipe Metal plate Cast-in-place concrete Precast concrete Wood
Bottomless Culvert	Culvert is discontinuous in circumference with rounded or square top and natural surface bottom. Also called <i>open-bottom culvert</i> .	 Square or Rectangular Arch (low Profile) Arch (high profile)	Corrugated metal pipe Metal plate Precast concrete Cast-in-place concrete Wood

Climate Change

Climate Change is the long-term global warming trend that general scientific consensus says is caused by human-induced increases in atmospheric greenhouse gases. These human-induced greenhouse gases are caused by deforestation and burning of fossil fuels such as gasoline, diesel and natural gas. The greenhouse gases are made up of CO₂ that traps heat in the atmosphere and thus increases the global climate. This increase in temperature adversely effects agriculture, forests, storm frequency and intensity. This can lead to accelerated deterioration of roadways, bridge damage, rail bucking and increase in flooding and stormwater.

MassDOT, using its statewide travel demand model, has provided the Montachusett MPO with statewide estimates of CO₂ emissions resulting from the collective list of all recommended projects in all the Massachusetts RTPs combined. Emissions are estimated in the same way as the criteria pollutants (volatile organic compounds, nitrogen oxides, and carbon monoxide) whose emissions are required for the air quality conformity determination (for further description, see Chapter 16. However, the CO₂ emissions shown here are part of an effort separate from the conformity analysis and are not part of those federal standards and reporting requirements.

The Global Warming Solutions Act (GWSA) legislation requires reductions by 2020 and further reductions by 2050, relative to the 1990 baseline. The project mix from this RTP (and all other RTPs) was modeled for both 2020 and 2035 using an Action (Build) vs. Baseline (No-Build) analysis to determine the CO₂ emissions attributed to the all MPO's mix of projects and smart-growth land use assumptions. The estimates of the modeled CO₂ emissions are provided below:

Massachusetts Statewide CO₂ Emissions Estimates
(all emissions in tons per summer day)

Year	CO ₂ Action Emissions	CO ₂ Base Emissions	Difference (Action – Base)
2010	101,514.4	101,514.4	n/a
2020	105,747.5	105,856.4	-108.9
2035	115,034.1	115,028.0	6.1

As shown above, collectively, all the projects in the RTPs in the 2020 Action scenario provide a statewide reduction of nearly 109 tons of CO₂ per day compared to the base case. However,

the 2035 Action scenario estimates an increase of about 6 tons of CO₂ emissions compared to the base case. It should be noted that this current analysis measures only projects that are included in the travel demand model. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.) will be further analyzed for CO₂ reductions in the next Transportation Improvement Program development cycle. This information will be updated and reported at that time.

Working closely with MassDOT, the Montachusett MPO will continue to report on its actions to comply with the GWSA and to help meet the GHG reductions targets. As part of this activity, the MPO will provide further public information on the topic and will advocate for steps needed to accomplish the MPO's and state's goals for greenhouse gas reductions.

Renewable Energy

The Montachusett Region is working on increasing the use of renewable energy sources. Some of the Montachusett Region communities have Wind-Energy Bylaws and Wind-Energy Turbines. The Montachusett Regional Planning Commission (MRPC) is also working on a Regional Energy Plan and the Montachusett Regional Transit Authority is buying renewable energy systems and vehicles.

Wind-Energy Bylaws/Ordinances

Wind-Energy Bylaws/Ordinances detail specific height and setbacks requirements for wind-energy systems and provide identified areas in which people are allowed to put up wind-energy turbines either by right or through a special permit. This provides an easier, quicker and less costly method than obtaining a zoning variance. In communities that do not have wind-energy bylaws/ordinances, a person might need to get a zoning variance to build their wind-energy turbine. The following is a list of communities within the Montachusett Region that have Wind-Energy Bylaws/Ordinances: Ashburnham, Ashby, Athol, Clinton, Fitchburg, Gardner, Groton, Lunenburg and Winchendon

Green Communities

There are 53 communities in the Commonwealth that are ranked as clean energy leaders and are eligible for municipal renewable power and energy efficiency grants which Massachusetts Department of Energy Resources (DOER) denotes them as a Green Community. These are communities that have met five criteria, one of which is providing as-of-right siting in designated locations for renewable/alternative energy generation, research and development, or manufacturing facilities. For communities with by-right Wind-Energy bylaws/ordinances, they already meet this criterion. The other four are: adopt an expedited application and permit process for as-of-right energy facilities, establish benchmark for energy use and developed a plan to reduce baseline by 20 percent within 5 years, purchase only fuel-efficient vehicles, set requirements to minimize life-cycle energy costs for new construction. These criteria all deal with decreasing energy usage or increasing renewable energy usage, which

will help lower CO₂ emissions. There are three Green Communities in the Montachusett Region. They are Athol, Gardner and Lancaster.

Renewable Energy Systems

Throughout the Montachusett Region, there are various renewable energy systems including wind turbines, solar photovoltaic, geothermal, landfill gas, hydro, and biomass. Over the last few years, there has been an increase in these types of systems throughout the region. The increase in renewable energy systems is helping relieve the demand on burning fossil fuels which lowers CO₂ emissions and greenhouse gases. See map at end of this chapter for full list and locations of renewable energy systems. MRPC is in the process of inventorying the many systems throughout the region as part of the Montachusett Regional Energy Plan, which is discussed in the next section.

Montachusett Regional Energy Plan

The MRPC is in the process of development a Regional Energy Plan. It was awarded \$66,000 from the federal Department of Commerce's Economic Development Administration (EDA) to put together the plan. The goal of the plan is to make recommendations to the Montachusett Region's 22 communities to promote the reduction of electricity used, energy used for transportation, an non-electric energy used for heating; replacement of fossil fuels with renewable resources and the reduction of global climate change emissions. The scope of work for this project includes a renewable energy regional inventory (mentioned above), design and construction of energy educational exhibits, and series of community workshops. An assessment and analysis of the Montachusett Region Current Energy Needs/Demands (by end-user) will also be undertaken. Based upon this information, Worcester Polytechnic Institute students will work to build a system dynamics simulation model of future energy demands and needs within the Montachusett Region. The model will be used to simulate a variety of path-altering scenarios. The plan is to be finished by October 2011.

Montachusett Energy Advisory Committee

Montachusett Energy Advisory Committee is a group of various representatives from private and public sectors with an interest in energy issues and was appointed by the Montachusett Region Comprehensive Economic Development Strategy Committee (MRCEDS). The Energy Advisory Committee was formed the end of 2009 as part of a grant awarded by EDA to develop an Emergency Back-Up Power Sources Mitigation Plan. The committee provided oversight and policy guidance to the MRPC staff during its implementation. The committee continues to operate and provides the same oversight over the current Regional Energy Plan.

All Mode Corridors

To lessen the reliance on driving and burning fossil fuels, which led to global climate change, the region is initiating programs that make it easier and safer to use all modes of

transportation. This includes the development and promotion of bicycle and pedestrian trails and lanes and the establishment of Safe Routes to School programs in member communities.

Over the last few years, the MRPC has utilized GIS mapping to document where various pedestrian, bicycle and mixed use trails are in the region. By the end of 2011 all 22 MRPC communities will have been surveyed and mapped. This will provide an inventory for citizens of the region to know what public trails are available for use, what trails are under consideration for development and where possible connections exist between communities. Using trail inventories in these ways can encourage the use of alternative pedestrian modes of travel and might be a first step in planning for future trail construction.

Please refer to the Bicycle and Pedestrian chapter of this RTP for further details on these items.

Transit Oriented Development

Where new transit stations, in particular commuter rail stations, are proposed further analysis of the location and the surrounding area should be conducted to evaluate the potential for Transit Oriented Development (TOD) projects. With the development of new mass transit facilities, an opportunity may be present to locate and develop residential and commercial facilities to take advantage of the connections to be provided. Having homes and facilities located near mass transit encourages more people to use public transportation which leads to people driving less miles in their automobiles and providing a more sustainable transportation option to fulfill their needs. A possible TOD project could be at the commuter rail facility entitled Wachusett Station in Fitchburg near the Westminster line should be examined to determine if residential development might be feasible. On the other end of the spectrum, the possible commuter rail facility near McPherson Road in Ayer/Devens needs to be evaluated more closely as the location abuts U.S. Fish and Wildlife land and is considered environmentally sensitive.

Hazards

Pre-Disaster Mitigation Plans

In 2008, MRPC wrote Natural Hazard Pre-Disaster Mitigation Plans for all 22 communities in the Montachusett Region. These plans were funded by the Federal Emergency Management Agency through the Massachusetts Emergency Management Agency and the Massachusetts Department of Conservation and Recreation. These plans identified hazards and assessed their risk of occurring. These hazards included climate change as well as flooding, wind, winter storm and fire related hazards. Flooding, droughts and severe winter storms can be caused by climate change's increase in temperature and storm frequency. These plans also included mitigation strategies for these types of hazards.

Planning for these natural disasters and climate change can provide mitigation and increased resilience to the transportation system. The Pre-Disaster Mitigation Plans point out potential areas in the transportation system that might be negatively affected by various hazards. With

the right implementation from these plans, the transportation system will either be spared by the disaster or climate change or be able to quickly return to operation after a disaster as expected by transportation customers.

MA Initiatives/Strategies

GreenDOT

On June 2, 2010, the Massachusetts Department of Transportation (MassDOT) launched the GreenDOT Policy Directive, a comprehensive environmental responsibility and sustainability initiative that will make MassDOT a national leader in “greening” the state transportation planning. MassDOT’s GreenDOT Vision is as follows-

“The Massachusetts Department of Transportation will be a national leader in promoting sustainability in the transportation sector. Through the full range of our activities, from strategic planning to construction and system operations, MassDOT will promote sustainable economic development, protect the natural environment, and enhance the quality of life for all of the Commonwealth’s residents and visitors. This will enable MassDOT to use resources in a manner that serves its existing customers while preserving our resources for future generations.”

The following three mutually-reinforcing goals form the foundation of GreenDOT, which form the basis for “Applicable Regional Objectives/Strategies”

- Reduce greenhouse gas (GHG) emissions
- Promote the healthy transportation modes of walking, bicycling, and public transit
- Support smart growth development

The MRPC notes the relationship between the GreenDOT initiative and the “Global Warming Solutions Act (GWSA)” discussed in 2(b) below. The GWSA targets a 25% reduction of GHG emissions below 1990 levels in 2020. Transportation is 7.3% of the 25% reduction.

The following are the State targeted GHG reductions from GreenDOT policy:

GreenDOT Policy Goals	Principal Actions	GHG Reduction
Reduce Greenhouse Gas Emissions	<ul style="list-style-type: none"> • Construction • Fleet • TDM • Eco-Driving 	1.53 MMTCO ₂ e (5.3%)
Promote Healthy Transportation	Transportation investments that enable increased use of these modes	0.20 MMTCO ₂ e (0.7%)
Support Smart Growth Development	Change in travel behavior due to smart growth development patterns	0.38 MMTCO ₂ e (1.3%)
Total		2.11 MMTCO₂e (7.3%)

Global Warming Solutions Act

The Global Warming Solutions Act (GWSA) of 2008 requires the MA Secretary of Energy and Environmental Affairs to establish a statewide limit on GHG emissions of between 10 percent and 25 percent below 1990 levels for 2020 – on the way toward an 80 percent reduction in emissions by 2050 – along with a plan to achieve the 2020 target. Secretary Bowles set the 2020 limit at 25 percent and the Clean Energy and Climate Plan for 2020 (released December 29, 2010) contains the measures necessary to meet the limit.

Current State and Federal policies established since 2007 are projected to reduce GHG emissions by roughly 19% below 1990 levels. With the adoption of the implementation plan by Secretary Bowles, GHG emissions will be further reduced to 25%. Some policy examples include:

- Advanced building energy codes
- Tree retention and planting to reduce heating and cooling loads
- More stringent EPA power plant rules
- Clean energy imports
- Pay As You Drive (PAYD) auto insurance
- Federal and California vehicle efficiency and GHG standards
- Reducing GHG emissions from motor vehicle air conditioning
- Stationary equipment refrigerant management
- MEPA GHG policy and protocol
- Consideration of GHG emissions in State permitting, licensing, and administrative approvals

Transportation is second only to buildings in responsibility for GHG emissions in the State, and is a fast growing emissions sector. The vast majority of emissions come from cars and trucks, although air travel is a rapidly rising emissions source. There are several means of addressing transportation emissions, all of which Massachusetts has been pursuing, improving vehicle efficiency, moderating the growth in auto travel through providing alternatives to it, and promoting the development and use of vehicle fuels that yield lower GHG emissions than petroleum-based fuels. The *Massachusetts Clean and Energy and Climate Plan for 2020* (“*The Climate Plan*”) takes into account State and Federal measures to improve vehicle efficiency, reduce vehicles miles traveled, and increase use of lower-carbon fuels, and proposes additional measures that will contribute toward meeting the 2020 limit. Below is a list of the Specific Transportation-related policy. The Climate Plan addresses-

- Federal and California vehicle efficiency and GHG standards (existing policy)
- Federal emissions and fuel efficiency standards for medium and heavy duty vehicles (new policy)
- Federal Renewable Fuel Standard and Regional Low Carbon Fuel Standard (existing policy)
- Clean Car Consumer Incentives (new policy)

- Pay As You Drive (PAYD) Auto Insurance Pilot (new policy)
- Sustainable Development Principles (existing policy)
- GreenDOT (new policy – 2(a) see above)
- Smart Growth Policy Package (expanded policy)

Healthy Transportation Compact

The Healthy Transportation Compact (HTC) is a key requirement of the landmark transportation reform legislation signed into law in June 2009. Co-chaired by the Secretary of Transportation and the Secretary of Health and Human Services and including the Secretary of Energy and Environmental Affairs, MassDOT Highway Administrator, MassDOT Transit Administrator, and Commissioner of Public Health, this inter-agency initiative is designed to facilitate transportation decisions that balance the needs of all transportation users, expand mobility, improve public health, support a cleaner environment and create stronger communities. Planning recommendations and projects need to address and advance the HTC objectives. More information can be found at <http://www.massdot.state.ma.us/main/HealthyTransportationCompact.aspx>.

Vision for the HTC:

The Commonwealth of Massachusetts is strongly committed to supporting and promoting the healthy transportation modes of walking, bicycling and transit through livable development patterns; inclusive transportation planning and design; and healthy transportation mode choice. These healthy modes of walking, bicycling and transit are essential not only for providing transportation options and for creating a cleaner environment, but also for advancing active and healthy lifestyles that support improved public health.

Goals for the HTC:

- To promote 'Healthy, Livable and Sustainable Communities' through land use, transportation and public health policies and initiatives
- To promote and encourage walking, bicycling and transit through state policies and programs
- To ensure a "Complete Streets" design approach that provides appropriate accommodation of pedestrians and bicycles in all transportation and development projects that use federal funds or state funds, or that require state permits
- To use Health Impact Assessments as a tool to promote healthy transportation goals

MassDOT views the Compact as an exciting opportunity to strengthen our commitment to public health and increased access for bicyclists and pedestrians. In order to achieve this, MassDOT is committed to facilitating comprehensive coordination among the public sector, private sector, and advocacy groups, as well as among transportation, land use, and public health stakeholders. MassDOT has already begun to form partnerships with advocates and public health professionals to lay the groundwork for transportation initiatives that support public healthy and active living.

To address this significant public health problem, Massachusetts launched **Mass in Motion** in January 2009. Mass in Motion aims to promote wellness and to prevent overweight and obesity in Massachusetts – with a particular focus on the importance of healthy eating and physical activity - a priority area of the HealthyMass Compact.

Proposed Outcomes of the HTC, which form the basis for “Applicable Regional Objectives/Strategies, are as follows:

- Reduce greenhouse gas emissions
- Improve access for persons with mobility limitations
- Increase opportunities for physical activity
- Increase bicycle and pedestrian travel
- Cost-effective transportation services for persons with limited mobility

Stormwater Mitigation

In 1996, the Massachusetts Department of Environmental Protection (the “Department” or “MassDEP”) issued the Stormwater Policy that established Stormwater Management Standards aimed at encouraging recharge and preventing stormwater discharges from causing or contributing to the pollution of the surface waters and groundwaters of the Commonwealth. In 1997, MassDEP published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy. In February 2008, MassDEP has revised the Stormwater Management Standards and Massachusetts Stormwater Handbook to promote increased stormwater recharge, the treatment of more runoff from polluting land uses, low impact development (LID) techniques, pollution prevention, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater best management practices (BMPs). MassDEP applies the Stormwater Management Standards pursuant to its authority under the Wetlands Protection Act, M.G.L. c. 131, § 40, and the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53. The revised Stormwater Management Standards have been incorporated in the Wetlands Protection Act Regulations, 310 CMR 10.05(6)(k) and the Water Quality Certification Regulations, 314 CMR 9.06(6)(a).

Except as expressly provided within the Stormwater Policy and Standards, stormwater runoff from all industrial, commercial, institutional, office, residential and transportation projects including site preparation, construction and redevelopment, and all point source stormwater discharges from said projects shall be managed according to the Stormwater Management Standards.

As indicated previously, one new element of the 2008 Stormwater Management Standards is incorporation of Low Impact Development (LID) techniques along with environmentally sensitive site design.

The Wetlands Regulations, 310 CMR 10.04, and the Water Quality Certification Regulations, 314 CMR 9.02, define environmentally sensitive site design to mean design that incorporates low impact development techniques to prevent the generation of stormwater and non-point

Chapter 13 – Environment and Climate Change

source pollution by reducing impervious surfaces, disconnecting flow paths, treating stormwater at its source, maximizing open space, minimizing disturbance, protecting natural features and processes, and/or enhancing wildlife habitat. The Wetlands Regulations, 310 CMR 10.04, and the Water Quality Certification Regulations, 314 CMR 9.02, define low impact development (LID) techniques to mean innovative stormwater management systems that are modeled after natural hydrologic features. Low impact development techniques manage rainfall at the source using uniformly distributed decentralized micro-scale controls. Low impact development techniques use small cost-effective landscape features located at the lot level.

Proponents of projects subject to the Stormwater Management Standards must consider environmentally sensitive site design and low impact development techniques to manage stormwater. Proponents shall consider decentralized systems that involve the placement of a number of small treatment and infiltration devices located close to the various impervious surfaces that generate stormwater runoff in place of a centralized system comprised of closed pipes that direct all the drainage from the entire site into one large dry detention basin. MRPC has revised one of the Regional Goals and Objectives related to stormwater management by explicitly including use of LID techniques within the stormwater-related strategy.

Environmental Consultation Meeting

A special Environmental Consultation meeting was scheduled and held on July 12, 2011 at the offices of the MRPC at the MART Garage and Maintenance Facility, 1427R Water Street in Fitchburg. Invited guests included state and local officials with environmental connections or interest as well as members of the Montachusett Joint Transportation Committee.

The following is a listing of identified agencies/groups/organizations contacted regarding the Environmental Consultation Meeting:

State & Federal	Local
<ul style="list-style-type: none"> • Army Corps of Engineers • Department of Conservation & Recreation • Department of Fish & Game • Department of Environmental Protection • Executive Office of Environmental Affairs • Massachusetts Audubon Society • Massachusetts Department of Agriculture • Massachusetts Division of Fisheries & Wildlife • Massachusetts Forestry Association • MassGIS • Massachusetts Historical Commission 	<ul style="list-style-type: none"> • Conservation Commissions • Devens Enterprise Commission • Friends of the Oxbow National Wildlife Refuge • Land Trusts • Monoosnoc Brook Greenway Coalition • Millers River Environmental Center • Nashua River Watershed • The Appalachian Mountain Club • Trustees of the Reservation • Wachusett Greenways

Chapter 13 – Environment and Climate Change

<ul style="list-style-type: none">• Massachusetts Historical Society• Massachusetts Office for Commonwealth Development• Massachusetts Smart Growth Alliance• Massachusetts Water Resources Authority• Massachusetts Watershed Coalition• National Resources & Environmental Conservation• New England Forestry Foundation	
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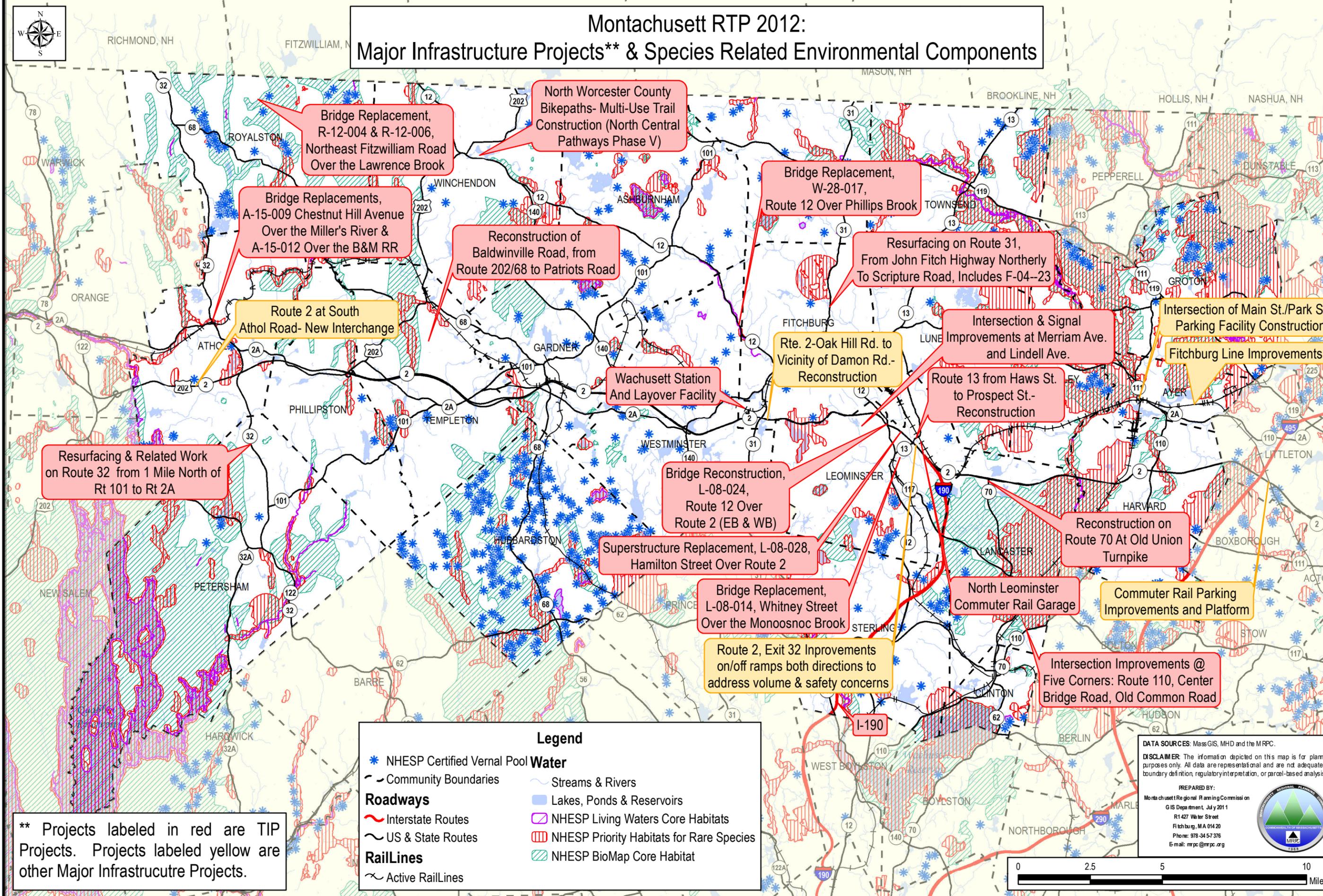
Those in attendance at the July 12, 2011 meeting included representatives from MART, a reporter for the Gardner News, and an individual from the town of Ashby.

The information presented was primarily focused on presenting the GreenDOT initiatives as well as reviewing what was presented at the previous Environmental Consultation for the 2007 Regional Transportation Plan.

General comments focused on:

- How the Montachusett Region can assist the state in reducing Greenhouse Gas. One idea in particular was to install solar projects on town landfills.
- Continuing to increase the number of hybrid buses that operate through MART
- Interest in locating vehicle recharge stations at all commuter parking areas

Montachusett RTP 2012: Major Infrastructure Projects** & Species Related Environmental Components



Bridge Replacement, R-12-004 & R-12-006, Northeast Fitzwilliam Road Over the Lawrence Brook

North Worcester County Bikepaths- Multi-Use Trail Construction (North Central Pathways Phase V)

Bridge Replacements, A-15-009 Chestnut Hill Avenue Over the Miller's River & A-15-012 Over the B&M RR

Reconstruction of Baldwinville Road, from Route 202/68 to Patriots Road

Bridge Replacement, W-28-017, Route 12 Over Phillips Brook

Resurfacing on Route 31, From John Fitch Highway Northerly To Scripture Road, Includes F-04--23

Route 2 at South Athol Road- New Interchange

Wachusett Station And Layover Facility

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Intersection & Signal Improvements at Merriam Ave. and Lindell Ave.

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Bridge Replacement, L-08-014, Whitney Street Over the Monoosnoc Brook

North Leominster Commuter Rail Garage

Commuter Rail Parking Improvements and Platform

Route 2, Exit 32 Improvements on/off ramps both directions to address volume & safety concerns

Intersection Improvements @ Five Corners: Route 110, Center Bridge Road, Old Common Road

Legend

- * NHESP Certified Vernal Pool
- Community Boundaries
- Streams & Rivers
- Lakes, Ponds & Reservoirs
- NHESP Living Waters Core Habitats
- NHESP Priority Habitats for Rare Species
- NHESP BioMap Core Habitat

Roadways

- Interstate Routes
- US & State Routes

RailLines

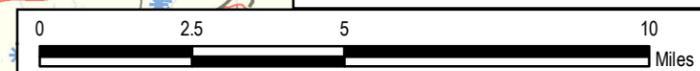
- Active RailLines

** Projects labeled in red are TIP Projects. Projects labeled yellow are other Major Infrastructure Projects.

DATA SOURCES: MassGIS, MHD and the MRPC.

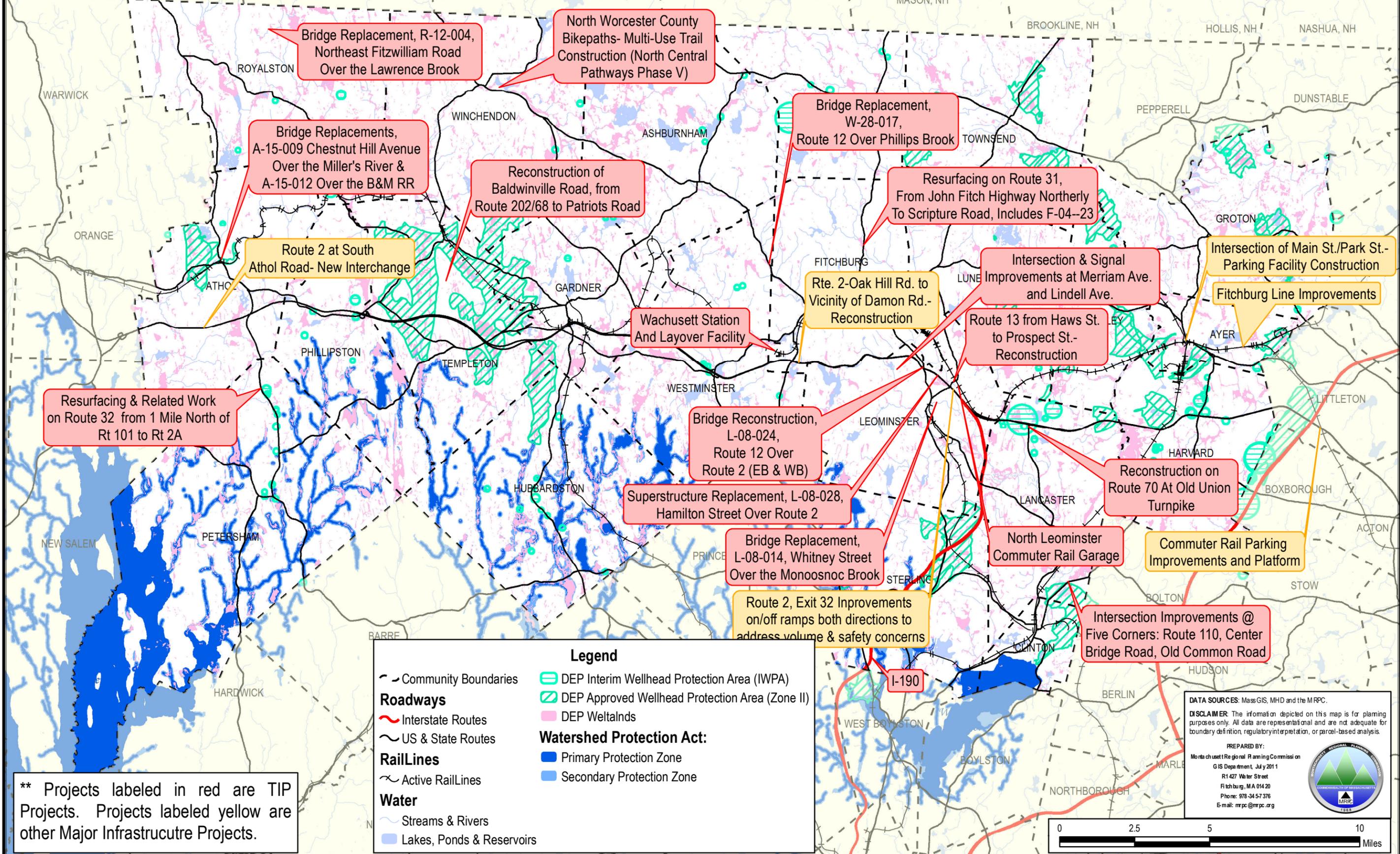
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Montachusett RTP 2012: Major Infrastructure Projects** & Water Related Environmental Components



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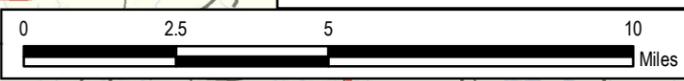
Legend

- - - Community Boundaries
- Interstate Routes
- US & State Routes
- Active RailLines
- Streams & Rivers
- Lakes, Ponds & Reservoirs
- DEP Interim Wellhead Protection Area (IWPA)
- DEP Approved Wellhead Protection Area (Zone II)
- DEP Wetlands
- Primary Protection Zone
- Secondary Protection Zone

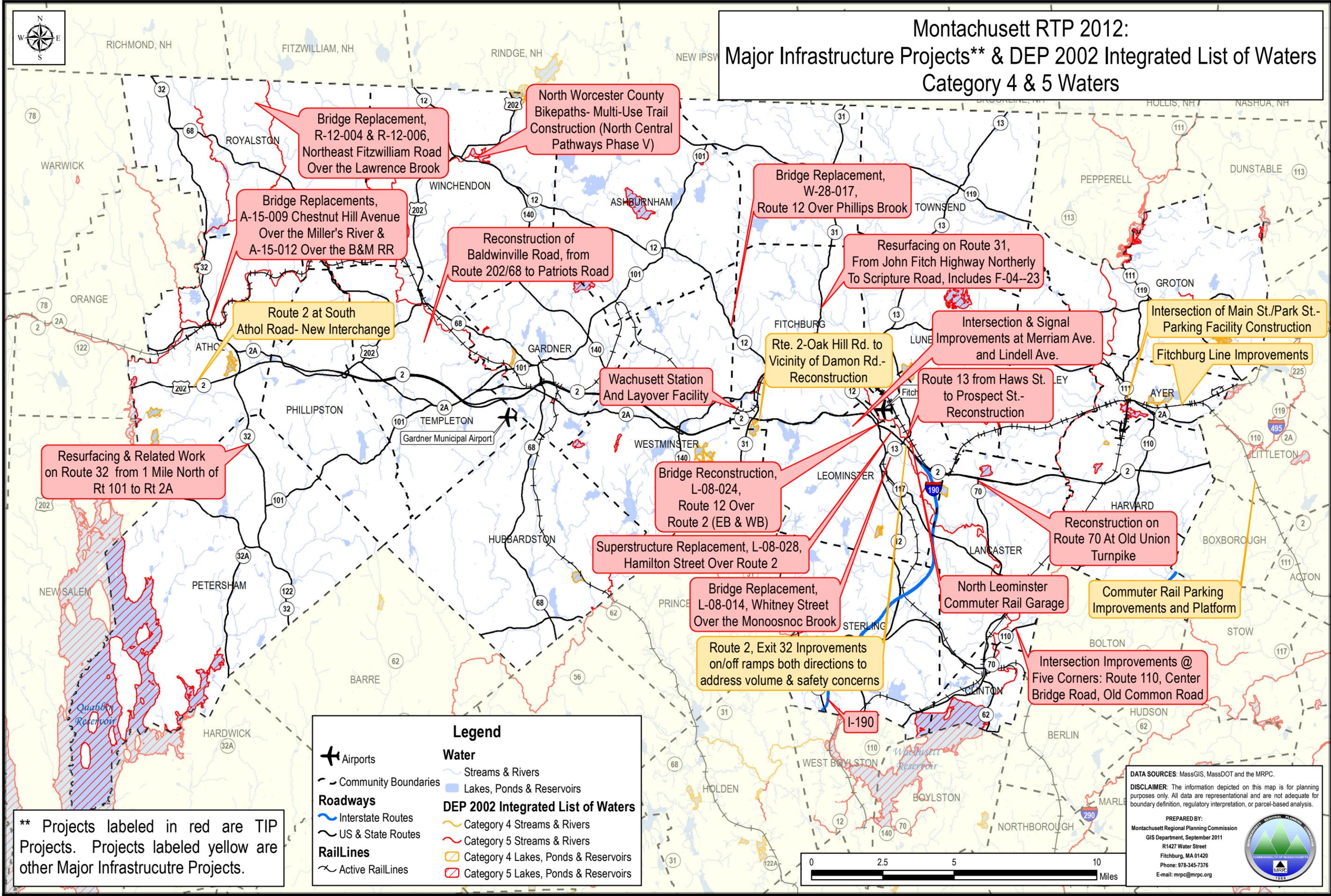
Watershed Protection Act:

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Montachusett RTP 2012: Major Infrastructure Projects** & DEP 2002 Integrated List of Waters Category 4 & 5 Waters



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Legend

Airports
✈ Airports

Community Boundaries
--- Community Boundaries

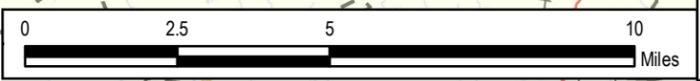
Roadways
— Interstate Routes
~ US & State Routes

RailLines
~ Active RailLines

Water
— Streams & Rivers
■ Lakes, Ponds & Reservoirs

DEP 2002 Integrated List of Waters
— Category 4 Streams & Rivers
— Category 5 Streams & Rivers
■ Category 4 Lakes, Ponds & Reservoirs
■ Category 5 Lakes, Ponds & Reservoirs

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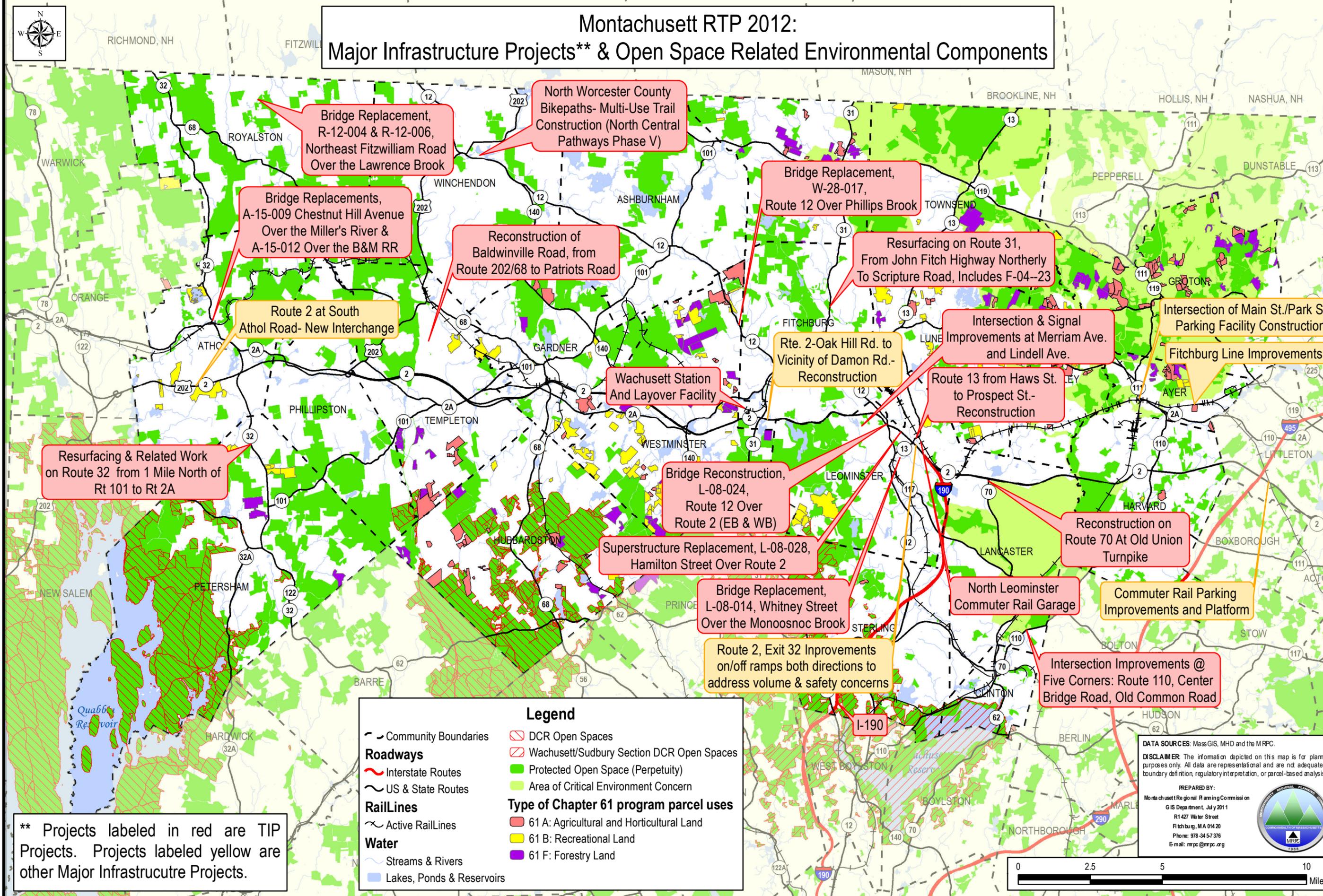


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Montachusett RTP 2012: Major Infrastructure Projects** & Open Space Related Environmental Components



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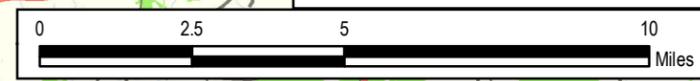
Intersection Improvements @ Five Corners: Route 110, Center Bridge Road, Old Common Road

Legend

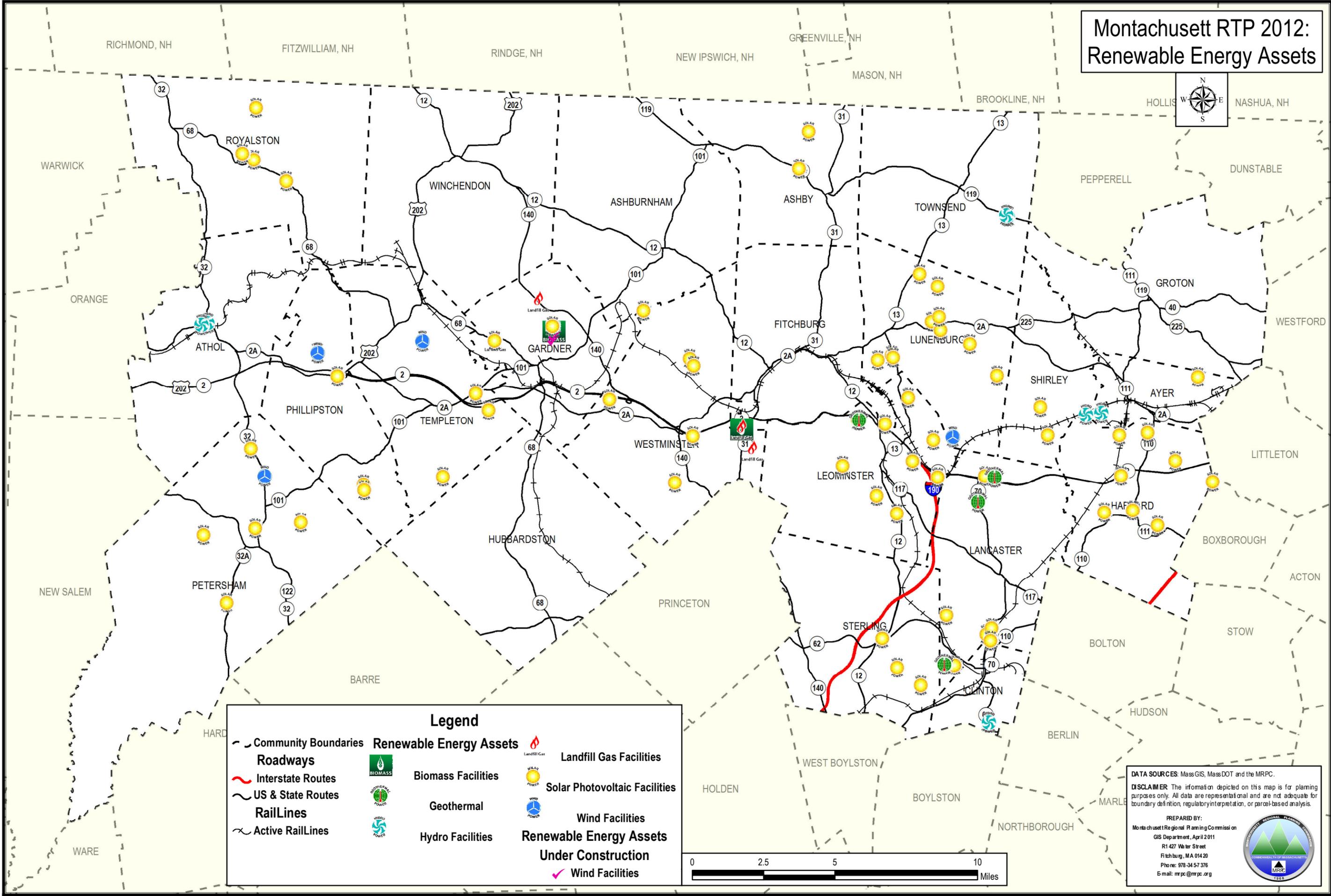
- Community Boundaries
- DCR Open Spaces
- Wachusett/Sudbury Section DCR Open Spaces
- Protected Open Space (Perpetuity)
- Area of Critical Environment Concern
- Type of Chapter 61 program parcel uses**
 - 61 A: Agricultural and Horticultural Land
 - 61 B: Recreational Land
 - 61 F: Forestry Land
- Roadways**
 - Interstate Routes
 - US & State Routes
- RailLines**
 - Active RailLines
- Water**
 - Streams & Rivers
 - Lakes, Ponds & Reservoirs

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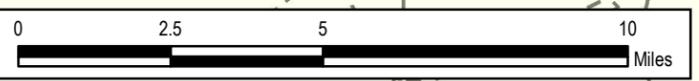


Montachusett RTP 2012: Renewable Energy Assets



Legend

Community Boundaries	Renewable Energy Assets	Landfill Gas Facilities
Interstate Routes	Biomass Facilities	Solar Photovoltaic Facilities
US & State Routes	Geothermal	Wind Facilities
Rail Lines	Hydro Facilities	Renewable Energy Assets Under Construction
Active Rail Lines	Wind Facilities	Wind Facilities



DATA SOURCES: Mass GIS, Mass DOT and the MRPC.

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