CHAPTER 8

Photo: Route 9 in Northampton, MA

CONGESTION

A. INTRODUCTION

Congestion means different things depending on where you are and what mode of transportation you are using. In any case, the consequences of excessive congestion are real: aggressive driving, decreased personal safety, and, eventually, stifled community development. The environment also suffers. Stop-and-go traffic needlessly increases greenhouse gas emissions from vehicles and wastes fuel. Congestion also wastes people's personal and professional time.

Understanding where and why traffic congestion is happening is an important step toward reducing it. The Pioneer Valley Congestion Management Process (CMP) works toward identifying the major traffic congested locations within the Pioneer Valley Region. This information is essential in advancing future transportation improvements that will reduce traffic congestion and improve the overall safety and efficiency of our transportation network.

The CMP is an integrated planning activity. It supports the Metropolitan Planning Organization (MPO) planning process for regional transportation

infrastructure, maintenance, and operating investments. In addition, CMP activities and information are valuable to planning at the municipal level for non-federal transportation investments, as well as for decision-making about land use, environmental protection, housing and community development.

CMP activities are intended to identify existing deficiencies in the regional transportation system through ongoing monitoring and analysis of key performance measures. These performance measures themselves may evolve as a region's transportation capacities, needs, and shortcomings change.

CMP activities are comprehensive. They involve multiple agencies at all levels of government and stakeholders in communities large and small.

PVPC developed a vision to provide a framework for the development of the CMP.

VISION

The Pioneer Valley Congestion Management Process identifies, evaluates, monitors, and implements transportation strategies that enhance the safety and efficiency of the movement of people, goods, and information.

1. Regulatory Context

The current transportation reauthorization bill Fixing Americas Surface Transportation Act (FAST - Act) retains the CMP requirement of the Safe Accountable Flexible Efficient Transportation Equity Act – a Legacy for Users (SAFETEA-LU) and MAP-21. In addition, FAST- Act features 8 steps framework for CMP.

- Develop congestion management objectives;
- Identify areas of application;
- Define system or network of interest;
- Develop performance measures;
- Institute system performance monitoring plan;
- Identify and evaluate strategies;
- Implement selected strategies and manage transportation system;
- Monitor strategy effectiveness.

CMP activities are a continuation of the predecessor Congestion Management System (CMS) process established by the 1991 federal Intermodal Surface Transportation Efficiency Act (ISTEA). PVPC has continuously engaged in congestion monitoring and analysis consistent with federal guidance in support of the MPO process.

2. CMP Development Process

The CMP builds on previous versions completed for the Pioneer Valley Metropolitan Planning Organization. Consistent with Federal Highway Administration (FHWA) guidance, the CMP process for the Pioneer Valley has been broadened to better incorporate assessment of the congestion impacts and benefits experienced by transit, cyclists, and pedestrians. This necessitated a significant review and expansion of performance measures. PVPC therefore took this opportunity to engage in a public and agency review of CMP performance measures. Steps included:

- Generate implementation strategies for all transportation modes;
- Engage agency participants and stakeholders in review of the strategies;
- Identify timeframe for availability;
- Data collection and analysis;
- Public review of preliminary findings.

3. Implementation Strategies

The goal of the CMP is to identify, evaluate, and implement transportation implementation strategies that enhance the safety and efficiency of the movement of people, goods, and information throughout the Pioneer Valley. In order to achieve this goal PVPC identified the strategies necessary to obtain the data needed to fulfill this goal. Implementation Strategies included in the CMP are summarized in Table 8-1. The status of each strategy is based on the availability of existing data. Ongoing strategies have data which is currently collected by the PVPC or available from partner agencies. Immediate strategy data is not currently available but is anticipated to be available in the near future. Future strategy data is also not available but is highly desirable for use in future CMP activities.

Table 8-1 – CMP Implementation Strategies

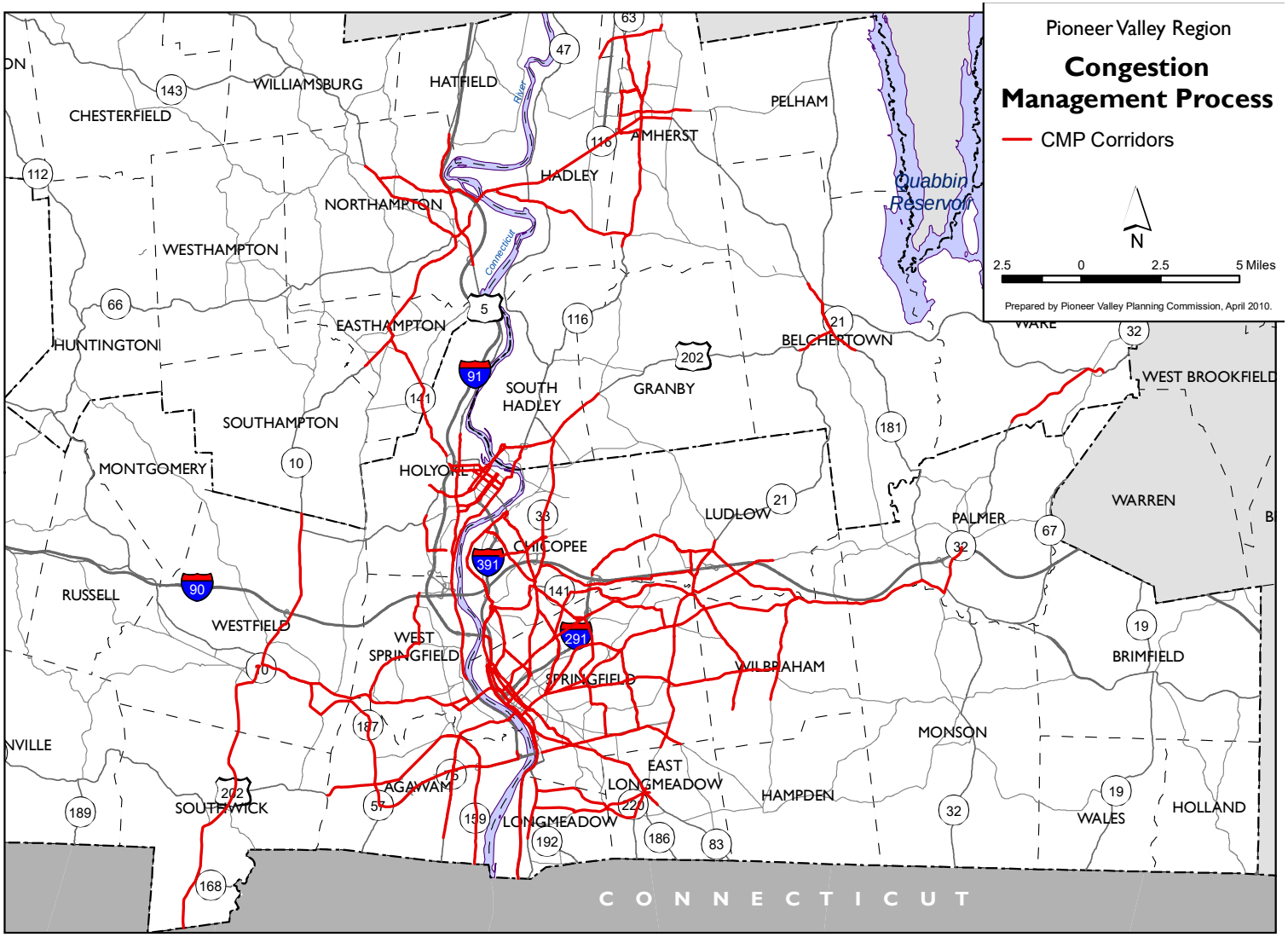
Strategy	Status
Monitor on-time performance, ridership, and customer satisfaction for all transit and paratransit services of the Pioneer Valley Region	Ongoing
Develop regional route Congestion Ratio, Delay per Mile, and Congestion Index through collection of travel time data using NPMRDS data	Ongoing
Inventory and monitor pavement conditions for all federal aid eligible roadways.	Ongoing
Increase awareness and availability of park-and-ride lots in the Pioneer Valley region.	Ongoing
Monitor and update the inventory of bicycle lanes and trails in the region.	Ongoing
Increase the percentage of bicycle rack utilization on buses.	Ongoing
Increase customer satisfaction levels of the bus terminal and shelters.	Ongoing
Increase and inventory the number of municipal bicycle racks in the region.	Ongoing
Identify regional auto/transit mode split.	Future
Identify system wide transportation alternatives and monitor, update, and increase the number of intermodal transfer points.	Future
Decrease the number of structurally deficient Bridges.	Ongoing
Identify safe alternate heavy vehicle routes in the region.	Ongoing
Map travel time contours to show distance traveled in 15 minute intervals.	Ongoing
Identify off-ramps that are operating at above capacity.	Immediate
Increase efficiency of rail system wide.	Immediate
Improve LOS on major intermodal connector routes to the National Highway System.	Future
Monitor and update the percentage of areas without broadband access.	Ongoing
Increase the number of ITS based cameras, variable message boards, and detection units in Region	Ongoing
Continue to utilize car based GPS travel time data collection as appropriate	Ongoing
Improve access to advance information on ongoing construction activity.	Immediate
Data sharing with regional public and private partners.	Immediate
Provide more advance information for transit riders on anticipated vehicle arrival time.	Ongoing
Monitor the average incident response time	Future
Monitor Peak hour loading vs. vehicle rated capacities (load factors).	Ongoing
Monitor transit vehicle crash rate and identify high crash locations	Ongoing
Monitor PVTA customer satisfaction related to safety throughout the PVTA system.	Ongoing
Monitor the EPDO ranking at intersections in the region	Ongoing
Monitor the percent of the Federal Aid Eligible Roadway Network rated as Unreliable	Ongoing
Identify communities in the Pioneer Valley with a Safe Route to School Program.	Ongoing
Annual totals of fatalities and injuries caused by motor vehicle crashes.	Ongoing
Develop Transit Severity Ranking based on the information available from the PVTA AVL	Immediate
Identify data to increase coverage outside the NHS / Interstate system covered by NPMRDS data	Immediate

4. CMP Corridors

The CMP corridors are the basis for all data collection and analysis. When developing the corridors, PVPC staff utilized data and results from previous CMP reports, past congestion relief studies, and general knowledge of the region. This information was used to develop the CMP corridor map of 76 unique corridors that are presented in Figure 8-1.

It is difficult to ensure that every congested roadway in the region is being monitored. While CMP activities are both interactive and comprehensive, the availability of resources and data guides the assessment of congestion in the region. As technology continues to advance, data will become more readily available allowing more corridors to be analyzed in the CMP. PVPC will consider adding corridors at the request of a communities' chief elected official. If requested to do so, PVPC will perform 3 days of travel time data collection. If the data verifies congestion, PVPC will consider adding the corridor. Likewise, PVPC can discontinue a corridor if the corridor is not considered congested based on our CMP process. See appendix for latest CMP report.

Figure 8-1 – CMP Corridors

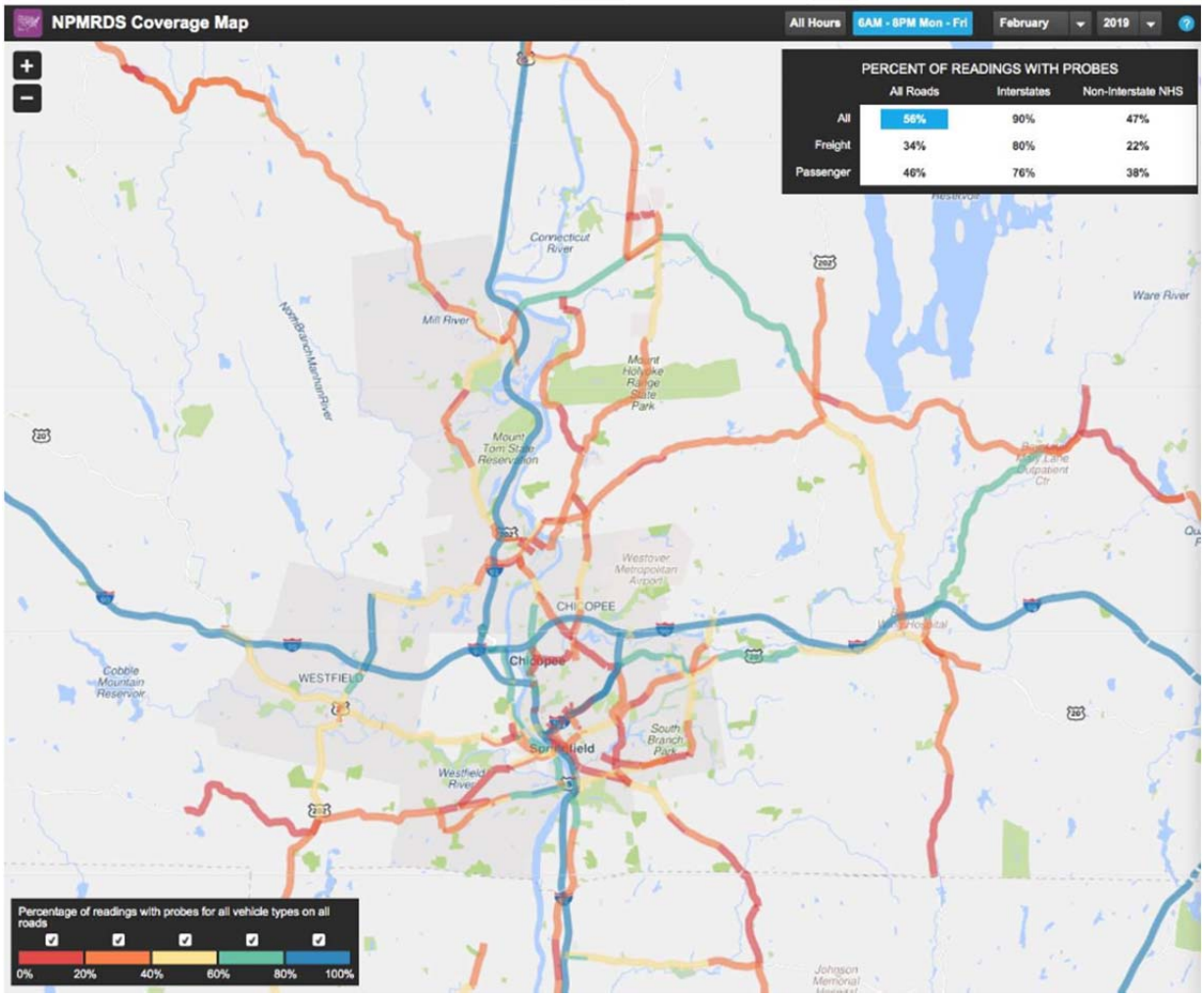


5. National Performance Measures Research Data Set (NPMRDS)

NPMRDS is defined as the baseline dataset to meet the newly established federal congestion and freight performance reporting regulation. Data is available for all state departments of transportation and metropolitan planning organizations; and is available from 2017 to the present. NPMRDS provides consistent data for passenger and commercial freight roadway performance across the National Highway System.

The federal performance measure planning rule (PM3) for congestion only requires states to report on the Interstate and National Highway System (NHS). Figure 1 shows the portion of the roadway network in the Pioneer Valley region covered by the NPMRDS data.

Figure 8-2 – NPMRDS Coverage



PVPC is in the process of integrating NPMRDS data as the primary data used in the CMP. By utilizing NPMRDS data, PVPC can process data for the entire region in a much more efficient and accurate way. Not only does the NPMRDS data allow PVPC to monitor reliability of roadways to meet the PM3, staff can also calculate the Travel Time Index (TTI) by roadway segment. TTI is used to measure congestion intensity. It is the ratio of time spent in traffic during peak traffic times as compared to light or free flow traffic times. By processing TTI by roadway segment, PVPC will be able to identify regional bottlenecks. See Figure 8-3 and 8-4.

For the RTP, PVPC staff has used the same methodology used to determine PM3 reliability by roadway segment to determine TTI. Staff will reevaluate the methodology and modify it to better meet the needs of the CMP.

Figure 8-3 – Travel Time Index – Urban (2017)

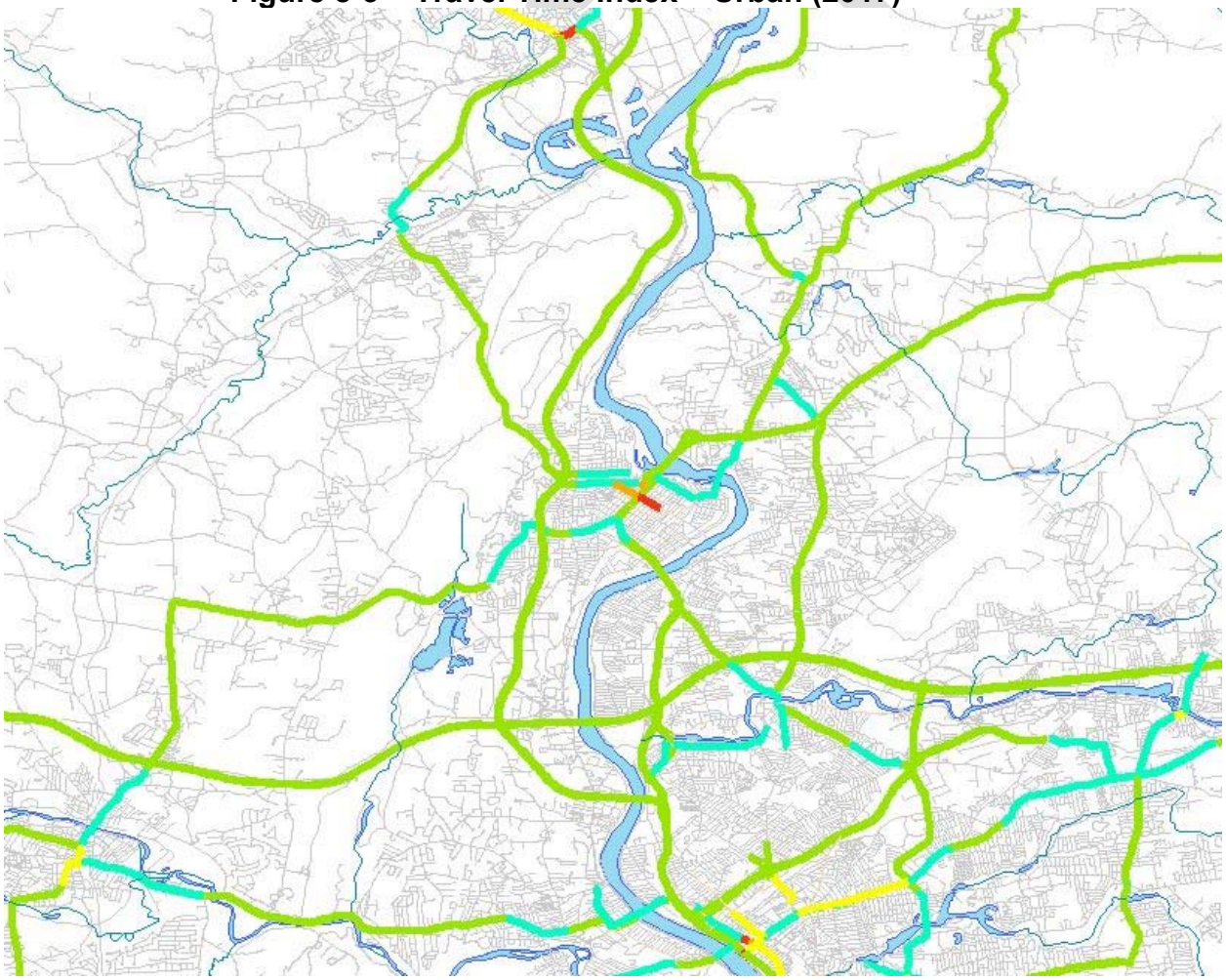
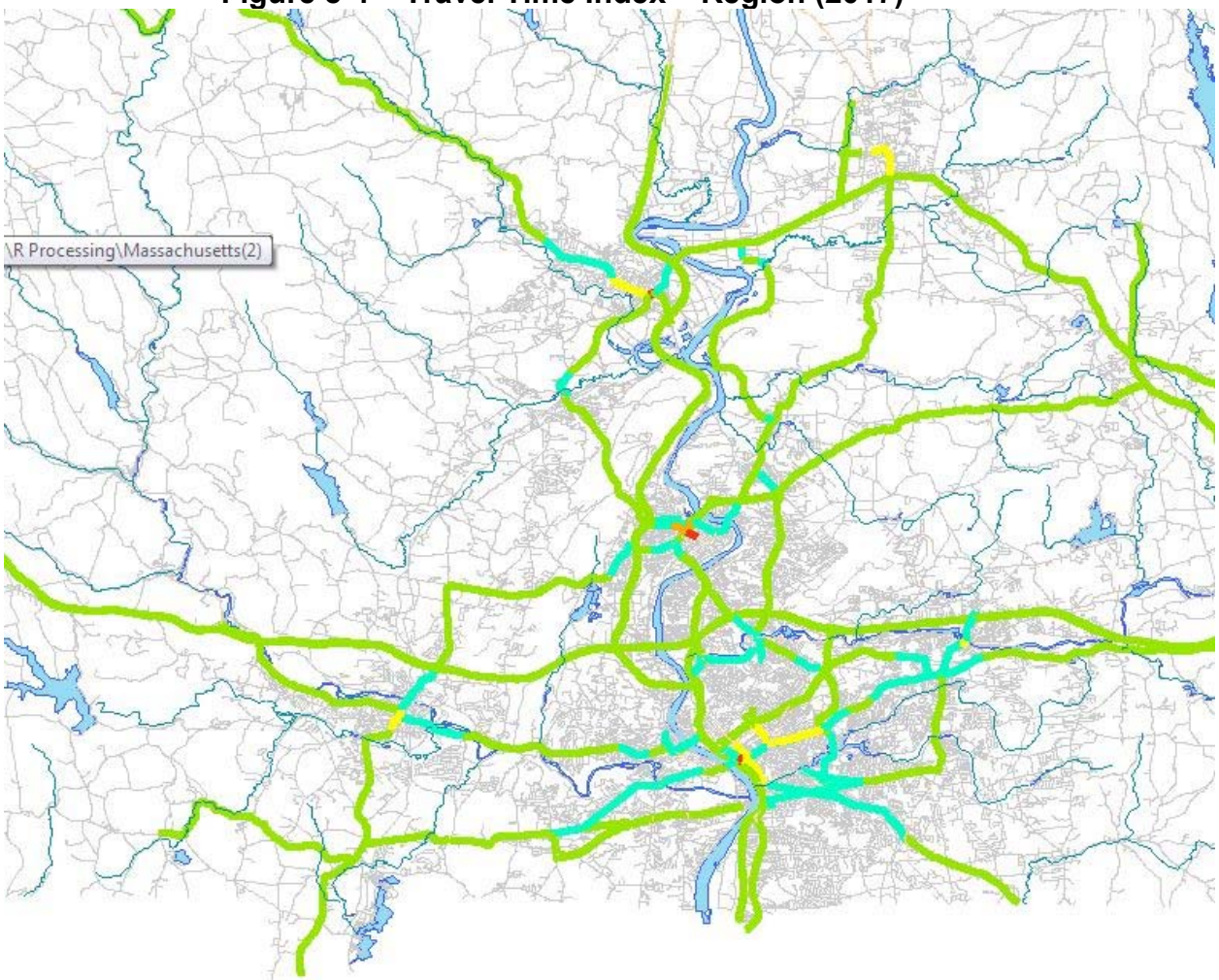


Figure 8-4 – Travel Time Index – Region (2017)



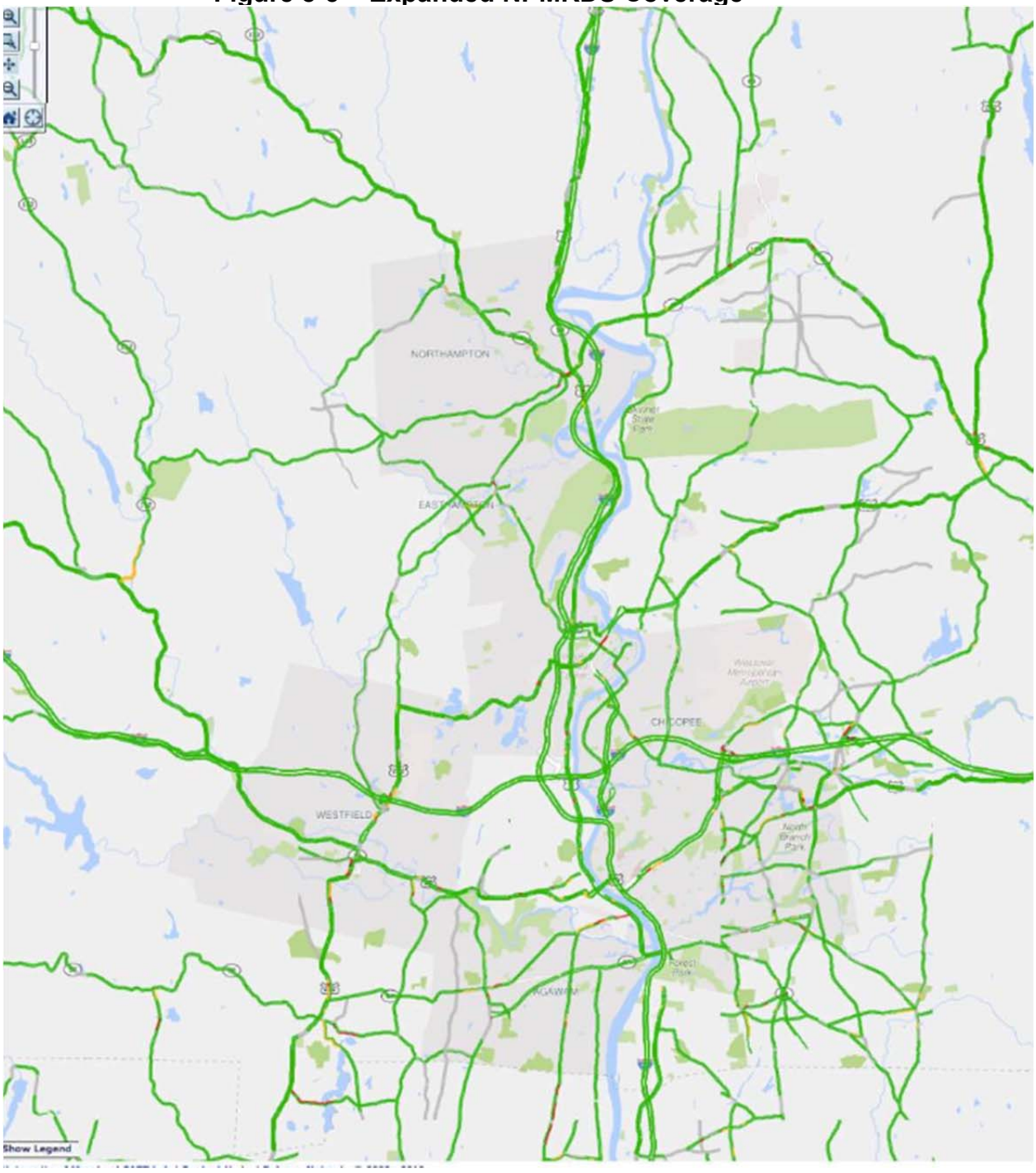
As can be seen in Figure 8-3 and 8-4 the majority of the congestion (red, orange, and yellow) are located in the urban centers in close proximity to the interstate system. Red locations are indicated by any roadway segment with a TTI greater than 2, Orange or those segments between 1.75 and 1.99, and Yellow are between 1.5 and 1.74. For reference a TTI of 2 indicates a travel time twice that of the free flow travel time. PVPC will integrate 2018 data into the process before updating the CMP report and the Top bottleneck report.

6. Expanded NPMRDS Data

Although NPMRDS data meets the requirements of PM3, is does not sufficiently cover the roadway network in the Pioneer Valley Region. PVPC is in the process of identifying resources to acquire expanded NPMRDS data. Figure 8-5 illustrates the coverage of the expanded data in our region. Although the expanded NPMRDS data would not provide full roadway coverage, we believe the data would work sufficiently for our CMP and Regional Bottleneck reports. Manual data may still be

needed on a small scale to verify congestion or to fill in gaps on known congestion routes.

Figure 8-5 – Expanded NPMRDS Coverage



B. CONGESTION STUDIES

As part of the CMP process, PVPC is required to monitor and develop strategies to improve congestion in the region. Under this section we have identified several proposed locations PVPC can perform congestion studies in a future UPWP as well of a list of TIP projects that may improve congestion within the Pioneer Valley Region. Many locations identified as a regional bottleneck or a corridor of serious congestion do not appear in Table 8-2 as a candidate for a future study as they were determined to have a planned transportation improvement project to reduce congestion, a planned congestion study, or have a recently completed study.

Table 8-2 – Potential Congestion Studies to be advanced through a Future UPWP

Location	Study
Region wide	Develop a congestion "Toolbox" which will contain various congestion management strategies which can be applied to locations identified as being congested. Strategies will be based on type and extent of congestion
Region wide	Update the Top 15 Bottlenecks report – NPMRDS Data
PVTA Service Area	Advance the "Transit Congestion Severity" calculation based on the data discussed in the transit congestion severity section of this chapter
Interstate and NHS Off Ramp Study	Study existing congestion that causes traffic to queue back onto the highway
Regional Corridor Updates	Evaluate the existing CMP corridors and evaluate for future CMP update based on availability of data.
Regional Corridor Congestion Ranking	Update corridor ranking based on NPMRDS and expanded NPMRDS data
Region Wide	Analysis of Top Bottleneck locations based on NPMRDS data

Table 8-3 – TIP Projects that May Improve Congestion

Current TIP	Municipality	SID	Project Name and Description	Estimated Cost
2020	Northampton	608236	NORTHAMPTON- RECONSTRUCTION OF DAMON ROAD, FROM ROUTE 9 TO ROUTE 5	$ 10,043,653
2020	Chicopee	604434	RECONSTRUCTION & RELATED WORK ON FULLER ROAD, FROM MEMORIAL DR (RTE 33) TO SHAWINIGAN DR (2.0 MILES)	$ 8,034,211
	Springfield	608717	SPRINGFIELD- RECONSTRUCTION OF SUMNER AVE AT DICKINSON ST AND BELMONT AVE (THE "X")	$ 13,369,637
2022/2023	West Springfield	608374	RECONSTRUCTION OF MEMORIAL AVENUE (ROUTE 147), FROM COLONY ROAD TO THE MEMORIAL AVENUE ROTARY (1.4 MILES)	$ 22,545,121
2021	Northampton	607502	INTERSECTION IMPROVEMENTS AT KING ST, NORTH ST & SUMMER ST AND AT KING ST & FINN ST	$ 3,384,309
2021 SW	Holyoke	606450	TRAFFIC SIGNAL UPGRADES AT 15 INTERSECTIONS ALONG HIGH & MAPLE ST	$ 9,100,000
2021/2022	Hadley	605032	HADLEY- RECONSTRUCTION ON ROUTE 9, FROM MIDDLE STREET TO MAPLE/SOUTH MAPLE STREET	$ 23,893,982
2021	Amherst	608084	AMHERST- IMPROVEMENTS & RELATED WORK ON ROUTES 9 & 116, FROM UNIVERSITY DRIVE TO SOUTH PLEASANT STREET (0.8 MILES)	$ 3,892,738
2020	Westfield	607773	WESTFIELD- IMPROVEMENTS & RELATED WORK ON ROUTE 20, COURT ST & WESTERN AVE, LLOYDS HILL RD TO HIGH ST/MILL ST INTERSECTION (PHASE II) Eastern Section	$ 8,153,565
2021	Springfield	608782	SPRINGFIELD- INTERSECTION IMPROVEMENTS AT COTTAGE ST, ROBBINS RD AND INDUSTRY AVE	$ 2,748,386
2021	Springfield	608718	SPRINGFIELD- INTERSECTION IMPROVEMENTS AT BERKSHIRE AVE, COTTAGE AND HARVEY ST	$ 2,280,751
2020 SW	Springfield	608560	IMPROVEMENTS ON ST. JAMES AVENUE AT TAPLEY STREET	$ 1,589,420
	Northampton	609286	NORTHAMPTON- DOWNTOWN COMPLETE STREETS CORRIDOR AND INTERSECTION IMPROVEMENTS ON MAIN STREET (ROUTE 9)	$ 7,654,605
2021	Easthampton	608577	EASTHAMPTON- IMPROVEMENTS AND RELATED WORK ON UNION STREET (ROUTE 141) FROM PAYSON AVENUE TO HIGH STREET (0.36 MILES)	$ 3,284,450
2023	Longmeadow / Springfield	608881	RESURFACING AND INTERSECTION IMPROVEMENTS ON LONGMEADOW STREET (ROUTE 5) AND CONVERSE STREET (0.84 MILES)	$ 5,228,168
	Chicopee	609061	CHICOPEE - INTERSECTION RECONSTRUCTION, MONTGOMERY RD AT GRANBY RD AND MCKINSTRY AVE, AND MONTGOMERY RD AT TURNPIKE ACCESS RD	$ 6,000,000
	South Hadley	608785	MAIN STREET ROAD IMPROVEMENT PROJECT	$ 3,089,720
2021 SW	Springfield	608565	IMPROVEMENTS ON ST. JAMES AVENUE AT ST. JAMES BOULEVARD AND CAREW STREET	$ 2,400,000

1. Travel Time Contours

Travel Time Contours are a great visual tool for showing average travel times from a specific location within the Pioneer Valley Region. These contours were developed for the region based on the location of centers of employment. A total of six employment centers were selected because of their geographic diversity and significance. Each contour is broken down into 15, 30, 45, and 60 minute intervals.

Pioneer Valley Region Travel Time Contours were created using the Esri ArcGIS Online Spatial Analysis Use Proximity Tool Set - Create Drive-Time Areas. Create Drive-Time Areas identifies areas that can be reached within a specified drive time or drive distance. The tool measures out from up to 1,000 roadway points to create drive time buffers. Drive time buffers are calculated using the street location, density, and other physical/use attributes. They take into account one-way streets, stop signs, traffic signals, traffic volume, speed limit, physical barriers, and terrain. The information for both the original contours (circa 2001) and the new contours (2014) are shown in the tables below. The latest Pioneer Valley Region Travel Time Contours are shown in Figures 8-6 – 8-11.

Table 8-4 – Travel Time Comparison Northbound Routes (2001, 2015, and 2019)

Northbound	2001 (Minutes)	2015 (Minutes)	2019 (Minutes)
North End Bridge Rotary	2.25	3.86	4.06
I-91 Exit 9 (Route. 20 - North End Bridge)	2.03	4.33	5.06
I-91 Exit 10 (Birnie Ave)	0.65	0.78	0.91
I-91 Exit 12 (I-391 - Chicopee)	1.05	1.09	1.08
I-91 Exit 13A (Route 5 - West Springfield	0.58	0.79	0.77
I-91 Exit 14 (Massachusetts Turnpike)	2.38	2.54	2.53
I-91 Exit 15 (Holyoke - Ingleside)	0.65	0.90	0.85
I-91 Exit 16 (Holyoke - Route 202)	1.48	1.60	1.56
I-91 Exit 17A (Holyoke - Route 141)	1.17	0.81	0.77
I-91 Exit 18 (Northampton - Route 5)	6.17	7.55	7.23
I-91 Exit 19 (Northampton - Route 9)	1.80	1.91	2.02
I-91 Exit 21 (Hatfield/Northampton)	2.10	2.32	2.36
I-91 Exit 22 (North Hatfield)	2.37	2.61	2.59
I-91 Exit 24 (Deerfield/Whately)	7.12	4.40	4.28
I-91 Exit 26 (Greenfield - Route 2A)	10.47	7.74	7.65
I-91 Exit 27 (Greenfield - Route 2)	2.37	2.58	2.57
I-91 Exit 28 (Bernardston)	4.12	4.67	4.60
Vermont State Line	4.17	4.13	4.19
I-91 VT Exit 1 (US Route 5)	6.93	6.88	7.36
Total	**59.85**	**61.49**	**62.44**

As can be seen in Tables 8-4 – 8-7, with the exception of southbound travel, the average travel times in the region over the past 15 years have not changed significantly. Travel times on average where measured to be approximately 45 seconds slower overall than in 2001 (not including southbound data.) This can be attributed to the fact that infrastructure improvements made in the past have been offset by an increase in vehicular volumes on the roadways. The significant decrease in travel times on roadways in the southbound direction can be attributed partially to less roadway congestion but also to better data. The 2001 data was manually collected by PVPC staff. The new data as discussed previously is calculated using GIS software and is based on a larger sample size. Westbound times also show a minor decrease in travel times while eastbound and northbound times have increased slightly.

Table 8-5 – Travel Time Comparison Southbound Routes (2001, 2015, and 2019)

Southbound	**2001 (Minutes)**	**2015 (**Minutes**)**	**2019 (Minutes)**
Memorial Bridge Rotary	5.10	1.86	2.15
I-91 Exit 3 (Route 5/57 - South End Bridge)	2.53	3.01	4.10
I -91 Exit 2 (Longhill Street)	0.37	0.89	0.73
I-91 Exit 1 (Route 5 - Longmeadow)	0.63	0.12	0.12
I-91 CT Exit 49 (US Route 5)		3.77	3.77
I-91 CT Exit 48 (CT Route 220)	1.27	1.53	1.54
I-91 CT Exit 47 (CT Route 190)	2.08	0.41	0.41
I-91 CT Exit 46 (US Route 5)	2.30	2.57	2.59
I-91 CT Exit 45 (Bradley Airport)	8.22	2.16	2.12
Total	**22.50**	**14.46**	**17.53**

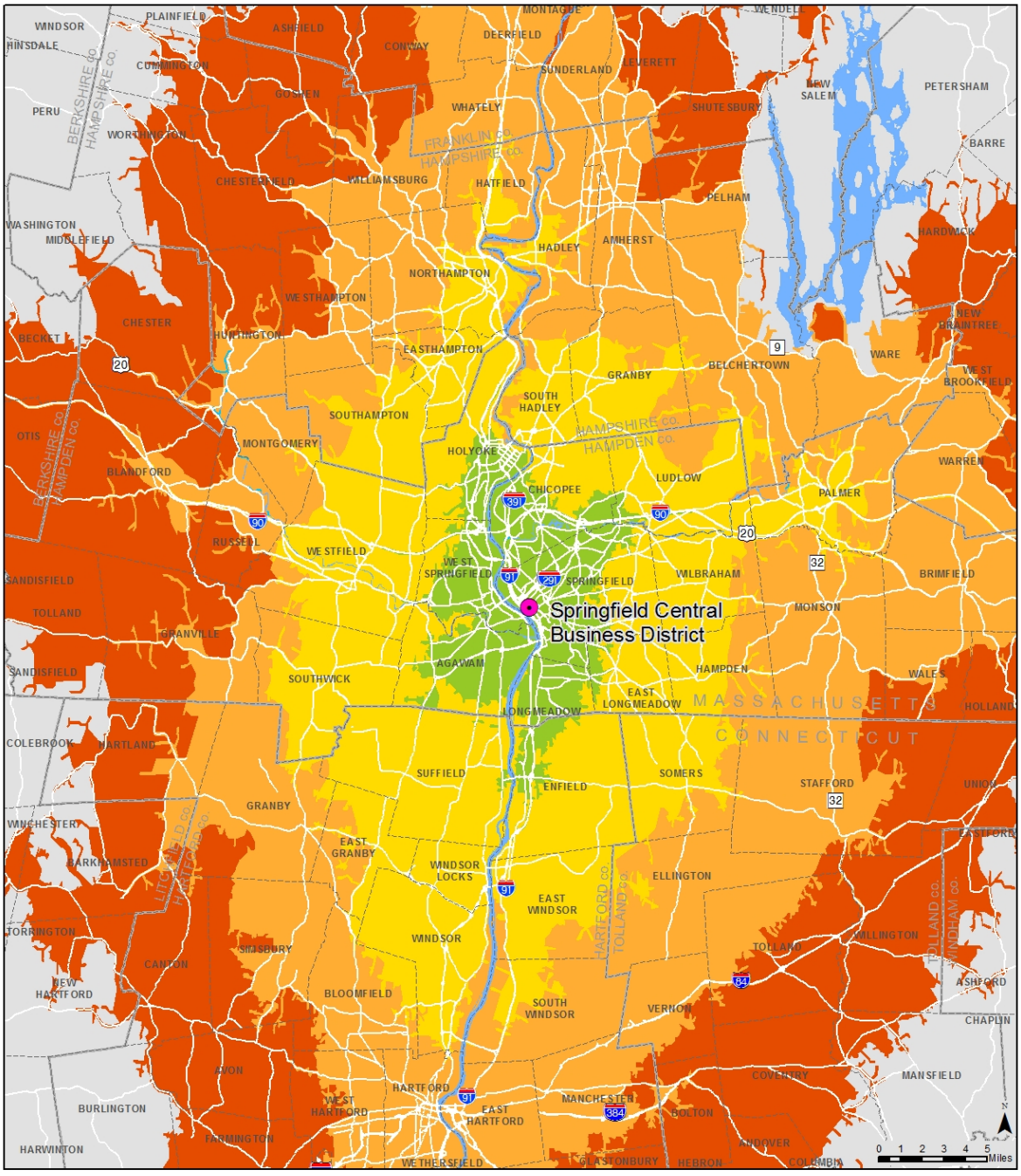
Table 8-6 – Travel Time Comparison Eastbound Routes (2001, 2015, and 2019)

Eastbound	**2001 (Minutes)**	**2015 (Minutes)**	**2019 (Minutes)**
I-291 Exit 2 (Dwight/Chestnut Streets	4.67	5.51	6.65
I-291 Exit 3 (Armory Street)	0.73	0.68	0.73
I-291 Exit 4 (St. James Avenue)	1.07	1.37	1.34
I-291 Exit 5 (Page Boulevard)	1.72	1.76	1.77
I-291 Exit 6 (Shawinigan Drive)	1.38	1.26	1.28
I-90 Exit 6 (Chicopee/Springfield)	2.03	2.01	1.94
I-90 Exit 7 (Ludlow)	4.27	3.20	3.45
I-90 Exit 8 (Palmer)	5.88	7.02	7.00
I-90 Exit 9 (Sturbridge)	14.12	14.71	14.43
I-90 Exit 10 (Auburn/Worcester)	10.67	10.87	10.73
Total	**46.53**	**48.39**	**49.32**

Table 8-7 – Travel Time Comparison Westbound Routes (2001, 2015, and 2019)

Westbound	2001 (Minutes)	2015 (Minutes)	2019 (Minutes)
I-90 Exit 4 (Holyoke/West Springfield	12.78	10.73	10.36
I-90 Exit 3 (Westfield)	5.45	4.43	4.99
I-90 Exit 2 (Lee)	27.23	28.12	27.69
I-90 Exit 1 (West Stockbridge)	7.63	8.14	7.91
Total	**53.10**	**51.42**	**50.95**

Figure 8-6 – Travel Time Contours for the Springfield Central Business District



Central Business District Drive Times

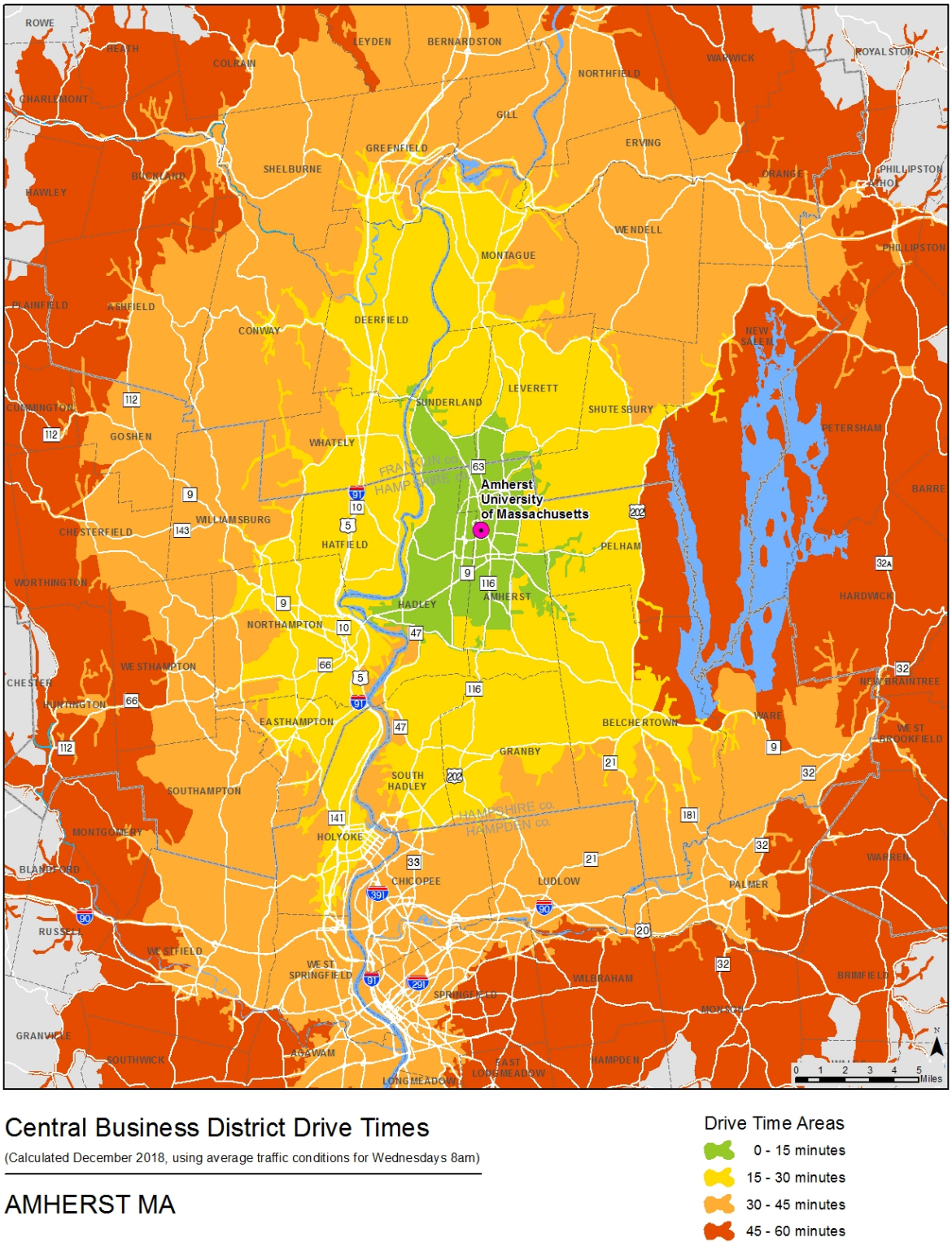
(Calculated December 2018, using average traffic conditions for Wednesdays 8am)

SPRINGFIELD MA

Drive Time Areas

- 0 - 15 minutes
- 15 - 30 minutes
- 30 - 45 minutes
- 45 - 60 minutes

Figure 8-7 – Travel Time Contours for the University of Massachusetts - Amherst



Central Business District Drive Times

(Calculated December 2018, using average traffic conditions for Wednesdays 8am)

AMHERST MA

Drive Time Areas

- 0 - 15 minutes
- 15 - 30 minutes
- 30 - 45 minutes
- 45 - 60 minutes

Figure 8-8 – Travel Time Contours for the East Longmeadow Industrial Park

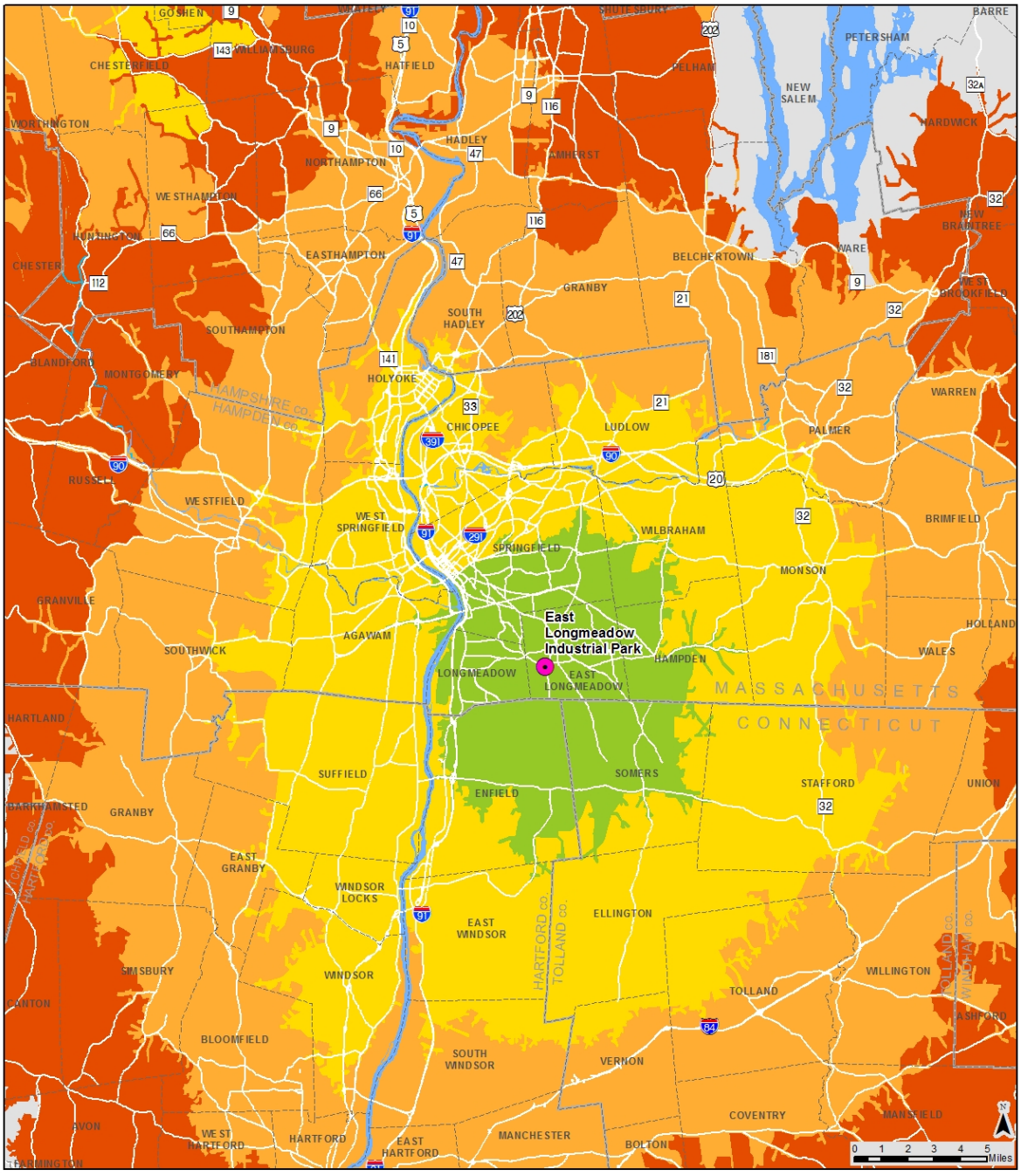


Figure 8-9 – Travel Time Contours for the Northampton Central Business District

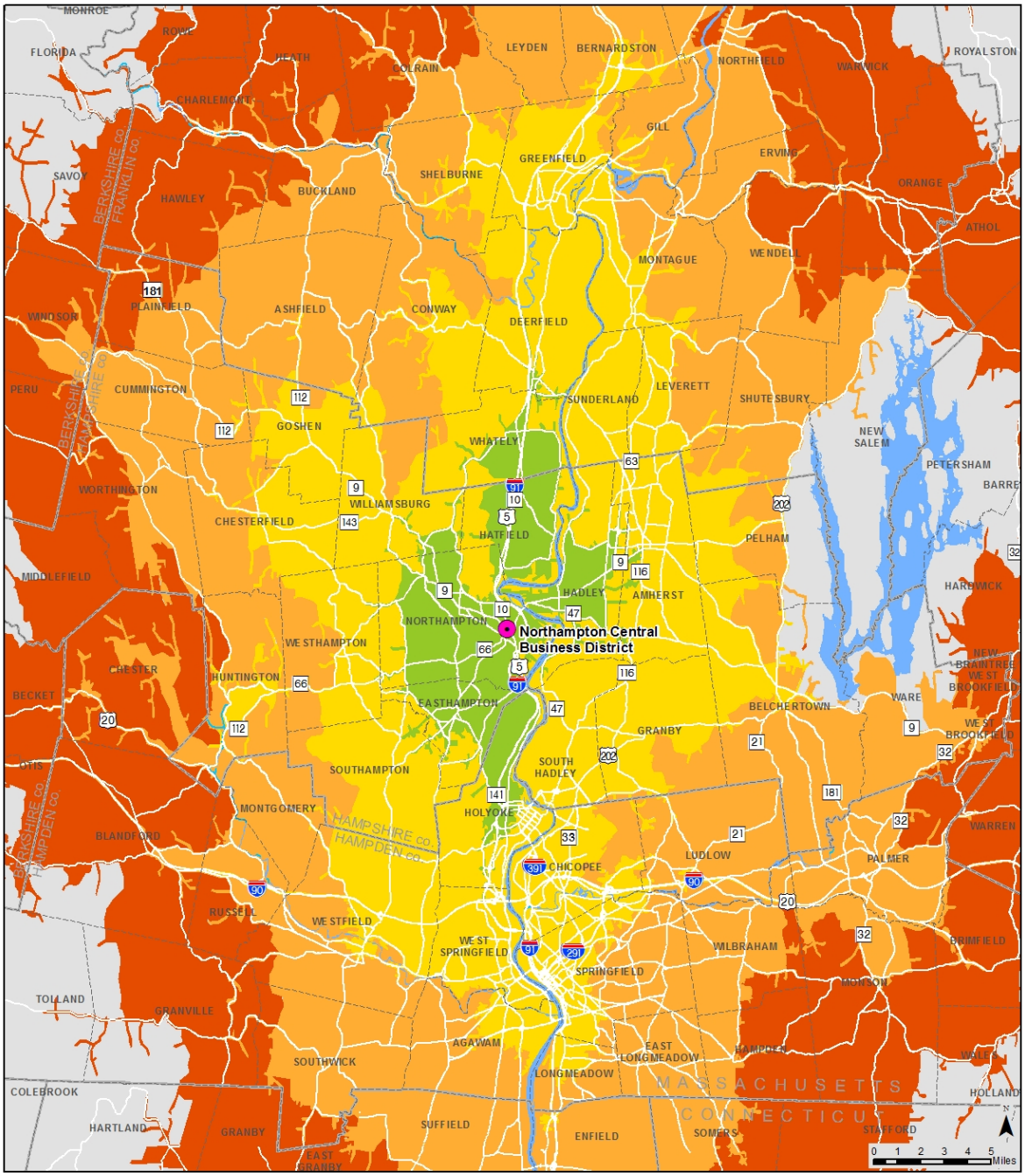
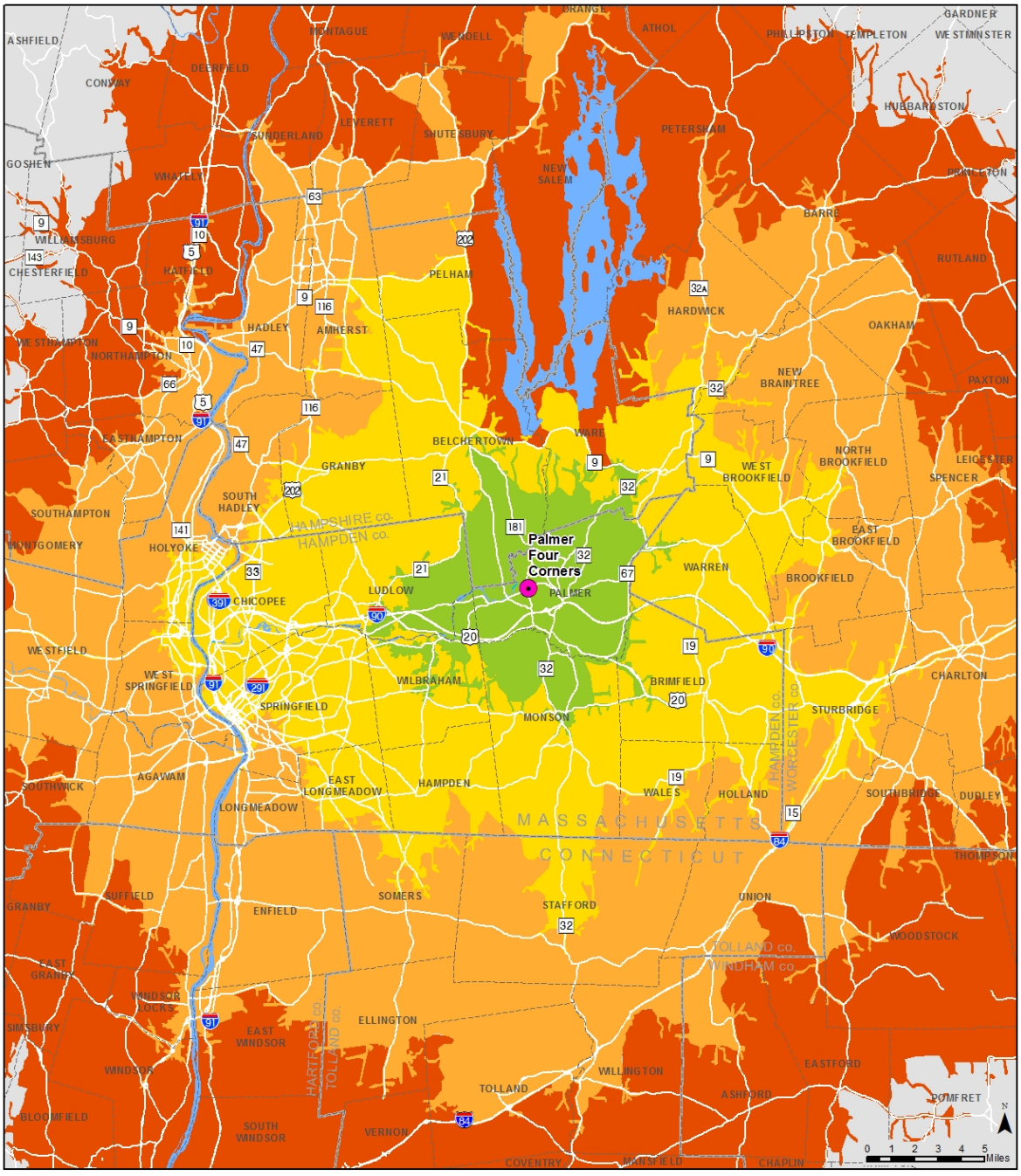


Figure 8-10 – Travel Time Contours for the Palmer Four Corners



Central Business District Drive Times

(Calculated December 2018, using average traffic conditions for Wednesdays 8am)

PALMER MA

Drive Time Areas

- 0 - 15 minutes
- 15 - 30 minutes
- 30 - 45 minutes
- 45 - 60 minutes

Figure 8-11 – Travel Time Contours for Westfield Summit Lock