EMERGENCY PREEMPTION SCAN IN THE MONTACHUSETT REGION

Including Signal Inventory

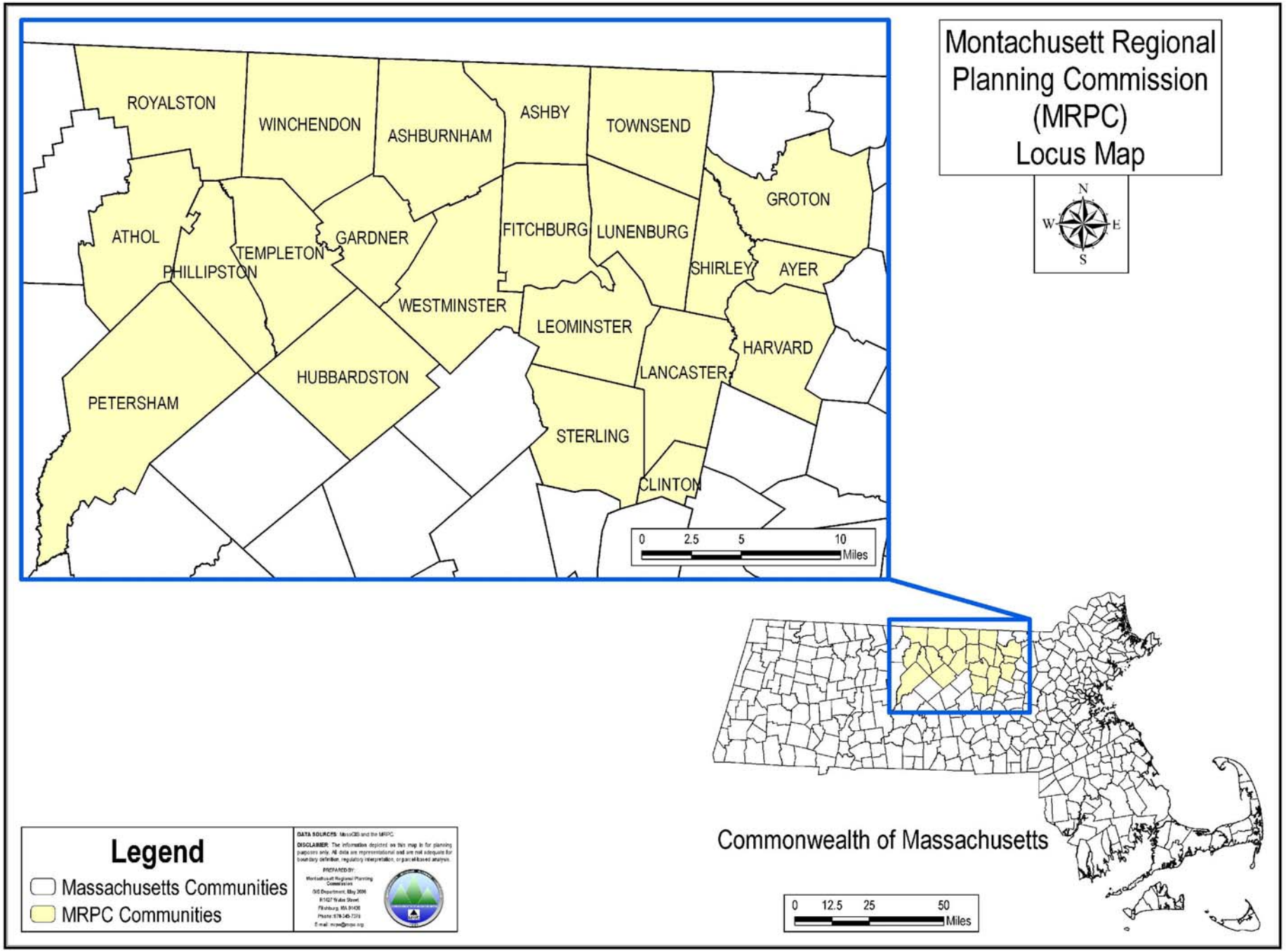
Safety and Security Planning Assistance
Fall 2009

Prepared by:
Montachusett Regional Planning Commission
R1427 Water Street
Fitchburg, MA. 01420

This document was prepared in accordance with 23 USC 450 by the Montachusett Regional Planning Commission under Contract No. 0052453 with the Massachusetts Highway Department and with the assistance of the Federal Highway Administration, and the Federal Transit Administration. Contact Brian Doherty at 978-345-7376 ext. 316 or by email at bdoherty@mrpc.org for more information.

EMERGENCY PREEMPTION SCAN IN THE MONTACHUSETT REGION

Including the Communities of:
Ashburnham, Ashby, Athol, Ayer, Clinton, Fitchburg, Gardner, Groton, Harvard, Hubbardston, Lancaster, Leominster, Lunenburg, Petersham, Phillipston, Royalston, Shirley, Sterling, Templeton, Townsend, Westminster, and Winchendon


Montachusett Regional Planning Commission (MRPC) Locus Map
N
W
E
S
ROYALSTON
WINCHENDON
ASHBURNHAM
ASHBY
TOWNSEND
GROTON
ATHOL
PHILLIPSTON
TEMPLETON
GARDNER
FITCHBURG
LUNENBURG
SHIRLEY
AYER
WESTMINSTER
LEOMINSTER
HARVARD
LANCASTER
HUBBARDSTON
PETERSHAM
STERLING
CLINTON
0 2.5 5 10 Miles
Commonwealth of Massachusetts
0 12.5 25 50 Miles
Legend
Massachusetts Communities
MRPC Communities
DATA SOURCES: MassGIS and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, May 2009
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

MONTACHUSETT JOINT TRANSPORTATION COMMITTEE

COMMUNITY	APPOINTED BY SELECTMEN OR MAYOR	APPOINTED BY PLANNING BOARD
Ashburnham	Margaret Whitney	James Zarozinski
Ashby	Mary Krapf	Wayne Stacy
Athol	Doug Walsh	
Ayer	Pauline Hamel	Jim Lucchesi
Clinton		
Fitchburg		Paula Caron
Gardner		
	Daniel Keeney	
Groton	Anna Eliot	Joshua Degen
Harvard	Lucy Wallace	Joseph Sudol, Jr.
Hubbardston	Lyn Gauthier	James Crystoff
Lancaster		Noreen Piazza
Leominster	Mary Charpentier	Andrew Taylor
Lunenburg		Robert Saiia
Petersham	Roy Nilson	
Phillipston	Ronald Recos	Kevin Flynn
Royalston	Andrew West	
Shirley	Joseph Lynch	John Oelfke/Charles Colburn
Sterling		Charles Hadjju
Templeton	Chantell Wead/Bud Chase	Gerald White
Townsend	Edward Kukkula	Nicholas E. Thalheimer
Westminster		Andrew J. Sears
Winchendon		John White

EXOFFICIO MEMBERS

Trey Joseph Wadsworth	Office of Transportation Planning (OTP) and Executive Office of Transportation (EOT)
Paul Maloney, P.E.	Federal Highway Administration (FHWA)
William Gordon, P.E.	Federal Transit Administration (FTA)
Thomas C. Curron	Department of Environmental Protection (DEP)
Laurie Scarbrough	Mass Highway - District 2
	Mass Highway - District 3
Margaret Whitney	Montachusett Regional Planning Commission (MRPC)

ORGANIZATION MEMBERS

Al Futterman	Nashua River Watershed Association (NRWA)
Donna Brooks	Northern Worcester County Board of Realtors
Tony Salerno	Amalgamated Transit Union #690 (ATU 690)
Kit Walker	Fitchburg Airport Commission
Elizabeth Zoldak	North Central MA Chamber of Commerce
	Fitchburg Council on Aging
Frank Garcia	South Fitchburg Neighborhood Association
Richard Montuori	Mass Development
Peter Lowitt	Devens Enterprise Commission (DEC)

MONTACHUSETT METROPOLITAN PLANNING ORGANIZATION SIGNATORIES

Executive Office of Transportation (EOT) Secretary	James A. Aloisi, Jr.
Mass Highway (MHD) Commissioner	Luisa Paiewonsky
Montachusett Regional Planning Commission (MRPC) Chairman	Victor Koivumaki
Montachusett Regional Transit Authority (MART) Chairman	Mayor Dean Mazzarella
Mayor City of Fitchburg	Mayor Lisa Wong
Mayor City of Gardner	Mayor Mark Hawke
Chairperson, Winchendon Board of Selectmen *Subregion 1*	Keith Barrows
Chairperson, Townsend Board of Selectmen *Subregion 2*	David Chenelle
Chairperson, Ayer Board of Selectmen *Subregion 3*	Cornelius Sullivan
Chairperson, Lancaster Board of Selectmen *Subregion 4*	Jennifer Leone

MPO SUB-SIGNATORY COMMITTEE MEMBERS

David Mohler, Director OTP, EOT, for Secretary Aloisi
Arthur Frost, Project Development Engineer for Commissioner Paiewonsky
Glenn Eaton, Executive Director, MRPC, for Chairman Koivumaki
Mohammed H. Khan, Administrator, MART, for Chairman Mayor Mazzarella

EXOFFICIO MEMBERS

Paul Maloney, P.E.	FHWA
William Gordon, P.E.	FTA

MONTACHUSETT REGIONAL PLANNING COMMISSION (MRPC) OFFICERS

Victor Koivumaki, Chairman	Lancaster
Paula Caron, Vice Chairman	Fitchburg
John White, Secretary	Winchendon
James W. Meehan, Treasurer	Athol
Robert Grubb, Asst. Treasurer	Gardner

MONTACHUSETT JOINT TRANSPORTATION COMMITTEE (MJTC) OFFICERS

Paula Caron, Chairman	Fitchburg
John Oelfke, Vice Chairman	Shirley
Robert Saiia, Secretary	Lunenburg

MONTACHUSETT REGIONAL PLANNING COMMISSION STAFF

Glenn Eaton, Executive Director
Brad Harris, Transportation Project Director
George Kahale, Transit Project Director
John Hume, Director of Planning and Development
Shelly Hatch, Director of Community Development
Chantell Wead, Regional Planner
Linda Parmenter, Principal Planner
George Snow, Principal Planner
Sheri Bean, Transportation Planner
Brian Doherty, Transportation Planner
Ann Carabba, Regional Planner
Nancy Belliveau, Fiscal Manager
Bobbi Jo Johnson, Fiscal Assistant
Jason Stanton, GIS Analyst
Renee Marion, GIS Analyst
Stephanie Brow, Administrative Secretary
Mariena Harris, Intern
Nicola Kahale, Intern

CONTENTS

INTRODUCTION

The 2009 Safety and Security Planning Assistance (S&SPA) program *Emergency Preemption Scan in the Montachusett Region* is a combination of an inventory and information gathering task as well as a continued effort to improve our understanding of the conditions of the transportation network in the Montachusett region. The information collected and database developed will be considered in future transportation planning studies and project prioritization efforts. This report describes the process of this year's program as well as previous studies and information attained to make recommendations for improvements to the regions signalized intersection infrastructure.

During the development of the 2008 S&SPA "*Emergency Response Road Network Report*" it came to the attention of the Montachusett Regional Planning Commission (MRPC) that there was a general interest in emergency preemption controls among emergency responders in the region. This interest, coupled with a lack of up to date information on this type of transportation infrastructure led to developments in the 2009 program. Highlights of the 2009 program include an updated inventory of traffic lights and preemption device use in the region; a new electronic database organizing and providing visual reference of these signals for use by the MRPC Transportation Department; and this report documenting our findings and providing analysis, prioritization and recommendations for the future implementation of preemption device use in the Montachusett region.

PREEMPTION DEVICES

Preemption devices fall into the category of an ITS, or Intelligent Transportation System. An ITS utilizes advance technology to improve different aspects of the transportation network such as safety, mobility, efficiency and productivity. Preemption controls in traffic signals allow normal operation of traffic lights to be altered, and is used both for transit orientated vehicles and more commonly for emergency response vehicles.

Upon approaching the lighted intersection a vehicle with preemption privileges would trigger a response from a sensor that would adjust the normal phase of the signal and provide a green phase favoring the vehicles direction of travel. Typically the sensor is located next to or near the actual traffic signal and the vehicle with preemption privileges would have a unit attached which would emit visible flashes of light or invisible infrared pulses at a specified frequency to trigger the sensor. After the unit has been detected, the signal would turn green after going through the normal procedure of yellow to red in other directions as well as for pedestrians crossing on a crosswalk. Once the vehicle passes through the intersection normal operation would resume.

A common implementation of signal preemption systems is a method of communicating to the emergency vehicle operator as well as civilian drivers that a traffic signal is under control of a preemption device. Known as a notifier, this device is almost always an additional light located near the traffic signals. The notifier light might flash or stay on to

warn that the light is being preempted and there is an emergency or transit vehicle approaching.

Some systems can be implemented with varying frequencies assigned to specific types of uses, which would then allow an intersection's preemption equipment to differentiate between a fire engine or emergency vehicle and a bus sending a signal simultaneously, and then grant priority access first to the fire engine. In the case where two fire engines approach a signal, priority would be granted to the first engine detected.

FIGURE 1: Emergency Preemption Device in Montachusett Region

Shown above is a preemption control device located at a newly installed traffic light at the intersection of Rte. 12 and Nichols St. on the Fitchburg/Leominster city line. From left to right are the traffic signal; the notifier; and the preemption sensor.

Emergency Preemption

According to the American Heart Association, a person under cardiac arrest's survival chances are reduced 7-10% with every minute not attended to, after 8 minutes there is little chance of survival[1], making a rapid emergency response time crucial. In a study done by the Federal Highway Administration (FHWA) in Fairfax County, Virginia on the effect of preemption controls, it is proven that the use of preemption improves response times dramatically, i.e. the system permited vehicles along U.S. 1 to pass through high

[1] *American Heart Association Website (2008). http://www.americanheart.org*

volume intersections more quickly with fewer conflicts, saving 30 to 45 seconds per intersection.[2]

Response times for emergency responders and transport times for emergency transporters can be the single largest impact on the outcome of the situation. With the improved travel times due to use of preemption devices, people needing immediate medical attention from an EMS or being rush transported to hospitals have a higher chance of living. In addition, police and fire fighters can access and service the community as promptly as possible and the overall effective service radius of a single station could greatly increase in area.

Opticom™ and *radio* are two different systems of preemption that currently exist in the region. In a *radio* based system an antenna on the traffic signal detects a narrow band radio transmission from an emergency vehicle and once the frequency pulse is detected and the proper direction is determined, the signal is preempted. In some cases a manual radio request is made by the emergency vehicle operator to a signal controller who then changes the signal for the vehicle. A broad range of technology and protocol are considered radio systems. These systems are typically older technology.

The *Optcom*™ preemption system used in the region uses infrared emitters mounted on the emergency vehicle to communicate with the signal and provide the temporary right of way to the vehicle. The receiver is connected to a circuit card which is located inside of the traffic control cabinet. When the circuit card determines that the signal is valid it will activate an output which will request the green light from the traffic controller for the approaching emergency vehicle. Generally, Opticom™ systems can be installed to simply recognize any confirmed preemption signal, or they can be further customized and linked to computer-aided dispatch systems that are capable of identifying which emergency vehicle pre-empted the signal, as well as the time and direction of travel when the signal was pre-empted. These Opticom™ systems use newer technology which is more effective and are the recommended preemption system in the Montachusett region.

There is a clear benefit to preemption controls and it is obvious why there was much interest during the development of last years report. This report contains information on emergency preemption only. While transit preemption is in use in some locations throughout the country, emergency preemption is the most common and only use in the Montachusett region.

[2] *Traffic Signal Preemption for Emergency Vehicles: A Cross-Cutting Study. January 2006: Federal Highway Administration, et al.*

STUDY PROCESS

Surveys Conducted

The MRPC has gathered local information from surveys and other contacts throughout the program year in order to assess what role preemption plays within the region. The two largest private ambulance providers servicing the region, MEDSTAR and Woods Ambulance, were identified by surveying hospitals in the region. These private ambulance providers along with all fire and EMS services in MRPC communities and Police Departments in communities with at least one signal controlled intersection have been contacted and surveyed to attain information on preemption use in the region.

Below are some statistics and observations made from the surveys. A full chart of responses is available in the appendix.

- The two largest ambulance providers in the region, MEDSTAR and Woods Ambulance, reported *34* and *8* emergency transport vehicles servicing the region respectively. Of these **42** emergency transport vehicles **none** have preemption capabilities.

- Of all the information from surveys returned by Fire Departments in the region, **22%** of all municipal ambulances and fire trucks were reported to have preemption capabilities

- Of all the information from surveys returned by Police Departments in the region, **0%** of all police cruisers were reported to have preemption capabilities.

Although only about 70% of all surveys distributed to emergency responders in the region were returned, only half of all communities in the MRPC region possess at least one intersection fully controlled by traffic signals and therefore are likely to show less interest in preemption activities. Firm observations can be made about the use and existence of preemption in the region from the contacts made and surveys obtained.

It is clear that the main, if not the only user of preemption controls in the region are municipal fire and EMS vehicles. In the survey responses some stressed the importance that more intersections and vehicles should be equipped with the technology, and some, mostly those in communities without signal controlled intersections, mentioned little need for preemption in-town unless transporting to hospitals such as UMASS Memorial in Leominster where signal controlled intersections are virtually unavoidable.

Inventory Taken

Municipal Departments of Public Works, Wire Inspectors and MassHighway Districts 2 and 3 have been contacted to attain information on signalized intersections in the region. This information has been used to update and build databases the MRPC uses to aid in various studies and reports.

The MRPC has been able to update and add to databases and general information used to reference these locations on our transportation network. A paper database has been compiled containing locations and descriptions of all fully controlled signalized intersections in the region as well as all known flashing yellow warning signals. Intersection diagrams and timing/phasing charts for a majority of these signals have also been obtained. This data has been updated into a computerized database for future MRPC reference.

TABLE I: Montachusett Signal Inventory shows figures as of September 2009 that MRPC has collected on traffic signals and preemption capability in the region. The chart lists breakdowns for each type of signal. Fully controlled signalized intersections are reflected in the "Control" column and flashing yellow traffic lights in the "Warning" column.

	Control	Warning	Totals
Signals	83	24	107
% of Total	78%	22%	100%
Preemption	65	n/a	65
%Preemption	78%	n/a	n/a
Radio	29	n/a	29
%Radio	45%	n/a	n/a
Opticom™	14	n/a	14
%Opticom™	22%	n/a	n/a
R/O	19	n/a	19
%R/O	30%	n/a	n/a
Undetermined	2	n/a	2
%Undetermined	3%	n/a	n/a

The inventory process has confirmed a total of 107 traffic lights in the region divided among 83 control signals (78%) and 24 warning lights (22%). Preemption devices only exist on control signals and in the Montachusett region, 65 of the 83 control signals (78%) include some preemption capability. The two preemption technologies present in the region, radio and Opticom™, comprise 45% (29) and 22% (14) of all control signals with preemption respectively. Those with both radio and Opticom™ capabilities comprise of 30% (19) of all signal controlled intersections while 3% (2) of these intersections contain preemption but the type is undetermined.

The U.S. Department of Transportation (U.S. DOT) ITS Deployment Statistics website tracks ITS deployment in the countries largest metropolitan areas. According to a 2006 DOT poll in which 106 metropolitan areas throughout the U.S. were surveyed, 98 were using preemption devices. The poll states that out of 151,198 lighted intersections in these metro areas, 31,559 (21%) had preemption controls of which 2,891 of the 151,198 (2%) included transit signal preemption.

In Massachusetts the Boston metropolitan area had reported 96 of 2,428 (4%) lighted intersections with emergency vehicle preemption of which only 22 (1%) included transit signal preemption. The City of Springfield, MA. being the only other area of Massachusetts represented in the survey, reported 19 of 45 (42%) lighted intersections with emergency vehicle preemption and did not report any which included transit signal preemption. (U.S. DOT)

TABLE II: Preemption Comparisons below shows the comparison between the findings from the MRPC inventory and the statistics from the U.S. DOT. The table suggests that preemption devices are more commonly included in intersections in the Montachusett region than in the areas displayed in the U.S. DOT statistics. The accuracy of the U.S. DOT statistics is questionable however, due to the fact that the numbers are a few years old and the data was reliant only on entities who responded to their surveys. Therefore, the information provided in the table below should not be considered an absolutely accurate comparison of use of preemption in these areas, but as a look at the best data of known infrastructure in existence in other areas as compared to infrastructure in the Montachusett region.

Region	Montachusett	National	Boston (Metro)	City of Springfield
Reported Signals	83	151,198	2,428	45
Preemption	65	31,559	96	19
% Preemption	78%	21%	4%	45%

The maps titled “All Control Signals” in the appendix show locations of signalized intersections in the Montachusett region. A complete list of these intersections can also be found in the appendix. Aside from identifying which control signals include preemption capabilities, it is helpful to have a prioritized listing of those lacking preemption. In order to justify prioritizing one intersection over another additional data should be considered. The following information will help highlight locations that would benefit most from incorporating preemption use.

ADDITIONAL DATA TO CONSIDER

All maps mentioned below can be found in the Map Appendix at the end of this report.

Emergency Access and Transport Routes

Emergency Access and Emergency Transport routes were identified through the 2008 S&SPA "Regional Emergency Response Road Network Report". These routes were determined using input from local emergency responders, as well as proximity and access to hospitals, police and fire stations.

Emergency access routes would be routes commonly used by all emergency responders, i.e. police, ambulance, fire, etc. to access locations of emergencies. We considered these routes to be pipelines which provide access to many different neighborhoods or pockets of population. In more technical terms these access routes are comprised of all Interstate roadways such as I190, and I495 and all other numbered routes as well as all urban arterials, urban collectors and rural arterials in the Montachusett region. These roads are also known as the Federal Aid Eligible network. A list of all emergency access routes is provided in the appendix of this report. The maps identified "*Non-Preemption Control Signals on Emergency Access Routes*" shows these routes throughout the region.

Emergency transport routes contain many of the above mentioned emergency access routes, however, focus primarily on where emergency transport vehicles, i.e. ambulances, are most common. These routes are main arteries which emergency transport vehicles would use specifically to access hospitals in the Montachusett region. Many times these routes form a bottleneck of emergency response and transport activities around hospitals, making it even more important to have the finest quality and functioning transportation infrastructure possible. A list of all emergency transport routes can be found in the appendix. The maps identified *"Non-Preemption Control Signals on Emergency Transport Routes"* shows these routes throughout the region.

Dangerous Signalized Intersections and Interchanges

Using data that the Massachusetts Highway Department (MassHighway) obtains from the Massachusetts Registry of Motor Vehicles (RMV) to create crash tables for each community in Massachusetts, the transportation department at MRPC has been developing a crash database for the purpose of gathering crash statistics on the region. Phase I of the "*Roadway Safety Conditions in the Montachusett Region*" report (Spring 2008) identified the most dangerous intersections and interchanges throughout the region. Using the most up to date data available at the time of the analysis, which was from 2005, a list was compiled of the most dangerous intersections and interchanges in the region over a three year period (2002-2005).

The Equivalent Property Damage Only (EPDO) crash severity rating system was used to determine which locations should be in this list of dangerous intersections and interchanges. EPDO rates a crash based on crash severity that gives one

(1) point to a property damage only (PDO) crash, which is a crash that resulted in no injuries but property damage of at least $1000 or more; five (5) points for a crash involving at least one Non-fatal Injury; and ten (10) points to a crash that involves at least one Fatal Injury.

Intersections and interchanges were first ranked by EPDO and then on total number of crashes that occurred at the intersection or interchange. The map identified *"Non-Preemption Control Signals with Hazardous Intersection Rating"* shows intersections and interchanges on the MRPC list of most dangerous in the region, with a non-preemption control signal. Numbers provided on the map are its rank in the region on the hazardous intersection list. A list of all intersections and interchanges on this list can be found in the appendix.

Proximity to Hospitals / Police and Fire Stations

Locations of hospitals and police and fire stations are important to consider because of the high volume of emergency vehicles accessing them for various reasons. The proximity to these locations certainly effects the amount of emergency vehicle traffic that an intersection experiences and therefore should become a factor in prioritizing which signals are most in need of preemption capabilities. The maps identified *"Non-Preemption Control Signals with Hospital and Police/Fire Station Buffers"* shows these locations throughout the region with buffers highlighting which of the non-preemption signals lay in close range. Due to hospitals being hubs of emergency activity generating from around the region the buffers around them are larger (1 mile) than the ones around Police and Fire Stations (1/2 mile).

Emergency Transport Activity

Using information attained from communities in the region, the map *"Emergency Transports Per Year"* shows the number of times emergency transportation to a hospital was provided by municipal EMS services in the region. This information should be considered when prioritizing the need for preemption as an intersection in a community that sees more emergency transports annually would presumably have more of a need for preemption controls.

PRIORITIZATION

Considering the above mentioned information MRPC has prioritized fully signal controlled intersections in the region which currently do not have preemption capabilities. Since all these signals are located on an emergency transport and an emergency access route, the prioritization was determined by the four factors listed below in order from one to four.

1. Proximity to Hospitals/Police and Fire stations.
2. Rating on Hazardous Intersection List.
3. Emergency transports per year in community
4. Other considerations, including intersection location relevant to traffic flows and congestion in the region.

The map *"Prioritized Locations in Need of Preemption"* shows the prioritization of these intersections in the region and can be found in the Map Appendix. A list of these intersections is provided below.

TABLE III: Prioritized Signals

Signal #	Community	Street #1	Street #2	Priority #
36	Fitchburg	MAIN ST. (2A)	NORTH ST.	1
16	Fitchburg	MAIN ST. (2A)	ROLLSTON ST.	2
29	Fitchburg	MAIN ST. (2A)	MECHANIC ST.	3
37	Fitchburg	WATER ST. (12)	BENSON ST.	4
22	Fitchburg	PUTNAM ST.	LAUREL ST.	5
35	Fitchburg	BEMIS RD.	AIRPORT RD.	6
104	Townsend	MAIN ST. (119)	BROOKLINE ST.	7
33	Fitchburg	RIVER ST. (31/2A)	WALLACE ST. (East)	8
38	Gardner	PARKER ST. (101	GRAHAM ST.	9
106	Westminster	STATE RD. EAST	HAGER PARK RD	10
25	Fitchburg	JOHN FITCH HGWY	LUNENBURG ST. (2A)	11
34	Fitchburg	RTE. 2	MT. ELAM RD.	12
23	Fitchburg	SOUTH ST.	OLD SOUTH ST.	13
32	Fitchburg	SOUTH ST.	WANOOSNOC RD.	14
5	Athol	MAIN ST (2A)	DANIEL SHAYS	15
31	Fitchburg	SOUTH ST.	WHALON ST.	16
19	Fitchburg	WATER ST. (12)	5TH ST.	17
21	Fitchburg	JOHN FITCH HGWY	PEARL ST.	18
39	Gardner	ELM ST.	UNION SQ.	19
109	Winchendon	GARDNER RD. (140)	SPRING ST. (12)	20

REGIONAL ITS ARCHITECTURE FOR CENTRAL MASSACHUSETTS

The Regional Intelligent Transportation Systems (ITS) Architecture is a framework that was created by various transportation stakeholders, including the MRPC, which defines ITS uses and their interconnections. The "architecture" represents the relationship between transportation-related systems and institutions. "A regional ITS architecture, therefore, describes how a set of agencies will share responsibility and information for the vast array of technologies and systems deployed in a region" (IBI Group). Hence, the architecture serves many purposes, including improving interagency coordination, cost savings for transportation operations, and better services to the traveling public.

FIGURE II: Emergency Preemption Routing in Leominster

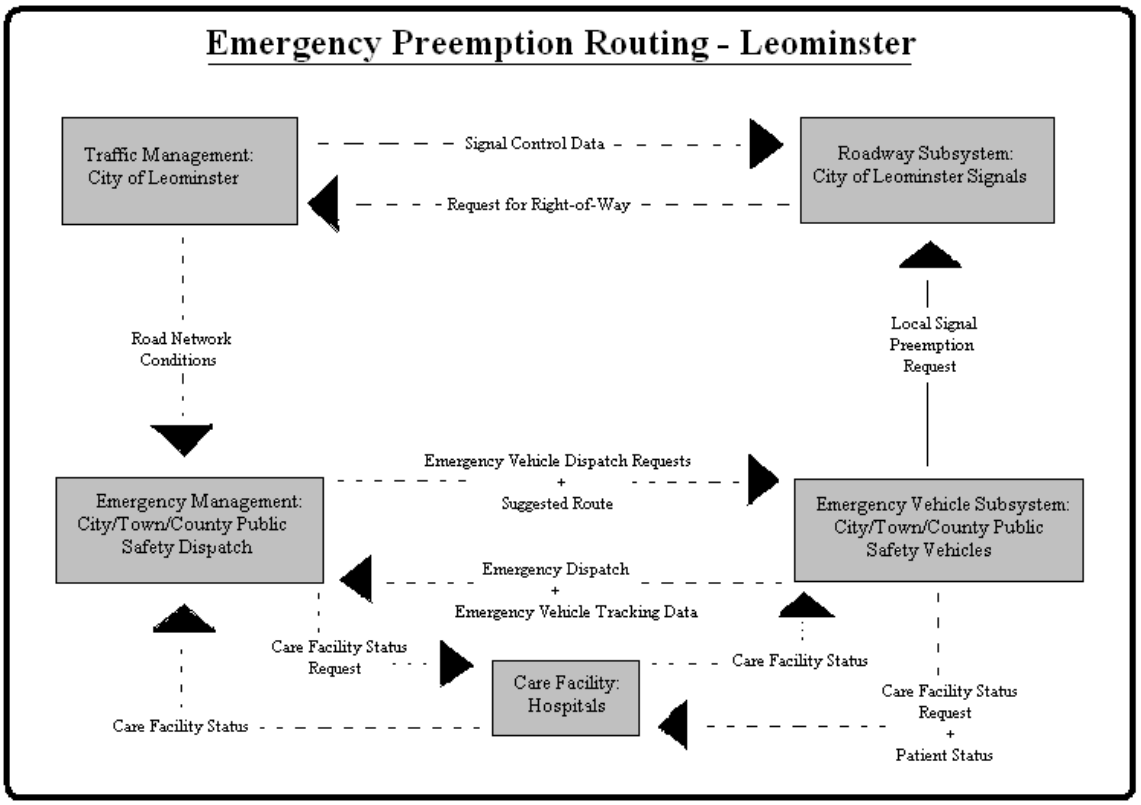


FIGURE II above shows the preemption use ITS Architecture in the city of Leominster. The same architecture applies to all cities/towns in the region with preemption signals. While the dotted lines signify what is projected as the organization of operations in the future, the solid lines show the flow of communication currently in place. The flow chart represents all agencies linked into the preemption architecture. Detailed descriptions of terms within this flow chart are available in the appendix of this report. The paragraph below was taken from the "*Regional ITS Architecture for Central Massachusetts"* final report and further explains the organization and operation of preemption use.

Traffic Signal Preemption (Local City/Town/County Public Safety)
This initiative introduces signal priority on vehicles operated by Local City/Town/County Public Safety departments. This will require coordination between the relevant department and the agencies operating traffic signals, namely local cities/towns. Requests for traffic signal preemption will be made to the traffic signal system. This will occur either locally at the signal controller or through a request to the central system, if the signal is part of such a system. Depending on the type of system used, the system may include elements on the vehicles to identify them to the signal system, elements on the controller hardware in the field, elements in the central signal system, and the network infrastructure to support communications between these system elements.
(IBI Group)

A regional ITS architecture can easily become large and complex. Reference "allows a user to investigate common questions such as, 'If my agency engages in a certain project or investment, what other agencies are involved?' Alternatively an agency might simply want to know all of the other agencies to which it is linked in the architecture." (IBI Group)

As the architecture gives clarification of the existing operation of the ITS, the projected operations aspect of the architecture serves as a primary guide as the ITS expands. A process was created while developing the Regional ITS Architecture that is meant to ensure that both the projected and existing framework would continue to be applied. According to Federal Highway Administration Rule and Federal Transit Administration Policy there is expectation that consistency will subsist between projects with ITS elements and the Regional ITS Architecture, therefore, for a project to be able to attain federal funding, they must comply with this framework. "The bottom line is that by examining consistency early and often during the planning process and by maximizing collaboration and cooperation – all within the context of existing practices – the region can avoid any delays to federal funding and approval." (IBI Group)

One aspect of preemption in the region that should not be overlooked is the existence of common preemption practices across municipal borders. For example, Mid-State Fire mutual aid system, which involves 37 cities and towns in Central Massachusetts, recommends using a common type of preemption system, Opticom™ so that many different entities can benefit. Communities that are part of the association are: Acton, Ashburnham, Athol, Ashby, Ayer, Barre, Berlin, Bolton, Boylston, Clinton, Devens, Fitchburg, Gardner, Hardwick, Harvard, Holden, Hubbardston, Lancaster, Leominster, Lunenburg, New Braintree, Oakham, Orange, Paxton, Petersham, Phillipston, Princeton, Royalston, Rutland, Shirley, Sterling, Templeton, Townsend, West Boylston, Westminster, Winchendon and Worcester.

COSTS AND COST PAYOFFS

The typical cost of implementing preemption is relatively affordable and proven to "pay for itself" over time terms of monetary figures as well as in both the benefits of safety improvements at intersections and through the technologies contribution to life saving situations, aspects of preemption that are hard to give a value. According to the U.S. DOT, emergency preemption typically costs $5,000 to $7,000 per intersection and about $1,000 to $2,000 for every vehicle equipped with the preemption technology.

Safety improvements at a lighted intersection and enhancements to the efficiency of emergency responders are clearly important benefits of implementing preemption. Considering the prices mentioned above the cost of preemption is relatively low but can add up when installing a large system. However, these costs can be mitigated by savings in other areas. "Improved response times can lead to an improvement in the insurance industry ratings of a communities fire insurance rate for residential and commercial property owners" (Traffic Signal Preemption for Emergency Vehicles). The Insurance Services Office (ISO), through its Public Protection Classification (PPC) program, assigns insurance ratings to each participating community once every 10 years.[3] By making improvements to response times and increasing a community's ability to suppress fires, insurance rates fall. These ratings are very important to communities as they pursue growth and economic development plans. In its annual report in the year 2000, the town of Blacksburg, Virginia reported that its ISO Class had been raised reflecting the response time improvements made possible by preemption deployments.[4]

[3] Insurance Services Office Website (2004). http://www.isomitigation.com

[4] Town of Blacksburg, Virginia (2000). Annual Report for the Year 2000.

OPPORTUNITIES FOR FUNDING SYSTEM IMPROVEMENTS

Regional Homeland Security Grants

The Northeast and Central Region Homeland Security Advisory Councils regularly reward competitive grants to communities for the purpose of planning, training and equipment in relation to security and emergency coordination, more specifically relating to terrorist threats. Since the installation and upkeep of a system of emergency preemption controls can be beneficial to responding to such issues, communities in the MRPC region may be able to solicit this opportunity to upgrade and/or acquire preemption controls installed in emergency vehicles and signalized intersections. For opportunities in Worcester County contact Central Massachusetts Regional Planning Commission (CMRPC), the fiduciary agent for that area; for opportunities in Middlesex County contact Metropolitan Area Planning Commission (MAPC).

Highway Safety Improvement Program Funding

Highway Safety Improvement Program (HSIP) funds are utilized on the Transportation Improvement Program (TIP), an annual prioritized listing of transportation and transit projects proposed for implementation during future federal fiscal years in the region. The purpose of these HSIP funds is to reduce the number of fatal and injury crashes by targeting high crash locations that are in need of improvements. If a location is proven to be a "high hazard location" such as those listed on the MRPC report *Phase I: Roadway Safety Conditions in the Montachusett Region* then it is eligible for HSIP funding. Since 12 out of 20 (60%) of the signalized intersections in the region without emergency preemption capabilities are listed in the Phase I report as hazardous intersections, they would be eligible to benefit from these funds. The MRPC will be looking at emergency preemption improvements that could utilize HSIP funds in the future.

CONCLUSION AND RECOMENDATIONS

In the course of developing new signal and preemption databases along with research of use throughout the region, the role of emergency preemption has become clearer. Through identifying existing infrastructure and determining needs in correlation to characteristics and shortcomings in the regions network of signalized intersections, progress can be made in improving the quality and effectiveness of emergency preemption use in the future. This Emergency Preemption Scan in the Montachusett Region is available as a reference tool and is presented for the use of the MRPC and all interested or involved parties concerned with this valuable ITS technology. The following list of recommendations is made by the MRPC in relation to future emergency preemption activities in the Montachusett region.

- Improve general knowledge of emergency preemption and its importance to safety and emergency response in the region to both municipalities and the public.
- Expand users of emergency preemption.
- Improve cooperation and communication between users in public, private and inter-municipal programs in the region.
- Promote use of same or similar system. (see Mid-State Fire Mutual Aid recommendations)
- It is important to identify one agency responsible for system maintenance, operations and communications.
- Continue to develop according to planned ITS Architecture for Central Massachusetts.
- Include more infrastructure in network.
- Communities are encouraged to pursue any funding opportunities, such as those mentioned in this report, which will work to improve or develop emergency preemption activities in their city or town.
- As the network of emergency preemption controls at intersections develops, communities may want to consider stipulations in agreements with private ambulance providers encouraging them to attain the equipment necessary to utilize the controls.
- Use prioritization provided in this report to put additional weight on possible projects that could include preemption in the future through the Transportation Improvement Program (TIP) process.

REFERENCES:

American Heart Association Website (2008). http://www.americanheart.org

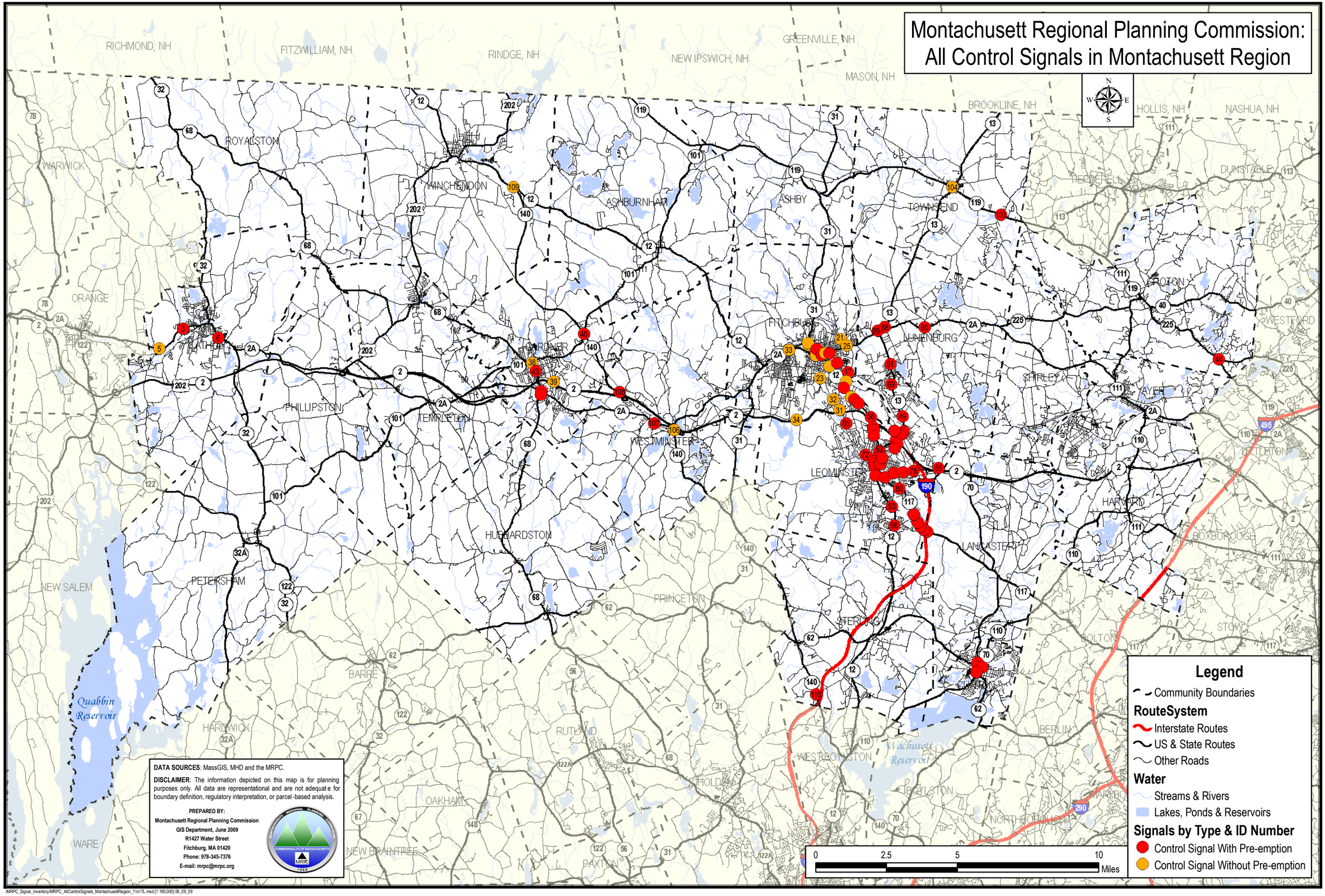
IBI Group (2005). Regional ITS Architecture for Central Massachusetts: Final Report Boston, MA.

Traffic Signal Preemption for Emergency Vehicles: A Cross-Cutting Study. January 2006: Federal Highway Administration, et al.

U.S. Department of Transportation ITS Deployment Statistics Website (2008). http://www.itsdeployment.its.dot.gov

APPENDIX

Montachusett Regional Planning Commission:
All Control Signals in Montachusett Region



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequat e for boundary definition, regulatory interpretation, or parcel -based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

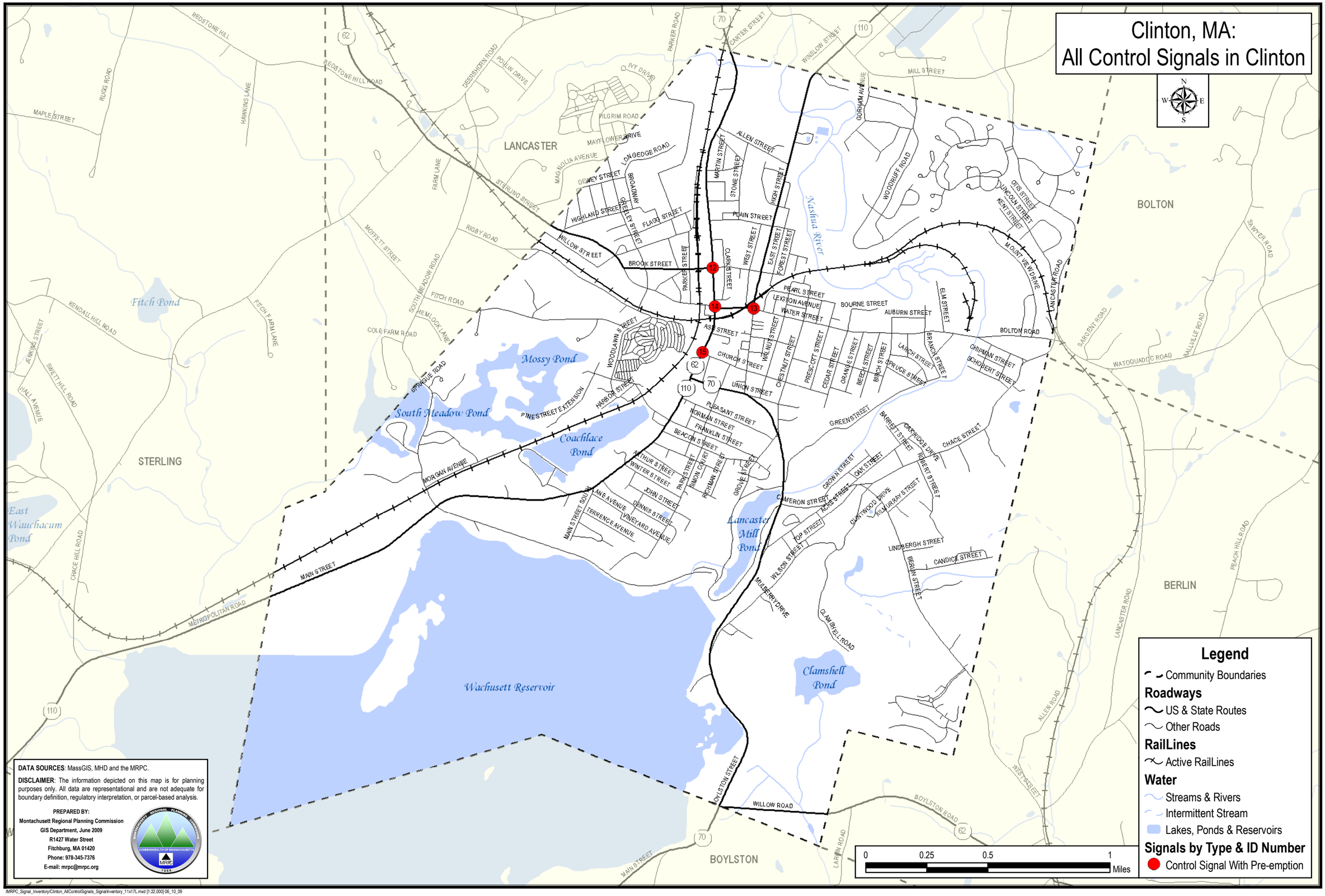
- Community Boundaries

RouteSystem
- Interstate Routes
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Signals by Type & ID Number
- Control Signal With Pre-emption
- Control Signal Without Pre-emption

Clinton, MA:
All Control Signals in Clinton



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

- Community Boundaries

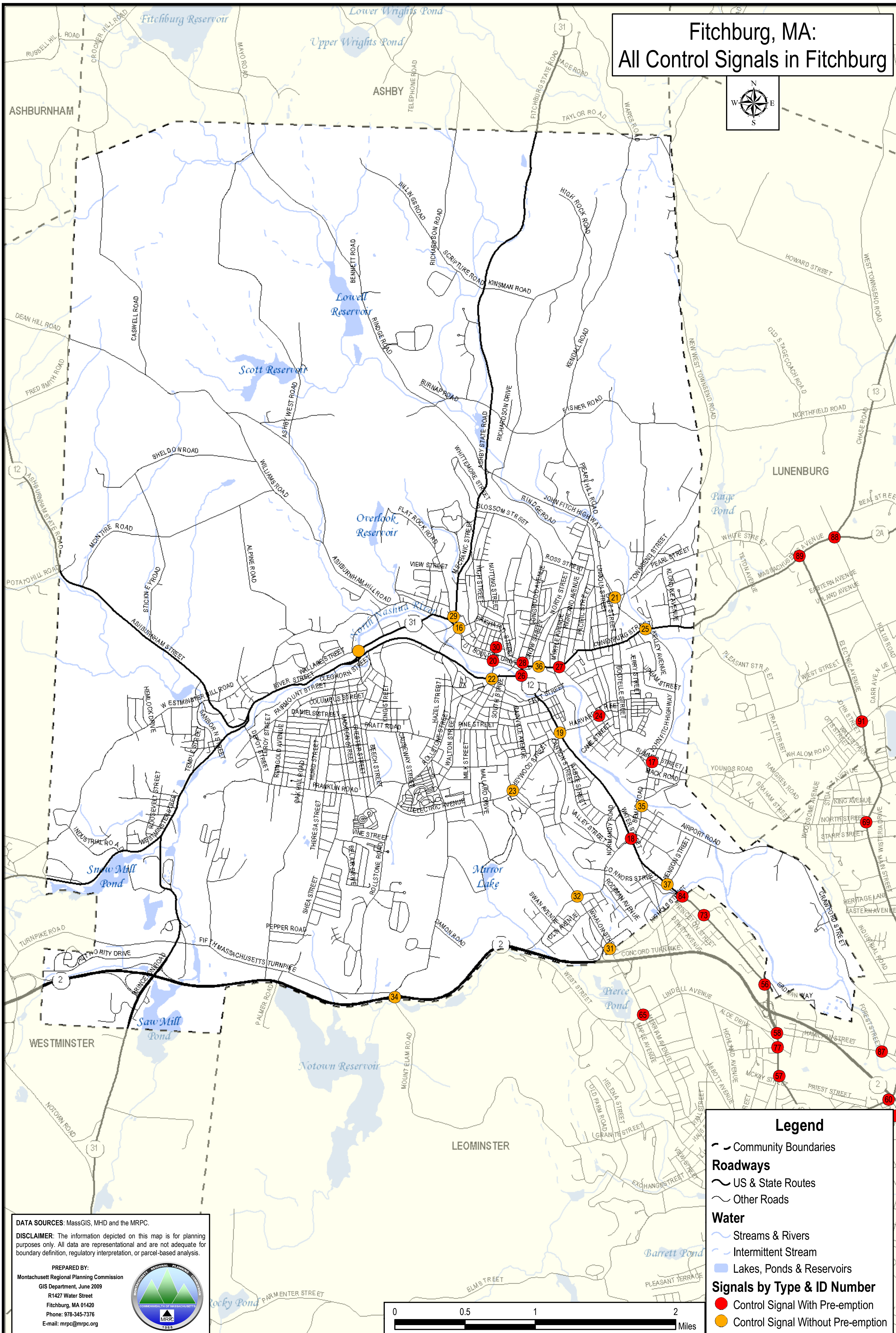
Roadways
- US & State Routes
- Other Roads

RailLines
- Active RailLines

Water
- Streams & Rivers
- Intermittent Stream
- Lakes, Ponds & Reservoirs

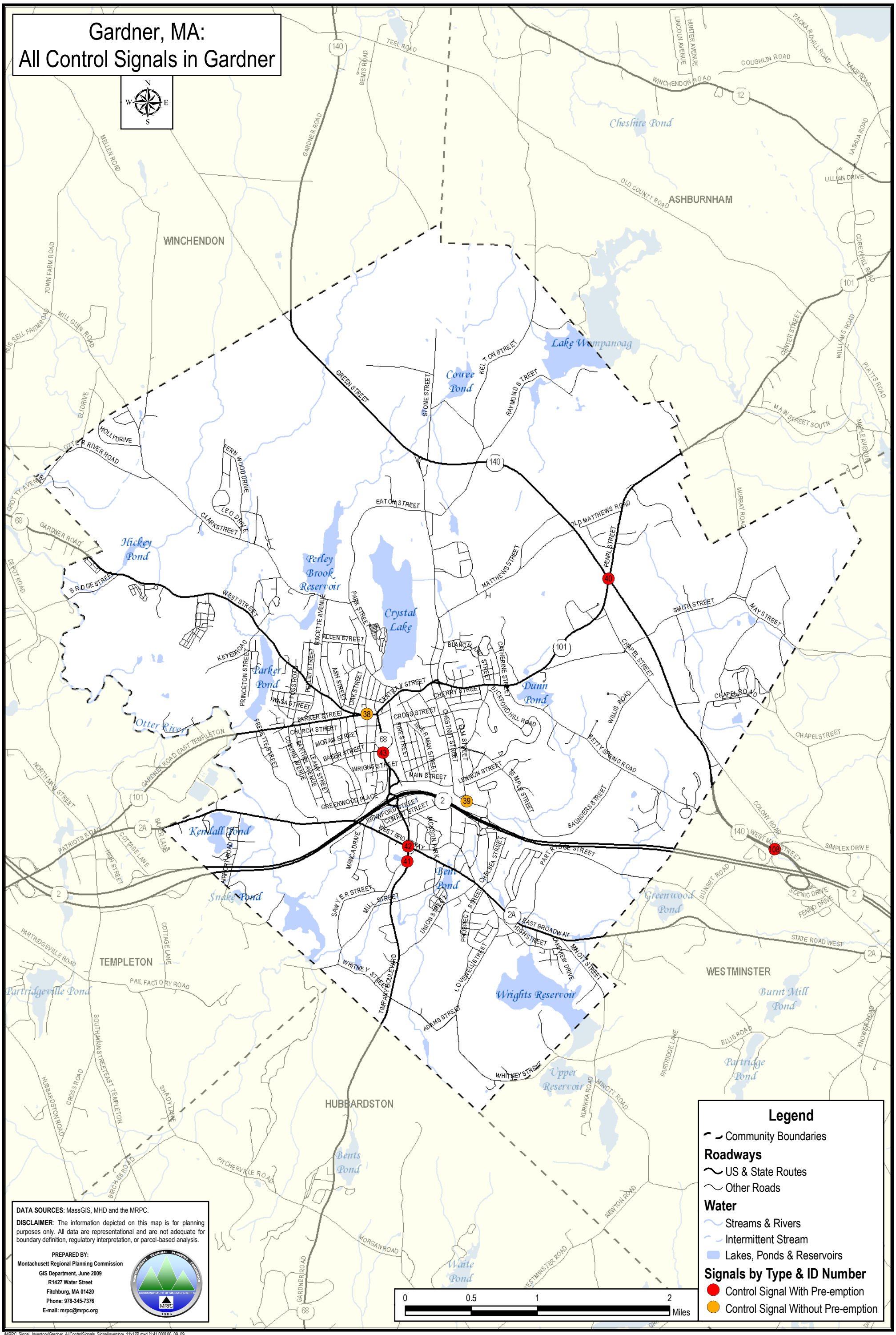
Signals by Type & ID Number
- Control Signal With Pre-emption

I:\MRPC_Signal_Inventory\Clinton_AllControlSignals_SignalInventory_11x17L.mxd [1:22,000] 06_10_09



Fitchburg, MA:
All Control Signals in Fitchburg
N
W
E
S
ASHBURNHAM
ASHBY
LUNENBURG
WESTMINSTER
LEOMINSTER
Fitchburg Reservoir
Lower Wrights Pond
Upper Wrights Pond
Lowell Reservoir
Scott Reservoir
Overlook Reservoir
North Nashua River
Paige Pond
Snow Mill Pond
Saw Mill Pond
Mirror Lake
Pierce Pond
Notown Reservoir
Barrett Pond
Rocky Pond
RUSSELL HILL ROAD
CROCKER HILL ROAD
MAYO ROAD
TELEPHONE ROAD
FITCHBURG STATE ROAD
PAGE ROAD
TAYLOR ROAD
WARES ROAD
HOWARD STREET
WEST TOWNSEND ROAD
OLD STAGECOACH ROAD
NORTHFIELD ROAD
CHASE ROAD
NEW WEST TOWNSEND ROAD
BILLINGS ROAD
RICHARDSON ROAD
SCRIPTURE ROAD
KINSMAN ROAD
HIGH ROCK ROAD
BENNETT ROAD
RINDGE ROAD
KENDALL ROAD
BURNAP ROAD
FISHER ROAD
RICHARDSON DRIVE
ASHBY STATE ROAD
CASWELL ROAD
DEAN HILL ROAD
FRED SMITH ROAD
ASHBY WEST ROAD
SHELDON ROAD
WILLIAMS ROAD
ASHBURNHAM STATE ROAD
POTATO HILL ROAD
MCINTIRE ROAD
STICKNEY ROAD
ALPINE ROAD
FLAT ROCK ROAD
ASHBURNHAM HILL ROAD
VIEW STREET
ASHBURNHAM STREET
WHITTEMORE STREET
BLOSSOM STREET
RINDGE ROAD
JOHN FITCH HIGHWAY
PEARL HILL ROAD
MECHANIC STREET
HIGH STREET
NUTTING STREET
ROSS STREET
LONGWOOD AVENUE
NORTH STREET
HIGHLAND AVENUE
MYRTLE AVENUE
PACIFIC STREET
LINCOLN STREET
DAY STREET
TOWNSEND STREET
PEARL STREET
KLONDIKE AVENUE
LUNENBURG STREET
KELLEY AVENUE
JERRY STREET
BOUTELLE STREET
UPHAM STREET
HARVARD STREET
CANE STREET
SUMMER STREET
MACK ROAD
WATER STREET
BEMIS ROAD
AIRPORT ROAD
NORMANDY ROAD
VALLEY STREET
ELSBREE STREET
CANTON STREET
HEYWOOD STREET
RAINVILLE AVENUE
SOUTH STREET
PINE STREET
MILK STREET
MALLARD DRIVE
WALTON STREET
ROLLSTONE STREET
HAZEL STREET
CAUSEWAY STREET
ELECTRIC AVENUE
WALLACE STREET
RIVER STREET
CLEGHORN STREET
FAIRMOUNT STREET
COLUMBUS STREET
DANIELS STREET
PRATT ROAD
KING STREET
MADISON STREET
CHESTER STREET
BEECH STREET
FRANKLIN ROAD
LEROY STREET
DEPOT STREET
REINGOLD AVENUE
OAK HILL ROAD
HURD STREET
THERESA STREET
VINE STREET
BELAIR DRIVE
ROLLSTONE ROAD
SHEA STREET
PEPPER ROAD
DAMON ROAD
W ESTMINSTER HILL ROAD
HEMLOCK DRIVE
SANBORN STREET
TEMPLE STREET
ROOSEVELT STREET
WESTMINSTER STREET
INDUSTRIAL ROAD
TURNPIKE ROAD
AUTHORITY DRIVE
PRINCETON ROAD
FIFTH MASSACHUSETTS TURNPIKE
PALMER ROAD
MOUNT ELAM ROAD
NOTOWN ROAD
PARMENTER STREET
ELM STREET
PLEASANT TERRACE
EXCHANGE STREET
VIEW STREET
GRANITE STREET
OLD FARM ROAD
HELENA STREET
ABBOTT AVENUE
HIGHLAND AVENUE
MCKAY STREET
PRIEST STREET
HAMILTON STREET
ALOE DRIVE
LINDELL AVENUE
MERRIAM AVENUE
MAPLE AVENUE
WEST STREET
CONCORD TURNPIKE
PRINCETON STREET
DEWEY AVENUE
NICHOLS STREET
BENSON STREET
CONNORS STREET
RODMAN AVENUE
WHALON STREET
OLIN AVENUE
SWAN AVENUE
ERDMAN WAY
CRAWFORD STREET
FOREST STREET
INDUSTRIAL ROAD
HERITAGE LANE
EASTERN AVENUE
MAIN STREET
WISTERIA DRIVE
STARR STREET
NORTH STREET
KING AVENUE
STUART AVENUE
WOODSOME AVENUE
GRAHAM STREET
RAMGREN ROAD
YOUNGS ROAD
WHALOM ROAD
PRATT STREET
OTIS STREET
JOHN STREET
WALLIS PARK
CARR AVENUE
HOLLIS ROAD
ELECTRIC AVENUE
WEST STREET
PLEASANT STREET
UPLAND AVENUE
EASTERN AVENUE
TILTON AVENUE
MASSACHUSETTS AVENUE
WHITE STREET
BEAL STREET
2
2A
12
13
31
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
34
35
36
37
56
57
58
60
65
69
73
77
84
87
88
89
91
Legend
Community Boundaries
Roadways
US & State Routes
Other Roads
Water
Streams & Rivers
Intermittent Stream
Lakes, Ponds & Reservoirs
Signals by Type & ID Number
Control Signal With Pre-emption
Control Signal Without Pre-emption
0
0.5
1
2
Miles
DATA SOURCES: MassGIS, MHD and the MRPC.
DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.
PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org
MONTACHUSETT REGIONAL PLANNING COMMISSION
COMMONWEALTH OF MASSACHUSETTS
MRPC
1968

Gardner, MA:
All Control Signals in Gardner



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

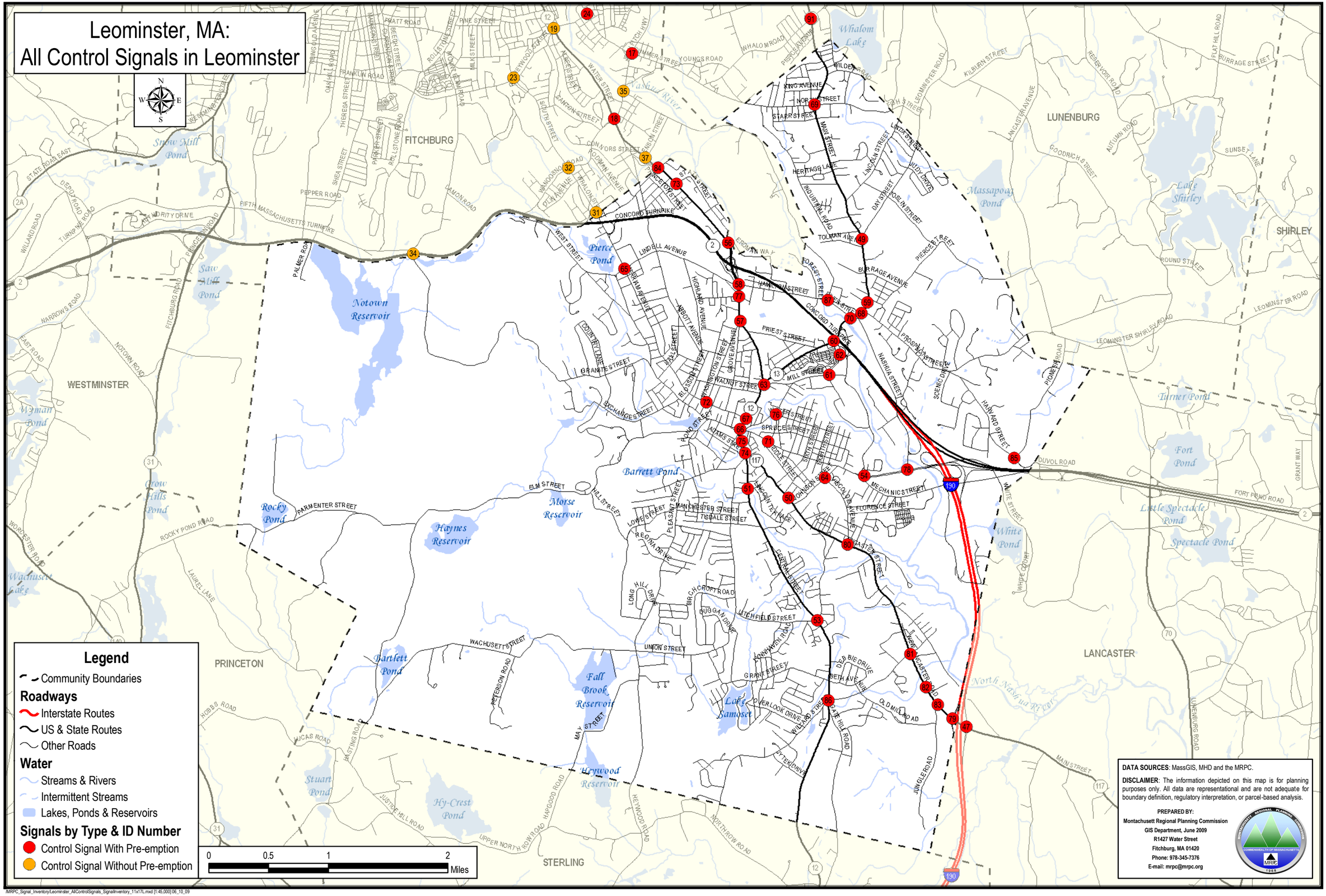
- Community Boundaries

Roadways
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Intermittent Stream
- Lakes, Ponds & Reservoirs

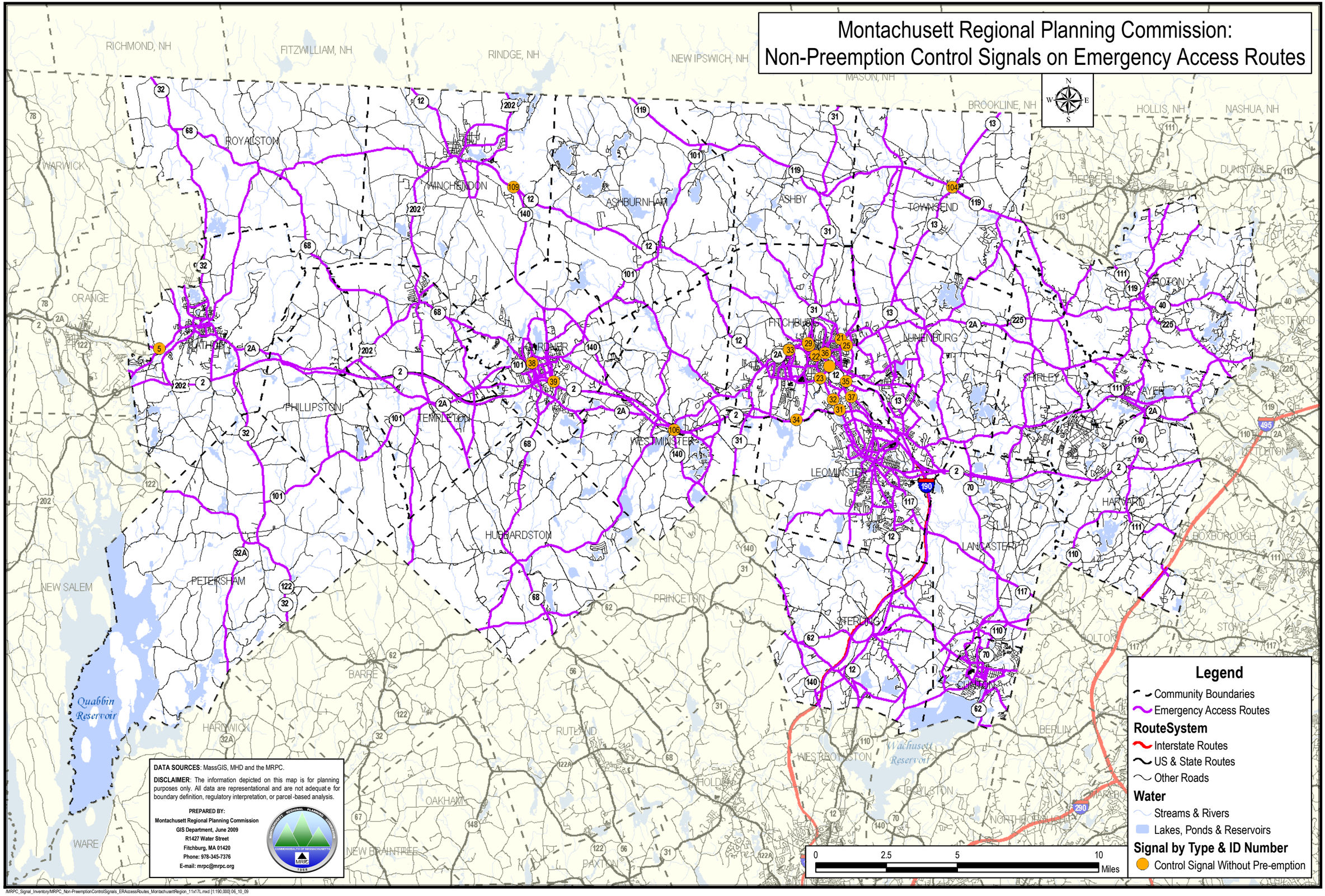
Signals by Type & ID Number
- Control Signal With Pre-emption
- Control Signal Without Pre-emption

Leominster, MA:
All Control Signals in Leominster



I:\MRPC_Signal_Inventory\Leominster_AllControlSignals_SignalInventory_11x17L.mxd [1:45,000] 06_10_09

Montachusett Regional Planning Commission:
Non-Preemption Control Signals on Emergency Access Routes



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequat e for boundary definition, regulatory interpretation, or parcel -based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

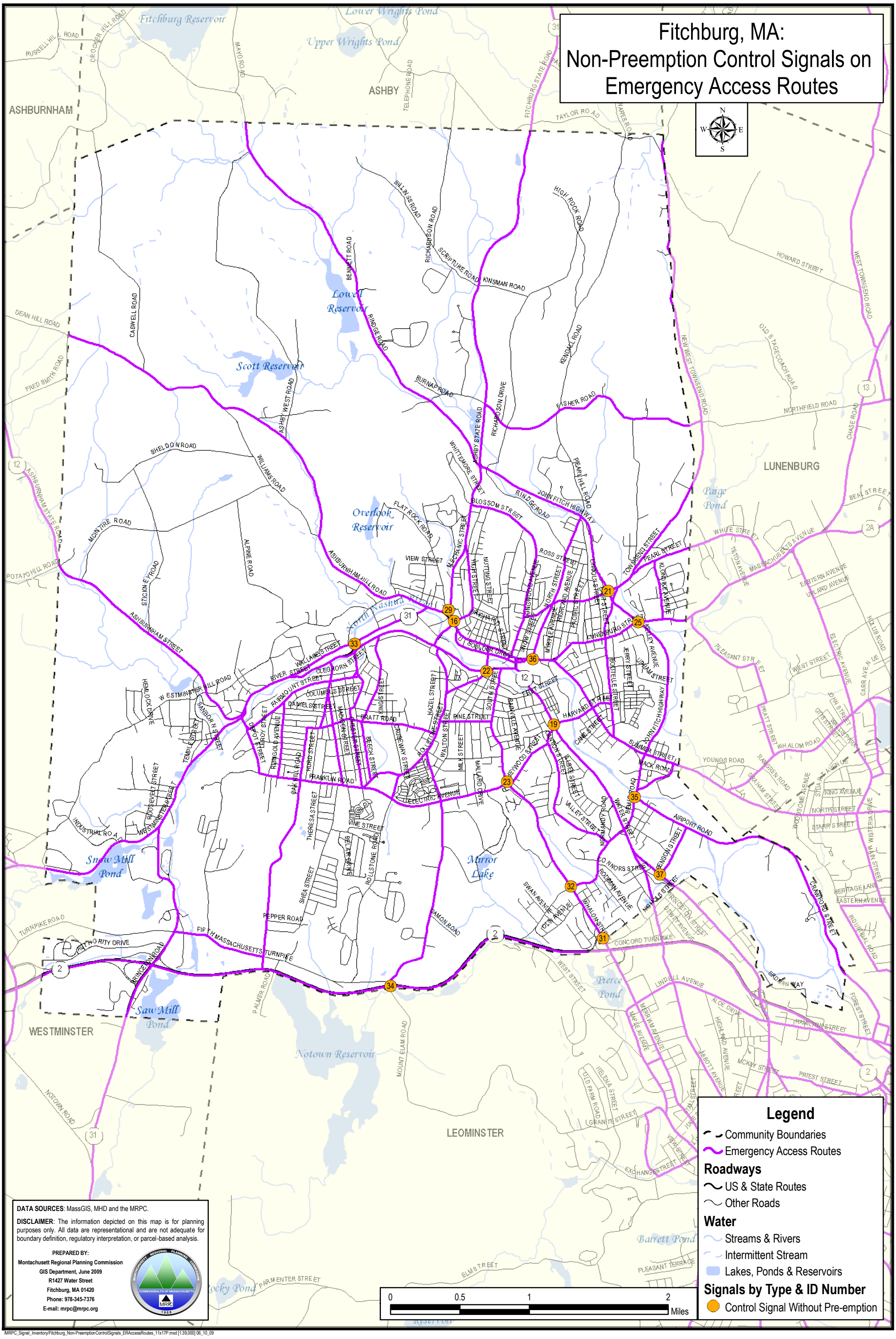
- Community Boundaries
- Emergency Access Routes

RouteSystem
- Interstate Routes
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Signal by Type & ID Number
- Control Signal Without Pre-emption

Fitchburg, MA:
Non-Preemption Control Signals on Emergency Access Routes



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

- Community Boundaries
- Emergency Access Routes

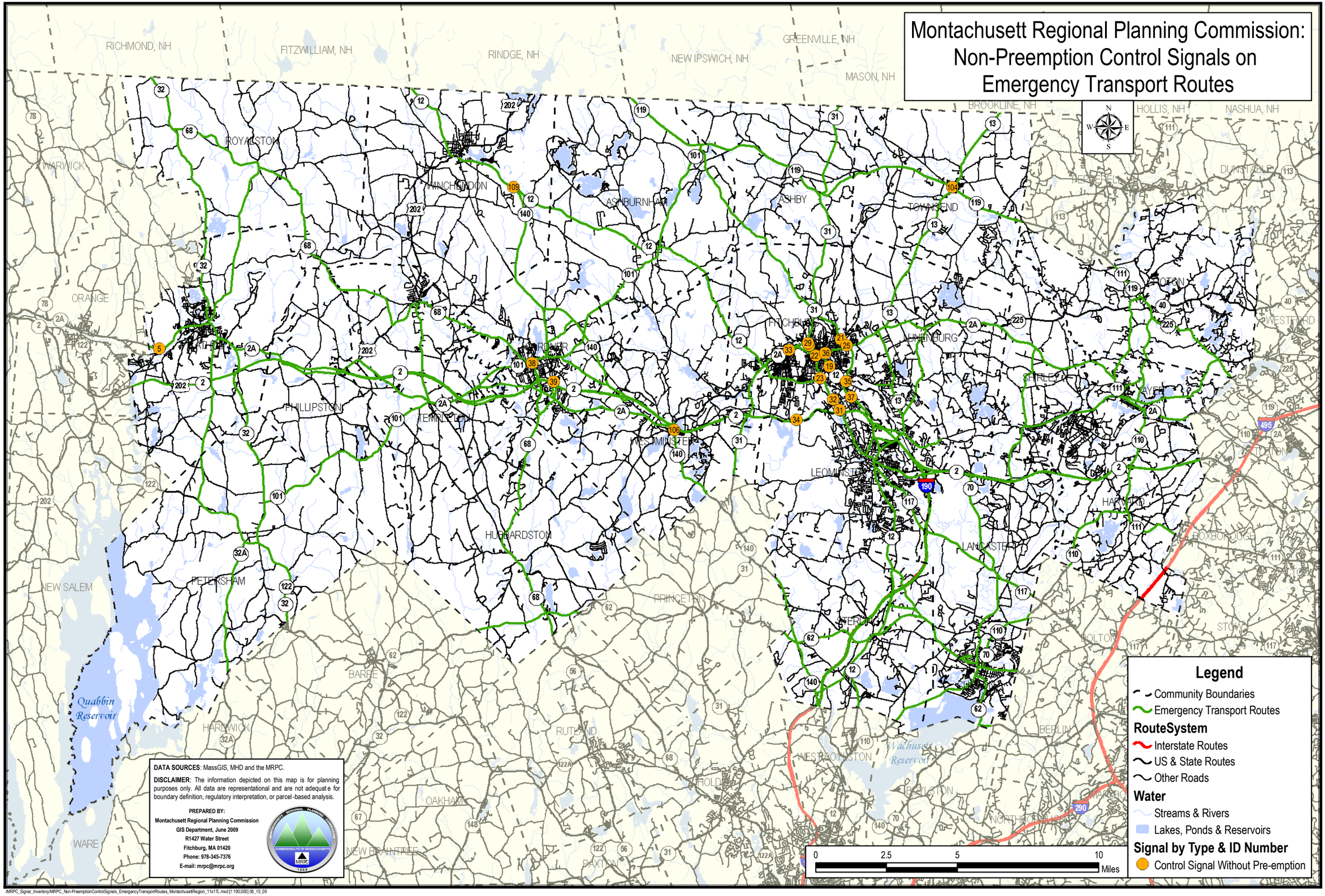
Roadways
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Intermittent Stream
- Lakes, Ponds & Reservoirs

Signals by Type & ID Number
- Control Signal Without Pre-emption

/MRPC_Signal_Inventory/Fitchburg_Non-PreemptionControlSignals_ERAccessRoutes_11x17P.mxd [1:39,000] 06_10_09

Montachusett Regional Planning Commission: Non-Preemption Control Signals on Emergency Transport Routes



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequat e for boundary definition, regulatory interpretation, or parcel -based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

- Community Boundaries
- Emergency Transport Routes

RouteSystem

- Interstate Routes
- US & State Routes
- Other Roads

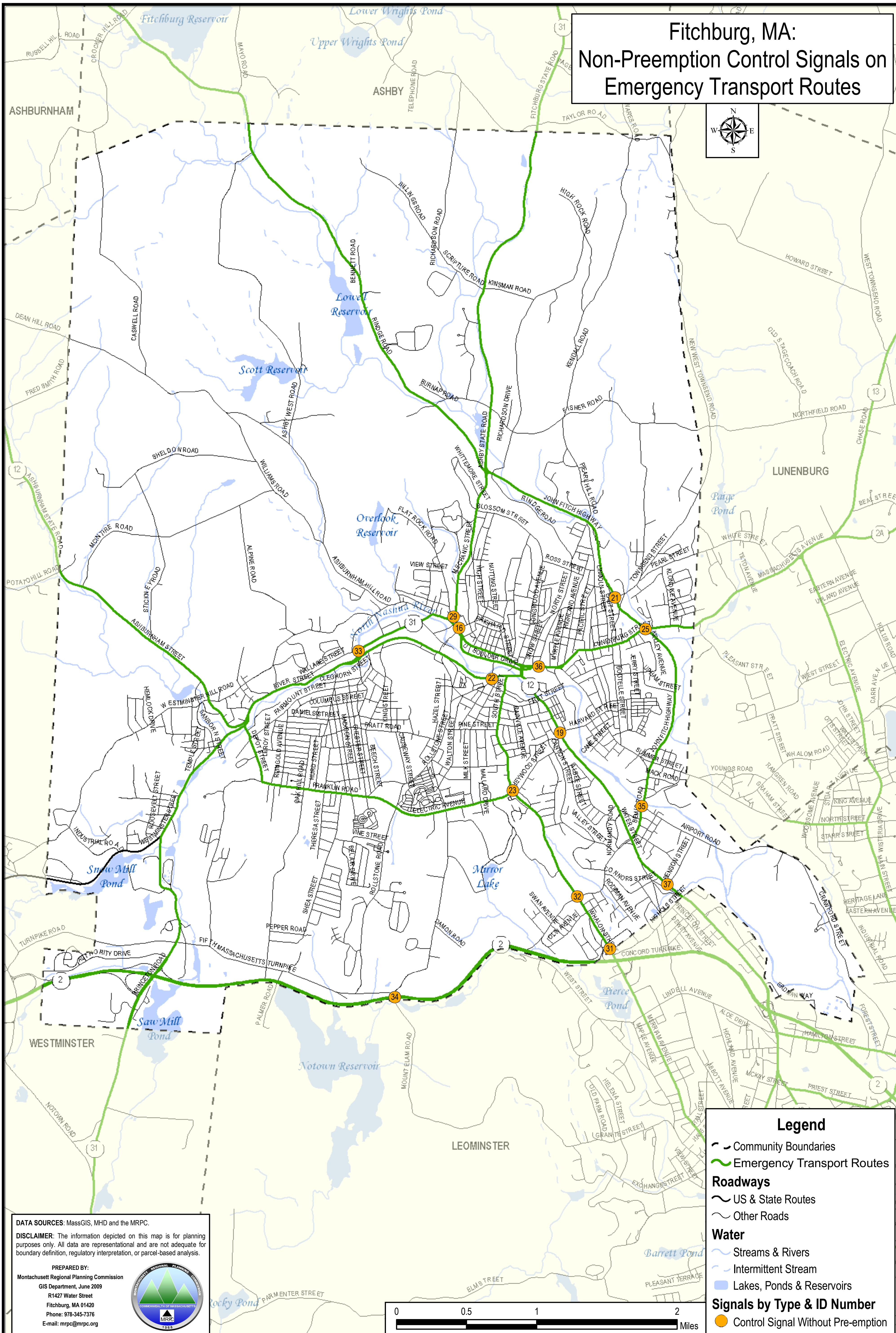
Water

- Streams & Rivers
- Lakes, Ponds & Reservoirs

Signal by Type & ID Number

- Control Signal Without Pre-emption

Fitchburg, MA: Non-Preemption Control Signals on Emergency Transport Routes



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Montachusett Regional Planning Commission:
Non Pre-emption Control Signals with Hazardous Intersections in Montachusett Region

RICHMOND, NH
FITZWILLIAM, NH
RINDGE, NH
NEW IPSWICH, NH
BROOKLINE, NH
HOLLIS, NH
NASHUA, NH
DUNSTABLE
PEPPERELL
TOWNSEND
ASHBY
ASHBURNHAM
WINCHENDON
ROYALSTON
WARWICK
ORANGE
ATHOL
PHILLIPSTON
GARDNER
TEMPLETON
FITCHBURG
LUNENBURG
SHIRLEY
AYER
GROTON
WESTFORD
LITTLETON
WESTMINSTER
LEOMINSTER
HARVARD
BOXBOROUGH
LANCASTER
STERLING
CLINTON
BOLTON
STOW
BERLIN
WEST BOYLSTON
BOYLSTON
HUBBARDSTON
PETERSHAM
NEW SALEM
HARDWICK
BARRE
PRINCETON
RUTLAND
HOLDEN
OAKHAM
PAXTON
NEW BRAINTREE
WARE
Quabbin Reservoir
Wachusett Reservoir

N
W
E
S

DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequat e for boundary definition, regulatory interpretation, or parcel -based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

* Intersection Hazards are labeled in red

0 2.5 5 10 Miles

Legend

- Community Boundaries

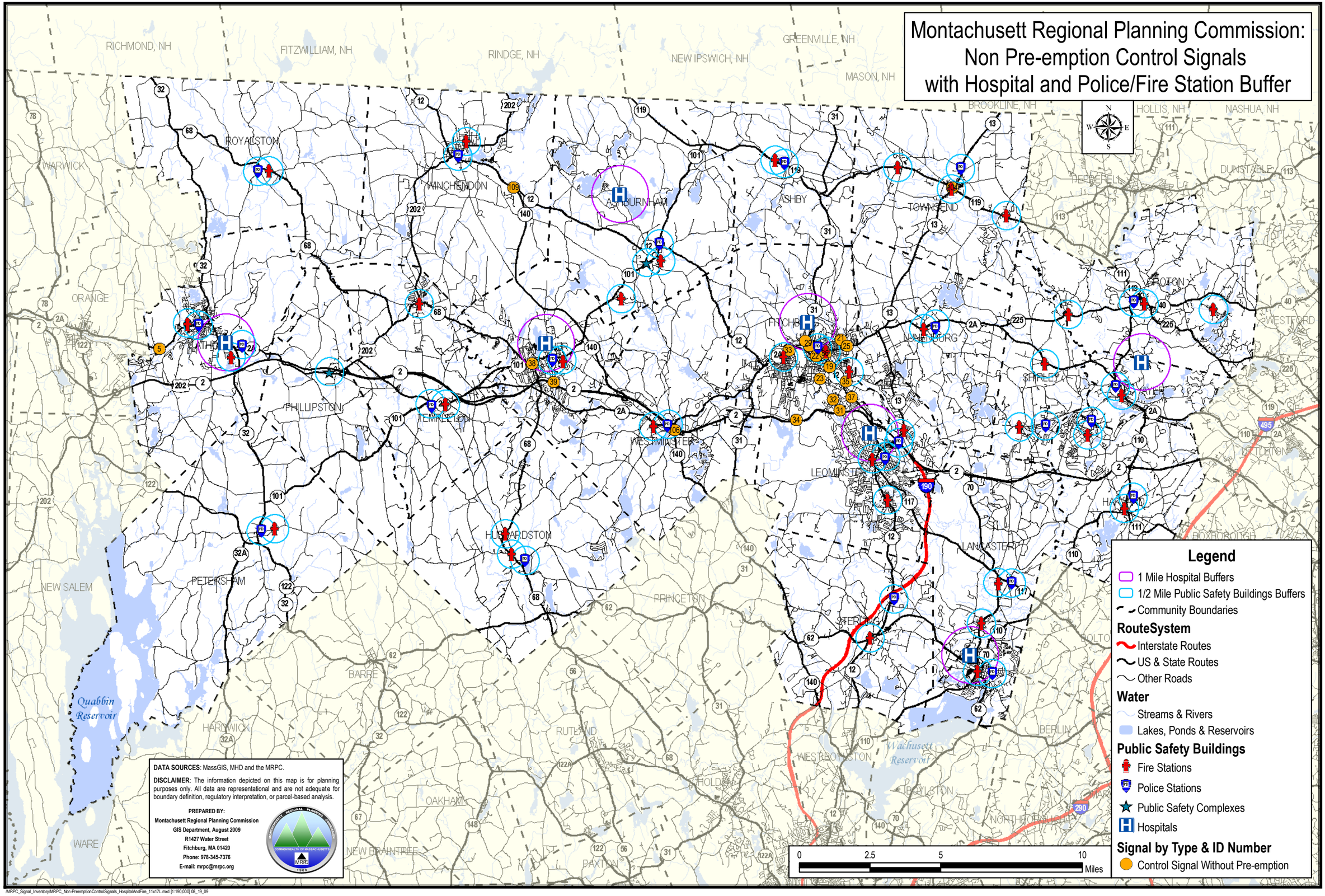
RouteSystem
- Interstate Routes
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Signal by Type & ID Number*
- Control Signal Without Pre-emption

/MRPC_Signal_Inventory/MRPC_Non-PreemptionControlSignals_HazardousIntersections_11x17L.mxd [1:190,000] 06_23_09

Montachusett Regional Planning Commission:
Non Pre-emption Control Signals
with Hospital and Police/Fire Station Buffer



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, August 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

- 1 Mile Hospital Buffers
- 1/2 Mile Public Safety Buildings Buffers
- Community Boundaries

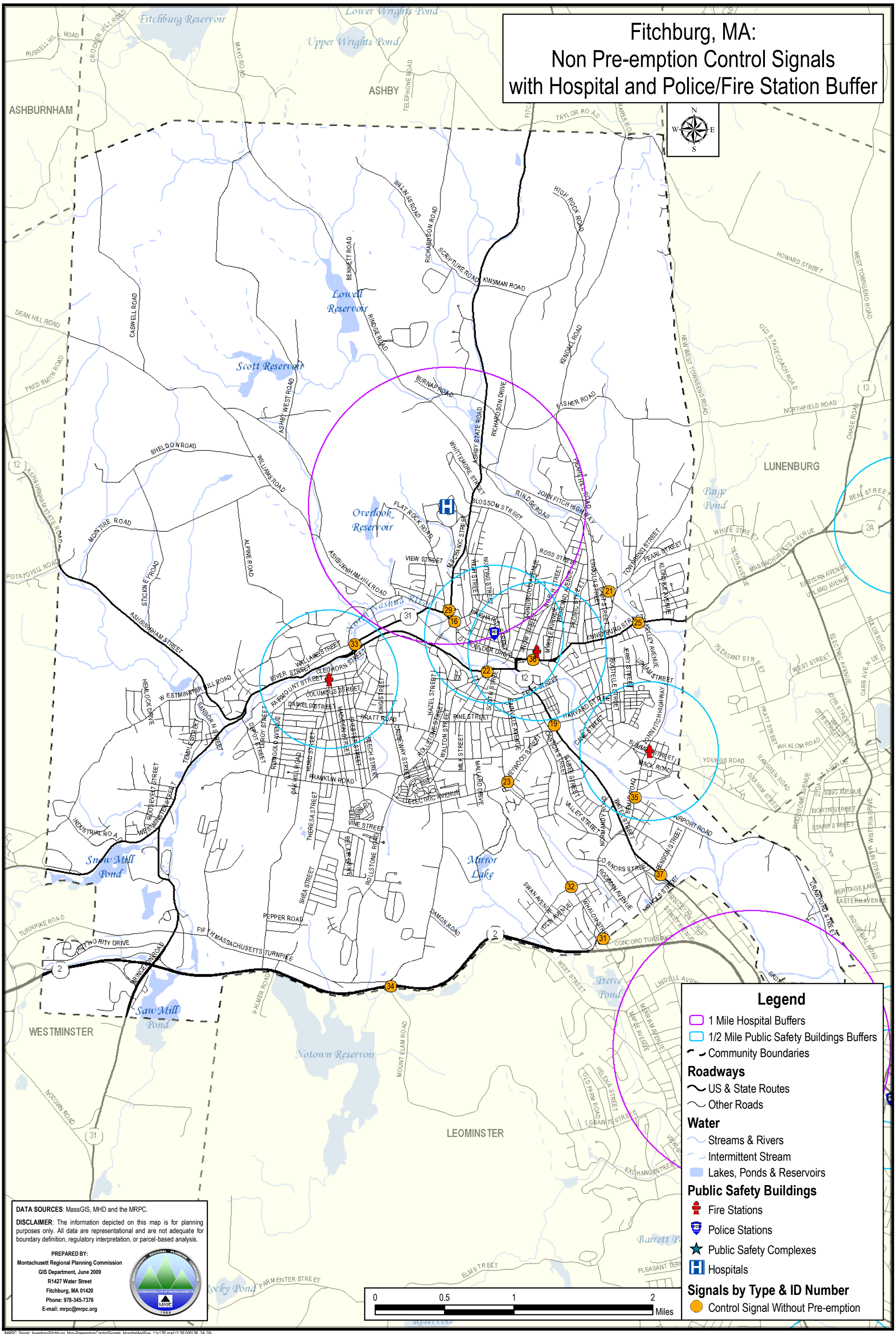
RouteSystem
- Interstate Routes
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Lakes, Ponds & Reservoirs

Public Safety Buildings
- Fire Stations
- Police Stations
- Public Safety Complexes
- Hospitals

Signal by Type & ID Number
- Control Signal Without Pre-emption

Fitchburg, MA:
Non Pre-emption Control Signals
with Hospital and Police/Fire Station Buffer



DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, June 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Montachusett Regional Planning Commission: Emergency Transports per Year

RICHMOND, NH
FITZWILLIAM, NH
RINDGE, NH
NEW IPSWICH, NH
GREENVILLE, NH
MASON, NH
BROOKLINE, NH
HOLLIS, NH
NASHUA, NH
WARWICK
ROYALSTON
WINCHENDON
ASHBURNHAM
ASHBY
TOWNSEND
PEPPERELL
DUNSTABLE
ORANGE
ATHOL
GARDNER
FITCHBURG
LUNENBURG
GROTON
SHIRLEY
AYER
WESTFORD
PHILLIPSTON
TEMPLETON
WESTMINSTER
LEOMINSTER
HARVARD
LITTLETON
HUBBARDSTON
LANCASTER
BOXBOROUGH
ACTON
NEW SALEM
PETERSHAM
PRINCETON
STERLING
BOLTON
STOW
BARRE
CLINTON
HUDSON
HARDW
RUTLAND
BERLIN
WEST BOYLSTON
HOLDEN
BOYLSTON
MARLE
NORTHBOROUGH
OAKHAM
WARE
PAXTON

Legend

Community Boundaries

Emergency Transports per Year

- No Data
- 0-250 per Year
- 250-500 per Year
- 500-1000 per Year
- 1000-1500 per Year
- 3000-3500 per Year

DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, August 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

0 2.5 5 10 Miles

/MRPC_Signal_Inventory/EmergencyTransports_PerYear_11x17L.mxd [1:190,000] 08_19_09

Montachusett Regional Planning Commission: Prioritized Locations for Emergency Preemption

Signal #	Community	Street #1	Street #2	Priority #
36	Fitchburg	MAIN ST. (2A)	NORTH ST.	1
16	Fitchburg	MAIN ST. (2A)	ROLLSTON ST.	2
29	Fitchburg	MAIN ST. (2A)	MECHANIC ST.	3
37	Fitchburg	WATER ST. (12)	BENSON ST.	4
22	Fitchburg	PUTNAM ST.	LAUREL ST.	5
35	Fitchburg	BEMIS RD.	AIRPORT RD.	6
104	Townsend	MAIN ST. (119)	BROOKLINE ST.	7
33	Fitchburg	RIVER ST. (31/2A)	WALLACE ST. (East)	8
38	Gardner	PARKER ST. (101	GRAHAM ST.	9
106	Westminster	STATE RD. EAST	HAGER PARK RD	10
25	Fitchburg	JOHN FITCH HGWY	LUNENBURG ST. (2A)	11
34	Fitchburg	RTE. 2	MT. ELAM RD.	12
23	Fitchburg	SOUTH ST.	OLD SOUTH ST.	13
32	Fitchburg	SOUTH ST.	WANOOSNOC RD.	14
5	Athol	MAIN ST (2A)	DANIEL SHAYS	15
31	Fitchburg	SOUTH ST.	WHALON ST.	16
19	Fitchburg	WATER ST. (12)	5TH ST.	17
39	Gardner	ELM ST.	UNION SQ.	19
21	Fitchburg	JOHN FITCH HGWY	PEARL ST.	18
109	Winchendon	GARDNER RD. (140)	SPRING ST. (12)	20

DATA SOURCES: MassGIS, MHD and the MRPC.

DISCLAIMER: The information depicted on this map is for planning purposes only. All data are representational and are not adequate for boundary definition, regulatory interpretation, or parcel-based analysis.

PREPARED BY:
Montachusett Regional Planning Commission
GIS Department, October 2009
R1427 Water Street
Fitchburg, MA 01420
Phone: 978-345-7376
E-mail: mrpc@mrpc.org

Legend

Prioritized Signals in Montachusett Region
- Signals Prioritized
- Community Boundaries

RouteSystem
- Interstate Routes
- US & State Routes
- Other Roads

Water
- Streams & Rivers
- Lakes, Ponds & Reservoirs

0 2.5 5 10 Miles

Appendix Chart I: Feedback from Municipal Emergency Preemption Users

Response	City/Town	Traffic signals	Department	Vehicles in fleet	Vehicle Preemption (%)	Model	% Useful intersections	Comments
x	**Ashburnham**		Fire	13	None			
	Signals:	*Warning*	Police					
x	**Ashby**		Fire	6 Fire/1 Ambulance	None			Only use for preemption is when transporting to Leominster Hospital, there are 10 stop lights in route to Leominster Hospital
	Signals:	*Warning*	Police					
x	**Athol**		Fire	7 Fire/3 Ambulance	None			Mentioned that preemtion would be useful on 50% of the intersections on the primary response routes for police and fire
x	*Signals:*	*Control / Pedestrian*	Police	7				
x	**Ayer**		Fire	10	None			
	Signals:	*Warning*	Police					
	Clinton		Fire					
x	*Signals:*	*Control / Warning*	Police	8	None			
x	**Fitchburg**		Fire	24	50%	Opticom	48%	Respondee feels they should have all intersections and at least 8 more vehicles equipped with preemption controls
	Signals:	*Control / Warning*	Police					
x	**Gardner**		Fire	9	20%	Opticom, Radio	66%	
x	*Signals:*	*Control*	Police	14	None			Mentioned FD's use of opticom by 3M

Response	City/Town	Traffic signals	Department	Vehicles in fleet	Vehicle Preemption (%)	Model	% Useful intersections	Comments
x	**Groton**		Fire	18	2 ambulances/3 firetrucks	Opticom	100% in town	18 vehicles include 2 duty vehicles, 1 chiefs vehicle and forestry vehicles
x	*Signals:*	*Control*	Police	10	none			
x	**Leominster**		Wire Insp.	23	33% (7)	Opticom	30% Opticom/100% Radio controled	Wire inspector got back with all information, detailed review of preemption use and intersection capabilities provided in feedback and documented
	Signals:	*Control / Warning*						
x	**Lunenburg**		Fire	9	None		All in town	Uses radio preemption for signals in town
x	*Signals:*	*Control*	Police	7	None		n/a	
	Phillipston		Fire					
x	*Signals:*	*Warning*	Police	3	None			
x	**Shirley**		Fire	10	None			
	Signals:	*Warning*	Police					
x	**Sterling**		Fire	12	42% (5 of 12)	opticom		Also works in mutual aid communities with system, particularly Worcester where ambulances transport to hospitals
	Signals:	*Warning*	Police					
x	**Templeton**		Fire	12	None			If Contruction was to take place where a lane was closed 24 hrs. a day then some type of control would need to be implemented
x	*Signals:*	*Warning*	Police	6	None	n/a	n/a	

Response	City/Town	Traffic signals	Department	Vehicles in fleet	Vehicle Preemption (%)	Model	% Useful intersections	Comments
x	**Townsend**		Fire	12	None			Says that preemtion would be very helpful if all signalized intersections and vehicles in fleet were equipped
x	*Signals:*	*Control / Warning*	Police	9	None			
x	**Westminster**		Fire	9	100%	Opticom	66%	Mid-state fire mutual aid association has previously voted to recommend only Opticom for mutual aid system
x	*Signals:*	*Control*	Police	10	0	n/a		

Appendix Chart II: Signal Descriptions

Signal #	Community	Street #1	Street #2	Street #3	Street #4	Signal Type	Has Preemption	Preemption Type	Intersection Hazard Number	On Emergency Access Route	On Emergency Transport Route	Priority Number
3	Athol	MAIN ST (2A)	EXCHANGE ST			CONTROL	YES	OPTICOM	91	YES	YES	
5	Athol	MAIN ST (2A)	DANIEL SHAYS			CONTROL	no		68	YES	YES	15
6	Athol	MAIN ST (2A)	PLEASANT ST.			CONTROL	YES	OPTICOM	0	YES	YES	
12	Clinton	MAIN ST. (70)	BROOK ST. (62			CONTROL	YES	RADIO	52	YES	YES	
13	Clinton	HIGH ST. (110)	WATER ST.			CONTROL	YES	RADIO	0	YES	YES	
14	Clinton	MAIN ST. (70/62)	WATER ST. (110)	STERLING ST.		CONTROL	YES	RADIO	114	YES	YES	
15	Clinton	MAIN ST. (70/62)	CHURCH ST.			CONTROL	YES	RADIO	0	YES	YES	
16	Fitchburg	MAIN ST. (2A)	ROLLSTON ST.	ACADEMY ST.		CONTROL	no		44	YES	YES	2
17	Fitchburg	JOHN FITCH HGWY	SUMMER ST.			CONTROL	YES	OPTICOM	11	YES	YES	
18	Fitchburg	WATER ST. (12)	BEMIS RD.	WANOOSNOC RD.		CONTROL	YES	OPTICOM	18	YES	YES	
19	Fitchburg	WATER ST. (12)	5TH ST.	BOYLE ST.		CONTROL	no		0	YES	YES	17
20	Fitchburg	PUTNAM ST.	BOULDER ST.			CONTROL	YES	OPTICOM	0	YES	YES	
21	Fitchburg	JOHN FITCH HGWY	PEARL ST.	TOWNSEND ST.		CONTROL	no		0	YES	YES	18
22	Fitchburg	PUTNAM ST.	LAUREL ST.	KIMBALL ST. (12)	CROSS ST.	CONTROL	no		40	YES	YES	5
23	Fitchburg	SOUTH ST.	OLD SOUTH ST.	ELECTRIC AVE.		CONTROL	no		20	YES	YES	13
24	Fitchburg	HARVARD ST.	SUMMER ST.			CONTROL	YES	OPTICOM	59	YES	no	
25	Fitchburg	JOHN FITCH HGWY	LUNENBURG ST.			CONTROL	no		12	YES	YES	11
26	Fitchburg	WATER ST. (12)	LAUREL ST.			CONTROL	YES	OPTICOM	0	YES	YES	
27	Fitchburg	MAIN ST. (2A)	LUNENBURG ST.	SUMMER ST.		CONTROL	YES	OPTICOM	92	YES	YES	
28	Fitchburg	MAIN ST. (2A)	WATER ST.			CONTROL	YES	OPTICOM	47	YES	YES	
29	Fitchburg	MAIN ST. (2A)	MECHANIC ST.			CONTROL	no		0	YES	YES	3
30	Fitchburg	MAIN ST. (2A)	PUTNAM ST.	OLIVER ST.		CONTROL	YES	OPTICOM	86	YES	YES	
31	Fitchburg	SOUTH ST.	WHALON ST.	TWIN CITY PLAZA		CONTROL	no		0	YES	YES	16
32	Fitchburg	SOUTH ST.	WANOOSNOC RD.			CONTROL	no		24	YES	YES	14
33	Fitchburg	RIVER ST. (31/2A)	WALLACE ST. (East)			CONTROL	no		0	YES	YES	8
34	Fitchburg	RTE. 2	MT. ELAM RD.			CONTROL	no		17	YES	YES	12
35	Fitchburg	BEMIS RD.	AIRPORT RD.			CONTROL	no		34	YES	YES	6
36	Fitchburg	MAIN ST. (2A)	NORTH ST.			CONTROL	no		54	YES	YES	1
37	Fitchburg	WATER ST. (12)	BENSON ST.			CONTROL	no		74	YES	YES	4
38	Gardner	PARKER ST. (101)	GRAHAM ST.	CONNORS ST.		CONTROL	no		0	YES	YES	9
39	Gardner	ELM ST.	UNION SQ.	PEARSON BLVD.		CONTROL	no		0	YES	YES	19
40	Gardner	PEARL ST. (101)	RTE. 140			CONTROL	YES	OPT. & RAD.	19	YES	YES	
41	Gardner	TIMPANY BLVD. (68)	DYER ST. (Timpany Plaza)			CONTROL	YES	OPT. & RAD.	0	YES	YES	
42	Gardner	TIMPANY BLVD. (68)	W. BROADWAY (2A)			CONTROL	YES	OPT. & RAD.	33	YES	YES	
43	Gardner	WILLOW ST.	MAIN ST (68)			CONTROL	YES	OPT. & RAD.	0	YES	YES	
44	Groton	BOSTON RD. (119)	FORGE VILLAGE			CONTROL	YES	OPTICOM	0	YES	YES	
47	Lancaster	NORTH MAIN ST.	190 N ON-RAMP			CONTROL	YES	OPT. & RAD.	0	YES	YES	
49	Leominster	MAIN ST. (13)	DAY ST.			CONTROL	YES	RADIO	94	YES	YES	
50	Leominster	LANCASTER ST. (117)	DERWIN ST.			CONTROL	YES	RADIO	0	YES	YES	
51	Leominster	CENTRAL ST. (12)	GRAHAM ST.			CONTROL	YES	RADIO	0	YES	YES	
53	Leominster	CENTRAL ST. (12)	LITCHFIELD ST			CONTROL	YES	RADIO	31	YES	YES	
54	Leominster	MECHANIC ST.	COMMERCIAL DR	LEOMINSTER CONNECTOR		CONTROL	YES	RADIO	98	YES	YES	
56	Leominster	N.MAIN ST. (12)	ERDMAN WAY			CONTROL	YES	RADIO	45	YES	YES	
57	Leominster	N.MAIN ST. (12)	WASHINGTON ST			CONTROL	YES	RADIO	86	YES	YES	
58	Leominster	N.MAIN ST. (12)	LINDELL AVE.	HAMILTON ST.		CONTROL	YES	RADIO	15	YES	YES	

Signal #	Community	Street #1	Street #2	Street #3	Street #4	Signal Type	Has Preemption	Preemption Type	Intersection Hazard Number	On Emergency Access Route	On Emergency Transport Route	Priority Number
59	Leominster	MAIN ST. (13)	PROSPECT ST.	RAILROAD SQ.		CONTROL	YES	RADIO	65	YES	YES	
60	Leominster	MAIN ST. (13)	HAWS ST.			CONTROL	YES	RADIO	71	YES	YES	
61	Leominster	HAWS ST.	MILL ST.	SACK BLVD.		CONTROL	YES	RADIO	61	YES	no	
62	Leominster	RTE. 2 ON-RAMP	HAWS ST.			CONTROL	YES	RADIO	0	YES	no	
63	Leominster	MAIN ST. (13)	N.MAIN ST. (12)	MILL ST.	HIGH ST.	CONTROL	YES	RADIO	67	YES	YES	
64	Leominster	VISCLOID AVE.	JOHNSON ST.			CONTROL	YES	RADIO	0	YES	no	
65	Leominster	MERRIAM AVE.	LINDELL AVE.			CONTROL	YES	RADIO	21	YES	YES	
66	Leominster	MAIN ST. (12)	MECHANIC ST.	WEST ST.		CONTROL	YES	RADIO	7	YES	YES	
67	Leominster	MAIN ST. (12)	MERRIAM AVE.			CONTROL	YES	RADIO	73	YES	YES	
68	Leominster	MAIN ST. (13)	NASHUA ST.			CONTROL	YES	RADIO	5	YES	YES	
69	Leominster	MAIN ST. (13)	NORTH ST.			CONTROL	YES	RADIO	51	YES	YES	
70	Leominster	MAIN ST. (13)	RIVER ST.			CONTROL	YES	RADIO	48	YES	YES	
71	Leominster	MECHANIC ST.	WHITNEY ST.			CONTROL	YES	RADIO	0	YES	YES	
72	Leominster	MERRIAM AVE.	WASHINGTON ST			CONTROL	YES	RADIO	64	YES	YES	
73	Leominster	N.MAIN ST. (12)	STATE ST.			CONTROL	YES	OPT. & RAD.	56	YES	YES	
74	Leominster	CENTRAL ST. (12	LANCASTER ST.			CONTROL	YES	OPT. & RAD.	0	YES	YES	
75	Leominster	CENTRAL ST. (12	PARK ST.			CONTROL	YES	RADIO	0	YES	YES	
76	Leominster	WATER ST.	WHITNEY ST.			CONTROL	YES	RADIO	0	YES	YES	
77	Leominster	N.MAIN ST. (12)	NELSON ST.	WATER TOWER PLAZA		CONTROL	YES	RADIO	8	YES	YES	
78	Leominster	LEOMINSTER CONN	NASHUA ST.			CONTROL	YES	RADIO	14	YES	YES	
79	Leominster	LANCASTER ST. (117)	I-190 S RAMP			CONTROL	YES	OPT. & RAD.	0	YES	YES	
80	Leominster	LANCASTER ST. (117)	VISCLOID AVE			CONTROL	YES	OPT. & RAD.	0	YES	YES	
81	Leominster	LANCASTER ST. (117)	WILLARD ST.			CONTROL	YES	OPT. & RAD.	105	YES	YES	
82	Leominster	LANCASTER ST. (117)	LOWES			CONTROL	YES	OPT. & RAD.	0	YES	YES	
83	Leominster	LANCASTER ST. (117)	JUNGLE RD.			CONTROL	YES	OPT. & RAD.	0	YES	YES	
84	Leominster	N.MAIN ST. (12)	NICHOLS ST.			CONTROL	YES	OPT. & RAD.	70	YES	YES	
85	Leominster	HARVARD ST.	ORCHARD HILL			CONTROL	YES	OPT. & RAD.	0	YES	no	
86	Leominster	CENTRAL ST. (12)	WILLARD ST.			CONTROL	YES	OPT. & RAD.	59	YES	YES	
87	Leominster	HAMILTON ST.	CRAWFORD ST	RIVER ST.		CONTROL	YES	RADIO	27	YES	YES	
88	Lunenburg	MASSACHUSETTS AVE. (2A)	CHASE RD (13)	HOLLIS RD.		CONTROL	YES	OPT. & RAD.	28	YES	YES	
89	Lunenburg	MASSACHUSETTS AVE. (2A)	ELECTRIC AVE.			CONTROL	YES	OPT. & RAD.	22	YES	YES	
90	Lunenburg	MASSACHUSETTS AVE. (2A)	MAIN ST.	SCHOOL ST.		CONTROL	YES	OPT. & RAD.	0	YES	YES	
91	Lunenburg	WHALOM RD.	ELECTRIC AVE.			CONTROL	YES	OPT. & RAD.	0	YES	YES	
103	Townsend	MAIN ST. (119)	SOUTH ST.	SPAULDING ST.		CONTROL	YES	OPTICOM	0	YES	YES	
104	Townsend	MAIN ST. (119)	BROOKLINE ST.	ELM ST. (13)		CONTROL	no		41	YES	YES	7
106	Westminster	STATE RD. EAST	HAGER PARK RD	EAST MAIN ST. (2A)		CONTROL	no		9	YES	YES	10
107	Westminster	MAIN ST. (2A)	BACON ST.			CONTROL	YES	OPTICOM	0	YES	YES	
108	Westminster	W. MAIN ST. (2A	SIMPLEX DR.	RTE. 2W RAMP		CONTROL	YES	OPTICOM	83	YES	YES	
109	Winchendon	GARDNER RD. (140)	SPRING ST. (12)			CONTROL	no		0	YES	YES	20
110	Sterling	RT 140	DANA HILL RD.	LEGG RD.		CONTROL	YES	OPTICOM	0	YES	YES	

Appendix Chart III: Emergency Transport Routes

CITY/TOWN	ROUTE/ROAD
Multiple	**Rte. 2**
Multiple	**Rte. I190**
Multiple	**Rte. 2A** From Orange TL to Exit 25 on Rte. 2 in Westminster From Rte. 31 in Fitchburg to Littleton TL
Multiple	**Rte. 12**
Multiple	**Rte. 13**
Multiple	**Rte. 31**
Multiple	**Rte. 32**
Multiple	**Rte. 32A**
Multiple	**Rte. 62** From Princeton TL to Berlin TL
Multiple	**Rte. 68** From Royalston Center to Rutland TL
Multiple	**Rte. 70** From Rte. 117 in Lancaster to Boylston TL
Multiple	**Rte. 101**
Multiple	**Rte. 110**
Multiple	**Rte. 111**
Multiple	**Rte. 117**
Multiple	**Rte. 119** From Ashburnham Center to Littleton TL
Multiple	**Rte. 122** From Petersham Center to New Athol Rd.
Multiple	**Rte. 140**
Ashburnham	Rindge Turnpike
Ashby	Rindge Rd.
Athol	New Sherborn Rd.
Athol	Pleasant St.
Athol	Chestnut Hill Ave.
Ayer	Washington St.
Ayer	Groton Rd.
Ayer	Central Ave
Ayer	Sand Pond Rd. from Central Ave to Westford Rd.
Ayer	Westford Rd.
Ayer	West Main St.
Ayer	Groton St.
Clinton	Water St.
Clinton	Bolton Rd.
Clinton	Highland St.
Clinton	Greeley St. from Rte. 62 to Highland St.
Fitchburg	Rindge Rd. from Ashby TL to Rte. 31
Fitchburg	John Fitch HWY
Fitchburg	Bemis Rd.
Fitchburg	South St.
Fitchburg	Depot St.
Fitchburg	Franklin Rd. from Depot St. to Electric Ave.
Fitchburg	Electric Ave.
Fitchburg	Boulder Dr.
Fitchburg	Main St. from Rte. 31 to Rte. 2A
Gardner	Green St.
Gardner	Woodland Ave.
Gardner	Matthews St.
Gardner	Elm St.
Gardner	Pearson Blvd.
Gardner	South Main St.
Gardner	Union St.
Gardner	Betty Spring Rd.
Groton	Old Ayer Rd.
Lancaster	Shirley Rd. from Shirley TL to Rte. 2
Leominster	Priest St.
Leominster	Hamilton St.
Leominster	North St. from Fitchburg TL to Rte. 13

CITY/TOWN	ROUTE/ROAD
Leominster	Day St.
Leominster	Prospect St.
Leominster	Mechanic St. from Main St. to Leominster Connector
Leominster	Washington St. from Merriam Ave. to Rte. 12
Leominster	Merriam Ave
Leominster	Leominster Connector
Lunenburg	Leominster Rd.
Petersham	New Athol Rd.
Royalston	Athol Rd.
Shirley	Main St.
Shirley	Front St.
Shirley	Lancaster Rd.
Shirley	Center Rd.
Sterling	Dana Hill Rd.
Sterling	Muddy Pond Rd.
Sterling	Greenland Rd. from Rte. 12 to Muddy Pond Rd.
Sterling	Pratts Junction Rd.
Sterling	Chocksett Rd.
Templeton	Baldwinville Rd.

Appendix Chart IV: Emergency Access Routes

CITY/TOWN	ROUTE/ROAD
Multiple	Rte. 2 East & West
Multiple	Rte. 2A
Multiple	Rte. 12
Multiple	Rte. 13
Multiple	Rte. 31
Multiple	Rte. 32
Multiple	Rte. 32A
Multiple	Rte. 62
Multiple	Rte. 68
Multiple	Rte. 70
Multiple	Rte. 101
Multiple	Rte. 110
Multiple	Rte. 111
Multiple	Rte. 117
Multiple	Rte. 119
Multiple	Rte. 122
Multiple	Rte. 140
Multiple	Rte. 190 North & South
Multiple	Rte. 495 North & South
Ashburnham	South Main St.
Ashburnham	Westminster St.
Athol	Daniel Shays HWY
Athol	Partridgeville Rd. (from Orange TL to Eagleville Rd.)
Athol	Eagleville Rd.
Athol	South Athol Rd.
Athol	Carbon St.
Athol	Exchange St.
Athol	Hapgood St.
Athol	Chestnut St. (from Main St. to Hapgood St.)
Athol	Riverbend St.
Athol	School St.
Athol	Traverse St.
Athol	Pleasant St.
Athol	Bridge St.
Athol	Chestnut Hill Ave.
Athol	North Orange Rd.
Athol	Pinedale Ave.
Athol	Pequoig Ave.
Athol	Wellington St. (from Crescent St. to Pequoig Ave)
Athol	Lenox St. (from Pinedale Ave. to Silver Lake St. [Rte. 32])
Athol	Mt. Pleasant St. (from Main St. [Rte. 2A] to North Orange Rd.)
Ayer	Groton Shirley Rd.
Ayer	Washington St.
Ayer	West Main St.
Ayer	Central Ave.
Ayer	Sandy Pond Rd.
Ayer	Westford Rd.
Ayer	Willow Rd. (from Commuter Rail tracks to Westford Rd.)
Ayer	Groton Harvard Rd.
Ayer	Old Groton Rd.
Ayer	Columbia St. (from Main St. to Central Ave.)
Clinton	Greeley St.
Clinton	Woodlawn St. (from Rigby St. to Pine St.)
Clinton	Pine St. (from Woodlawn St. to New Harbor Rd.)
Clinton	New Harbor Rd.
Clinton	Franklin St.
Clinton	Beacon St.
Clinton	South Meadow Rd.
Clinton	Brook St.

CITY/TOWN	ROUTE/ROAD
Groton	Townsend Rd.
Groton	Pepperell Rd.
Groton	Broadmeadow Rd.
Groton	Old Ayer Rd.
Groton	School St.
Groton	Hollis St.
Groton	Chicopee Row Rd.
Groton	Longley Rd.
Groton	Nashua Rd.
Groton	Sandy Pond Rd.
Harvard	Stow Rd. (from Eldridge Rd. to Codman hill Rd.)
Hubbardston	Barre Rd.
Hubbardston	Elm St.
Hubbardston	Brigham St.
Hubbardston	New Westminster Rd.
Hubbardston	Williamsville Rd. (from Barre TL to Burnshirt Rd.)
Hubbardston	Burnshirt Rd.
Lancaster	Bolton Rd.
Lancaster	Center Bridge Rd.
Lancaster	Old Common Rd.
Lancaster	Mill St.
Lancaster	Chace Hill Rd.
Lancaster	Deershorn Rd.
Lancaster	Sterling Rd. (from Deershorn Rd. to Main St.)
Lancaster	South Meadow Rd. (from Clinton TL to Sterling St.)
Lancaster	Parker Rd.
Lancaster	Shirley Rd. (from Shirley TL to Fort Pond Rd.)
Lancaster	Fort Pond Rd.
Lancaster	George Hill Rd. (from Main St. to Bolton Rd.)
Leominster	North St.
Leominster	Lincoln St.
Leominster	Eastern Ave
Leominster	Industrial Rd. (from Eastern Ave to Tolman Ave.)
Leominster	Tolman Ave. (from Main St. [Rte. 13] to Industrial Rd.)
Leominster	Day St.
Leominster	Joslin St.
Leominster	Pierce St. (from Joslin St. to Vista Ave./Haskell Ave.)
Leominster	Vista Ave
Leominster	Haskell Ave.
Leominster	Prospect St.
Leominster	Harvard St.
Leominster	Nashua St.
Leominster	Crawford St.
Leominster	Beacon St.
Leominster	Fairmont St.
Leominster	Mill St.
Leominster	Priest St.
Leominster	Lindell Ave. (from Rte. 12 [N. Main St.] to Maple St.)
Leominster	Grove Ave.
Leominster	Washington St.
Leominster	Walnut St.
Leominster	Abbot Ave.
Leominster	Blossom St.
Leominster	Merriam Ave.
Leominster	Granite St. (from West St. to Kingman Dr.)
Leominster	Kingman Dr.
Leominster	Exchange St. (from Kingman Dr. to West St.)
Leominster	Orchard St. (from Merriam Ave to West St.)
Leominster	Pond St.

CITY/TOWN	ROUTE/ROAD
Clinton	Grove St. (from Beacon St. to Chestnut St.)
Clinton	High St.
Clinton	Walnut St. (from Union St. to Water St.)
Clinton	Church St. (from Main St. to Chestnut St.)
Clinton	Cameron St.
Clinton	Oak St. (from Boylston St. to Berlin St.)
Clinton	Berlin St.
Clinton	Water St.
Clinton	Bolton Rd.
Clinton	Branch St.
Clinton	Vale St. (from Branch St. to Water St.)
Clinton	Allen St.
Clinton	Plain St. (from Main St. to High St.)
Clinton	Highland St. (from Sterling St. to Greeley St.)
Clinton	Green St.
Clinton	Rigby St. (from Greeley St. to Woodlawn St.)
Fitchburg	Pearl St.
Fitchburg	Coolidge Ave.
Fitchburg	Klondike Ave.
Fitchburg	Boutelle St.
Fitchburg	North St.
Fitchburg	Blossom St.
Fitchburg	Academy St. (from Main St. to High St.)
Fitchburg	High St. (from Academy St. to Mechanic St.)
Fitchburg	Boulder Dr. (from Main St./Snow St. intersection to Cushing St.)
Fitchburg	Summer St.
Fitchburg	Harvard St.
Fitchburg	Bemis Rd.
Fitchburg	Wanoosnoc Rd. (from Bemis Rd. to South St.)
Fitchburg	Intervale Rd.
Fitchburg	Airport Rd.
Fitchburg	Crawford St.
Fitchburg	Benson St.
Fitchburg	Abbott Ave.
Fitchburg	Whalon St.
Fitchburg	South St. (from Whalon St. to Laurel St.)
Fitchburg	Birch St. (from Water St. to Heywood St.)
Fitchburg	Canton St.
Fitchburg	Heywood St. (from Old South St. to Birch St.)
Fitchburg	Old South St. (from Heywood St. to Electric Ave./South St. intersection)
Fitchburg	Electric Ave.
Fitchburg	Franklin Rd. (from Depot St. to Rollstone St.)
Fitchburg	Depot St.
Fitchburg	Oak Hill Rd.
Fitchburg	Mt. Elam Rd.
Fitchburg	Rollstone St.
Fitchburg	Pine St.
Fitchburg	Pratt Rd.
Fitchburg	St. Joseph Ave.
Fitchburg	Fairmount St.
Fitchburg	Fairmount Pl.
Fitchburg	Beech St.
Fitchburg	River St. (from Oak Hill Rd. to Daniels St.)
Fitchburg	Daniels St. (from Clarendon St. to Kimball St.)
Fitchburg	Reingold Ave.
Fitchburg	Laurel St.
Fitchburg	Putnam St.
Fitchburg	Fifth Mass. TPK (from Oak Hill Rd. to Princeton Rd.)
Fitchburg	Ashburnham St.
Fitchburg	Ashburnham Hill Rd.
Fitchburg	Wallace St.
Fitchburg	Main St. (from Ashburnham Hill Rd. to River St.)

CITY/TOWN	ROUTE/ROAD
Leominster	Pleasant St.
Leominster	Franklin St.
Leominster	Union St.
Leominster	Litchfield St.
Leominster	Willard St. (from Central St. to Lancaster St.)
Leominster	Watchusett St.
Leominster	Elm St. (from Wachusett St. to Sterling TL)
Leominster	Viscoloid Ave.
Leominster	Sixth St. (from Lancaster St. to Mechanic St.)
Leominster	Mechanic St.
Leominster	Leominster Connector
Leominster	Whitney St.
Leominster	Water St. (from Main St. to Whitney St.)
Leominster	West St. (from Main St. to Maple Ave.)
Leominster	Maple Ave.
Lunenburg	Townsend Harbor Rd.
Lunenburg	Leominster Rd.
Lunenburg	Lancaster Ave.
Lunenburg	Leominster-Shirley Rd.
Lunenburg	Fort Pond Rd.
Lunenburg	Prospect St.
Lunenburg	Whalom Rd.
Lunenburg	Summer St.
Lunenburg	Lakefront Ave.
Lunenburg	Pratt St.
Lunenburg	West St. (from Pratt St. to Pleasant St.)
Lunenburg	Pleasant St.
Lunenburg	White St.
Lunenburg	West Townsend Rd.
Lunenburg	New West Townsend Rd.
Lunenburg	Northfield Rd. (from Chase Rd. to Highland St.)
Lunenburg	Highland St.
Lunenburg	Main St.
Lunenburg	Fish St.
Phillipston	Petersham Rd.
Royalston	Winchendon Rd.
Royalston	Athol Rd.
Shirley	Townsend Rd.
Shirley	Lawton Rd.
Shirley	Parker Rd.
Shirley	Center Rd.
Shirley	Leominster Rd.
Shirley	Main St.
Shirley	Front St.
Shirley	Lancaster Rd.
Shirley	Walker Rd.
Sterling	Greenland Rd.
Sterling	Dana Hill Rd.
Sterling	Muddy Pond Rd.
Sterling	Boutelle Rd.
Sterling	Campground Rd.
Sterling	Gates Rd.
Sterling	Squareshire Rd. (from Campground Rd. to Chace Hill Rd.)
Sterling	Chace Hill Rd. (from Rte 110 to Swett Hill Rd.)
Sterling	Swett Hill Rd.
Sterling	Kendall Hill Rd. (from Maple St. to Swett Hill Rd.)
Sterling	Maple St. (from Main St. to Kendall Hill Rd.)
Sterling	Redstone Hill Rd. (from Clinton Rd. to Rugg Rd.)
Sterling	Meetinghouse Hill Rd. (from Main St. to Rowley Hill Rd.)
Sterling	Rowley Hill Rd. (from Meetinghouse Hill Rd. to Rte. 190 overpass)
Sterling	Pratts Junction Rd.
Sterling	Chocksett Rd.

CITY/TOWN	ROUTE/ROAD
Fitchburg	Richardson Rd. (from Fisher Rd. to Ashby State Rd. [Rte. 31])
Gardner	Matthews St.
Gardner	Betty Springs Rd.
Gardner	Green St. (from Rte. 140 to Elm St.)
Gardner	Elm St.
Gardner	Woodland Ave.
Gardner	Chestnut St.
Gardner	Cross St.
Gardner	Cross St. EXT.
Gardner	Lawrence St. (from Pearl St. to Cross St. EXT.)
Gardner	Pine St.
Gardner	Logan St.
Gardner	Sherman St.
Gardner	Main St. (from Pearson BLVD. to Rte. 68)
Gardner	Pearson BLVD.
Gardner	VFW Circle
Gardner	South Main St.
Gardner	Union St.
Gardner	Minott St.
Gardner	Emerald St.
Gardner	Pleasant St.
Gardner	Baker St. (from Pleasant St. to Waterford St.)
Gardner	Waterford St. (from Rte. 101 to Baker St.)
Gardner	City Hall Ave.
Gardner	Greenwood St. (from Pleasant St. to Baker St.)
Gardner	Elm St.
Gardner	Park St.
Gardner	Eaton St.
Gardner	Oak St.
Gardner	Racette Ave.
Gardner	Sand St.
Gardner	Coleman St.
Gardner	Clark St. (from Park St. to Racette Ave.)
Gardner	Nichols St. (from Parker St. [Rte. 101] to Baker St.)
Gardner	Temple St.
Gardner	Union Sq.
Gardner	Willow St.

CITY/TOWN	ROUTE/ROAD
Templeton	North Main St. (from Rte 101/2A intersection to Depot Rd.)
Templeton	Depot Rd.
Templeton	Baldwinville Rd.
Templeton	Hubbardston Rd.
Templeton	South Main St. (from Rte. 101/2A intersection to Cross St.)
Templeton	Cross Rd.
Templeton	Barre Rd.
Templeton	Bridge St.
Templeton	Main St.
Townsend	Lunenburg Rd.
Townsend	West Elm St.
Townsend	Canal St.
Townsend	Mason Rd.
Townsend	New Fitchburg Rd. (from Rte. 119 to Vinton Pond Rd./Bayberry Hill Rd. intersection)
Townsend	Warren Rd.
Townsend	South St.
Townsend	Shirley Rd.
Westminster	South Ashburnham Rd.
Westminster	Bacon St.
Westminster	North Common Rd. (from Bacon St. to Oakmont Ave.)
Westminster	Oakmont Ave.
Westminster	Minott Rd. (from Gardner CL to intersection of Whitney St./Ellis Rd.)
Westminster	South St.
Westminster	Mile Hill Rd.
Westminster	Gatehouse Rd.
Westminster	East Rd.
Westminster	Stonehill Rd.
Westminster	Narrows Rd.
Westminster	Depot Rd.
Winchendon	Glenallan St. (from Spring St. to Rte. 202 to the New Hampshire SL)
Winchendon	Elmwood Rd. (from Central St. to Glenallan St.)
Winchendon	Central St. (from Maple St. to Elmwood Rd.)
Winchendon	Hall Rd.
Winchendon	High St. (from Central St. to Teel Rd.)
Winchendon	Teel Rd. (from High St. to Hall Rd.)
Winchendon	River St.

Appendix Chart V: Dangerous Intersections and Interchanges in the Montachusett Region

(Signalized intersections in RED; Intersections with at least one fatality in **BOLD**)

City/Town	*Community Rank*	*Region Rank*	*Intersections and Interchanges*	*EPDO Total*	*Total Crashes*	*Comments*
Leominster	**1**	**1**	**Rte. 2 (Exit 31)/N Main St. (Rte. 12)**	**384**	**192**	**Needs study**
Leominster	**2**	**2**	**Rte. 2 (Exit 32)/Main St. (Rte. 13)**	**240**	**120**	**Study completed, further study needed**
Lancaster	**1**	**3**	**Rte. 2 (Exit 35)/Lunenburg Rd. (Rte. 70)/Old Union Tnpk./Fort Pond Rd.**	**234**	**106**	**Study completed, further study needed**
Harvard	**1**	**4**	**Rte. 2 (Exit 38)/Ayer Rd. (Rte. 110;Rte. 111)**	**231**	**111**	**Needs study**
Leominster	3	5	Main St (Rt 13)/Nashua St/Hamilton St	208	108	Needs study
Leominster	4	6	Rte 2/Rte 190	206	74	Needs study
Leominster	5	7	Monument Square (Main St/Mechanic St)	198	98	Needs study
Leominster	6	8	N Main St. (Rte 12)/Nelson St./Water Tower Pl./Fruit St.	188	96	Study completed, improvements recommended
Westminster	**1**	**9**	**Rte. 2/140 (Exit 25)/State Rd. East (Rte 2A)/Hagar Park Rd.**	**180**	**70**	**Needs study**
Sterling	**1**	**10**	**Rte. 190 (Exit 6)/Leominster Rd. (Rte. 12)**	**167**	**70**	**Needs study**
Fitchburg	1	11	Bemis Rd./John Fitch HWY./Summer St.	166	82	Improvements completed, needs follow up
Fitchburg	2	12	John Fitch HWY/Lunenburg St. (Rte.2A)	165	81	Safety audit completed
Westminster	**2**	**13**	**Rte. 2 (Exit 24)/W Main St. (Rte. 140)**	**163**	**82**	**Improvements completed, needs follow up**
Leominster	7	14	Leominster Connector/Nashua St.	161	73	Improvements completed, needs follow up
Leominster	8	15	N Main St (Rte 12)/Lindell Ave./Hamilton St	155	75	Study completed, improvements recommended
Lancaster	**2**	**16**	**Rte. 2 (Exit 36)/Shirley Rd/Fort Pond Rd./Old Union Tnpk**	**133**	**61**	**Needs study**
Fitchburg	3	17	Rte. 2/Mount Elam Rd.	119	51	Study completed, improvements recommended
Fitchburg	4	18	Water St. (Rte. 12)/Wanoosnoc Rd./Bemis Rd.	113	57	Construction
Gardner	1	19	Pearl St. (Rte. 101)/Rte. 140	110	42	Improvements completed, needs follow up
Fitchburg	5	20	South St./Electric Ave./ Old South St.	105	41	Needs study
Leominster	9	21	Merriam Ave./Lindell Ave.	97	45	Study completed, improvements recommended
Lunenburg	1	22	Massachusetts Ave. (Rte. 2A;Rte. 13)/Electric Ave. (Rte. 13)	96	40	Needs study
Westminster	**3**	**22**	**Rte. 2 (Exit 27)/Depot Rd./Narrows Rd.** (Exit also in Fitchburg)	**96**	**40**	**Needs study**
Fitchburg	6	24	South St./Wanoosnoc Rd./Whalon St.	96	52	Needs study
Fitchburg	**7**	**25**	**Rte. 2 (Exit 28)/Princeton Rd. (Rte. 31)**	**93**	**53**	**Needs study**
Phillipston	**1**	**26**	**Rte. 2 (Exit 19)/Rte. 2A/Rte. 202** (Exit also in Templeton)	**91**	**31**	**Needs study**
Leominster	10	27	Hamilton St./Crawford St./River St.	90	43	Improvements completed, needs follow up
Lunenburg	2	28	Massachusetts Ave. (Rte. 2A;Rte. 13)/Chase Rd. (Rte. 13)	89	33	Needs study
Gardner	**2**	**29**	**Rte. 2 (Exit 22)/Pearson BLVD.**	**89**	**49**	**Improvements completed, needs follow up**

City/Town	*Community Rank*	*Region Rank*	*Intersections and Interchanges*	*EPDO Total*	*Total Crashes*	*Comments*
Gardner	3	30	Elm St./Central St.(Rte.101)/Pearl St.(Rte.101)/Green St.	88	40	Needs study
Leominster	11	31	Central St. (Rte 12)/Litchfield St.	87	39	Needs study
Lancaster	**3**	**32**	**Rte. 2 (Exit 37)/Jackson Rd.**	**87**	**43**	**Improvements completed, needs follow up**
Gardner	4	33	West Broadway (Rte.2A)/Timpany BLVD. (Rte.68)	84	40	Needs study
Fitchburg	8	34	Bemis Rd./Airport Rd. *	82	30	Needs study
Sterling	2	34	Leominster Rd. (Rte. 12)/Chocksett Rd.	82	30	Design
Leominster	**12**	**36**	**Rte. 2 (Exit 30)/Merriam Ave./Whalon St.** (exit also in Fitchburg)	**80**	**36**	**Needs study**
Fitchburg	**9**	**37**	**Rte.2 (Exit 30)/Whalon St./Merriam Ave.** (Exit also in Leominster)	**80**	**40**	**Study completed, further study needed**
Lancaster	**4**	**38**	**Rte. 190 (Exit 7)/N Main St (Rte. 117)**	**79**	**30**	**Improvements completed, needs follow up**
Templeton	**1**	**39**	**Rte. 2 (Exit 21)/Patriots Rd. (Rte. 2A)**	**79**	**31**	**Needs study**
Fitchburg	10	40	Kimble St. (Rte.12)/Laurel St./Cross St./Putnam St.	78	38	Needs study
Townsend	1	41	Main St. (Rte. 119)/Elm St. (Rte. 13)	78	46	Needs study
Leominster	13	42	Mechanic St./ Water St. (Depot Sq.)	77	37	Needs study
Fitchburg	11	43	Mechanic St. (Rte.31)/John Fitch Hwy/ Rindge Rd./Ashby State. Rd.	76	36	Design
Fitchburg	12	44	Main St. (Rte. 2A)/Rollstone St./Academy St.	75	32	Needs study
Leominster	14	45	N Main St (Rte 12)/Erdman Way	74	38	Improvements in progress
Gardner	**5**	**46**	**Rte. 2 (Exit 23)/Timpany BLVD.**	**73**	**28**	**Improvements completed, needs follow up**
Fitchburg	13	47	Water St. (Rte. 12)/Main St. (Rte. 2A)/Day St.	70	34	Needs study
Leominster	15	48	Main St (Rte 13)/River St	70	42	Improvements completed, needs follow up
Gardner	6	49	Elm St./Temple St.	69	28	Needs study
Sterling	**3**	**50**	**Rte. 190 (Exit 5)/Redemption Rock Tr (Rte. 140)** (also in Holdon)	**69**	**29**	**Needs study**
Leominster	16	51	Main St. (Rte 13)/North St.	67	31	Improvements completed, needs follow up
Clinton	1	52	Main St. (Rte.70)/Brook St. (Rte.62)	66	26	Improvements completed, needs follow up
Gardner	7	53	Parker St. (Rte. 101)/Nichols St.	63	35	Needs study
Fitchburg	14	54	Main St. (Rte 2A)/North St.	62	22	Construction
Lunenburg	3	54	Massachusetts Ave. (Rte. 2A)/White St.	62	22	Needs study
Leominster	17	56	N Main St. (Rte 12)/State St./Holman Ave.	61	25	Improvements in progress
Leominster	18	57	Central St. (Rte 12)/Grant St./Beth Ave.	60	20	Needs study
Townsend	2	58	Main St. (Rte. 119)/West Elm St./Canal St.	60	28	Needs study
Fitchburg	15	59	Summer St./Harvard St.	59	27	Needs study
Leominster	19	59	Central St (Rte 12)/Willard St.	59	27	Design
Leominster	20	61	Mill St./Haws St./Sack Blvd	57	33	Needs study
Winchendon	1	62	Spring St. (Rte 12)/ Glenallan St. (Rte 202)/ Hall Rd.	56	20	Needs study
Leominster	**21**	**63**	**Rte. 2 (Exit 34)/Mechanic St./Harvard St.**	**56**	**24**	**Improvements completed, needs follow up**
Leominster	22	64	Merriam Ave./Washington St.	55	23	Needs study

City/Town	*Community Rank*	*Region Rank*	*Intersections and Interchanges*	*EPDO Total*	*Total Crashes*	*Comments*
Leominster	23	65	Main St (Rt 13)/Prospect St.	55	31	Needs study
Fitchburg	16	66	Westminster St. (Rte. 2A)/Princeton Rd. (Rte. 12)	54	26	Needs study
Leominster	24	67	Main St. (Rte 13)/N Main St. (Rte 12)/High St./Mill St.	54	30	Needs study
Athol	1	68	South Main St.(Rte 2A)/Daniel Shays HWY	53	21	Needs study
Groton	1	68	Main St. (Rte. 119;Rte. 225)/Lowell Rd. (Rte. 40)/Broadmeadow Rd.	53	21	Needs study
Leominster	25	70	N Main St (Rte 12)/Nichols St./Battles St.	53	25	Improvements in progress
Leominster	26	71	Main St. (Rte 13)/Haws St.	53	33	Needs study
Fitchburg	17	72	Bemis Rd./Intervale Rd.	52	28	Needs study
Leominster	27	73	Main St. (Rte 12)/Merriam Ave./Columbia St.	52	32	Needs study
Fitchburg	18	74	Water St. (Rte. 12)/Benson St.	51	23	Construction
Leominster	28	75	Lancaster St. (Rte 117)/Elm Hill Ave.	50	18	Needs study
Leominster	28	75	Merriam Ave./Blossom St.	50	18	Needs study
Gardner	8	77	Timplany BLVD. (Rte. 68)/American Legion Circle	50	22	Needs study
Lancaster	5	78	High St. (Rte.110)/Bolton Rd.(Rte.110)/Center Bridge Rd./Old Common Rd.	50	30	Study completed, improvements recommended
Sterling	4	79	Redemption Rock Trail (Rte. 140)/Princeton Rd. (Rte. 62)	49	21	Needs study
Ayer	1	80	Carlton Circle	49	29	Needs study
Fitchburg	19	81	Lunenburg St. (Rte. 2A)/Klondike Ave.	48	16	Needs study
Phillipston	**2**	**81**	**Rte. 2 (Exit 18)/Templeton Rd.** (Exit also in Athol)	**48**	**16**	**Needs study**
Leominster	30	83	Mechanic St./3RD St./Walker St.	48	20	Design
Westminster	4	83	W Main St. (Rte. 140)/Simplex Dr. (opposite Exit 24 ramp)	48	20	Improvements completed, needs follow up
Fitchburg	20	85	Main St. (Rte. 2A)/Central St./Boulder Dr.	48	24	Needs study
Lancaster	6	85	Main St. (Rte.117)/Lunenburg Rd. (Rte. 70)	48	24	Study completed, improvements recommended
Fitchburg	21	86	Main St. (Rte. 2A)/Oliver St.	47	19	Needs study
Groton	2	86	Town Line Rd. (Rte. 119)/Proctor Rd./Townsend Rd.	47	19	Needs study
Leominster	31	86	N Main St (Rte 12)/Washington St./Grove Ave.	47	19	Study completed, improvements recommended
Harvard	2	89	Ayer Rd. (Rte. 110;Rte. 111)/Poor Farm Rd./Lancaster County Rd.	46	14	Needs study
Athol	2	91	Main St. (Rte.2A)/Exchange St.	46	18	Needs study
Fitchburg	22	92	Main St. (Rte.2A)/Summer St./ Lunenburg St. (Rte. 2A)	45	13	Needs study
Leominster	32	93	Mechanic St./Fifth St.	45	17	Needs study
Leominster	33	94	Main St (Rte 13)/Day St	45	21	Needs study
Athol	**3**	**95**	**Rte. 2 (Exit 17)/Rte. 2/Rte. 31**	**44**	**20**	**Needs study**
Fitchburg	23	95	Lunenburg St. (Rte.2A)/Townsend St./Boutelle St.	44	20	Needs study
Templeton	2	95	Gardner Rd. (Rte. 101)/Patriots Rd. (Rte. 2A)/N Main St./S Main St.	44	20	Study completed, improvements recommended
Leominster	34	98	Mechanic St./Leominster Connector/Commercial Rd	44	28	Design
Athol	4	99	Main St. (Rte. 32)/Chestnut St.	42	14	Study completed, further study needed
Fitchburg	24	99	River St.(Rte. 2A;Rte. 31)/Main St. (Rte. 2A)	42	14	Needs study
Fitchburg	25	101	Electric Ave./Rollston Rd.	42	18	Needs study
Leominster	35	101	Central St. (Rte 12)/Union St./Adams St.	42	18	Needs study
Westminster	**5**	**101**	**Rte. 2 (Exit 26)/Village Inn Rd.**	**42**	**18**	**Needs study**

City/Town	*Community Rank*	*Region Rank*	*Intersections and Interchanges*	*EPDO Total*	*Total Crashes*	*Comments*
Ashburnham	1	104	Center St. (Rte. 101)/Corey Hill Rd./ Williams Rd.	40	12	Study completed, improvements recommended
Clinton	2	105	Main St. (Rte.70;Rte.62;Rte110)/Union St. (Rte.70;Rte.62)	40	16	Needs study
Fitchburg	26	105	Electric Ave./Mount Elam Rd.	40	16	Needs study
Leominster	36	105	Lancaster St. (Rte 117)/Willard St.	40	16	Improvements completed, needs follow up
Lunenburg	4	105	Chase Rd. (Rte. 13)/West Townsend Rd.	40	16	Needs study
Westminster	6	105	State Rd. East (Rte. 2A)/Depot Rd./Bartherick Rd.	40	16	Study completed, improvements recommended
Winchendon	2	110	Front St. (Rte 12 & 202)/ School St. (Rte 12)/ River St. (Rte 202)	40	20	Study completed, improvements recommended
Groton	3	111	Main St. (Rte. 119;Rte. 111)/Fitchs Bridge Rd.	39	10	Needs study
Fitchburg	27	112	Clarendon St./Pratt St.	39	11	Needs study
Leominster	37	113	N Main St (Rte 12)/Hospital Rd	39	15	Needs study
Clinton	3	114	Water St. (Rte.110)/Main St. (Rte.70)	39	19	Improvements completed, needs follow up

Appendix List I: ITS Architecture Flow Chart Description of Terms

Architecture Flow	Architecture Flow Description
care facility status	Information regarding facility type and capabilities, facility status, and its ability to admit new patients.
care facility status request	Request for information regarding care facility availability and status.
emergency dispatch requests	Emergency vehicle dispatch instructions including incident location and available information concerning the incident.
emergency vehicle tracking data	The current location and operating status of the emergency vehicle.
local signal preemption request	Direct control signal or message to a signalized intersection that results in preemption of the current control plan and grants right-of-way to the requesting vehicle.
patient status	Information that supports assessment of the patient's condition. Information could include general categorization of patient status, patient vital signs, pertinent medical history, and emergency care information.
request for right-of-way	Forwarded request from signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.
road network conditions	Current and forecasted traffic information, road and weather conditions, traffic incident information, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is also included.
signal control data	Information used to configure and control traffic signal systems.
suggested route	Suggested route for a dispatched emergency or maintenance vehicle that may reflect current network conditions and the additional routing options available to en route emergency or maintenance vehicles that are not available to the general public.

(IBI Group)