CENTRAL MASSACHUSETTS METROPOLITAN PLANNING ORGANIZATION (CMMPO)

Highway Freight Accommodation Assessment Study: Northeast Transportation Planning Subregion

CMMPO
Central Massachusetts
Metropolitan Planning Organization

C M R P C
Central Massachusetts Regional Planning Commission

September 2024

Prepared in cooperation with the Massachusetts Department of Transportation and the U.S. Department of Transportation – Federal Highway Administration and the Federal Transit Administration. The views and opinions of the Central Massachusetts Regional Planning Commission expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation. A portion of this document was completed using District Local Technical Assistance (DLTA) funds provided to CMRPC.

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Preface

To assure that the federal-aid highway system in each of the Central Massachusetts Regional Planning Commission (CMRPC) transportation planning subregions is adequately accommodating existing trucking needs as well as those projected for the future, the Central Massachusetts Metropolitan Planning Organization (CMMPO) Unified Planning Work Program (UPWP) for FFY 2020 initiated a new study series, "Highway Freight Accommodation Assessments" for federal-aid State Numbered Routes. The first installment focused on the North subregion and was followed by the West, Southwest, and Southeast subregions. This report focuses on the Northeast subregion. Based on both field observations and detailed analyses, this document provides several suggested roadway improvement options and local trucking policy considerations to assure the continued flow of freight on the region's major highways while mitigating identified local impacts.

Further, as noted in MassDOT's 2023 *Massachusetts Freight Plan*, there is a recommended immediate need to improve and expand the Commonwealth's stock of truck parking facilities on primary truck routes. The compilation of the *Highway Freight Accommodation Assessment* study series, supported by the Federal Highway Administration (FHWA), is intended to assist in addressing this identified statewide need. Accordingly, in the spirit of Jason's Law, this study examines the potential for wisely located increases in available truck parking at key locations in the region, with a particular focus on rural highway freight movement needs.

*The CMMPO Endorsed UPWP for 2025 includes the next installment in this study series that will focus on the **Central** transportation planning subregion, which is the City of Worcester.*

1.0 Introduction

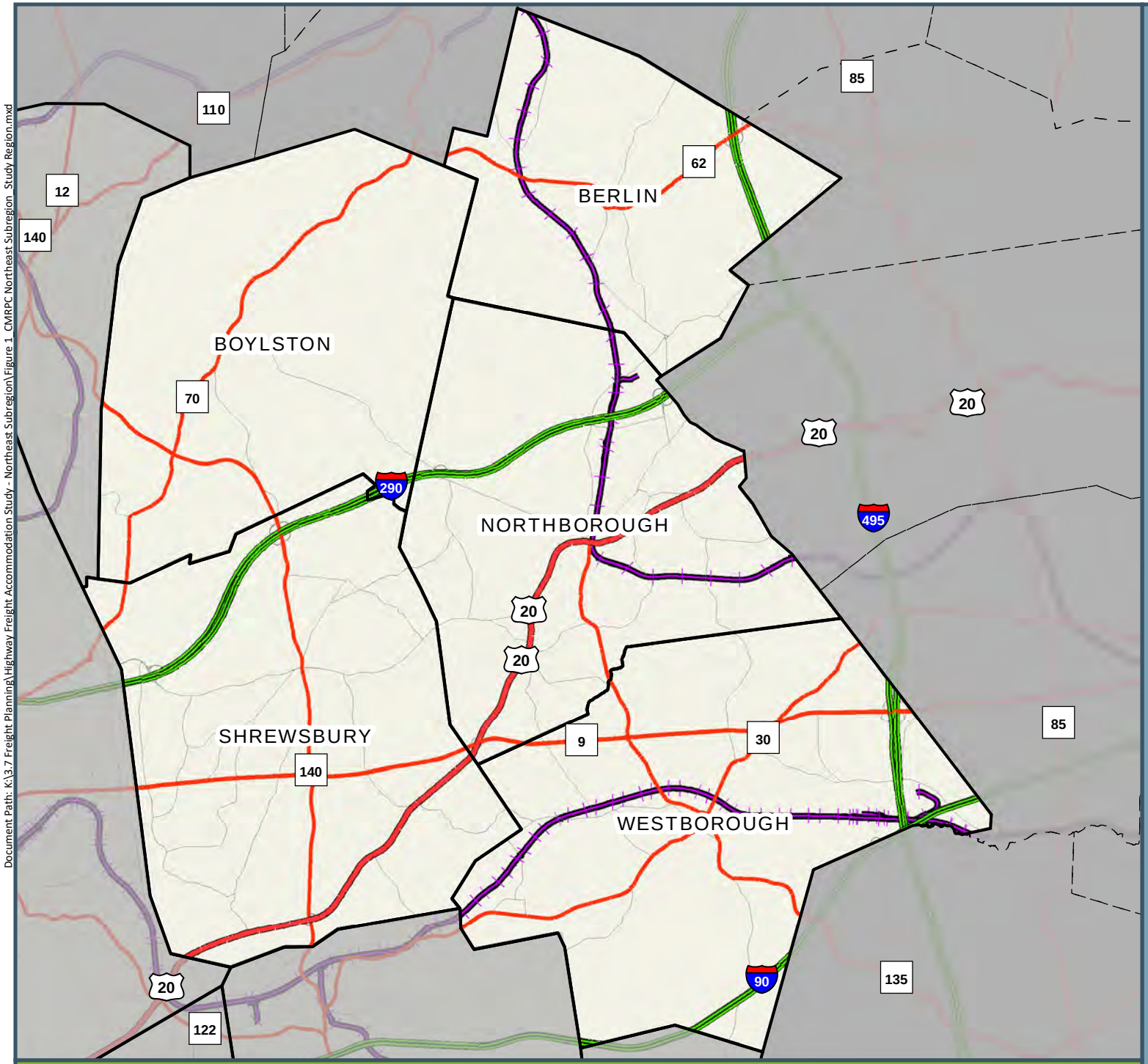
The CMMPO's Endorsed 2024 UPWP Freight Planning work activity indicates the compilation of a *Highway Freight Accommodation Assessment Study: Highway Trucking on State Numbered Routes*. This study is the fifth in the planned series of subregional *Highway Freight Accommodation Assessment* studies. This trucking-centric study focuses on the region's federal-aid highway network in the Northeast transportation planning subregion. The Northeast subregion includes five (5) host communities: Berlin, Boylston, Northborough, Shrewsbury, and Westborough. A map of the Northeast subregion can be found in **Figure 1**.

All eligible for federal-aid improvement funding, the following seven (7) State Numbered Routes in the Northeast subregion are the focus of this study effort:

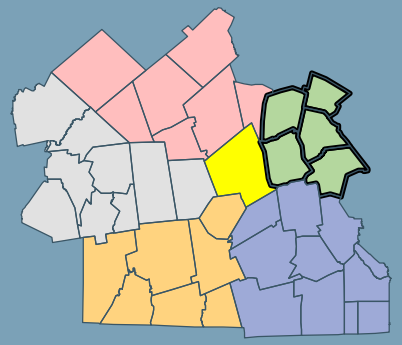
1. Route 9
2. US Route 20
3. Route 30
4. Route 62
5. Route 70
6. Route 135
7. Route 140

Major topics addressed in this *Freight Accommodation Assessment Study* include a subregional trucking amenities overview, an inventory of host community bylaws affecting local trucking operations, federal-aid highway network traffic volumes & truck percentages, a range of Management Systems (MS) data & analysis, Performance-Based Planning & Programming (PBPP) considerations, subregional Environmental Consultation maps and local Municipal Vulnerability Preparedness (MVP) Plan findings. In addition, the regional Travel Demand Forecasting Model, a computerized simulation of the region's multi-modal transportation network, provided future-year Vehicle Miles of Travel (VMT) projections for a range of truck classifications, verifying known highway freight routes as well as identifying areas of concentrated local trucking activity.

Based on this broad range of data, observations and corresponding analysis, a summary of findings table is presented. The *Highway Freight Accommodation Assessment Study* concludes with a series of suggested recommendations for both MassDOT and host community consideration. These include both local policy suggestions as well as options for roadway and bridge improvements. Some identified improvement projects may have the potential to utilize future-year Transportation Improvement Program (TIP) funding available to the CMMPO to assist state or local implementation. Suggested projects are intended to help assure the continued flow of highway freight throughout the greater planning region while mitigating identified local impacts.



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 1_CMRPC Northeast Subregion_Study Region.mxd



Legend

- Northeast Subregion Towns
- Active Railroads
- Interstate
- US Highway
- State Route
- Other Major Roads

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution interpreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC)
One Mercantile Street, Suite 520
Worcester, MA 01608

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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FIGURE 1 - NORTHEAST SUBREGION STUDY HOST COMMUNITIES

1.1 Area Trucking Amenities

Parking for Long-Distance Highway Trucking

Truck parking issues exist on a wide basis in greater New England. Truck-oriented facilities are somewhat limited in comparison to other areas of the country. Truckers - who must follow federal safety laws requiring mandatory rest periods - need places to park, eat, sleep and bathe. As demand for goods is anticipated to remain high, the needs of the trucking community must be addressed to ensure the continued safe flow of freight on the nation's network of major highways.

Public rest areas on limited access highways contribute little to the truck driver rest location system because of factors such as small size, poor condition, or not being on a key long-distance corridor. Adding or expanding commercial truck stops is an effective method of reducing truck parking at unofficial locations, along with their associated safety challenges. Good design and new technologies can serve to mitigate both the real and perceived negative impacts of a commercial truck stop. Long-term economic growth will continue to place increased demands on the motor freight system and associated rest location system.

Jason's Law federally mandates adequate rest periods for long-distance truck drivers. Adequate truck parking opportunities *must* be available to serve both the Commonwealth's existing and future projected needs. Looking to the future, efforts to increase the available supply of parking for long-distance trucking in the planning region need to continue. Both nationally and statewide, truck parking will continue to be a challenge and will require FHWA's and MassDOT's concerted, ongoing involvement. This could involve state & local policy changes that mandate addressing these needs, through both revised policy & regulation in addition to improved infrastructure. The CMMPO is *serious* concerning the implementation of Jason's Law to provide sufficient truck parking and, as such, encourages MassDOT to continue to address this critical area of concern.

MassDOT's *2023 Massachusetts Freight Plan* indicates the Commonwealth's deficiency in providing enough modern, full-service rest stops catering to trucking. There exists the potential for expanded existing or new additional facilities in the planning region for large truck parking to enable drivers to meet the federally required rest periods. Parking has the potential to be offered on a guaranteed, reservation-style basis, perhaps with basic amenities. As indicated in the Long-Range Transportation Plan (LRTP) for the region, *2050 Connections*, the CMMPO supports the implementation of additional modern, full-service rest stops throughout the greater region serving the trucking industry.

MassDOT Efforts to Improve Truck Parking Supply

In the spirit of Jason's Law, MassDOT is actively seeking to increase the amount of safe parking available for long-distance trucking activities in the Commonwealth. Initially, an inventory was compiled of the state's truck parking supply as well as parking availability/usage. An analysis of this data allowed for the suggestion of potential new truck parking facilities at 12 sites across 3 target areas of the state. Similarly, the potential also exists to expand the parking supply at an additional 12 sites along both the MassPike (I-90) and I-95 corridors. Further, the potential application of Intelligent Transportation Systems (ITS) will consider the use of available technologies for producing and relaying real-time truck parking occupancy data.

The MassDOT evaluation criteria for potential *new* truck parking included the number of available acres, right-of-way impacts, the distance from the nearest highway interchanges, as well as potential impacts to any nearby historic and environmental resources. High-level cost analysis screening was also conducted for the 12 sites considered in the study effort. Similarly, the MassDOT evaluation criteria for potential *expanded* truck parking evaluation criteria also included the number of available acres, feasibility of constructability, and any likely impacts to nearby environmental resources. Further, the top-ranked six (6) sites were also assessed using available truck probe data and historic traffic volume data.

The MassDOT *2023 Massachusetts Freight Plan* includes definitive recommendations to increase the supply of safe parking available for long-distance trucking activities throughout the Commonwealth. This would serve to eliminate gaps between truck parking facilities and, in turn, has the potential to enhance the efficiency of long-distance trucking operations while also improving safety on major highways. The *Plan* suggests the implementation of new truck stop facilities at three (3) target areas:

1. I-395 near the Connecticut state line,
2. I-95 near the I-93 interchange and,
3. I-495 north of I-290.

The *Plan* also suggests the expansion of existing facilities where demand exceeds supply, including all 11 service plazas on the MassPike (I-90). Further, MassDOT has also developed concept sketches and preliminary cost estimates for each potential expansion site on the MassPike.

Within the CMRPC planning region, two (2) sites for potential new truck parking are being considered by MassDOT. The first, in the Northeast planning subregion, is in the host community of Berlin on Taylor Road off Route 62 (Central Street) in close proximity to the I-495 Interchange #26. The other, in the Southwest planning subregion, is in the town of Oxford on Sutton Avenue, adjacent to I-395 Interchange #4. Further, MassDOT also identified three (3) existing sites for expansion potential:

1. MassPike (I-90) eastbound Charlton Service Plaza (within the Southwest planning subregion),
2. MassPike (I-90) westbound Chalton Service Plaza and,
3. MassPike (I-90) eastbound Natick Service Plaza.

MassDOT has indicated that the implementation of the new and/or expanded truck parking facilities will likely involve the following:

- Collaboration between local, regional, state, and multistate authorities to consider expansion or development of the recommended sites.
- Collaboration between local, regional, state, and multistate authorities to manage zoning, permitting, taxation, traffic, and other logistical and quality-of-life issues.
- Public-private partnerships between state and local authorities and private truck stop operators to defray any risks associated with the opening of the proposed new facilities.
- Development of smartphone apps and variable message signboards to allow drivers to view available spaces, reserve spaces, and receive directions, particularly for the new facilities.

Planned MassDOT Service Plaza investment

Presently, MassDOT continues working to enhance the Commonwealth's highway service plazas. The service plazas, in addition to enriching the touristic experience of highway travelers, are essential for commerce and other economic activities. MassDOT plans to invest in the service plazas to help the state remain economically competitive in the coming years. At this time, MassDOT is in the process of re-imagining the service plazas. As of July 2024, MassDOT efforts to build and expand available truck parking are ongoing. As part of the process, MassDOT is assessing opportunities related to service plaza truck parking, technology and amenities.

The underway statewide planning process has included community meetings and a user-friendly consumer experience survey. Input received from the public meetings and the survey will help lead to the creation of a service plaza "operating model" to guide continuing planning efforts. Host community meetings provided an opportunity for local officials and residents to learn more about the broader procurement process and provide feedback. Through the survey, service plaza customers and patrons were asked to provide feedback on a range of areas, some of which include property improvements, sustainability, EV charging considerations as well as community representation in the decision-making process.

During the Spring of 2024, MassDOT also solicited feedback from potential service plaza operators and other industry stakeholders to identify a "best-in-class" operating model to apply to 18 existing service plazas located along various major highways throughout Massachusetts. The feedback obtained from potential operators and other interested stakeholders will be used

to develop an understanding of each travel plaza's full potential to support the traveling public's needs. Further, the now underway planning process will eventually help define a future Request for Proposals (RFP) for the long-term lease and operation of the service plazas. With an eventual RFP, MassDOT will formally solicit bids and ultimately implement a best-in-class service plaza operating model for Massachusetts, providing food, beverage, convenience, gas, diesel, EV Charging, improved truck parking and other amenities. Among the 18 service plazas statewide included in the scope of MassDOT's planning effort, in the planning region they include I-90 (MassPike) in Charlton eastbound & westbound as well as Westborough westbound.

MassDOT Weigh Station Truck Parking Opportunities

It is suggested that both underutilized or dormant MassDOT Weigh Station infrastructure along the region's federal-aid highways could potentially assist long-distance truck drivers in meeting the federally-mandated rest period requirements. These paved and gated, yet often-empty, Weigh Stations could potentially present opportunities for large truck parking. Based on the staff's cursory research, not all Weigh Stations are currently in use, as activity levels appear to vary over time. Further, other opportunities for large truck parking may exist on other dormant or surplus MassDOT-owned properties throughout the Commonwealth.

The following is a list of roadside MassDOT Weigh Stations identified in the greater planning region:

Charlton:	I-90 (MassPike) Eastbound
Lancaster:	Route 2 Eastbound *(currently used for MassDOT construction staging)*
Sturbridge:	I-84 (Wilbur Cross Highway) Eastbound
Sturbridge:	I-84 (Wilbur Cross Highway) Westbound
Uxbridge:	Route 146 Northbound

In addition, based on CMMPO staff research, MassDOT currently maintains 12 Weigh-in-Motion Stations statewide. The location of the Weigh-in-Motion Stations are as follows:

- **Attleborough**: I-95 north of I-295
- **Chelmsford**: I-495 at Route 3
- **Chelmsford**: I-495 at Route 4
- **Chicopee**: I-391 at I-90 (MassPike)
- **Hatfield**: I-91 north of Chestnut Street
- **Ludlow/Springfield**: I-90 (MassPike) between exits 51 and 54
- **Methuen**: I-93 north of Routes 110/113
- **Norwell**: Route 3 (Pilgrim Highway) at River Street
- **Salem**: Highland Avenue at Mooney Road

- **Seekonk**: I-195 at Anthony Street
- **Sturbridge**: I-84 Westbound (Wilbur Cross Highway) Connecticut state line
- **Worcester**: I-190 south of West Mountain Street

Truck Parking Opportunities near Trucking Activity Centers

It is considered an ongoing challenge for long-distance truckers to seek and locate modest parking opportunities, especially in the more rural areas of the planning region. The CMMPO staff has considered outputs from the regional Travel Demand Forecasting Model to assist in identifying trucking "hot spots" in the region, helping to target potential locations for needed future truck parking opportunities. At this time, staff has identified potential truck parking opportunities for federally-required driver rest in the Northeast subregion at the following locations, one in each of the five (5) host communities encompassed in this study:

- **Berlin:** Route 62 Corridor
- **Boylston:** Route 70 & Route 140 Corridors
- **Northborough:** US Route 20 Corridor
- **Shrewsbury:** US Route 20 & Route 140 Corridors
- **Westborough:** Route 9 Corridor
- *OTHERS UNDER REVIEW, To Be Determined*

As an example, staff seek opportunities for large truck parking 24/7 in underutilized "big box" or shopping plaza parking lots and/or designated loading/maneuvering areas. Staff seeks to suggest local community bylaw refinements/additions to allow for controlled long-distance truck parking when store deliveries meet certain thresholds at various commercial, retail and industrial establishments. An example is the Walmart model used elsewhere in the nation: overnight parking welcome, in a supervised/monitored and maintained facility. Common courtesy by users to minimize emissions, noise and trash is expected.

Additionally, the needed expansion/addition of available rest stops for long-distance trucking may have the opportunity to be supported through private sector funding or, alternately, benefit from a "Public-Private Partnership" (PPP) funding scenario. Under a PPP, private funding is used to leverage designated public monies. Future potential PPP arrangements could include the following aspects:

- Rest stop construction & management
- Truck hook-ups for electrical power (vastly reducing idling)
- Diesel & other alternate fuel sales
- Light repair facilities
- Dining options & lavatories
- Other locally customized features

Availability of Diesel Fuel in the Northeast Subregion

Staff conducts periodic research to identify existing substantive diesel fueling opportunities in throughout the CMRPC planning region. This information is useful for long-distance trucking as well as for emergency situations that could strike the region. The Massachusetts Department of Environmental Protection (DEP) maintains a database of permitted locations for diesel storage.

This information for the five (5) host communities in the Northeast transportation planning subregion was extracted from the DEP database and is shown in **Table 1**. Based on the DEP information, at this time there are 22 commercial outlets in the Northeast transportation planning subregion providing diesel fuel sales. As can be seen from the table, all five (5) of the Northeast subregion communities have at least two (2) diesel stations.

Table 1

Diesel Fuel Locations in the Northeast Subregion

Facility Name	Facility Address	Host Community
Nouria Store #04005	64 River Road West	Berlin
Berlin Auto Services Inc	51 West Street	Berlin
Berlin Energy North #2121	265 Central Street	Berlin
Nouria Store #04035	328 Shrewsbury Street	Boylston
Boylston Gas & Market LLC	270 Shrewsbury Street	Boylston
Cumberland Farms #2503	15 Main Street	Northborough
Peterson-Northborough	23 Belmont Street	Northborough
Northborough Mobil	7 Belmont Street	Northborough
Sandz-E, LLC #MA0062	48 West Main Street	Northborough
Flynns Truck Stop	307 Hartford Turnpike	Shrewsbury
Shell #81 (Seasons Corner Market #81)	604 Hartford Turnpike	Shrewsbury
Nouria #04021	271 Boston Turnpike	Shrewsbury
Shrewsbury Gas & Market LLC	22 Maple Avenue	Shrewsbury
Cumberland Farms #2535	55 East Main Street	Westborough
Cumberland Farms #V0555	165 Flanders Road	Westborough
Global Montello Group #2720	139 Turnpike Road	Westborough
Nouria #04044	128 Turnpike Road	Westborough
Nouria #04219	27 East Main Street	Westborough
Westboro Gas & Repairs	49 Milk Street	Westborough
MA0069	11 Milk Street	Westborough
Gulf Oil Limited Partnership #3909	MM 104.4 WB MA Turnpike	Westborough
Westborough XTRA Mart	183 Turnpike Road	Westborough

1.2 Host Community Bylaws Concerning Trucking

Staff reviewed the local community bylaws of the Northeast subregion towns, seeking any pertaining to truck prohibitions, delivery hour restrictions, parking prohibitions or any other locally-defined rules concerning large commercial vehicles, such as local "Jake Brake" use discouragement. *(The phrase "Jake Brake" is slang for engineered safety devices for modern truck tractors that use an engine compression brake that closes the valves in an engine for added slowing ability.)* Based on staff research, it was determined that the town of Northborough in the Northeast subregion has local bylaws governing trucking operations whereas Berlin, Boylston, Shrewsbury, and Westborough presently do not.

Berlin – None Posted

Boylston – None Posted

Northborough

Five Ton Truck Exclusion (9-108-130)

A. The use and operation of heavy commercial vehicles having a carrying capacity of more than five tons are hereby restricted on the following-named streets or parts thereof and in the manner outlined and during the period of time set forth.
B. Exemptions. Subsection "A" of this section shall not apply to heavy commercial vehicles going to or coming from places upon said streets for the purpose of making deliveries of goods, materials or merchandise or similar collections from abutting land or buildings, or adjoining streets or ways to which access cannot otherwise be gained; or to vehicles owned by residents of said streets or adjoining streets or ways to which access cannot otherwise be gained; or to vehicles going to or coming from approved commercial or industrial establishments located on said streets; or to vehicles used in connection with the construction, maintenance and repair of said streets or public utilities therein; or to state, federal, municipal or public-service vehicles.
C. The exclusion set forth in this section is a twenty-four-hour exclusion.
D. The provisions of this section shall only apply when sufficient standard signs have been erected.
E. In accordance with the foregoing, the following streets are incorporated in this section: Whitney Street, from Church Street to Colburn Street.

Two and One Half Ton Truck Exclusion (9-108-140)

A. The use and operation of heavy commercial vehicles having a carrying capacity of more than 2.5 tons are hereby restricted on the following-named streets or parts thereof and in the manner outlined and during the period of time set forth.
B. Exemptions. Subsection (A) of this section shall not apply to heavy commercial vehicles going to or coming from places upon said streets for the purpose of making deliveries of goods, materials or merchandise or similar collections from abutting land or buildings, or adjoining streets or ways to which access cannot otherwise be gained; or to vehicles owned by residents of said streets or adjoining streets or ways to which access cannot otherwise be gained; or to vehicles going to or coming from approved commercial or industrial establishments located on said streets; or to vehicles used in connection with the construction, maintenance and repair of said streets or public utilities therein; or to state, federal, municipal or public-service vehicles.
C. The exclusion set forth in this section is a twenty-four-hour exclusion.
D. The provisions of this section shall only apply when sufficient standard signs have been erected.
E. In accordance with the foregoing, the following streets are incorporated in this section: Collins Road, from Ridge Road to Brigham Street; Davis Street, from US Route 20 to West Main Street; Maple Street, from US Route 20 to Bartlett Street; and Ridge Road, from Maple Street to Lyman Street.

Compression Brake Use Restricted (2-44-130)

No operator of a diesel truck shall use an engine brake, compression brake, dynamic brake or mechanical exhaust device, also known as exhaust or Jake braking, designed to assist in deceleration or braking, except for emergency use, while operating a vehicle on a public way, or designated portion of a public way, in the town, where such use is prohibited by a traffic rule or regulation issued by the Board of Selectmen after a public hearing. Whoever violates this bylaw shall be punished by a fine of $100 for the first offense and $300 for second and subsequent offenses. The owner of the vehicle may be cited in lieu of the operator.

Shrewsbury – None Posted

Westborough – None Posted

The CMRPC Regional Collaboration & Community Planning (RCCP) staff has broad expertise in crafting local community bylaws, village bylaws, and other similar documentation for various host communities. As is often the case, like the above town of Northborough text, the bylaws can be community-customized to account for local trucking activities, deliveries, and parking as well as other related activities.

2.0 State Numbered Routes

This section of the *Northeast Subregion Highway Freight Accommodation Assessment Study* details the primary focus network of State Numbered Routes owned and maintained by either MassDOT or the host communities. These highways are eligible for federal-aid improvement funding through the CMMPO's Transportation Improvement Program (TIP). Currently programmed TIP projects in the Northeast subregion are also listed. Further, the CMMPO's previously designated Critical Freight Corridors are summarized. Lastly, field-observed traffic volumes and associated truck percentages are presented.

2.1 Analysis Network

As previously stated, all State Numbered Routes eligible for federal-aid improvement funding in the Northeast subregion are the primary focus of the study effort. Other federal-aid town-owned & maintained highway segments have also been also included in the study scope, often serving as connectors between the State Numbered Routes. Again, the following seven (7) State Numbered Routes in the Northeast subregion are the focus of this analysis: Route 9, US Route 20, Route 30, Route 62, Route 70, Route 135, and Route 140. Segments of these highways that were previously designated by the CMMPO as Critical Freight Corridors are also identified.

Federal-Aid Eligible Road Classifications & Highway Ownership

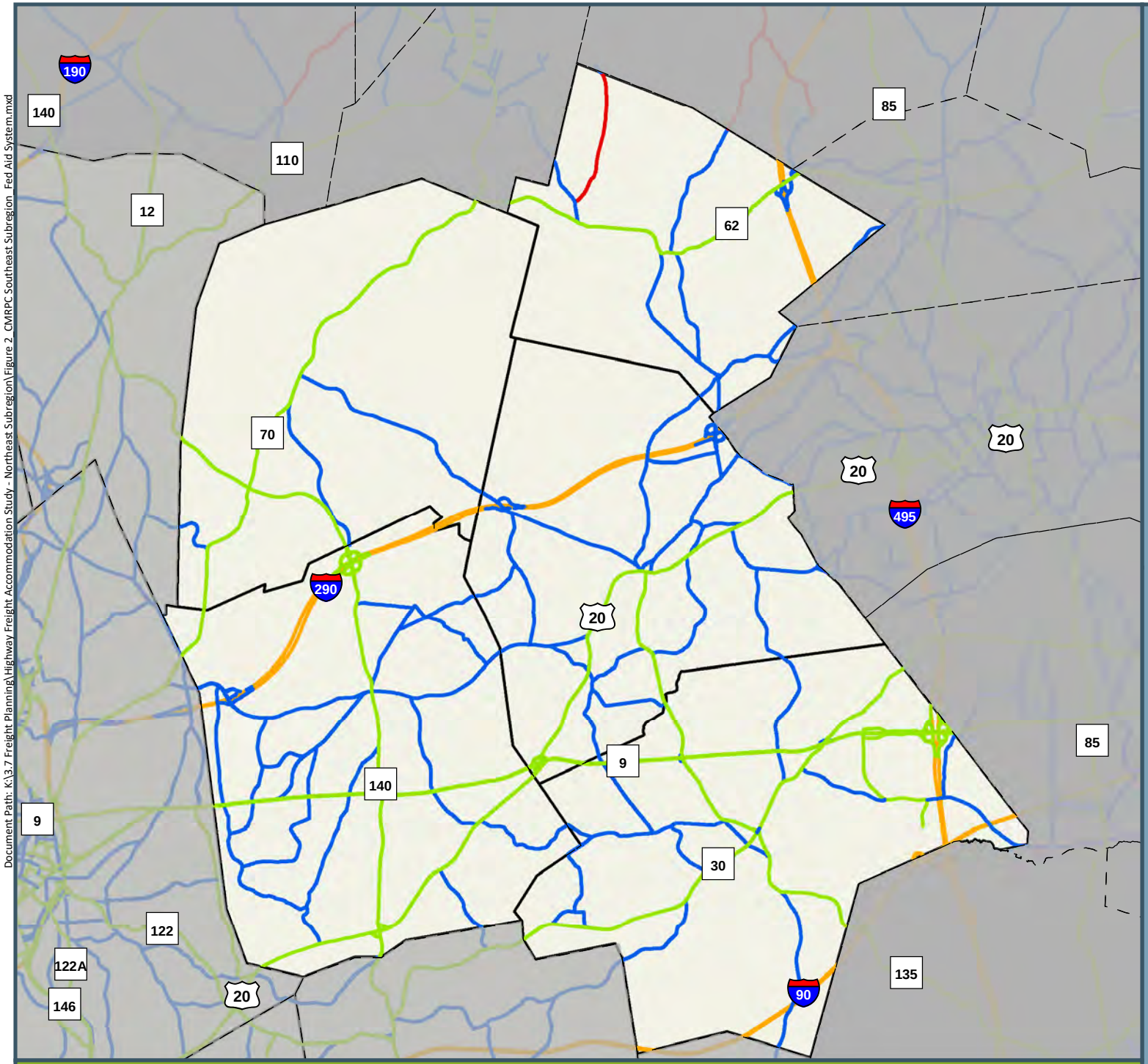
Figure 2 shows the federal-aid eligible highways in the Northeast subregion. Funds are allocated from the FHWA to MassDOT to be distributed to the state's MPO's for highway and other types of transportation improvement projects through the regional TIPs. A combination of functional classification and urban/rural designation determines if a roadway qualifies for the use of these federal funds. Eligibility includes all Interstates, urban/rural arterials, urban collectors, and rural major collectors. Rural minor collectors and local roads are excluded from this grouping and thus ineligible for federal-aid highway funding.

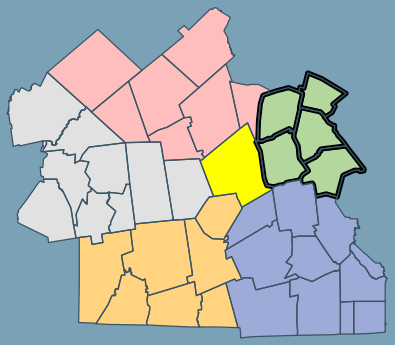
As shown on the map there are four (4) categories of federal-aid eligible roads. There are two (2) National Highway System (NHS) categories and two (2) Surface Transportation Program (STP) categories. The NHS-funded highway network represents all Interstate highways and principal arterials throughout Massachusetts. In addition, roadways connecting the NHS roadways with military bases are also considered part of the NHS network. Further, NHS passenger & freight terminals are connected to the NHS network by roadways called "NHS Connectors".

The STP-funded highway network is comprised of any functionally classified roadway. STP-funded roadways include all urban arterials, urban collectors, and rural arterials. As established in prior national transportation legislation, rural collectors are also eligible for STP funding. However, only a portion of the overall amount of STP funding allocated to the state can be applied to rural collector roadways, classified as the "C15" category.

There are three (3) Interstate NHS highways within the Northeast transportation planning subregion: Interstate 90 (Massachusetts Turnpike), Interstate 290, and Interstate 495. (It should be noted that as a MassDOT-operated toll road, Interstate 90 in Massachusetts is ineligible for federal-aid improvement funding.) Highways in the Northeast subregion eligible for NHS funding include Routes 9, US 20, 30, 62, 70, 135, and 140. Other major roadways within the Northeast subregion shown on the figure are classified as either STP-eligible or STP - C15.

In addition, **Figure 3** shows the highway ownership for the State Numbered Routes and other major roadways in the Northeast subregion. As can be seen in the figure most of the highways are owned, and thus maintained, by the five (5) host communities. The entirety of Interstate 90 (Massachusetts Turnpike), Interstate 290, Interstate 495, Route 9, US Route 20, Route 70 as well as portions of Route 30, Route 62, Route 135, and Route 140 are owned and maintained by MassDOT.





Legend

- Northeast Subregion Towns
- Interstate - NHS
- Other Road - NHS
- STP Eligible
- STP Road - C15

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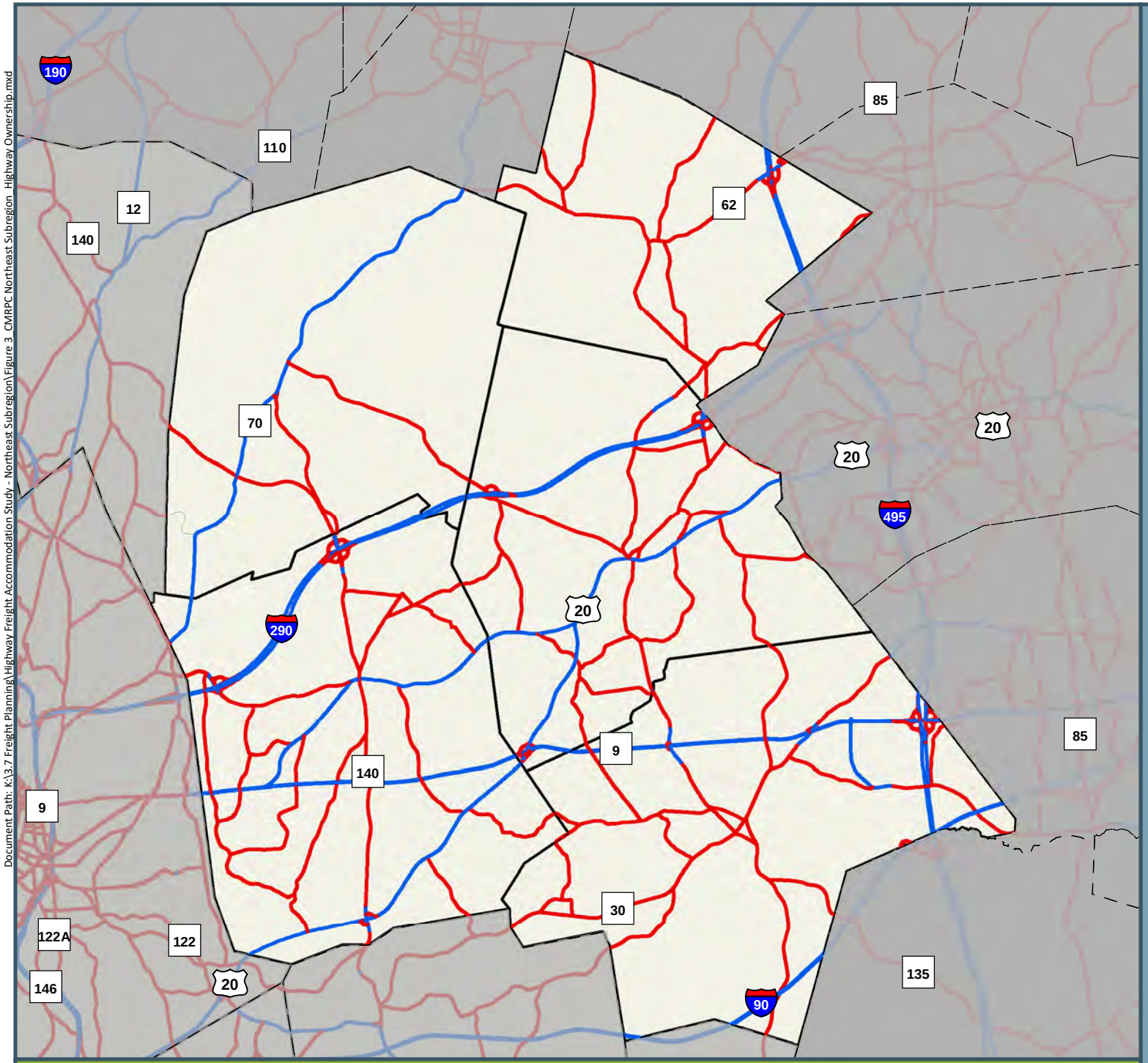
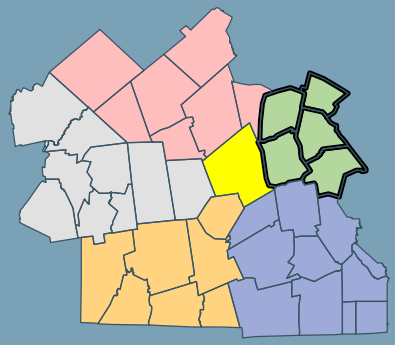
Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 2_CMRPC Southeast Subregion_Fed Aid System.mxd

FIGURE 2 - NORTHEAST SUBREGION FEDERAL-AID ELIGIBLE ROAD CLASSIFICATIONS



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 3_CMRPC Northeast Subregion_Highway Ownership.mxd



Legend

- Northeast Subregion Towns
- City or Town accepted road
- MassDOT Owned

N

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FIGURE 3 - NORTHEAST SUBREGION ROADWAY OWNERSHIP

Environmental Justice & Vulnerable Populations

Environmental Justice (EJ) was first highlighted in Executive Order 12898 (1994) which mandated all federal agencies to ensure that their programs do not disproportionately cause high and adverse effects on minority and low-income populations and to ensure that all potentially affected populations have the opportunity to full and fair participation in the transportation decision-making process. Moreover, the US Department of Transportation (DOT) Order 5610.2(a) presents the DOT's requirement to consider EJ in all programs, policies, and activities with the US DOT. The guiding principles in DOT's national policy are:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

To carry out the intent of the federal guidance, it was necessary to identify low income and minority communities or neighborhoods throughout the planning region. The CMMPO updated and approved the current EJ definition in November 2022 to reflect regional characteristics and demographic changes based on the decennial US Census. With the update, the phrase EJ has now evolved to Regional Environmental Justice "Plus" (REJ+). A REJ+ community is a designation assigned to Census block groups with relatively high shares of residents that are especially impacted by potential changes to established transportation networks. This designation is considered "regional" in nature because the socioeconomic characteristics that designate REJ+ status are considered in relation to regional percentiles. This is done by comparing block group characteristics to MPO-level percentiles as opposed to statewide percentiles. Further, the designation is called "Plus" because it includes characteristics beyond the traditional EJ definition so as to identify the most dominant factor that defines a given community's social vulnerabilities. The definition reads as follows:

- To qualify as an REJ+ community, a block group must meet the following thresholds that correspond to traditional EJ criteria. All data used for this analysis was obtained from the US Census in which the unit of analysis is census block groups (ACS 2021 5-year estimates).
    - **Income**: Annual median household income $\leq$ the MPO's 25th percentile.
    - **Race & Ethnicity**: Percent of individuals that identify as Hispanic or Latino; Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian or Other Pacific Islander; Some other race; or Two or more races and do not identify as White alone $\geq$ the MPO's 75th percentile.

    - **Limited English Proficiency (LEP)**: Percent of households with LEP speaking members ≥ the MPO's 75th percentile.
- While the characteristics that have been traditionally used to define EJ communities - thus establishing areas that are particularly vulnerable to social, economic, and political pressures - continue to be utilized, it is also recognized that these characteristics do not fully capture other socio-economic aspects that may indicate an area of high need with respect to transportation issues. This allows for the "most dominant factor" that drives transportation & accessibility needs in each community to be calculated and identified. The following "Plus" element characteristics are also considered for this determination:
    - **Car Ownership**: Percent of households without an available vehicle ≥ the MPO's 75th percentile.
    - **Disability**: Percent of households with one or more persons with a disability ≥ the MPO's 75th percentile.
    - **Age**: Percent of individuals aged 65 or older ≥ the MPO's 75th percentile.

The REJ+ thresholds were developed for each MPO region within the Commonwealth to serve as a control to the regional differences in socio-economic and demographic characteristics. The thresholds were calculated using the Quartile function in Excel to determine each MPO-specified threshold value within each EJ or "Plus" category. Block group-level values for each of six (6) characteristics are then compared to their respective MPO thresholds to determine if the block group meets the criteria for REJ+ designation. **Table 2** shows the CMMPO identified thresholds:

Table 2 – CMMPO REJ+ Thresholds

MPO	Income	Nonwhite	LEP	Disability	Zero-Vehicle	Senior
Central Mass	$60,921	41%	8%	32%	14%	21%

For block groups that are identified as REJ+ communities, the "most dominant" of the six characteristics was identified in terms of the greatest dissimilarity or distance from the MPO threshold. This identification provides a deeper sense of the social contexts that shape local transportation needs. Knowing that an REJ+ community's most dominant factor is a lack of automobile access, a high proportion of individuals with physical disabilities, or a high share of older individuals, provides greater insight into the programs, initiatives, or investments that can be made to promote accessibility & mobility for those who may need extra support. **Figure 4** shows the identified REJ+ populations in the Northeast planning subregion.

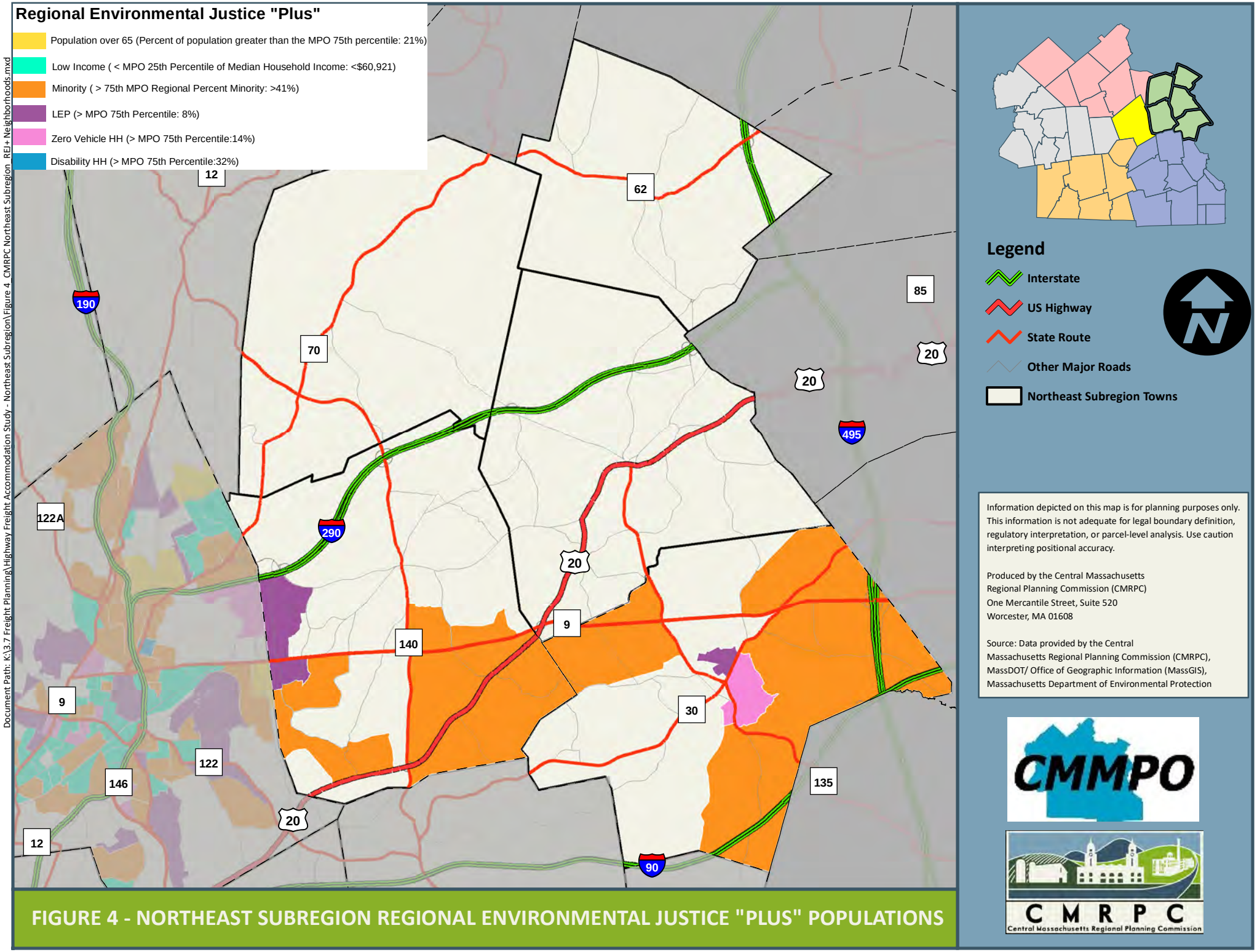
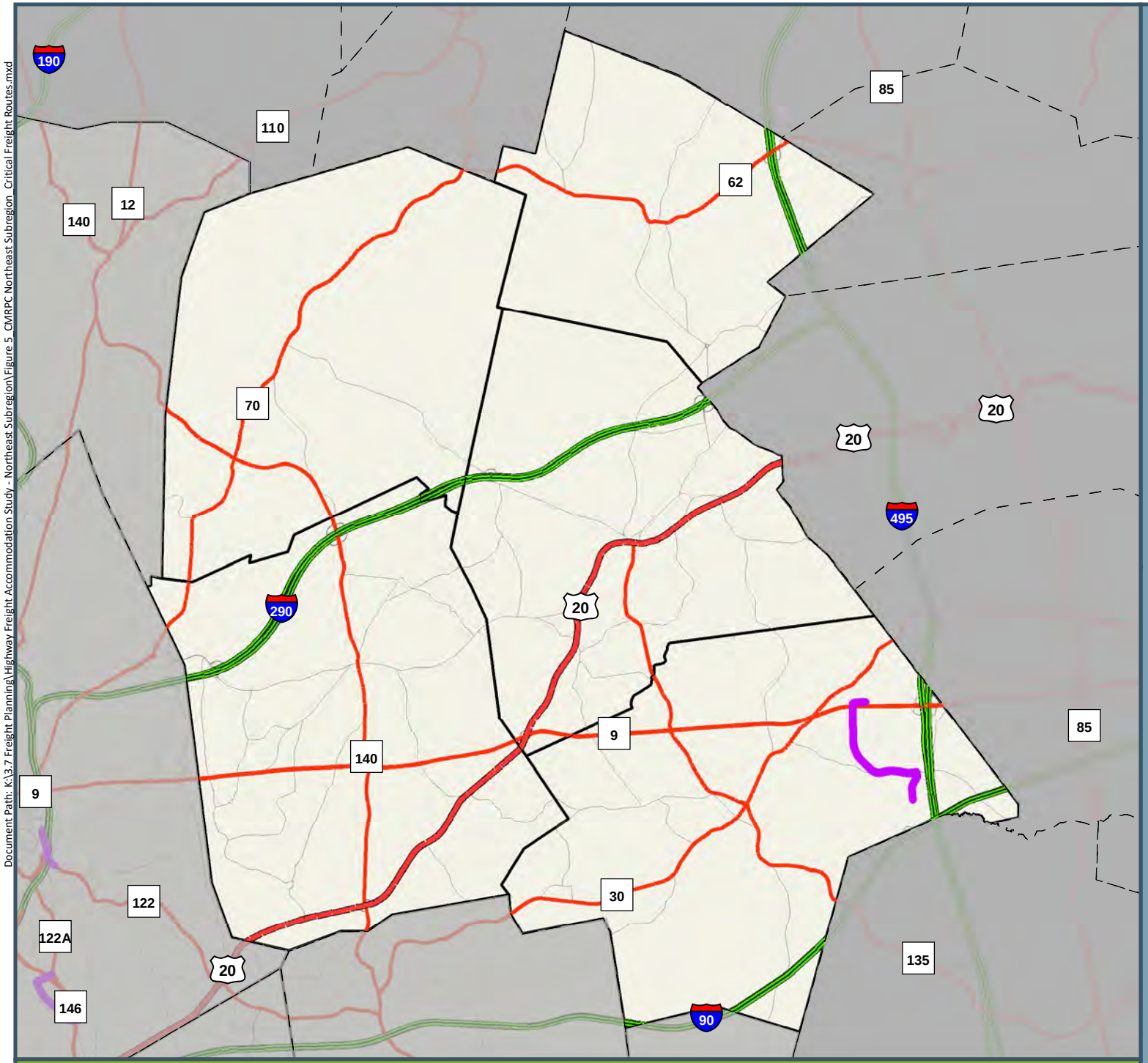
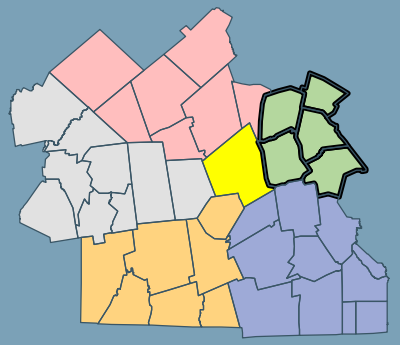


FIGURE 4 - NORTHEAST SUBREGION REGIONAL ENVIRONMENTAL JUSTICE "PLUS" POPULATIONS

Critical Freight Corridors

As part of the development of the state's prior 2018 *Massachusetts Freight Plan* (since updated in 2023), the CMMPO staff took an active role, as requested by MassDOT Office of Transportation Planning (OTP), in designating "Critical Rural & Urban Freight Corridors". This exercise reaffirmed existing, previously designated routes, while also establishing other new major highway freight routes in the planning region connecting to the NHS. As requested by MassDOT OTP, staff completed the process of identifying (reaffirming in many cases) primary highway freight routes throughout the region, delineating between those highways in the urban and rural areas. As part of this exercise, the region also needed to meet MassDOT OTP-allocated mileage parameters determined for each of the state's planning regions. The CMMPO region was allocated six (6) urban miles and 23 rural miles. As shown in **Figure 5**, in the Northeast planning subregion there is an established Critical Freight Corridor within the town of Westborough consisting of segments of Computer Drive, Flanders Road, and the entirety of Walkup Drive.





Legend

- Northeast Subregion Towns
- Critical Freight Corridor
- **Interstate**
- **US Highway**
- **State Route**
- Other Major Roads

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FIGURE 5 - NORTHEAST SUBREGION CRITICAL FREIGHT CORRIDORS

Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 5_CMRPC Northeast Subregion_Critical Freight Routes.mxd

2.2 Transportation Improvement Program (TIP) Projects

The TIP is a federally-required planning document that lists all highway, bridge, transit, bicycle & pedestrian, and intermodal projects in the CMMPO planning region that are programmed to receive federal-aid funding. Projects that improve air quality and safety are included in the TIP as well as projects of regional & statewide significance. Non federal-aid (NFA) projects, fully funded by the state, are also included in the TIP for information purposes. Aware of limited statewide transportation funding resources, the CMMPO's annual program of projects must demonstrate financial constraint within the federal-aid funding targets provided by MassDOT OTP.

Table 3 lists the Northeast planning subregion's TIP projects that are programmed in the Federal Fiscal Years 2025 – 2029. As can be seen in the table, there are five (5) projects programmed for federal-aid funding in the Northeast subregion totaling $79 million in cost. There are two (2) highway reconstruction projects, one (1) major intersection improvement project, one (1) bridge preservation project, and one (1) Safe Routes to School (SRS) project.

Table 3

Northeast Subregion TIP Projects (2025-2029)

Year	MassDOT Project ID	MPO	Municipality	MassDOT Project Description	District	Funding Source	Total Programmed Funds	Federal Funds	Non-Federal Funds	Other Information
Bridge Systematic Maintenance NB										
2025	612874	Central Mass	Multiple	SHREWSBURY- WORCESTER- BRIDGE PRESERVATION, S-14-021=W-44-115 (1RA & 1RB), I-290 (EB AND WB) OVER COMBINATION OF LAKE QUINSIGMOND AND LAKE AVENUE NORTH	3	HIP-BR	$23,098,070	$18,478,456	$4,619,614	Construction, Total Project Cost = $23,098,070, Design Status = Approved
Roadway Reconstruction										
2026	610825	Central Mass	Shrewsbury	SHREWSBURY- REHABILITATION & BOX WIDENING ON ROUTE 20, FROM ROUTE 9 TO SOUTH STREET	3	NHPP	$8,000,000	$6,400,000	$1,600,000	Construction, Project is AC'd between 2026 & 2028, Total Project Cost = $31,405,702, Design Status = 25%, YOE = 4%
Roadway Reconstruction										
2027	610825	Central Mass	Shrewsbury	SHREWSBURY- REHABILITATION & BOX WIDENING ON ROUTE 20, FROM ROUTE 9 TO SOUTH STREET	3	NHPP	$14,000,000	$11,200,000	$2,800,000	Construction, Project is AC'd between 2026 & 2028, Total Project Cost = $31,405,702, Design Status = 25%, YOE = 4%
Safe Routes to School										
2027	613367	Central Mass	Westborough	WESTBOROUGH- FISHER STREET IMPROVEMENTS (SRTS)	3	TAP	$2,114,100	$1,691,280	$422,820	Construction, Total Project Cost = $2,114,100, Design Status = Approved, YOE = 8%
Intersection Improvements										
2028	607764	Central Mass	Shrewsbury	SHREWSBURY- INTERSECTION & SIGNAL IMPROVEMENT AT US 20 (HARTFORD TURNPIKE) AT GRAFTON STREET	3	HSIP	$10,486,334	$9,437,701	$1,048,701	Construction, Total Project Cost = $10,486,334, Design Status = 25%, YOE = 12%
Roadway Reconstruction										
2028	610825	Central Mass	Shrewsbury	SHREWSBURY- REHABILITATION & BOX WIDENING ON ROUTE 20, FROM ROUTE 9 TO SOUTH STREET	3	NHPP	$9,405,702	$7,524,562	$1,881,140	Construction, Project is AC'd between 2026 & 2028, Total Project Cost = $31,405,702, Design Status = 25%, YOE = 4%
Roadway Reconstruction										
2029	613242	Central Mass	Westborough	WESTBOROUGH- ROADWAY IMPROVEMENTS ON ROUTE 30 (EAST MAIN STREET), FROM HASTINGS ELEMENTARY TO THOMAS NEWTON DRIVE	3	STBG	$10,236,825	$8,189,460	$2,047,365	Construction, Total Project Cost = $10,236,825, Design Status = Approved, YOE = 16%, PM Score = 15 out of 27

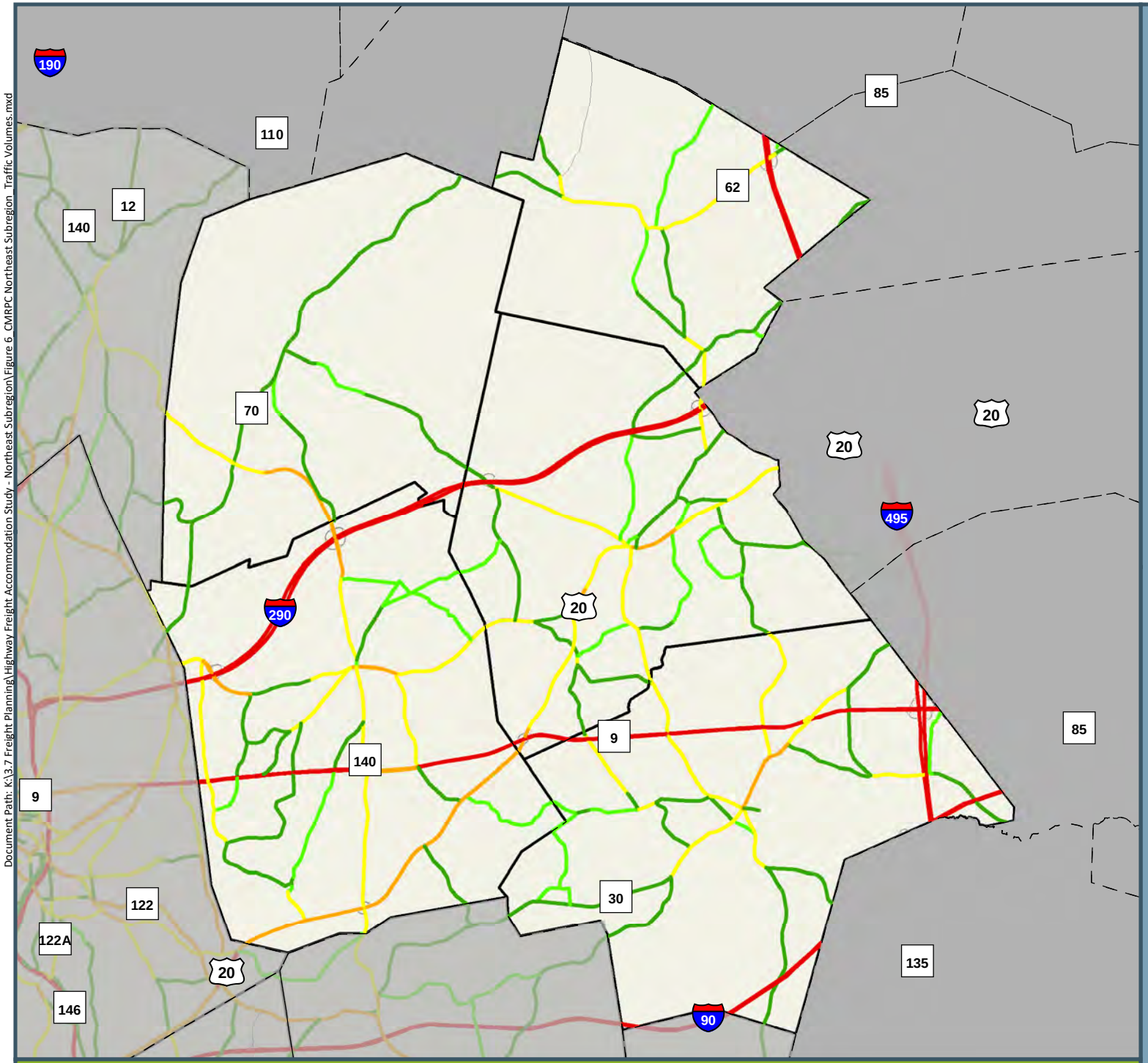
2.3 Traffic Volumes & Truck Percentages

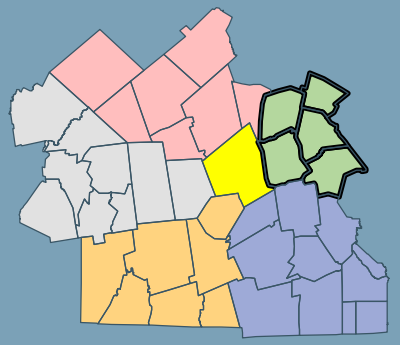
CMRPC conducts traffic counts on numerous federal-aid highways within the Central Massachusetts planning region. The Automatic Traffic Recorders (ATRs) can collect volume data as well as vehicle classification data. Classification data is separated into 13 categories, established by FHWA, in which more than half of the categories can be considered a heavy vehicle. Heavy vehicle data is only available from 2016 to the present. As such, some of the federal-aid highways monitored by the planning staff have no vehicle classification data at this time. The most current 24-hour traffic volume data available for the federal-aid highways in the Northeast subregion are shown on the following maps.

Figure 6 shows daily traffic volumes on the federal-aid highways within the Northeast subregion. Most State Numbered Routes and major roadways accommodate volumes below 7,500 vehicles per day (VPD). US Route 20 and Routes 30, 62, 135, and 140 have numerous segments carrying over 7,500 VPD while Route 9 accommodates over 30,000 VPD. Notably, Interstate 90 (Massachusetts Turnpike) handles over 100,000 VPD while Interstates 290 and 495 both carry well in excess of 80,000 VPD.

Figure 7 shows heavy vehicle volumes based on the thickness of the red line. The thicker the line, the higher the observed heavy vehicle volumes. As the map shows, there are several highways where heavy vehicle volume data is currently not available. The State Numbered Routes exceeding 1,000 heavy VPD are US Route 20 in Northborough, Route 30 in Westborough, Route 62 in Berlin, Route 135 in Northborough, and Route 140 in Boylston and Shrewsbury. Additionally, other major roadways exceeding 1,000 heavy VPD include Main Street & Quinsigamond Avenue in Shrewsbury and Lyman Street & Flanders Road in Westborough.

Figures 8 & 9 show heavy vehicle volumes by direction of travel. The first map shows daily heavy vehicle volumes for the northbound & eastbound directions. The second map shows daily heavy vehicle volumes for the southbound & westbound directions. The respective heavy vehicle volumes are color-coded in four categories corresponding to the observed volume totals. In addition to volume, **Figure 10** shows heavy vehicle volume percentages in the Northeast subregion. The observed percentages have been further separated into four categories, with red being the highest (>14%). Most highways in the subregion where vehicle classification data is available range between 5% and 14% heavy vehicles. Notably, there are several roadway segments exceeding 14% in each of the five host communities in the Northeast subregion.





Legend

- Northeast Subregion Towns
- < 2,500
- 2,500 - 7,499
- 7,499 - 14.999
- 14,999 - 30,000
- > 30,000

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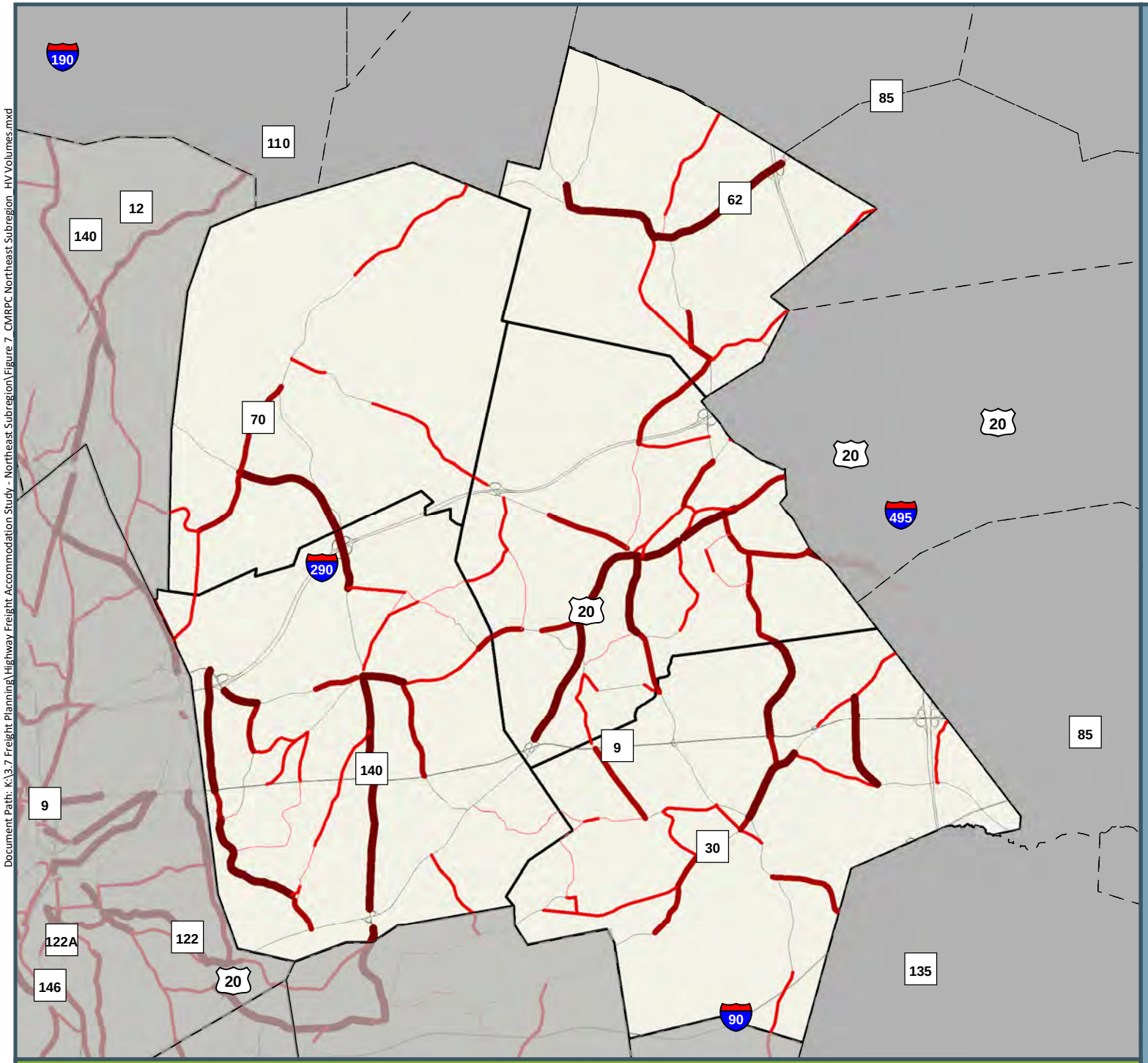
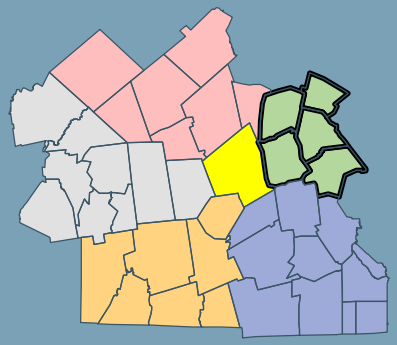
Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 6_CMRPC Northeast Subregion_Traffic Volumes.mxd

FIGURE 6 - NORTHEAST SUBREGION TRAFFIC VOLUMES





Legend

- Northeast Subregion Towns
- 1 - 100
- 101 - 500
- 501 - 1,000
- > 1,000
- No Data

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 7_CMRPC Northeast Subregion_HV Volumes.mxd

FIGURE 7 - NORTHEAST SUBREGION HEAVY VEHICLE VOLUMES

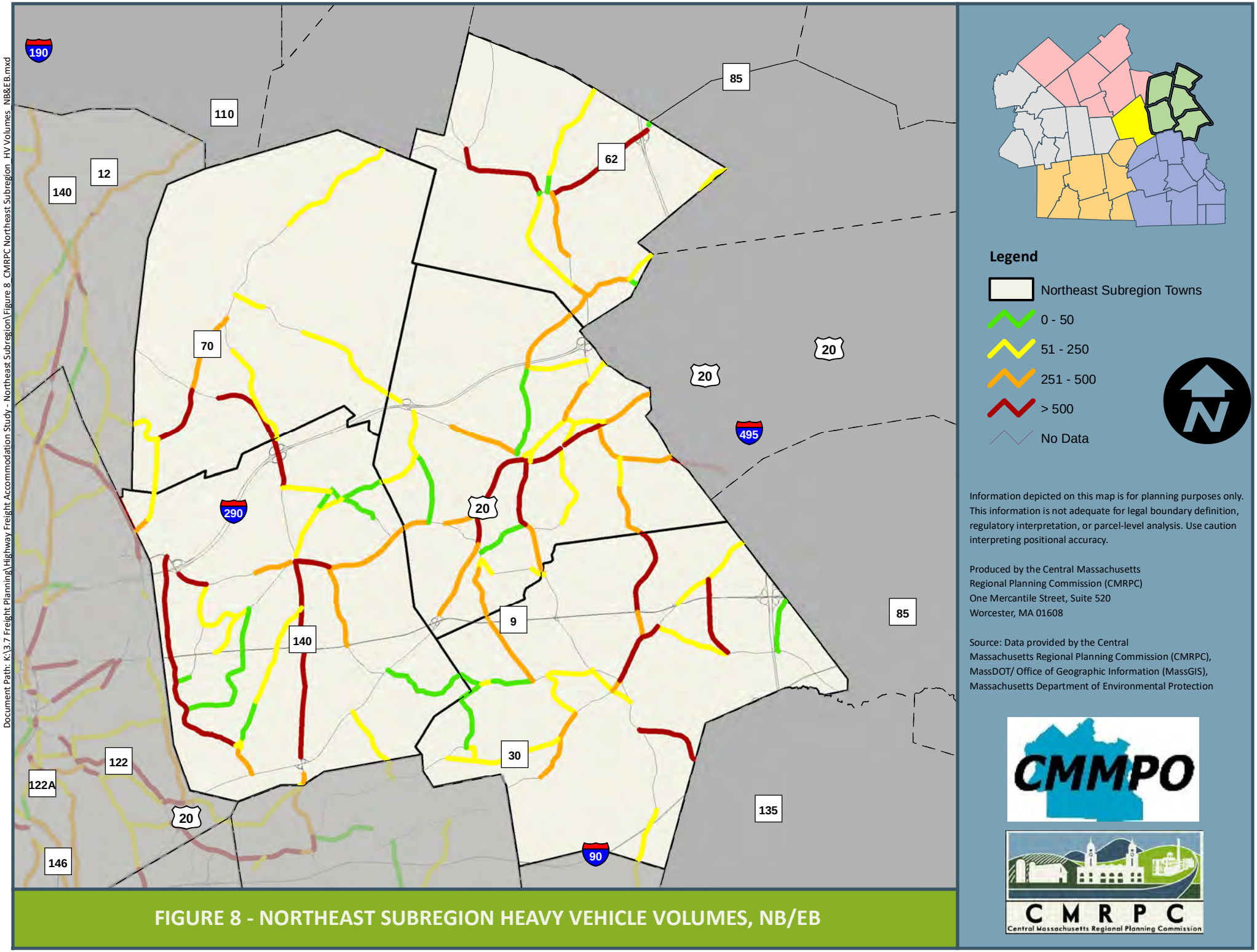
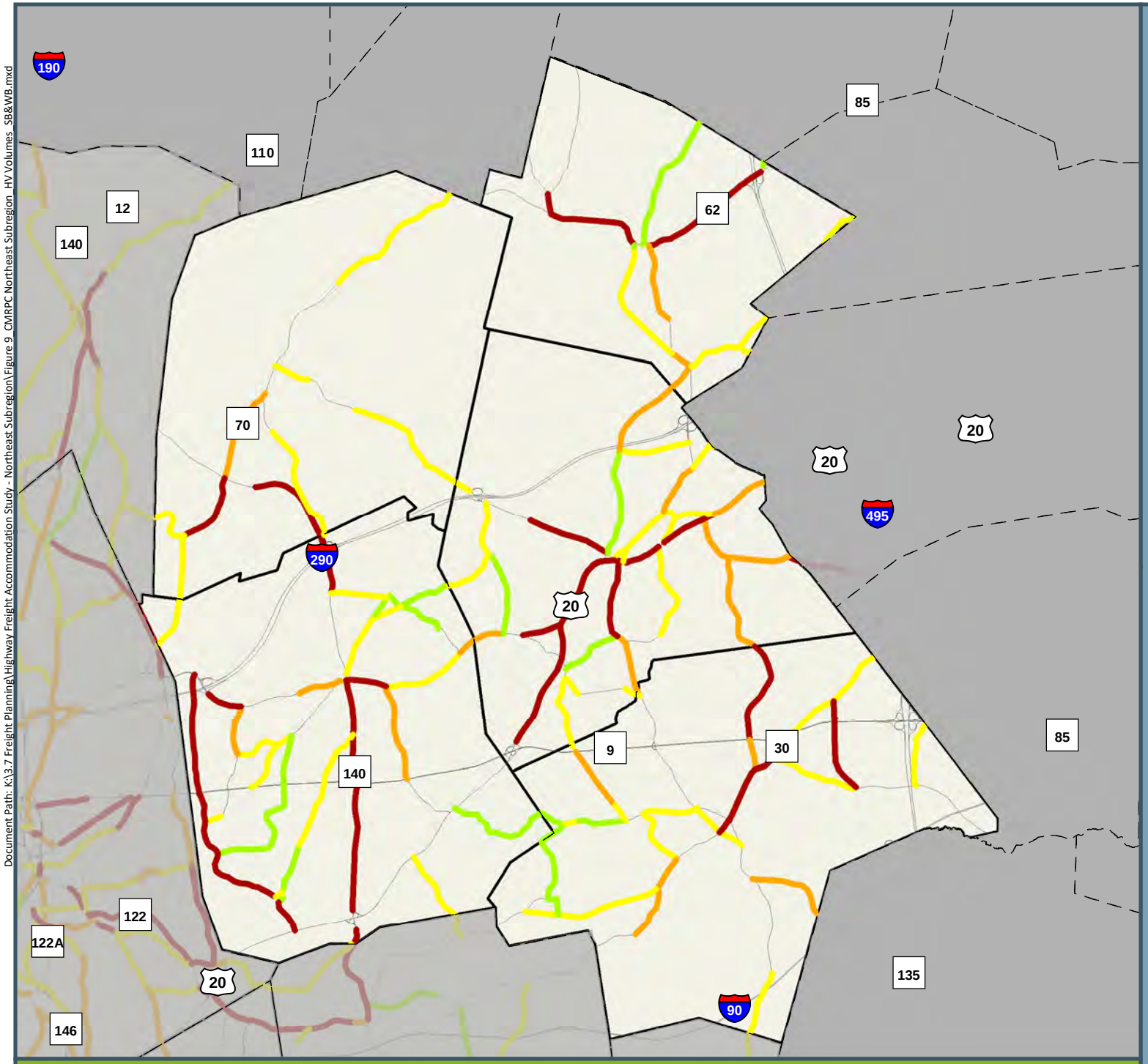
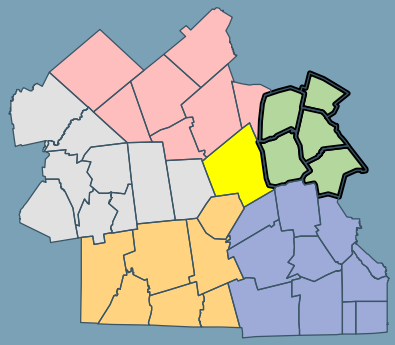


FIGURE 8 - NORTHEAST SUBREGION HEAVY VEHICLE VOLUMES, NB/EB





Legend

- Northeast Subregion Towns
- 0 - 50
- 51 - 250
- 250 - 500
- > 500
- No Data

N

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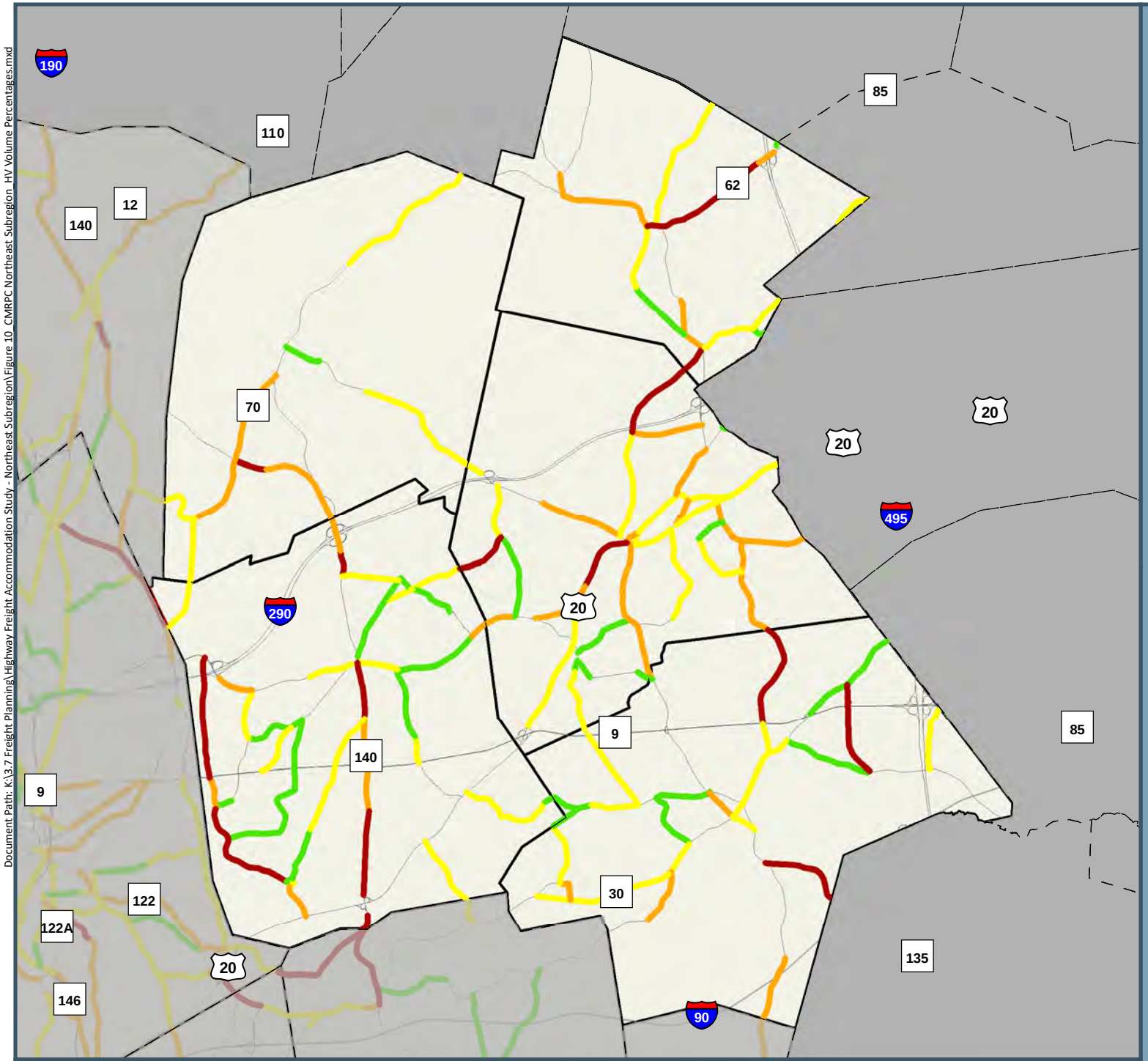
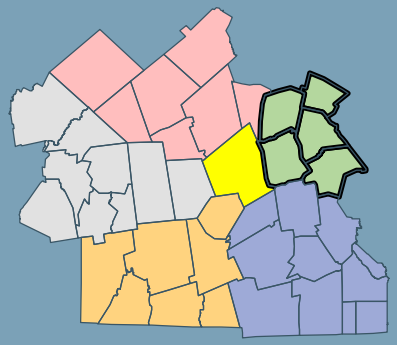
Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 9_CMRPC Northeast Subregion_HV Volumes_SB&WB.mxd

FIGURE 9 - NORTHEAST SUBREGION HEAVY VEHICLE VOLUMES, SB/WB





Legend

- Northeast Subregion Towns
- 2.00% - 4.99%
- 5.00% - 8.99%
- 9.00% - 13.99%
- > 14.00%
- No Data

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 10_CMRPC Northeast Subregion_HV Volume Percentages.mxd

FIGURE 10 - NORTHEAST SUBREGION HEAVY VEHICLE VOLUME PERCENTAGES

3.0 Host Community Management Systems Information

This section discusses the Management Systems data & analyses that is used for this study. Management Systems data includes congestion data such as highway travel speeds and intersection delays, safety data, pavement condition, traffic volumes and bridge conditions. These types of data are each considered separately but are also analyzed together within a data integration exercise, summarized at the end of this section. Knowing the specific highway segments that have multiple identified deficiencies greatly assists in the decision-making process concerning which to potentially improve first while also simultaneously addressing a range of identified issues.

3.1 Congestion Management Process (CMP)

A CMP is an accepted, systematic approach for managing network congestion that provides accurate and current information on transportation system performance and assesses alternate strategies for congestion management that meet both state and local needs. As defined in federal regulation, a planning region's CMP should provide for the safe and effective integrated management and operation of the multimodal transportation system. There are eight (8) recommended actions taken within a CMP, as follows:

1) Develop regional objectives
2) Define the CMP network
3) Develop multimodal performance measures
4) Monitor and collect data
5) Analyze congestion problems and needs
6) Identify and assess strategies
7) Program and implement strategies, and
8) Evaluate strategy effectiveness

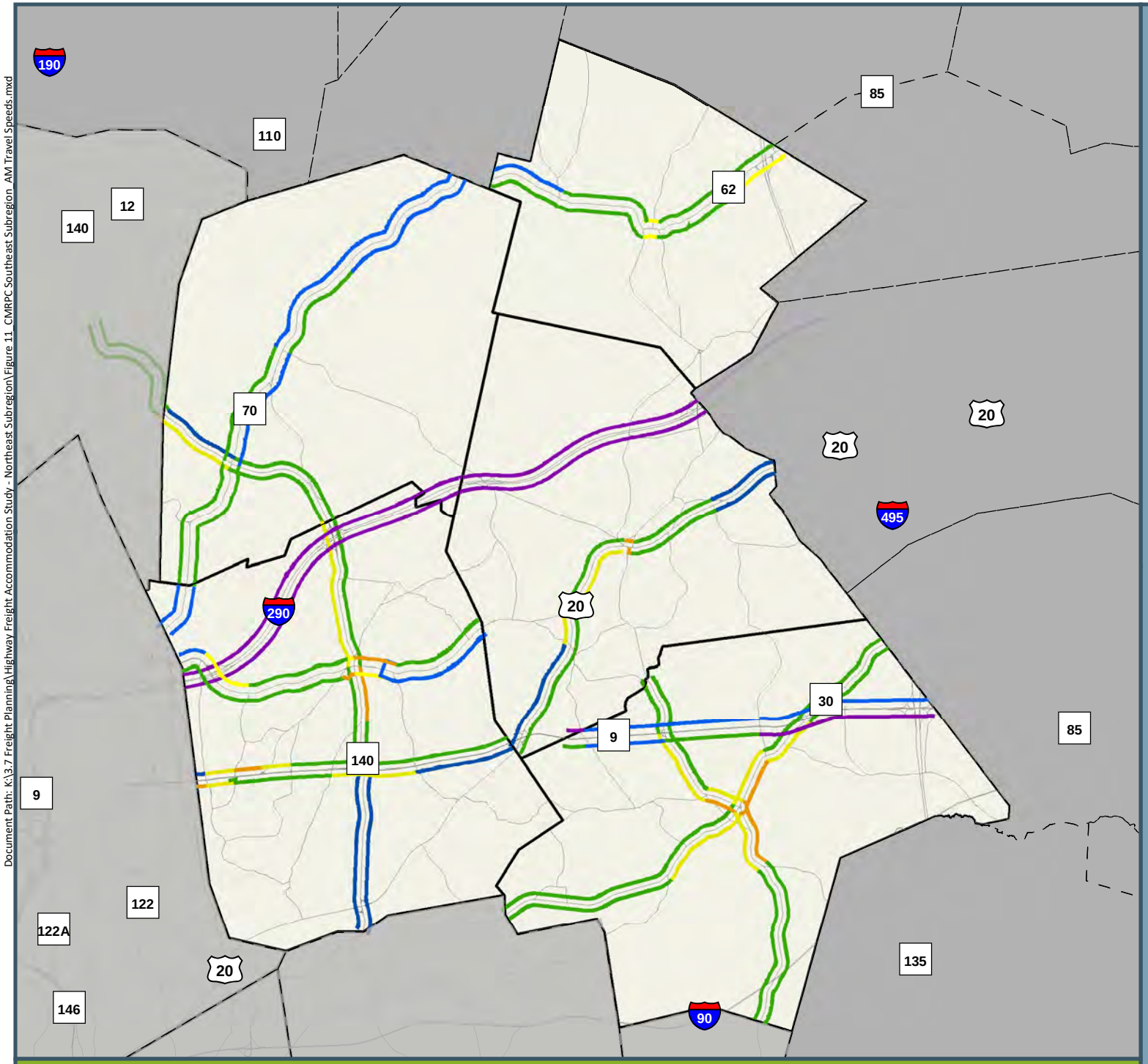
The CMP data included in this section are from both Travel Time & Delay studies and Turning Movement Counts (TMCs) conducted in the field.

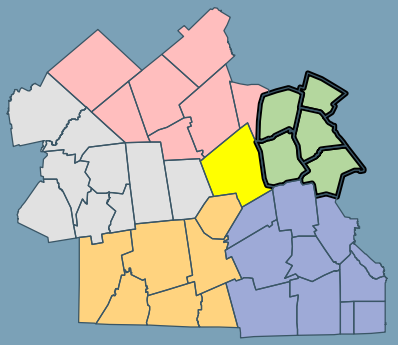
Roadway Segment Travel Speeds

To measure congestion on the planning region's highway facilities, Travel Time & Delay studies are periodically conducted on identified CMP focus roadway segments. Data is collected between 7:00 AM and 9:00 AM and from 4:00 PM to 6:00 PM on a single randomly selected weekday. In addition to determining average highway travel speeds, Travel Time & Delay studies on a particular roadway segment assist in the identification of critical vehicle delay

locations as well as length of encountered delays. The “average car” technique is used to collect this data. In this procedure, a test vehicle travels according to the driver’s judgement of the average speed of existing traffic flows. A Global Positioning System (GPS) device allows for the automated collection of travel time data.

The following two maps, **Figures 11 and 12**, show average travel speeds for the Northeast subregion in the AM and PM peak hours. Travel speeds are separated into six (6) categories and have been assigned different colors. The observed travel speeds are shown for both directions of travel. Travel speed data was available for segments of Routes 9, US 20, 30, 62, 70, 135, and 140. As shown in both maps, there is a mixture of observed travels speeds during both the AM and PM peak periods.





Legend

- Northeast Subregion Towns
- < 10 mph
- 10 - 19 mph
- 20 - 29 mph
- 30 - 39 mph
- 40 - 49 mph
- > 49 mph

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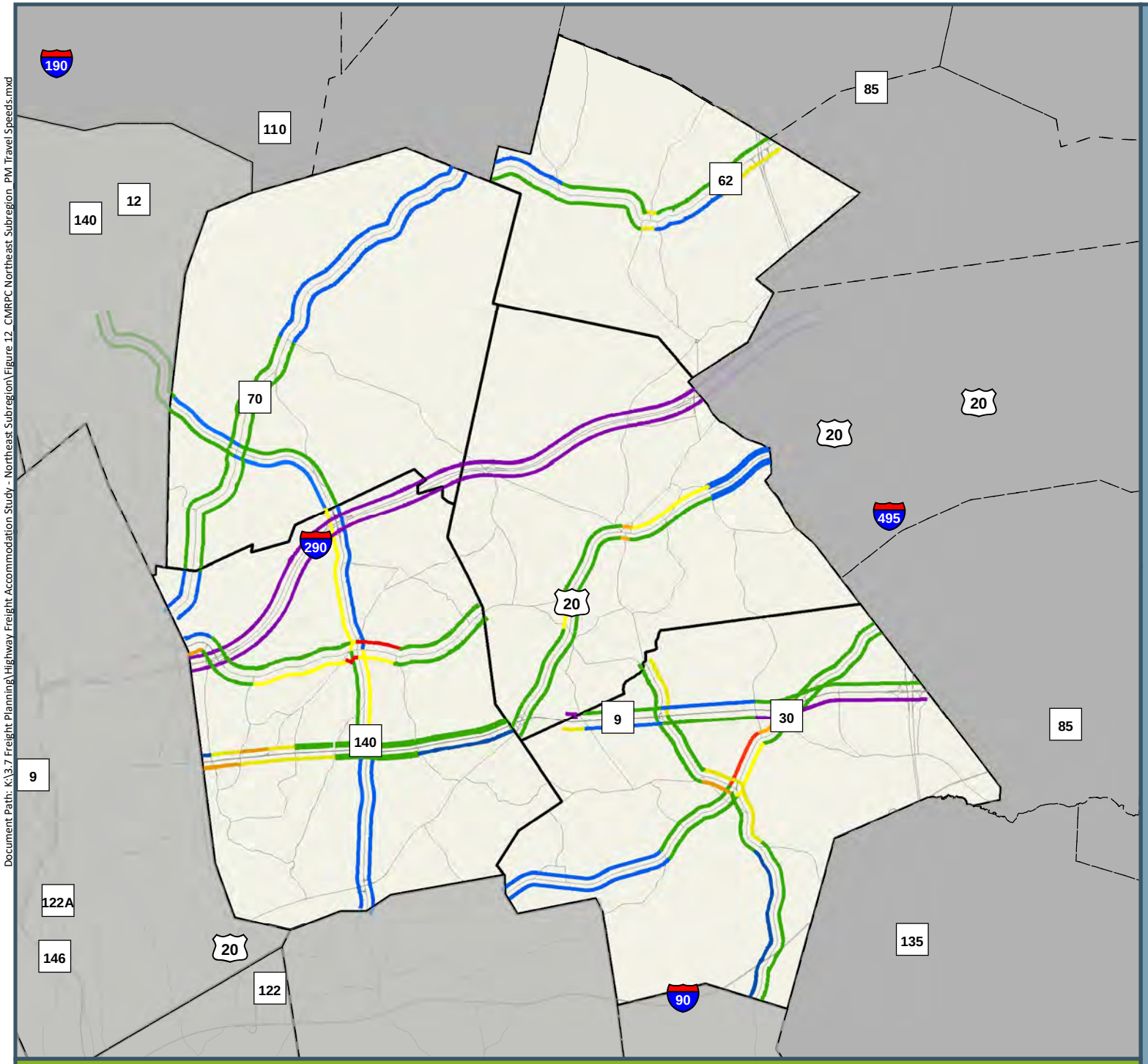
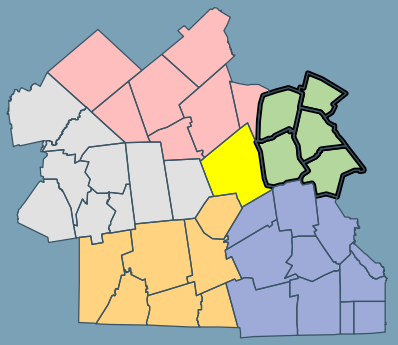
Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 11_CMRPC Southeast Subregion_AM Travel Speeds.mxd

FIGURE 11 - NORTHEAST SUBREGION OBSERVED AM PEAK HOUR TRAVEL SPEEDS





Legend

- Northeast Subregion Towns
- < 10 mph
- 10 - 19 mph
- 20 - 29 mph
- 30 - 39 mph
- 40 - 49 mph
- > 49 mph

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 12_CMRPC Northeast Subregion_PM Travel Speeds.mxd

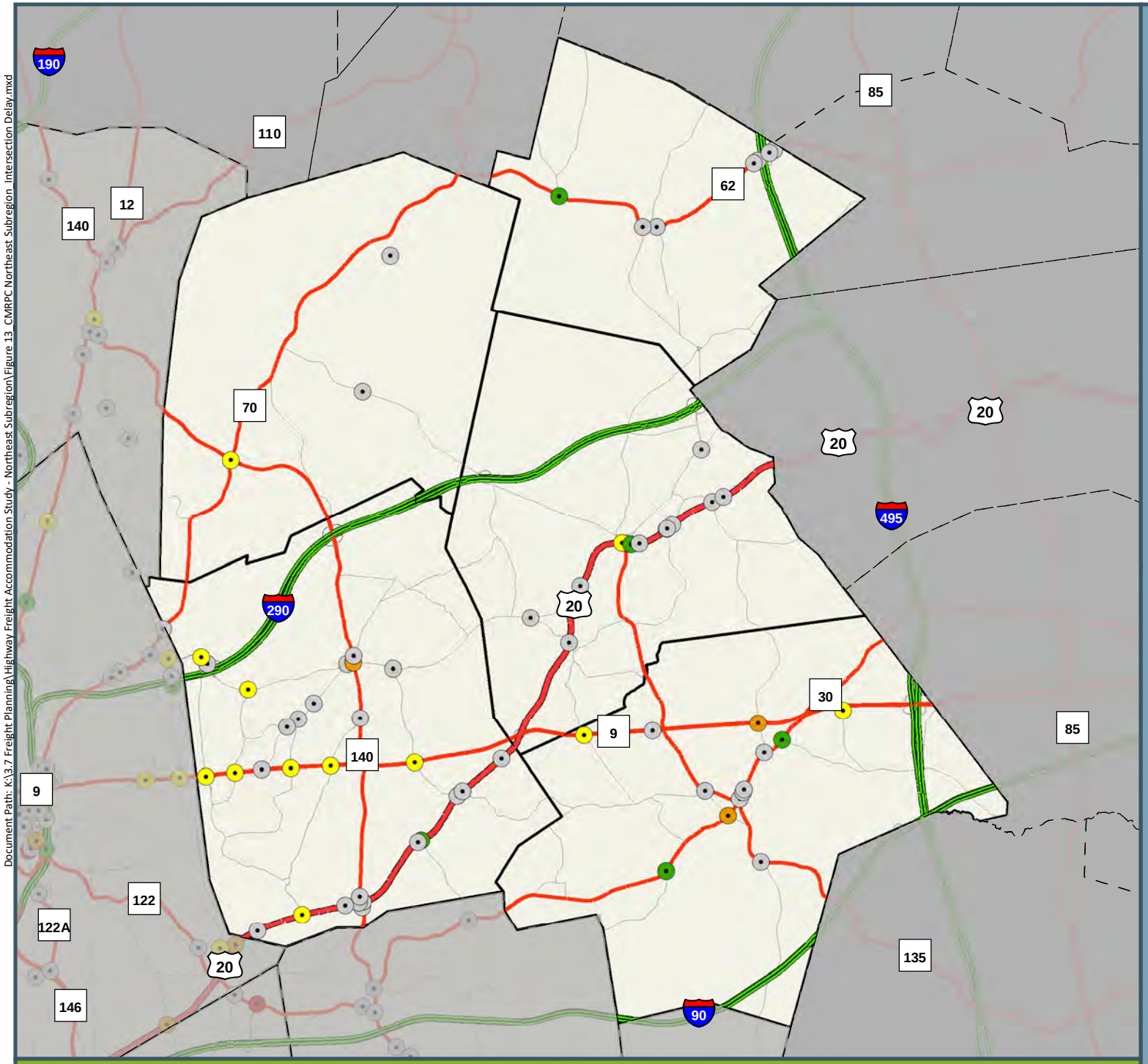
FIGURE 12 - NORTHEAST SUBREGION OBSERVED PM PEAK HOUR TRAVEL SPEEDS

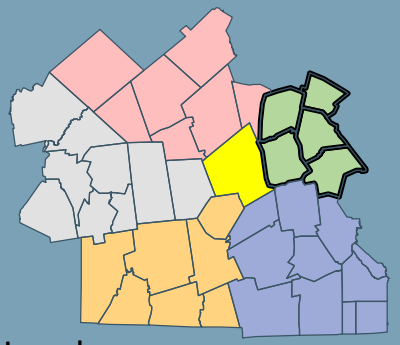
Intersection Encountered Delays

For all intersections where Turning Movement Counts (TMCs) are obtained, it is possible to analyze the total delay encountered during the examined peak hour travel periods. A byproduct of the process that results in intersection Level-of-Service (LOS) rankings is the "average delay encountered per entering vehicles". When multiplied by the number of vehicles to which the delay pertains, one can arrive at a total amount of delay, or time in "car-minutes". A car-minute is one car waiting for one minute, presumably idling and producing emissions as well as adding to total social and economic costs. Five cars waiting for a minute each, or one car waiting for a total of five minutes, results in the same theoretical total waiting time cost and would be measured and quantified by a total net delay of five car-minutes.

Signalized intersections have calculated delays of varying levels on all approaches. "STOP" sign-controlled intersections have delay calculated only for those vehicles arriving on the minor approaches that are required to stop as well as those vehicles on the major approaches waiting to make a left turn. Generally, signalized intersections often exhibit more total delay, however, a busy stop-controlled location (that may not presently meet the warrants for signalization) can exhibit substantial delays if volumes on both minor approaches predominately seek to cross the major approaches. Traffic signals establish orderly traffic flows and increase safety by providing the opportunity for traffic volumes to proceed on both the major and minor intersection approaches, thus balancing encountered vehicle delay. When two heavily traveled streets cross at a major signalized intersection, significant delays often result due to the high traffic volumes that need to be accommodated. Once intersection traffic signal operations are optimized, geometric improvements could potentially be considered, such as the addition of exclusive and/or shared turning lanes.

All five (5) of the Northeast subregion host communities have at least one critical intersection that was analyzed. Data has been collected for these intersections from 2010 to the present. If a location was counted over multiple years, then the most recent data was used. **Figure 13** shows the Northeast subregion's identified critical intersections in five categories. Most of the intersections are within the lowest category, which have less than 1,525 "car-minutes" of total delay. There are twelve (12) intersections that have more than 2,500 car-minutes of delay. These intersections are within the towns of Boylston, Northborough, Shrewsbury, and Westborough. There are also three (3) intersections in the Northeast subregion that have over 7,500 car-minutes of delay, one (1) in Shrewsbury and two (2) in Westborough.





Legend

TotalDelay in Minutes

- 7 - 1,525
- 1,525 - 2,500
- 2,500 - 7,500
- 7,500 - 10,000
- > 10,000
- Northeast Subregion Towns

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 13_CMRPC Northeast Subregion_Intersection Delay.mxd

FIGURE 13 - NORTHEAST SUBREGION ENCOUNTERED DELAY AT CRITICAL INTERSECTIONS

3.2 Safety Management System (SMS)

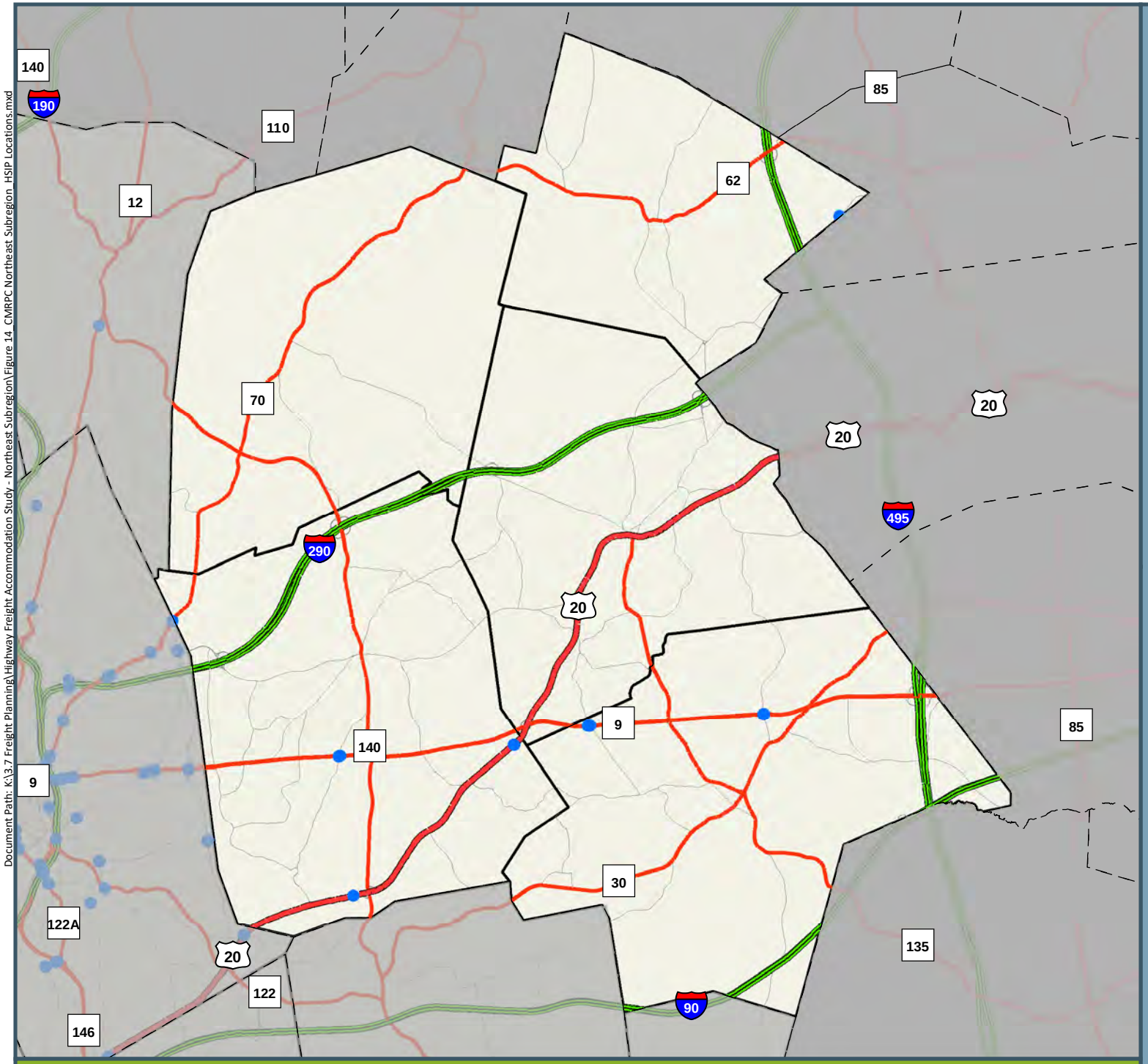
Vehicle crash data is provided by MassDOT through their web-based crash report tool "IMPACT". MassDOT's Registry of Motor Vehicles (RMV) branch provides the crash records incorporated into the IMPACT website. Notably, a quality control analysis is conducted on all crash records. Besides individual crashes, "crash clusters" that are indicative of numerous reported incidents are also identified for vehicles, bicycles, and pedestrians.

Highway Safety Improvement Program (HSIP) Locations

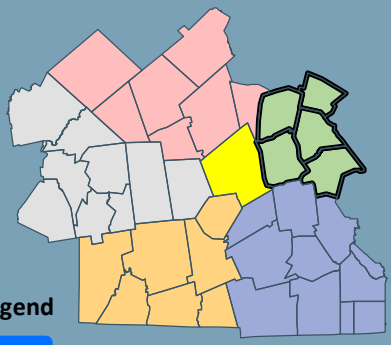
The purpose of FHWA's HSIP is to reduce the number of fatal and serious injury vehicle crashes by targeting high vehicle crash locations and causes on all public roads. Projects using HSIP funding are required to be data-driven, strategic approaches to improving highway safety that focus on system performance. An overarching requirement is that federal-aid HSIP funds must be used for safety projects that are consistent with MassDOT's established Strategic Highway Safety Plan (SHSP). Such projects are meant to address identified highway safety problems by correcting or improving a hazardous roadway location or feature.

An HSIP-eligible crash cluster is one in which the total number of Equivalent Property Damage Only (EPDO) crashes are within the top 5% in the planning region. The EPDO is a method of combining the number of crashes along with the severity of those crashes based on a weighted scale. Prior to 2016, the weighting factors used were as follows: a fatal crash was worth 10, an injury crash was worth 5 and a property damage-only crash was worth 1. Beginning in 2016, the weighting factors were updated so that fatal and injury crashes are now both worth 21 while a property damage-only crash continues to be worth 1.

As shown in **Figure 14**, there are six (6) HSIP crash clusters in the Northeast subregion identified between 2017 - 2019. There are crash clusters located in three (3) of the Northeast host communities. Berlin has one (1) HSIP eligible location while the town of Shrewsbury has three (3) and the town of Westborough has two (2). Five (5) out of the six (6) HSIP locations are located on State Numbered Routes. The HSIP cluster with the most crashes is the Route 9/Lyman Street intersection in Westborough, with a total of 51 reported incidents.



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 14_CMRPC Northeast Subregion_HSIP Locations.mxd



Legend

- HSIP Eligible Crash Clusters
- Interstate
- US Highway
- State Route
- Other Major Roads
- Northeast Subregion Towns

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FIGURE 14 - NORTHEAST SUBREGION HSIP ELIGIBLE CRASH CLUSTERS (2017-2019)

3.3 Pavement Management System (PMS)

Pavement management is an asset management system designed to assist decision-makers in determining the most cost-effective strategies to address poor or failing roadway conditions. In general, a successful PMS defines a roadway network, identifies the condition of each segment of the network, develops a list of needed improvements, and balances those needs with the available resources of the party responsible (local, state, or federal) for maintaining the defined roadway network. *OPENGOV | Asset Management* is software used by CMRPC for the CMMPO's ongoing pavement management program to assess overall pavement condition in the planning region.

Pavement data has been collected on all federal-aid eligible roadways by conducting "windshield surveys." A team of two CMRPC representatives inspect each roadway segment, taking note of the severity and extent of the following pavement distresses:

- Potholes
- Distortions
- Alligator Cracking
- Transverse and Longitudinal Cracking
- Block Cracking
- Rutting
- Bleeding/Polished Aggregate
- Surface Wear and Raveling
- Corrugations, Shoving, and Slippage

Based on the field-observed pavement distresses, an Overall Condition Index (OCI) was calculated for each surveyed roadway segment. The OCI is used to rate each segment on a scale of 0 to 100. An OCI of 100 indicates optimal pavement conditions, usually a newly paved roadway segment. Conversely, a score of 0 indicates that a roadway has failed entirely and is likely impassable for an average passenger vehicle. Starting at the top index rating of 100, the OCI is calculated by subtracting a series of deduct values, each associated with the severity and extent of the various pavement distresses listed above. The resulting OCI is a quantified rating of observed pavement condition.

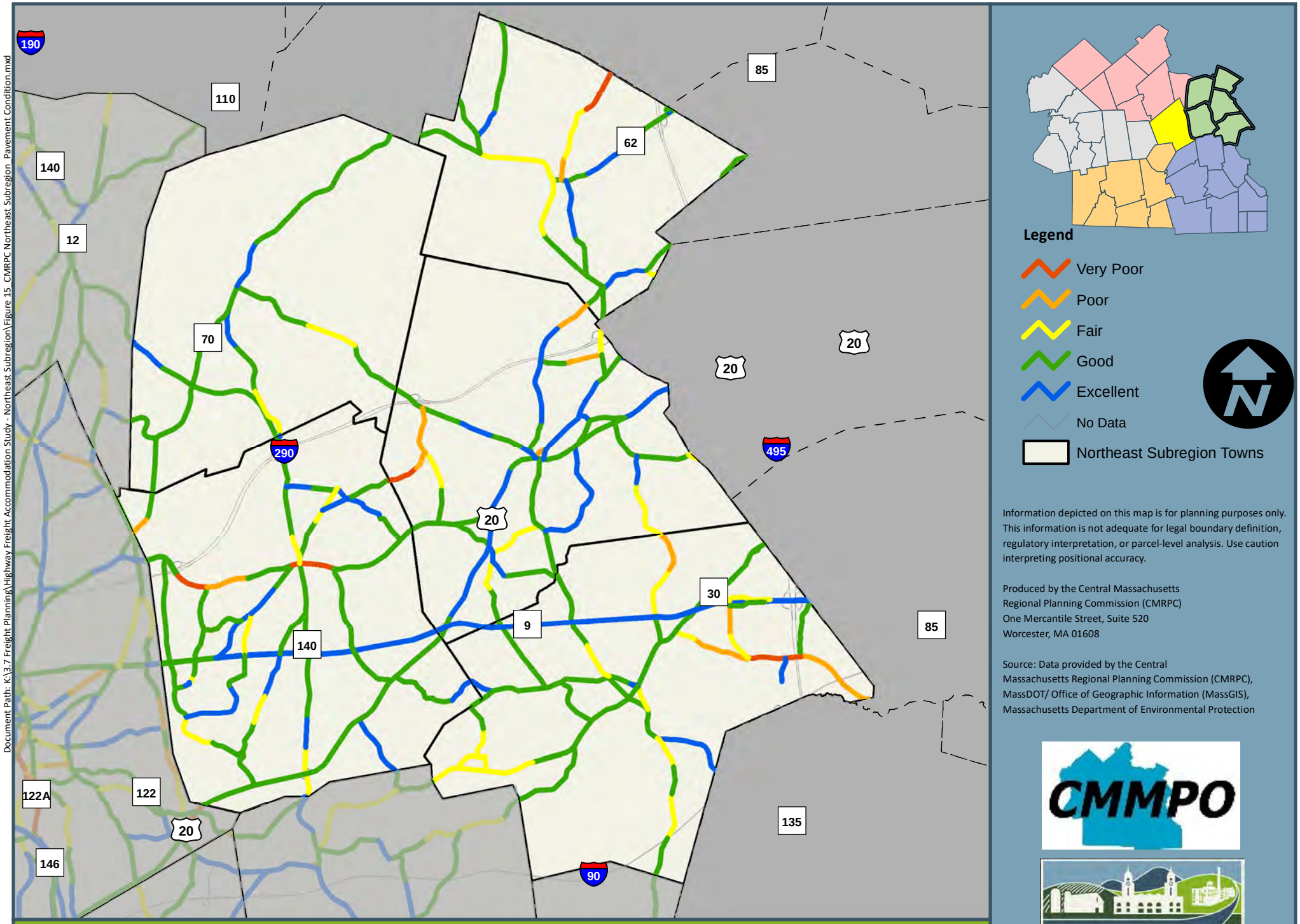
Depending on the OCI score, *OPENGOV's* recommended action category definitions are as follows:

- Do Nothing (OCI 100 – 88) – used when a road is in relatively perfect condition and prescribes no maintenance.
- Routine Maintenance (OCI 88 – 68, good condition) – used on roads in reasonably good condition to prevent deterioration from the normal effects of traffic and pavement age.

This treatment category would include either crack sealing, localized repair, or minor localized leveling.

- Preventative Maintenance (OCI 68 – 48) – used on roads in fair condition that have a slightly greater response to more pronounced signs of age and wear. This includes crack sealing, full-depth patching, and minor leveling, as well as surface treatments such as chip seals, micro-surfacing, and thin overlays.
- Structural Improvement (OCI 48 – 24) – used on poor roads when the pavement deteriorates beyond the need for surface maintenance applications, but the road base appears to be sound. These include structural overlays, shim and overlay, cold planning and overlay, and hot in-place recycling.
- Base Rehabilitation (OCI 24 – 0) – used for very poor roads that exhibit weakened pavement foundation base layers. Complete reconstruction and full-depth reclamation are indicated.

Figure 15 shows the observed pavement condition on the federal-aid highways in the Northeast subregion. As shown on the map, all roadways have been analyzed except for Interstates, which is the exclusive responsibility of MassDOT. Most communities in the Northeast planning subregion have roadway segments observed to be in both “poor” or “very poor” condition except for the town of Boylston. Overall, however, most roadways in the Northeast subregion were determined to be in “fair” condition or better.



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 15_CMRPC Northeast Subregion_Pavement Condition.mxd

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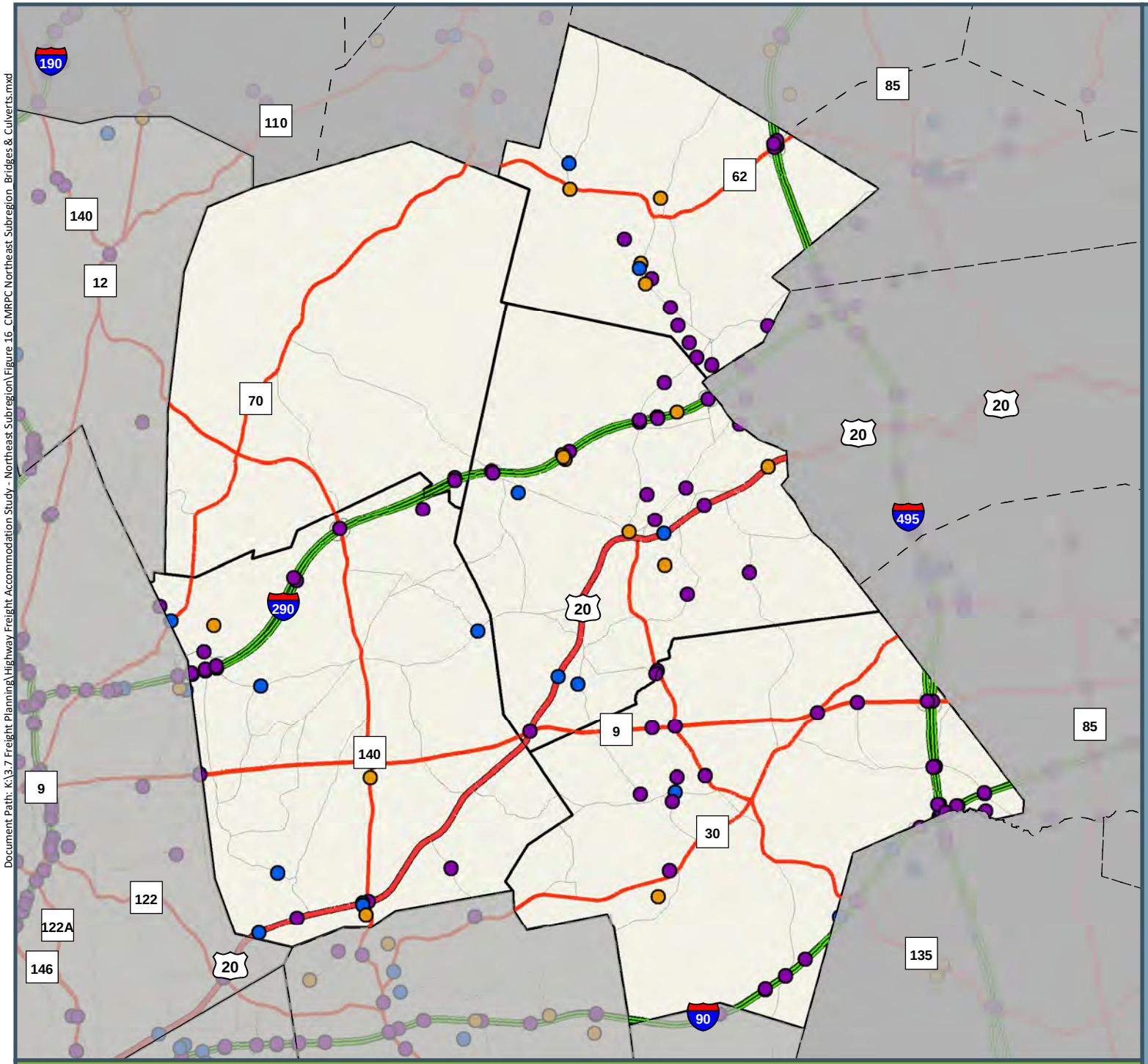
FIGURE 15 - NORTHEAST SUBREGION PAVEMENT CONDITION

3.4 Bridge Management System (BMS) and Culverts

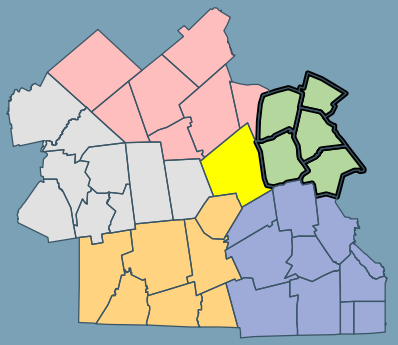
Figure 16 contains bridge data from the MassDOT – Highway Division Bridge Inspection Management System (BIMS). The types of structures included in the BIMS are:

- MassDOT Highway and municipally owned structures with spans greater than 20 feet. These are categorized as National Bridge Inventory (NBI) structures. MassDOT inspects NBI bridges on a biannual basis.
- MassDOT Highway and municipally owned short span bridges with spans between 10 and 20 feet. *The first complete inspection of the short span bridge inventory is currently in progress.*
- MassDOT Highway and municipally owned culverts with spans of 4 to 10 feet. *This category is currently incomplete, and an inventory effort is underway.*

There are a total of 104 bridges and culverts in the Northeast planning subregion. 21 of the total bridges and culverts are on State Numbered Routes. Additionally, there are 13 structures that are considered Structurally Deficient, however, only one (1) is situated on a State Numbered Route. A Structurally Deficient bridge is defined as a bridge whose condition has been rated no better than poor in any of these five areas: bridge deck, superstructures, substructures, culverts, and retaining walls. The host community of Northborough has the most structures overall with a total of 29 - some on the Interstate System - while the host community of Shrewsbury has the most structures on State Numbered Routes with a total of 10.



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 16_CMRPC Northeast Subregion_Bridges & Culverts.mxd



Legend

- Bridge (NBI)
- Short Span Bridge
- Culvert
- **Interstate**
- **US Highway**
- **State Route**
- Other Major Roads
- Northeast Subregion Towns

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FIGURE 16 - NORTHEAST SUBREGION BRIDGES AND CULVERTS

3.5 Management Systems Data Integration

Potential priorities for the Northeast planning subregion have been screened using a Management Systems approach, resulting in the identification of several highway segments that demonstrate the greatest need for improvement. The highway segments used in the integration analyses are based on staff's previously defined pavement data collection segments. These segments are usually less than one mile in length and are between two selected minor streets. All available data were analyzed based on these defined segments. The Management Systems integration approach combines the data related to congestion, safety, traffic volume, pavement condition, freight movement, intersection delays, and bridges to define "hot spots" within the Northeast subregion. The Management Systems data was analyzed to create corresponding scores based on the pre-determined criteria. **Table 4** summarizes the scoring method used for the highway segments.

Table 4 – Management Systems Analysis Scoring Criteria

Management System	Type of Data Used	Scoring Criteria	Points
Congestion	CMRPC Travel Demand Model	Segment is Congested	5 points
		Segment is not Congested	0 points
Safety	MassDOT Crash Data (2018-2020)	Segment has a Fatality	5 points
		Segment has an Injury	3 points
		Segment has a Property Damage-Only Crash	1 point
Traffic Volume	CMRPC Traffic Count Data	>20,000 VPD	5 points
		10,000 – 20,000 VPD	3 points
		<10,000 VPD	1 point
Pavement Condition	CMRPC Pavement Data	Segment is rated Very Poor	5 points
		Segment is rated Poor	3 points
		Segment is rated Fair	1 point
Freight	CMRPC Traffic Count Data	>1,000 Heavy Vehicles Per Day	5 points
		500 – 1,000 Heavy Vehicles Per Day	3 points
Freight Routes	Critical Freight Corridors	Segment is a Defined Critical Freight Corridor	3 points
Intersection Delays	CMRPC TMC Data	>7,500 Minutes of Total Delay	5 points
		1,525 – 7,500 Minutes of Total Delay	3 points

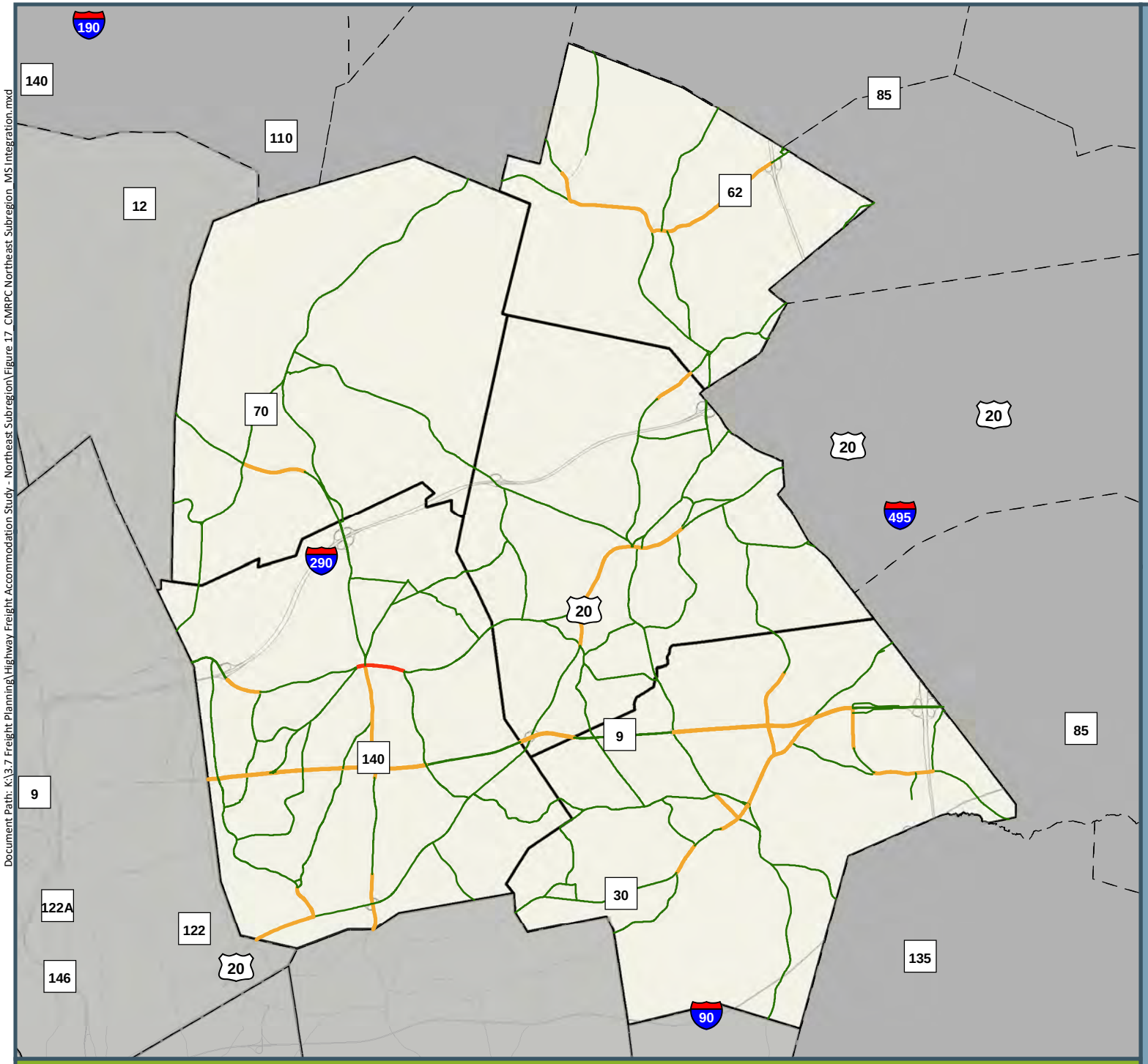
Management System	Type of Data Used	Scoring Criteria	Points
		<1,525 Minutes of Total Delay	1 point
Bridges	MassDOT Bridge Data	Segment has a Structurally Deficient or Weight-Restricted Posted Bridge	3 points

Based on the above scoring criteria, **Figure 17** shows the highway segment Management System integration results in three (3) categories. Tier 1 segments are considered "high priority", Tier 2 segments are considered "medium priority", and Tier 3 segments are "low priority". As the map shows, there is one (1) identified Tier 1 highway segment in the Northeast planning subregion within the town of Shrewsbury. Corresponding to the map, Tier 1 & 2 roadway segments are listed in **Table 5**. While there is only one (1) Tier 1 segment, there are a total of 40 Tier 2 highway segments that have been identified in the Northeast subregion. 31 of the 40 Tier 1 & 2 highway segments are located on Routes 9, US 20, 30, 62, and 140. The town of Shrewsbury has the most Tier 1 & 2 segments with a total of 14 while the town of Westborough is second with a total of 13.

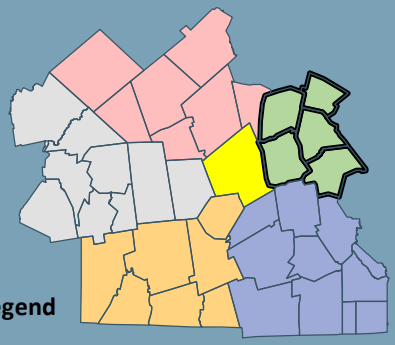
Table 5 – Management Systems Tier 1 & 2 Roadway Segments

Community	Roadway	From	To	Total Points
Shrewsbury	Main St	Maple Ave	South St	28
Shrewsbury	Main St	I-290 EB Ramp	Old Mill Rd	24
Westborough	Lyman St	East Main St	Boston-Worcester Tnpk (9)	21
Westborough	West Main St (30)	East Main St (30)	Oneil Dr	21
Shrewsbury	Grafton St (140)	Main St	Lake St	21
Berlin	West St (62)	Coburn Rd	Derby Rd	20
Northborough	West Main St (20)	Westbrook Rd	South St	19
Northborough	Main St (20)	South St	East Main St	19
Westborough	Connector Rd	Butterfield Dr	Boston-Worcester Tnpk (9)	18
Shrewsbury	US Route 20	Worcester CL	Lake St	18
Shrewsbury	Route 9 EB	Worcester CL	Maple Ave	18
Shrewsbury	Route 9 WB	Maple Ave	Worcester CL	18
Westborough	Route 9 WB	Milk St (135)	Lyman St	18
Westborough	Route 9 EB	Milk St (135)	Lyman St	18
Westborough	Route 9 WB	Lyman St	Connector Rd	18
Westborough	Route 9 EB	Lyman St	Connector Rd	18
Berlin	West St (62)	Central St (62)	Coburn Rd	18

Community	Roadway	From	To	Total Points
Berlin	Central St (62)	Sawyer Hill Rd	I-495 Overpass	17
Westborough	East Main St (30)	Lyman St	South St	17
Northborough	West Main St (20)	US Route 20	Westbrook Rd	17
Westborough	Flanders Rd	Washington St	Connector Rd	17
Westborough	East Main St (30)	Route 9	Lyman St	17
Westborough	West Main St (30)	Mill Rd	Nourse St (30)	17
Berlin	Central St (62)	South St	Brewer Rd	17
Shrewsbury	Grafton St (140)	Lake St	Route 9	17
Shrewsbury	Memorial Dr (140)	211 Memorial Dr (140)	Grafton TL	16
Berlin	Central St (62)	Brewer Rd	Sawyer Hill Rd	16
Shrewsbury	Route 9 EB	Maple Ave	Lake St	16
Shrewsbury	Route 9 EB	Lake St	South St	16
Shrewsbury	Grafton Cir (140)	Grafton St (140)	Memorial Dr (140)	15
Westborough	Lyman St	Route 9	Hospital Rd	15
Shrewsbury	Lake St	US Route 20	S Quinsigamond Ave	15
Westborough	Church St	West Main St (30)	Fisher St	14
Boylston	Shrewsbury St (140)	Main St (70)	East Temple St	14
Northborough	US Route 20	West Main St	Davis St	14
Berlin	West St	Derby Rd	Allen Rd	14
Northborough	Whitney St	Coolidge Cir	Berlin TL	13
Northborough	Route 9 EB	Shrewsbury TL	Westborough TL	13
Northborough	Route 9 WB	Westborough TL	Shrewsbury TL	13
Shrewsbury	Route 9 WB	Lake St	Maple Ave	13
Shrewsbury	Route 9 WB	South St	Lake St	13



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 17_CMRPC Northeast Subregion_MS Integration.mxd



Legend

Total

- Tier 3 = 1 - 12 points
- Tier 2 = 13 - 24 points
- Tier 1 = 25 - 36 points
- Northeast Subregion Towns

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FIGURE 17 - NORTHEAST SUBREGION MANAGEMENT SYSTEMS DATA INTEGRATION

4.0 Other Major Considerations

This section of the *Northeast Subregion Highway Freight Accommodation Study* covers a range of other considerations that influence the decision-making process of where to potentially apply future-year federal-aid improvement funding. Following federal Performance Management requirements, Truck Travel Time Reliability (TTTR) in the planning region is summarized and a comparison is made between statewide MassDOT TTTR targets, and the conditions observed in the planning region. Next, a series of Environmental Consultation maps are provided showing the critical natural features in the Northeast subregion. Findings extracted from the established Municipal Vulnerability Preparedness (MVP) programs for each host community are also reviewed. The trucking-centric findings of the regional Travel Demand Forecast Model, a computer simulation of the network of highways in the Northeast subregion, are then summarized. Both existing and future benchmark year truck Vehicle Miles Traveled (VMTs) have been estimated by the Model, as well as potential future-year "bottleneck" highway segments.

4.1 Performance Management

Performance-Based Planning and Programming (PBPP) refers to a transportation agency's application of performance management in their ongoing planning and programming activities. PBPP requirements were initially federally legislated through Moving Ahead for Progress in the 21st Century (MAP-21) and reaffirmed in the more recent Bipartisan Infrastructure Law (BIL). These Acts transformed the federal-aid highway program by establishing new requirements for performance management to ensure the most efficient investment of federal transportation funds that support the following seven National Goals:

1. Safety
2. Infrastructure Condition
3. Congestion Reduction
4. System Reliability
5. Freight Movement and Economic Activity
6. Environmental Sustainability
7. Reduced Project Delays

The CMMPO's PBPP process is shaped by both federal transportation performance management requirements and the MPO's regional goals and objectives. These locally customized goals and objectives have been integrated within each of the federally established "Planning Emphasis Areas" when developing transportation plans and projects. By addressing the defined Emphasis Areas in all phases of the transportation planning process, the CMMPO

enables the creation of more balanced and holistic transportation projects and, in addition, corresponding policy for the region. Similarly, a major intent of PBPP is to ensure that transportation investment decisions – both long-term planning and short-term programming – are based on the ability to meet the established goals.

The following summary covers the federally required performance measure related to freight.

Truck Travel Time Reliability (TTTR)

TTTR is the amount of time it takes trucks to drive the length of a highway segment. This measure is only calculated on the Interstate System. The following methodology is applied to determine TTTR for various times of the day:

1. Calculate the travel times from the five time periods used in this measure (shown in **Figure 18**)
2. Find and calculate the TTTR ratio from the 50th and 95th percentile times for each time period
3. The TTTR Index is generated by multiplying each highway segment's largest ratio of the five periods by its length, then dividing the sum of all length-weighted segments by the total length of Interstate.

Figure 18

Level of Truck Travel Time Reliability (TTTR) *(Single Segment, Interstate Highway System)*		
Monday - Friday	6am – 10am	$TTTR = \frac{55\ sec}{35\ sec} = 1.57$
	10am – 4pm	TTTR = 1.25
	4pm – 8pm	**TTTR = 2.52**
Weekends	6am – 8pm	TTTR = 1.2
All Days	8pm – 6am	TTTR = 1.05

MassDOT TTTR Targets and CMMPO Comparison

MassDOT followed FHWA regulation in measuring TTTR on the Interstate System using the National Performance Management Research Data Set (NPMRDS) provided by FHWA. These performance measures aim to identify the predictability of travel times on the major highway network by comparing the average travel time along a given segment against longer travel times. **Table 6** shows the annual TTTR ratio results from 2017 to 2023 for both statewide and the CMMPO region. The 2-year (2024) and 4-year (2026) LOTTR targets for the Interstate System are also shown. The first performance period target (2022) is also included for comparison. The TTTR ratio in 2020 is well below the previous three (3) years of data due to

the COVID-19 pandemic as people were either required to stay at home and/or work from home, which generated far less vehicles on the Interstate System. The following statewide and CMMPO Interstate and Non-Interstate percentages are from the Probe Data Analytics Suite of the Regional Integrated Transportation Information System (RITIS) website. The CMMPO region includes I-90 (Massachusetts Turnpike), I-190, I-290 and I-395. Interstates 90, 290, and 495 travel through a part of the Northeast planning subregion.

Table 6 – Annual TTTR Ratio Results for Statewide & CMMPO Interstates

Year	Statewide Interstate TTTR Ratio	CMMPO Interstate TTTR Ratio	Interstate TTTR Target		
			2022	2024	2026
2017	1.81	1.71	1.85	1.80	1.75
2018	1.88	1.79			
2019	1.84	1.77			
2020*	1.44	1.22			
2021	1.61	1.59			
2022	1.71	1.61			
2023	1.74	1.70			

**COVID-19 pandemic initially occurred during 2020*

4.2 Environmental Consultation

Major features of the natural environment in the Northeast planning subregion were also identified as part of this *Accommodation Assessment study*. The following maps show major environmental systems within the study area that have impacts on such things as drainage, water quality and wildlife migration.

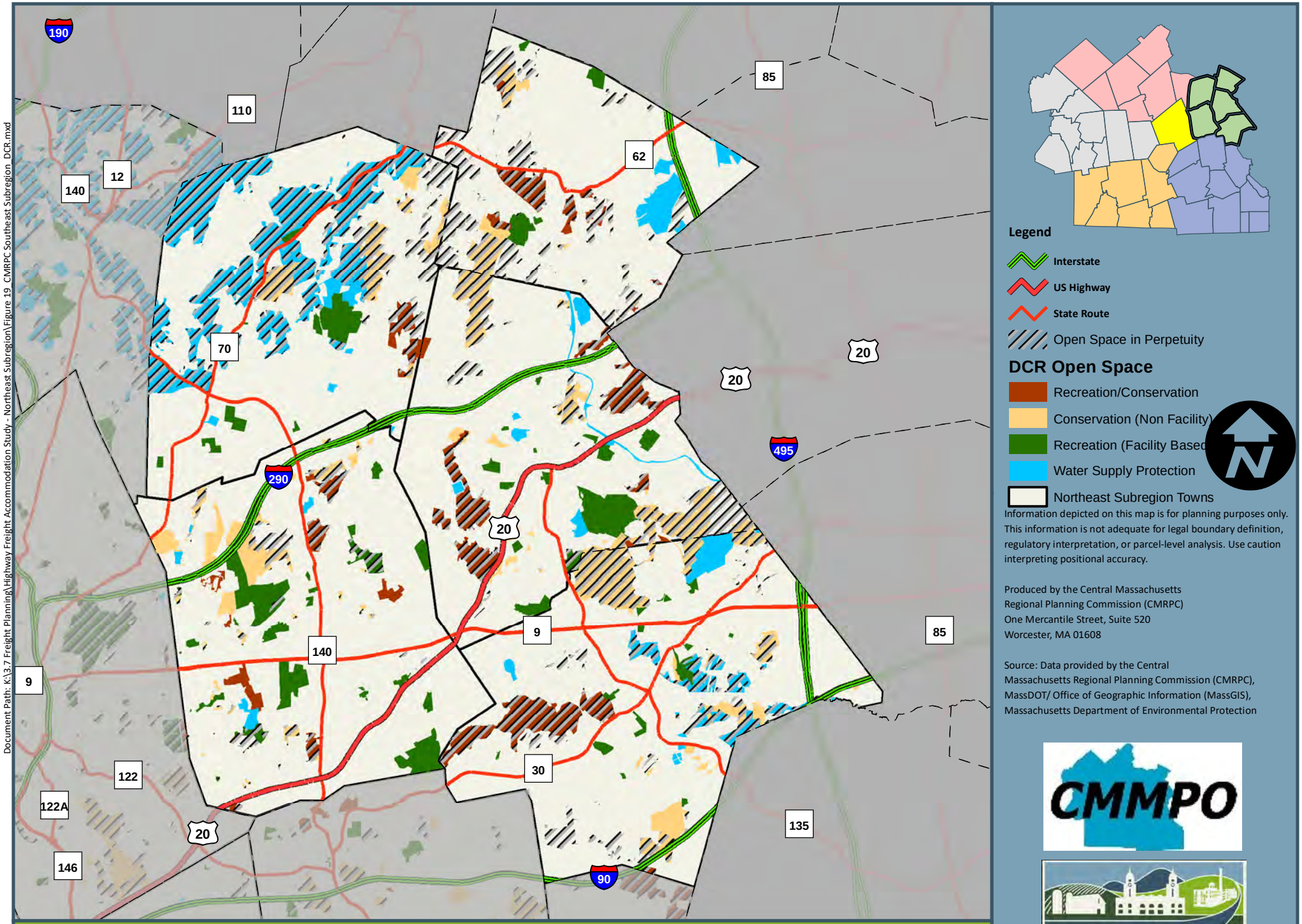
Figure 19 shows general land use within the Northeast subregion which includes recreation, conservation, water supply, and open space areas. This data is managed by the Massachusetts Department of Conservation and Recreation (DCR). The mission of the DCR is to protect, promote and enhance the state's wealth of natural, cultural, and recreational resources. As the map shows, there is a large water supply protection area in Boylston, which is for the Wachusett Reservoir. Additionally, there are numerous conservation and recreation areas in the other Northeast subregion communities.

Figure 20 shows wetland areas within the Northeast subregion study area. Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year. The data comes from the Massachusetts Department of Environmental Protection (DEP). The DEP is responsible for ensuring clean air and water, safe management and recycling of solid and hazardous wastes, timely cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources. Included in the map are bogs, marshes, swamps, and open water. As can be seen, there are numerous defined

wetlands in this subregion as well as some larger open water bodies in the towns of Boylston, Shrewsbury, and Westborough.

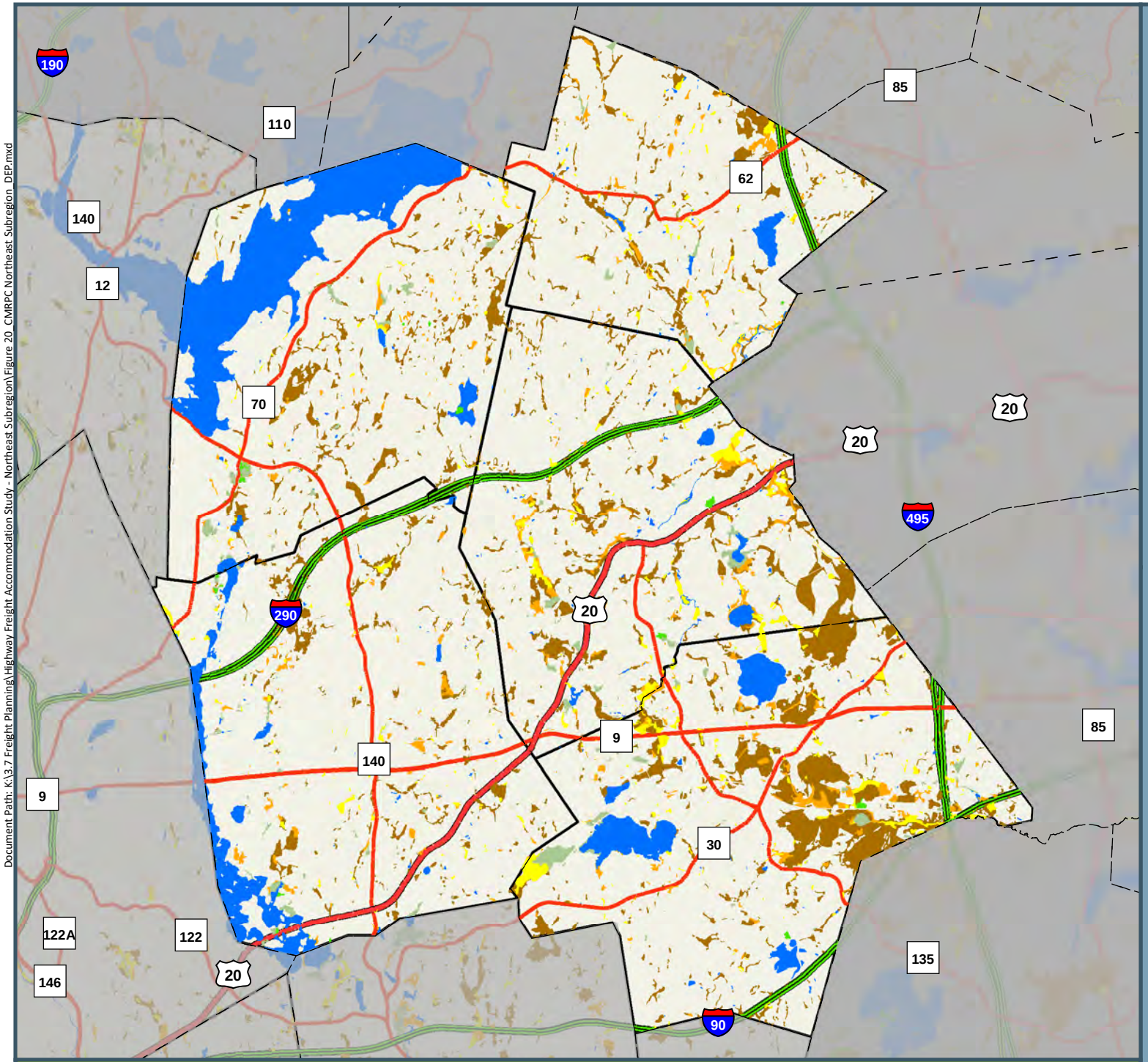
As shown in **Figure 21**, the federal National Heritage & Endangered Species Program (NHESP) provides the data for vernal pools and rare species habitats (plants & animals). Vernal pools are small, shallow ponds characterized by lack of fish and by periods of dryness. The overall goal of the NHESP is the protection of the state's wide range of native biological diversity. The NHESP is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state. As can be seen on the map, there are many certified vernal pools in the towns of Northborough and Westborough. Further, each of the five (5) towns in the study area has priority habitats of rare species.

Flood zones were created by the Federal Emergency Management Agency (FEMA) as a guide to establishing corresponding National Flood Insurance Rates. The 100-year flood zone means that there is a one percent annual chance of a flood within that defined area. The 500-year flood zone means that there is a 0.2 percent annual chance of a flood. The closer something is to the flooding source - river, stream, pond, etc. - the greater the risk of flooding. Flood zones are also used to calculate flood insurance rates for homes and businesses. **Figure 22** shows all the 100 and 500-year flood zones in the Northeast planning subregion. Most delineated flood zones in the Northeast subregion are 100-year, in particular large areas in Boylston, Shrewsbury, and Westborough. In addition, there are several smaller 500-year flood zones in each of the Northeast subregion's host communities.



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 19_CMRPC Southeast Subregion_DCR.mxd

FIGURE 19 - NORTHEAST SUBREGION GENERAL LAND USE (DCR)



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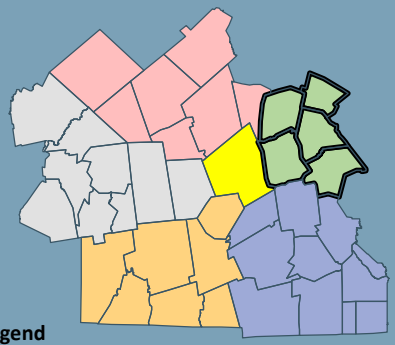

Legend

- OPEN WATER
- BOG
- DEEP MARSH
- SHALLOW MARSH MEADOW OR FEN
- SHRUB SWAMP
- WOODED SWAMP
- Interstate
- US Highway
- State Route
- Northeast Subregion Towns

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Worcester, MA 01608

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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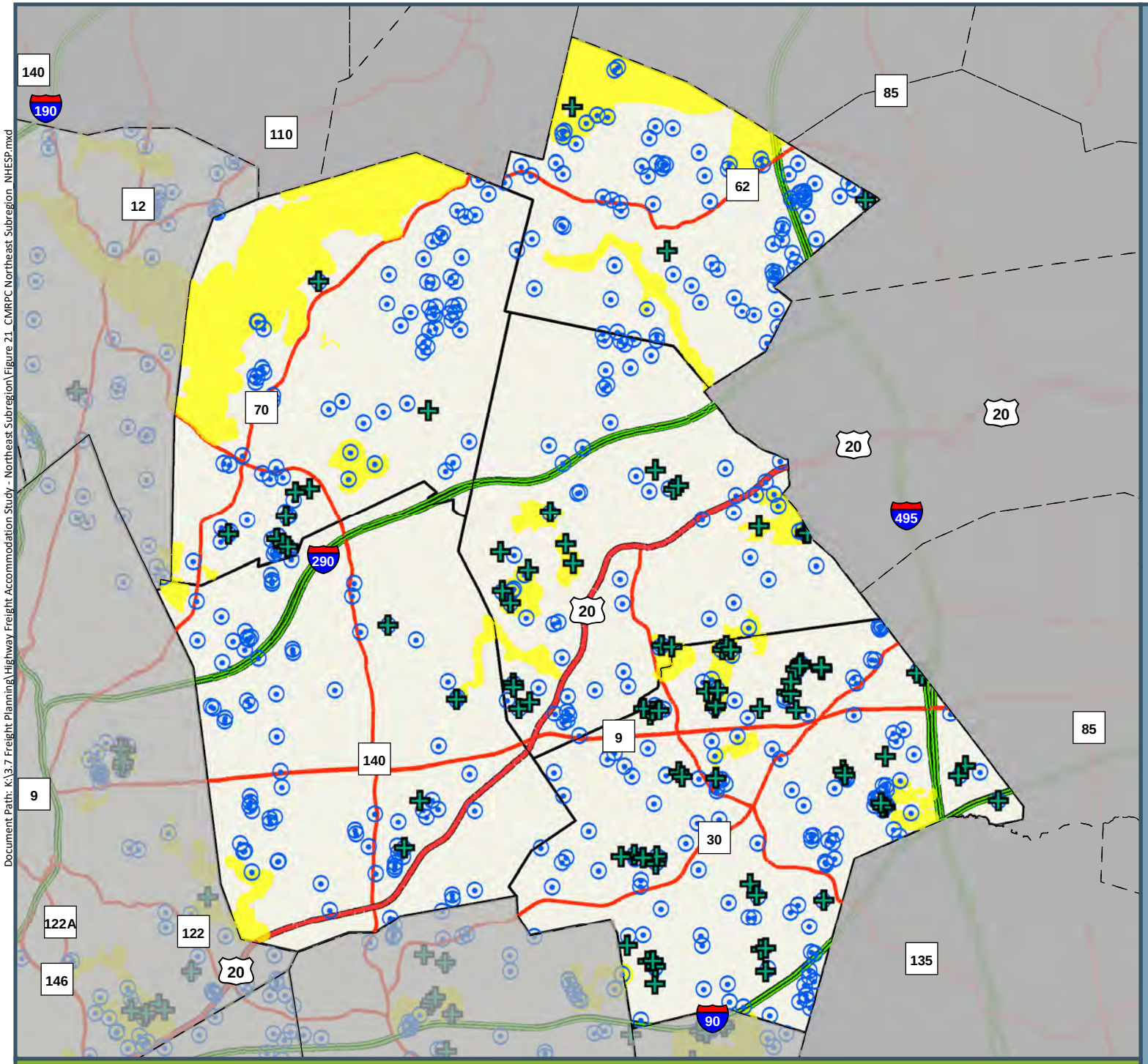
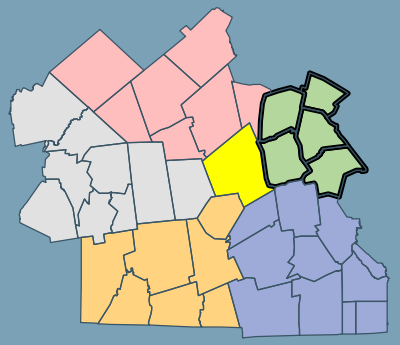
FIGURE 20 - NORTHEAST SUBREGION WETLANDS (DEP)



Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 21_CMRPC Northeast Subregion_NHESP.mxd



Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- NHESP Priority Habitats of Rare Species
- Interstate
- US Highway
- State Route
- Northeast Subregion Towns

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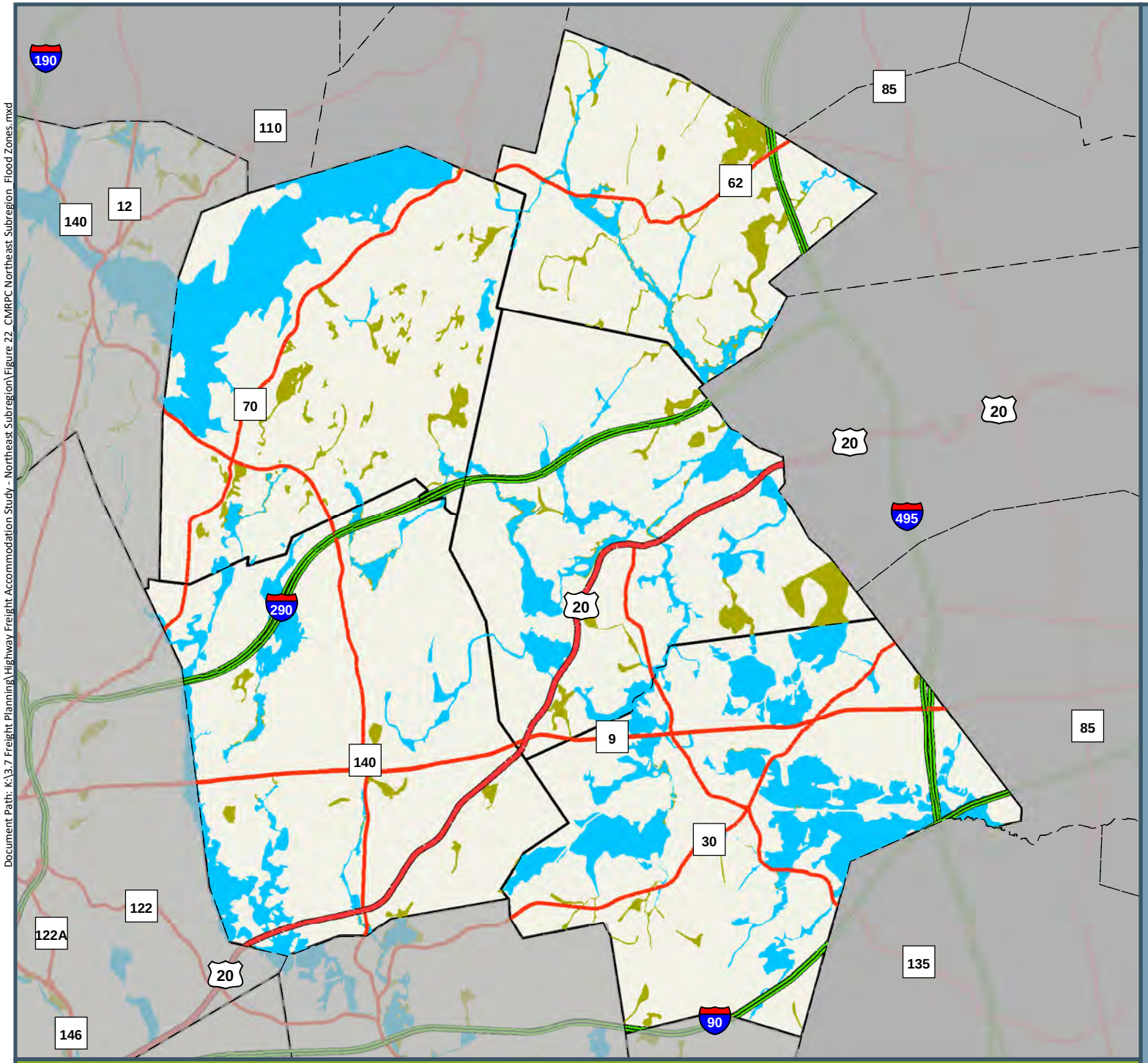
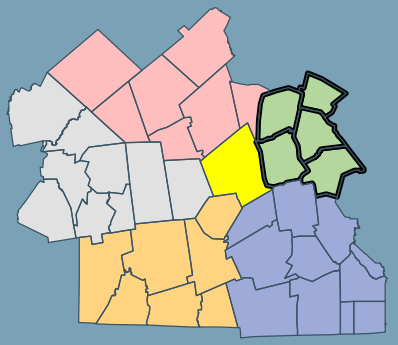
FIGURE 21 - NORTHEAST SUBREGION VERNAL POOLS & RARE SPECIES HABITATS (NHESP)





Legend

- FEMA 100 Year Flood Zone
- FEMA 500 Year Flood Zone
- Interstate
- US Highway
- State Route
- Northeast Subregion Towns

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Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 22_CMRPC Northeast Subregion_Flood Zones.mxd

FIGURE 22 - NORTHEAST SUBREGION 100/500 YEAR FLOOD ZONES (FEMA)

4.3 Municipal Vulnerability Preparedness (MVP)

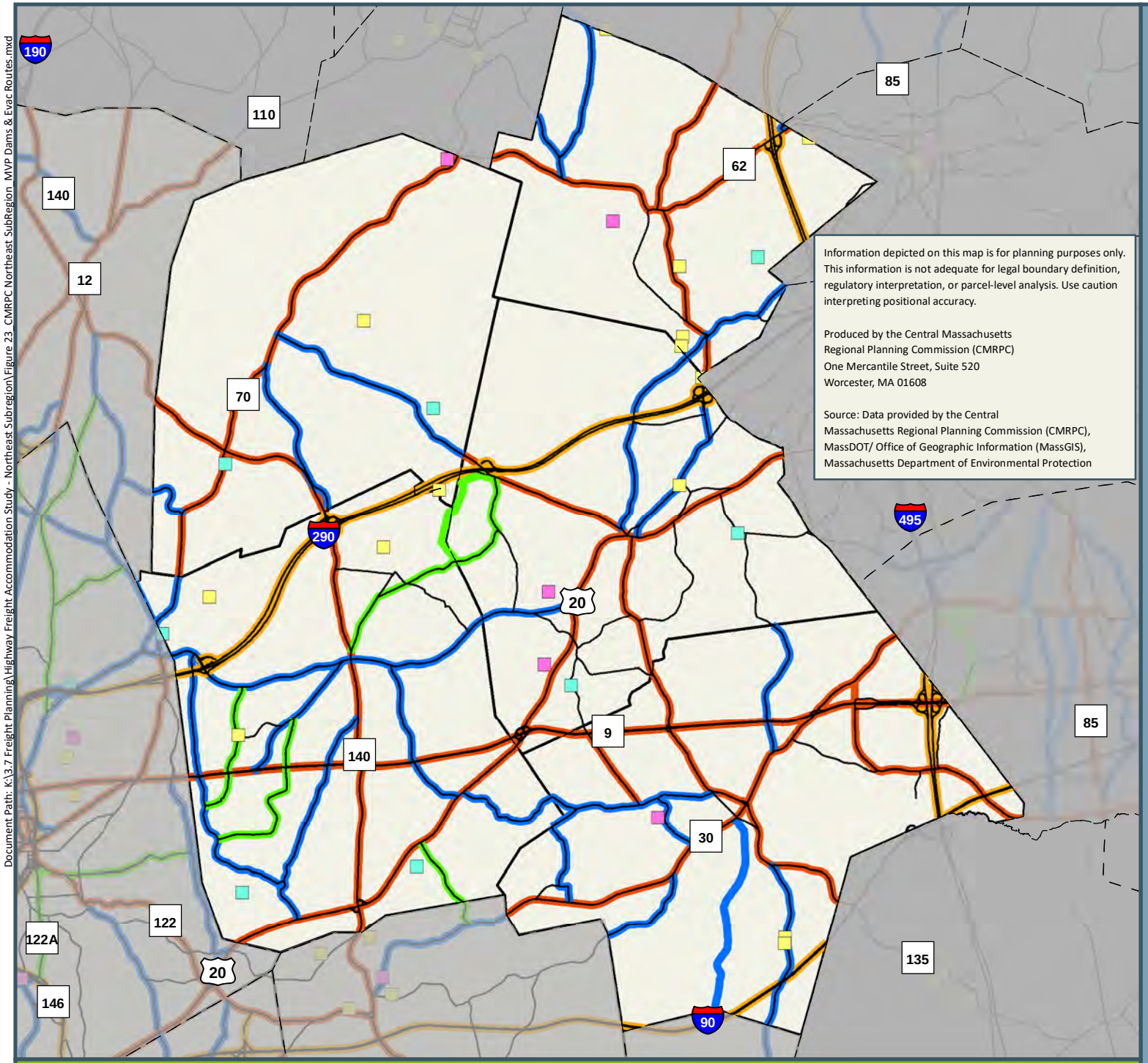
The state's MVP Program provides planning grants to municipalities to complete vulnerability assessments and develop action-oriented resiliency plans. Communities that complete the MVP planning process become certified "MVP Communities" and are eligible for Action Grant funding and other funding opportunities through the Commonwealth. Critical to this process, various stakeholders actively engage in discussions to determine the top hazards related to climate change that currently impact or could have a future impact on a community.

Figure 23 shows the established Evacuation Routes and the Hazardous Dams within the Northeast subregion communities. The Evacuation Routes were developed as part of the Worcester County Evacuation Plan. During the compilation of the County Evacuation Plan, each community identified their important roadways and defined them as primary, secondary, or tertiary Evacuation Routes. Besides the State Numbered Routes, other major roads were designated as Evacuation Routes. As the map shows, the Evacuation Routes may have a primary designation in one town but a secondary designation in an adjoining town.

As for the Hazardous Dams, this data is maintained by the Massachusetts Office of Dam Safety. The map shows the dams classified into three categories. The categories are High Hazard, Significant Hazard, and Low Hazard. The hazards are defined as follows:

- **High Hazard**: Located where failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways or railroads.
- **Significant Hazard**: Located where failure may cause loss of life and damage homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- **Low Hazard**: Located where failure may cause minimal property damage to others. Loss of life is not expected.

Overall, there are a total of 24 hazardous dams identified within the Northeast subregion. All communities in the Northeast subregion have at least one (1) hazardous dam. There are four (4) High Hazard dams in the subregion, and the town of Northborough has the most with a total of two (2). Notably, there are also numerous hazardous dams located near State Numbered Routes.



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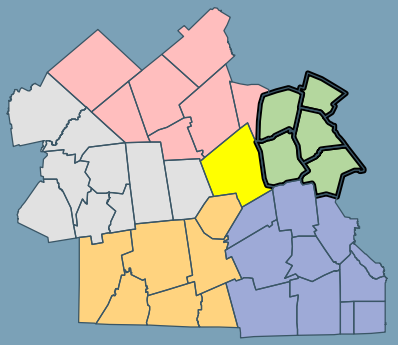
Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection



Legend

Hazards (Dams)

- High Hazard Dam
- Significant Hazard Dam
- Low Hazard Dam

Regionwide Evacuation Routes

- Interstate Highway
- Primary
- Secondary
- Tertiary
- Federal Aid Eligible Roads
- Northeast Subregion Towns

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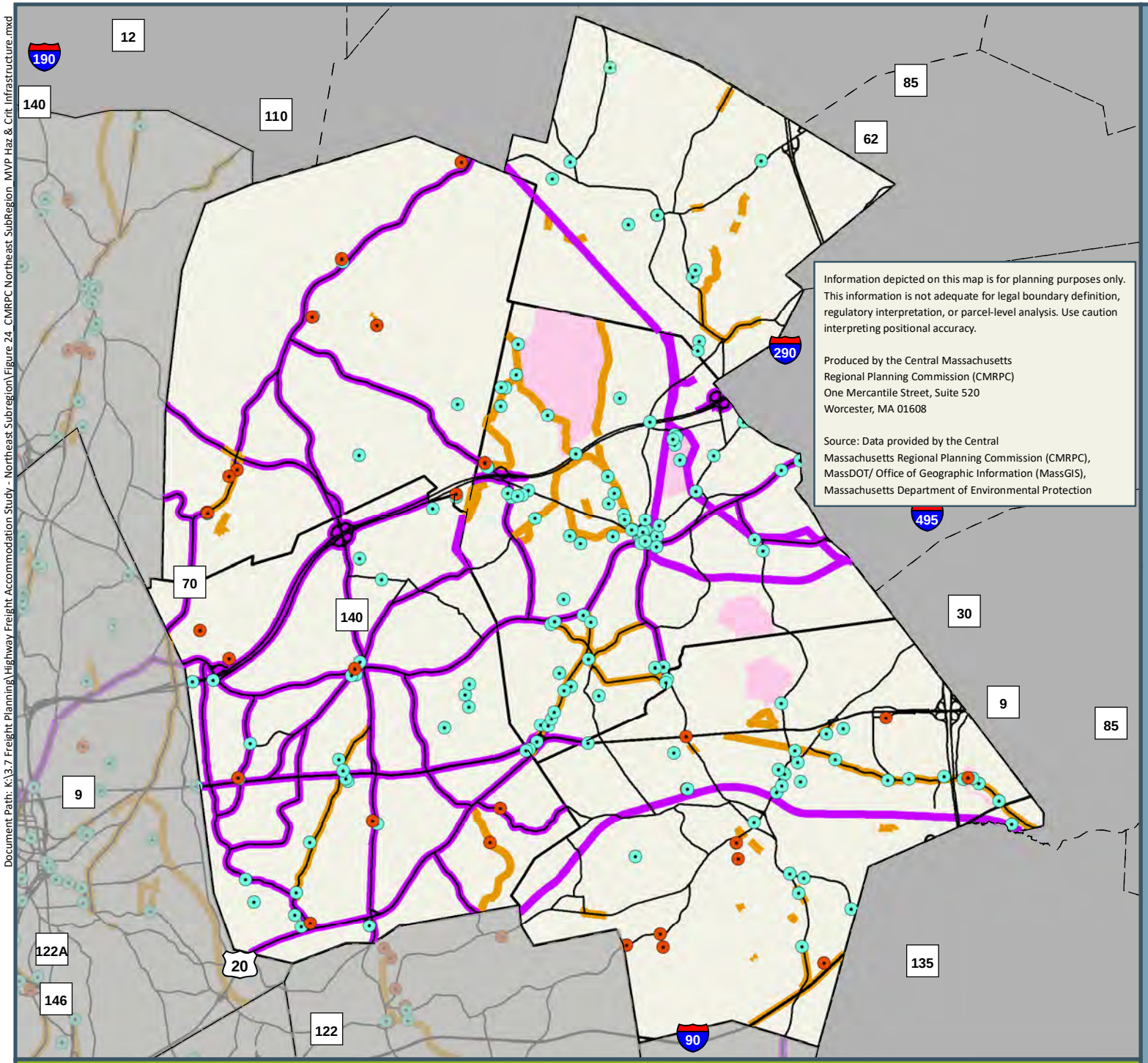
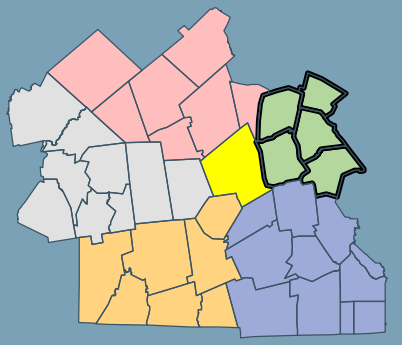
FIGURE 23 - NORTHEAST SUBREGION MVP LAYERS: HAZARDOUS DAMS & REGIONAL EVACUATION ROUTES

Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 23_CMRPC Northeast SubRegion_MVP Dams & Evac Routes.mxd

Figure 24 shows locally identified vulnerable critical infrastructure and hazards within the Northeast subregion communities. The types of vulnerable critical infrastructure can differ for each community. The types of infrastructure include major roadways, dams, water & sewer pumping stations, and important buildings such as police stations, fire stations, or Department of Public Works (DPW) garages. Most of the communities in the Northeast subregion considered the police stations, fire stations, and DPW garages as critical infrastructure. Bridges, dams, libraries, pumping stations, and schools were also considered critical infrastructure in most of the towns.

All towns in the Northeast subregion contain numerous locally identified hazards. These hazards include dams, flooding issues (past & present), snowdrifts & icing during the winter, and areas for potential fires. Fire hazards were identified in most towns and flooding hazards were identified in each of the five (5) Northeast subregion communities.





Legend

Locally Identified

- Vulnerable Critical Infrastructure
- Hazard
- Vulnerable Critical Infrastructure
- Hazard
- Vulnerable Critical Infrastructure
- Hazard
- Federal Aid Eligible Roads
- Northeast Subregion Towns

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FIGURE 24 - NORTHEAST SUBREGION MVP LAYERS: LOCALLY IDENTIFIED HAZARDS & CRITICAL INFRASTRUCTURE

Document Path: K:\3.7 Freight Planning\Highway Freight Accommodation Study - Northeast Subregion\Figure 24_CMRPC Northeast SubRegion_MVP Haz & Crit Infrastructure.mxd

4.4 Travel Demand Model

Introduction

Within this installment in the series of *Highway Freight Accommodation Assessment* studies focusing on the federal-aid highway system, the region's Travel Demand Model ("Model") Forecasting software was used to estimate and compile the anticipated Vehicle Miles of Travel (VMT) of heavy vehicles - transporting a broad range of freight - for both existing & projected future conditions in the Northeast planning subregion. Community land use projections utilized by the Model were developed by MassDOT with input from the UMass Donahue Institute as well as the State's regional planning agencies including CMRPC. Further, CMRPC also developed projections that were also used to craft future benchmark year growth scenarios for all Northeast planning subregion communities. Considered a tool for projecting future year traffic growth and its associated impacts, the results of the Model need to be considered in a relative sense and must be considered only as "best estimates" based on currently available information.

The Model is a computer-based simulation of the greater planning region's multimodal transportation network and includes all highways on the Federal-Aid highway system and fixed route public transit. After developing traffic volumes by time of day for all network roads, the model then reports VMT aggregated to a community level for each roadway classification - the FHWA roadway functional classifications are used - as well as vehicle type. The Model's 2020 "base-year" analysis network, representing an existing case, has been "calibrated", or adjusted, to essentially simulate existing roadway travel conditions, based on field-observed traffic volumes which include the percentage of heavy vehicles.

For the purposes of this study effort, the regional Model was utilized to estimate heavy vehicle VMT for the Morning (6 AM-9 AM) peak travel period, Mid-Day (9 AM-3 PM) period, the Evening (3 PM-6 PM) peak, as well as Nighttime (6 PM-6 AM) travel period, resulting in Daily totals. The Model-calculated estimated VMT has also been summarized for each host community in the Northeast planning subregion. Using the year 2020 as the basis for the projected future-year benchmark analyses, heavy vehicle VMT estimates have been derived by the Model for the planning scenario years of 2030, 2040, and 2050. *(It should be noted that the Model analyses do not necessarily reflect the known/unknown impacts of the COVID-19 pandemic. For further information, one could contact MassDOT as that agency has evaluated COVID-19 impacts and recovery for the entire State.)*

Truck Type Groupings

The Model results provide truck VMT estimates within three (3) broad groupings of the Federal Highway Administration's (FHWA) Vehicle Classifications. Shown in **Table 7** are the 13 established FHWA Vehicle Classifications. The table indicates the equivalences between the

FHWA Vehicle Classifications, and the corresponding three (3) categories of truck type groupings used by the Model. As can be seen in the table, in addition to "Auto", these groupings are defined as "Light Trucks", "Medium Trucks" and "Heavy Trucks". Light Trucks are commercial vehicles with 4 or 6 tires while Medium Trucks are single unit commercial vehicles with more than 6 tires. Heavy Trucks are all articulated vehicles.

Table 7
FHWA Vehicle Classification

Classification Number	Description	Type of Vehicle
1	Motorcycles	Auto
2	Passenger Cars	Auto
3	Pickups and Vans	Auto
4	Buses	Medium Truck
5	Single Unit 2 Axle Truck	Light Truck
6	Single Unit 3 Axle Truck	Medium Truck
7	Single Unit 4 Axle Truck	Medium Truck
8	Trailer 3 or 4 Axle Truck	Heavy Truck
9	Trailer 5 Axle Truck	Heavy Truck
10	Trailer 6 Axle Truck	Heavy Truck
11	Multi-Trailer 5 Axle Truck	Heavy Truck
12	Multi-Trailer 6 Axle Truck	Heavy Truck
13	Multi-Trailer 7 or More Axle Truck	Heavy Truck

These Model analyses results for each host community in the Northeast planning subregion are summarized in **Tables 8, 9, 10, and 11** for each defined truck type grouping. Although the primary purpose of the *Accommodation Assessment* study series is to focus on the federal-aid eligible State Numbered Routes in each of the defined CMRPC planning subregions, the Model analyses summaries presented for each host community ***do not*** reflect, where applicable, Interstate System truck VMT. Thus, both estimated and projected truck VMT totals for I-290 in the towns of Boylston, Northborough and Shrewsbury as well as for I-495 in the towns of Berlin and Westborough are ***not*** reflected in the community totals shown in the following summary tables. Accordingly, **Table 8** includes the estimated truck VMT for the 2020 base case, **Table 9** lists the projected truck VMT for the future year 2030, **Table 10** includes the projected truck VMT for the future year 2040 and, finally, **Table 11** summarizes the projected truck VMT for the future year 2050. Again, the listed VMT are by time of day: AM Peak, Mid-Day (MD), PM Peak, Nighttime (NT) as well as the Daily total.

Truck Vehicle Miles of Travel (VMT) Observations

As can be seen in **Table 8**, truck Vehicle Miles of Travel (VMT) under the existing 2020 case are highest in the town of Westborough with total estimated daily truck VMT in excess of 55,400

miles, largely due to the heavily utilized Route 9 corridor as well as State Numbered Routes 30 and 135. Further, due to the location of the Route 9 interchange with I-495 on the eastern edge of Westborough as well as the proximity of the I-495 interchange with I-90 (MassPike) - presently being reconstructed - trucks from a broad geographic area are attracted to this host community. Next, the town of Shrewsbury exhibits truck VMT of approximately 50,800 miles. Here, both the US Route 20 and State Numbered Route 9 corridors contribute in large part to the truck VMT estimated in Shrewsbury and, although to a lesser extent, State Numbered Route 140. Next, the town of Northborough ranks third with a VMT of nearly 28,000 miles of daily truck travel utilizing both US Route 20, which essentially bisects the host community, as well as State Numbered Route 9, which skirts the southwest corner of the Northborough, as well as State Numbered Route 135. The town of Berlin exhibits nearly 15,200 miles of daily truck travel primarily using State Numbered Route 62. Last in the Northeast planning subregion is the town of Boylston with a truck VMT of just over 10,300 daily miles largely due to both State Numbered Routes 70 and 140.

Table 8
Existing Truck VMT: 2020 Benchmark Year

	2020												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Berlin	1,502	1,015	1,377	1,755	1,134	1,514	1,626	1,111	1,506	1,080	677	889	15,184
Boylston	722	781	1,045	856	922	1,231	778	836	1,118	589	623	827	10,328
Northborough	2,695	1,928	2,386	3,166	2,226	2,741	2,893	2,075	2,576	2,184	1,411	1,709	27,989
Shrewsbury	5,104	3,252	4,091	6,184	3,948	4,985	5,520	3,508	4,409	4,086	2,551	3,164	50,803
Westborough	6,650	3,044	3,808	7,791	3,637	4,562	7,133	3,275	4,085	5,724	2,543	3,186	55,438
Totals	16,674	10,020	12,706	19,752	11,867	15,033	17,950	10,805	13,694	13,663	7,805	9,774	159,742

Shown in **Table 9**, under anticipated 2030 conditions, total daily estimated truck VMT remains highest in the town of Westborough with over 62,300 miles of travel, a significant increase of around 6,900 miles over the base year condition. This is, again, largely due to the heavily utilized Route 9 corridor as well as State Numbered Routes 30 and 135. In addition, as previously detailed, the location of the Route 9 interchange with I-495 on the eastern edge of town and, importantly, the nearby I-495 interchange with I-90 (MassPike) - which will be completely reconstructed in 2030 - serve to attract trucks from a broad geographic area to Westborough. The new reconstructed and modernized interchange is anticipated to provide for vastly improved traffic flow between I-495 and I-90 (MassPike).

Ranking next, similar to the previous benchmark year, the town of Shrewsbury exhibits truck VMT of over 51,800 miles. In Shrewsbury, US Route 20 and State Numbered Routes 9 and 140 contribute to the estimated future year increase of over 1,000 miles in daily truck VMT. The planned widening of US Route 20 in Shrewsbury to a consistent four-lane cross section will serve to accommodate the anticipated truck VMT increase. The town of Northborough is next

with a daily truck VMT of around 29,800 miles, an increase of over 1,800 miles over 2020 conditions. In this community, trucking utilizes US Route 20 as well as State Numbered Routes 9 and 135. Continuing, the table indicates that in 2030 the town of Berlin exhibits daily truck VMT of approximately 15,500 miles of travel, primarily using State Numbered Route 62. Lastly, the host community of Boylston experiences a minimal increase with a projected 2030 truck VMT of just over 10,400 miles.

Table 9
Projected Truck VMT: Future 2030 Condition

	2030												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Berlin	1,447	1,070	1,475	1,702	1,214	1,650	1,578	1,180	1,616	1,020	682	895	15,528
Boylston	704	798	1,087	829	925	1,249	765	866	1,180	560	623	840	10,426
Northborough	2,831	2,064	2,572	3,294	2,352	2,917	3,054	2,249	2,814	2,277	1,521	1,855	29,802
Shrewsbury	5,192	3,355	4,171	6,178	4,044	5,039	5,573	3,576	4,445	4,297	2,680	3,308	51,857
Westborough	7,757	3,352	4,174	9,073	4,010	5,013	8,178	3,563	4,422	6,459	2,810	3,528	62,339
Totals	17,930	10,638	13,479	21,076	12,544	15,869	19,148	11,433	14,477	14,614	8,316	10,426	169,952

Looking to the 2040 future benchmark year, as shown in **Table 10**, overall daily truck VMT is projected to increase in each of the five Northeast subregion host communities, although, based on currently available information, at a more modest rate than projected between 2020-2030. Total daily truck VMT will remain highest at over 62,800 miles in the town of Westborough. Similar to the prior decades, projected truck VMT in the town of Shrewsbury will continue to rank second in the Northeast subregion exhibiting a daily total of over 53,400 miles. This represents an increase of almost 1,600 miles of truck travel over the 2030 scenario. This could in part be due to further anticipated development/redevelopment along Shrewsbury's segment of the US Route 20 corridor. Under 2040 conditions, total daily truck VMT in the town of Northborough is expected to increase by less than 500 miles over the 2030 benchmark year. Next is the host community of Berlin where a projected daily increase of just over 100 miles is anticipated. Lastly, in 2040, estimated truck VMT in Boylston will increase in excess of 200 miles over 2030 conditions.

Table 10
Projected Truck VMT: Future 2040 Condition

	2040												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Berlin	1,462	1,091	1,511	1,710	1,219	1,663	1,570	1,179	1,633	1,026	679	891	15,635
Boylston	721	816	1,114	842	941	1,275	785	889	1,211	568	630	848	10,640
Northborough	2,869	2,119	2,646	3,325	2,394	2,978	3,078	2,290	2,863	2,294	1,545	1,887	30,289
Shrewsbury	5,328	3,447	4,290	6,345	4,173	5,207	5,732	3,689	4,592	4,421	2,777	3,429	53,430
Westborough	7,765	3,400	4,227	9,079	4,072	5,082	8,155	3,625	4,500	6,486	2,861	3,589	62,841
Totals	18,145	10,873	13,790	21,302	12,800	16,205	19,320	11,671	14,800	14,795	8,491	10,644	172,836

Under projected 2050 conditions, as shown in **Table 11**, overall daily truck VMT is anticipated to again increase in all five Northeast subregion host communities. In some, Shrewsbury and Westborough, daily truck VMT growth will be somewhat robust with respective increases of over 1,400 miles in Westborough and over 1,700 miles in Shrewsbury. Elsewhere in the subregion, daily truck VMT will increase by almost 950 miles in Northborough. Elsewhere, in the remaining Northeast subregion towns, modest truck VMT increases are expected in the 2050 benchmark year for both Berlin and Boylston, with respective increases of around 140 and 230 miles of daily truck VMT.

Table 11
Projected Truck VMT: Future 2050 Condition

	2050												
	AM			MD			PM			NT			
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	VMT Totals
Berlin	1,492	1,091	1,501	1,743	1,228	1,678	1,609	1,195	1,644	1,044	672	881	15,778
Boylston	738	832	1,136	863	957	1,297	810	913	1,248	579	637	857	10,868
Northborough	2,937	2,196	2,757	3,395	2,460	3,067	3,167	2,392	3,014	2,337	1,580	1,932	31,234
Shrewsbury	5,506	3,568	4,447	6,541	4,306	5,374	5,918	3,795	4,723	4,566	2,878	3,557	55,179
Westborough	7,946	3,490	4,341	9,249	4,172	5,209	8,322	3,715	4,612	6,614	2,932	3,679	64,282
Totals	18,620	11,177	14,183	21,791	13,123	16,624	19,825	12,011	15,242	15,140	8,700	10,907	177,341

The corresponding percentage increases and decreases in projected truck VMT in the Northeast transportation planning subregion during the various travel periods of a typical weekday are provided in **Tables 12, 13, and 14. Table 12** summarizes the percentage increases/decreases anticipated in the ten-year period between 2020 and 2030. Again, truck VMT using the Interstate System are ***not*** included to allow enhanced focus on the anticipated impacts to federal-aid eligible State Numbered Routes.

In the town of Westborough, the largest percentage increases in the Northeast planning subregion are realized. Throughout all daily time parameters delineated by the Model, light truck percentage increases range from 12.9% to 16.6%, while medium tuck percentage increases range from 8.8% to 10.5%. Heavy truck increases range from 8.2% to 10.7%. Further, as specifically mentioned above, in 2030, the anticipated far-reaching impacts of the reconstruction and modernization of the I-495/I-90 (MassPike) interchange in the host communities of Hopkinton and Westborough are evident as construction at this location will be completed in this future benchmark year.

Projected percentage increases in truck VMT in the host community Northborough are experienced throughout all time parameters shown in the table. The percentage increases in heavy trucks are the largest, ranging from 6.4% during the Midday to 9.3% during the evening peak. Overall, Shrewsbury sees more modest percentage increases in daily truck VMT, the largest occurring during the Nighttime hours. As can been seen, both the towns of Berlin and Boylston show percentage increases in the medium and heavy truck categories, while there is

notable, although minor, overall percentage reductions under the light truck category throughout the day in each town.

Table 12
Projected Truck VMT: Percentage Increases 2020-2030

	Change 2020 to 2030											
	AM			MD			PM			NT		
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck
Berlin	-3.7%	5.4%	7.1%	-3.0%	7.1%	9.0%	-2.9%	6.2%	7.3%	-5.5%	0.8%	0.7%
Boylston	-2.5%	2.2%	4.0%	-3.2%	0.3%	1.5%	-1.7%	3.6%	5.6%	-5.0%	0.0%	1.6%
Northborough	5.0%	7.1%	7.8%	4.1%	5.7%	6.4%	5.6%	8.4%	9.3%	4.3%	7.8%	8.6%
Shrewsbury	1.7%	3.2%	2.0%	-0.1%	2.4%	1.1%	1.0%	1.9%	0.8%	5.2%	5.0%	4.6%
Westborough	16.6%	10.1%	9.6%	16.5%	10.2%	9.9%	14.6%	8.8%	8.2%	12.9%	10.5%	10.7%

Similarly, **Table 13** summarizes the percentage increases and decreases in truck VMT anticipated between the future benchmark years of 2030 and 2040. Lesser percentage increases as well as some relatively minor percentage decreases are, through this analysis, projected during this decade. Here Shrewsbury exhibits the largest, although modest, percentage increases of all the towns in the Northeast planning subregion. Notables are the percentage increases ranging from 3.3% to 3.6% in heavy truck VMT during the Midday, PM and Nighttime analysis parameters. In the host communities of Berlin, Boylston, and Northborough all show percentage increases in truck VMT ranging from just under 1% to a maximum of 2.9% for all truck categories during all time parameters, with some minor percentage decreases for light and medium trucks shown in the town of Berlin. During this decade, truck percentage increases in the town of Westborough are anticipated to be the smallest, with a maximum of nearly 2% for medium and heavy trucks during the PM and Nighttime hours.

Table 13
Projected Truck VMT: Percentage Increases 2030-2040

	Change 2030 to 2040											
	AM			MD			PM			NT		
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck
Berlin	1.0%	2.0%	2.5%	0.5%	0.4%	0.8%	-0.5%	-0.1%	1.1%	0.6%	-0.4%	-0.4%
Boylston	2.5%	2.4%	2.5%	1.5%	1.8%	2.0%	2.6%	2.6%	2.6%	1.5%	1.0%	0.9%
Northborough	1.4%	2.7%	2.9%	0.9%	1.8%	2.1%	0.8%	1.8%	1.7%	0.7%	1.6%	1.8%
Shrewsbury	2.6%	2.7%	2.9%	2.7%	3.2%	3.3%	2.8%	3.2%	3.3%	2.9%	3.6%	3.6%
Westborough	0.1%	1.4%	1.3%	0.1%	1.5%	1.4%	-0.3%	1.8%	1.8%	0.4%	1.8%	1.7%

Lastly, **Table 14** summarizes the percentage increases in daily truck VMT anticipated between the future benchmark years of 2040 and 2050. Certainly, less is presently known about likely travel conditions within this future time parameter. Still, truck VMT increases in the host community of Northborough are anticipated to exceed 5% for heavy trucks during the PM peak travel period and, similarly, over 4% during the AM peak travel period. During this decade, the

town of Shrewsbury is projected to realize increases in daily truck VMT for all truck types during all time parameters, ranging from 2.8% to 3.7%. Boylston sees a percentage increase of 3.3% in light truck VMT during the evening peak travel period, along with smaller percentage increases in the other truck types during each time parameter. The town of Westborough experiences consistent projected increases in VMT throughout the day, ranging between 1.9% and 2.7%. In the town of Berlin, the smallest percentage increases in truck VMT are seen, the maximum being 2.5% under the light truck category during the PM peak travel period. Further, slight reductions in heavy truck VMT are shown in Berlin during both the AM and Nighttime parameters.

Table 14
Projected Truck VMT: Percentage Increases 2040-2050

	Change 2040 to 2050											
	AM			MD			PM			NT		
	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck	Light Truck	Medium Truck	Heavy Truck
Berlin	2.1%	0.0%	-0.7%	1.9%	0.7%	0.9%	2.5%	1.3%	0.7%	1.7%	-1.0%	-1.2%
Boylston	2.4%	1.9%	2.0%	2.5%	1.7%	1.7%	3.3%	2.8%	3.0%	2.0%	1.2%	1.1%
Northborough	2.4%	3.6%	4.2%	2.1%	2.8%	3.0%	2.9%	4.5%	5.3%	1.9%	2.3%	2.4%
Shrewsbury	3.3%	3.5%	3.6%	3.1%	3.2%	3.2%	3.2%	2.9%	2.8%	3.3%	3.7%	3.7%
Westborough	2.3%	2.7%	2.7%	1.9%	2.5%	2.5%	2.0%	2.5%	2.5%	2.0%	2.5%	2.5%

Congestion in the Northeast Subregion

In an effort to detect existing congestion and its potential future year spread, the Model was used to calculate Volume-to-Capacity ("V/C") ratio data ranges for the host communities in the Northeast planning subregion. The higher the V/C ratio, the more indicative of heavy travel. Where the peak period Models cover a 3-hour period, using a V/C ratio of 0.80 for the 3 hours would suggest that one of the 3 hours is close to or beyond a V/C ratio value of 1.0. This is indicative of the fact that traffic volumes are not distributed uniformly over the 3 hours, but rather have a peak hour within the 3 hours with traffic volumes building or declining on either side of the peak. V/C ratios exceeding 1.0 theoretically indicate *over-capacity* conditions with significant incurred vehicle delay. As a product of this exercise, the following color-coded maps showing the analyses results were compiled and are shown in **Figures 25 through 32.**

Model-Calculated V/C Ratio Observations

As previously mentioned, the Model's 2020 analysis network has been "calibrated", or adjusted, to best estimate existing roadway travel conditions, based on field-observed traffic volumes which include the percentage of heavy vehicles. Under the 2020 existing case, shown in **Figures 25 & 26**, lengthy segments of Route 62 in the town of Berlin experience V/C ratios exceeding 0.80 during both peak travel periods, including the segment on the eastern side of the community at the I-495 interchange & Hudson town line. This condition appears to alleviate somewhat on the eastern segment of Route 62 during the evening peak travel period.

The town of Boylston has no roadway segments with V/C ratios over 0.80 under this analysis scenario. In Northborough, as is typically the case, V/C ratios over 0.80 are seen in the town center along US Route 20 during both peak periods. This condition spreads during the evening peak period west to Time Square as well as on the eastern segment of US Route 20 between Bartlett Street and the Marlborough city line. The segment of Route 9 hosted by the community also shows V/C ratios over 0.80 during both peak periods.

In the town of Shrewsbury, during both the morning and evening peak travel periods, V/C ratios in exceeding 0.80 are seen along the Route 9 corridor from Lake Quinsigamond through to Route 140. US Route 20 experiences V/C ratios over 0.80 between the Worcester line and Lake Street during both peak travel periods. The southern segment of Lake Street also exhibits a similar condition during both peak periods. Northbound Route 140 approaching Main Street in the town center has V/C ratios exceeding 0.80, again during both peak travel periods. This condition is also seen on Route 140 south of US Route 20 to the Grafton town line. Further, a portion of Main Street between I-290 and Old Mill Road sees V/C ratios over 0.80 during both the AM & PM peaks.

In the host community of Westborough, during the morning peak period the Route 9 corridor shows V/C ratios exceeding 0.80 between Lyman Street and the I-495 interchange & Southborough town line. This same condition spreads westerly during the evening peak travel period to Otis Street. Elsewhere in town, lengthy segments of both the Route 30 and Route 135 corridors exhibit V/C ratios over 0.80 during both peak travel periods. This condition certainly impacts travel conditions in Westborough's town center where Routes 30 & 135 intersect. Similarly, Lyman Street experiences V/C ratios greater than 0.80 during both peaks while a minimal segment of Flanders Road appears to show a V/C ratio exceeding 0.80 during the AM peak.

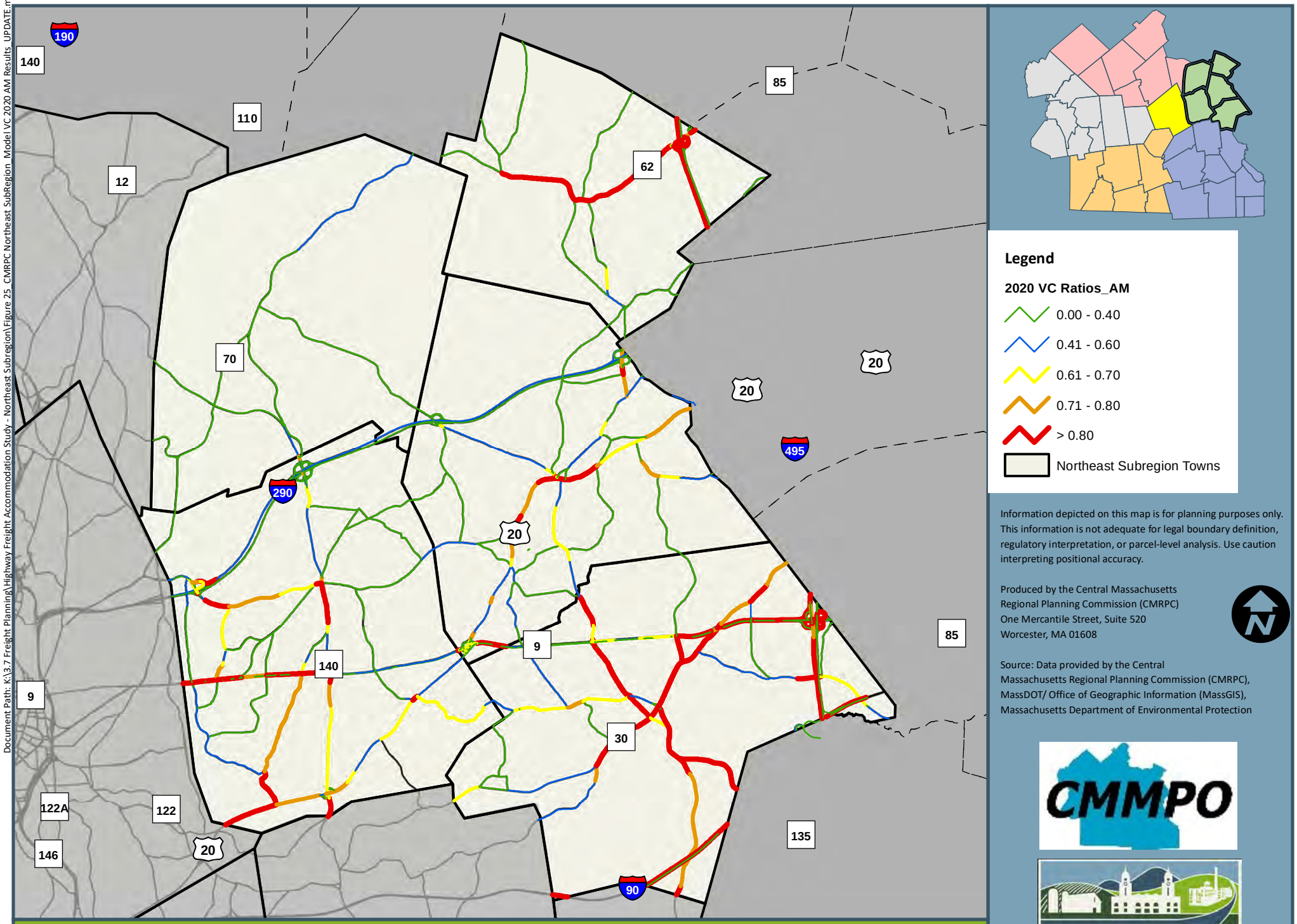
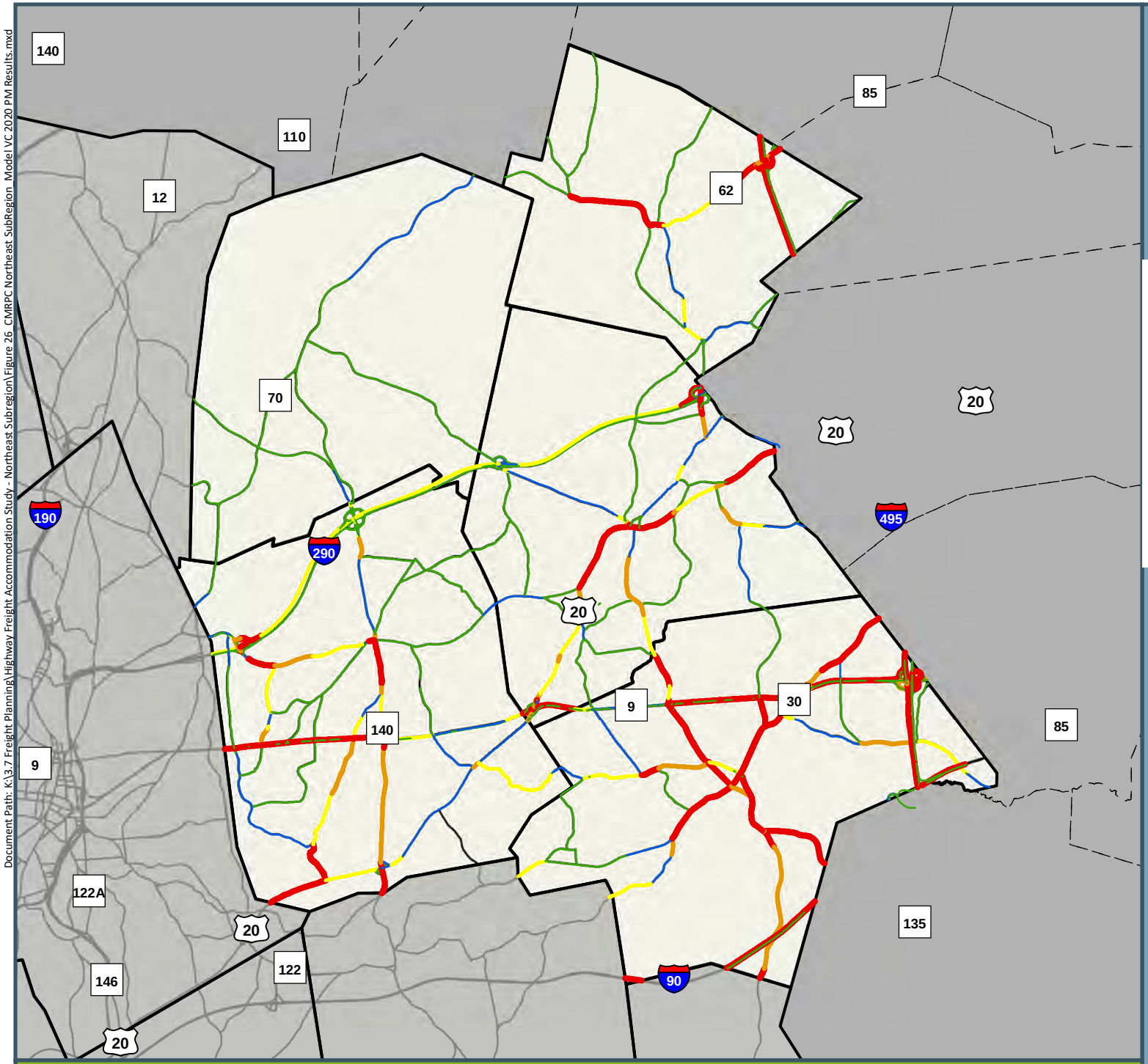
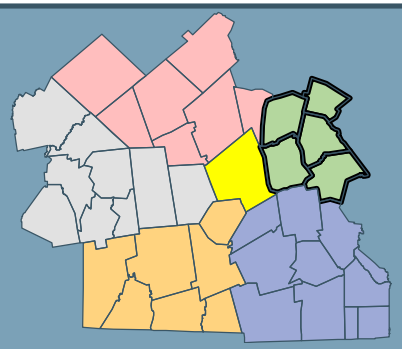


FIGURE 25 - NORTHEAST SUBREGION EXISTING 2020 V/C RATIOS, AM PEAK PERIOD





Legend

2020 VC Ratios_PM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Northeast Subregion Towns

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Produced by the Central Massachusetts Regional Planning Commission (CMRPC)
One Mercantile Street, Suite 520
Worcester, MA 01608

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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FIGURE 26 - NORTHEAST SUBREGION EXISTING 2020 V/C RATIOS, PM PEAK PERIOD

Under the 2030 benchmark year scenario, shown in **Figures 27 & 28**, the Model results indicate peak travel period V/C ratios greater than 0.80 that continue to be anticipated in the host community of Berlin along lengthy segments of Route 62 during both peak travel periods as well as a segment of South Street during the evening peak. The town of Boylston continues to have no roadway segments with V/C ratios over 0.80 under the 2030 analysis scenario. In Northborough, V/C ratios over 0.80 are expected to continue through the town center area along US Route 20 during both peak periods. In 2030, this condition affects US Route 20 from Times Square through to East Main Street. As seen prior, during the evening, V/C ratios over 0.80 spread on the eastern segment of US Route 20 between Bartlett Street and the Marlborough city line. Further, a segment of Bartlett Street also shows V/C ratios over 0.80 during both peak periods under the 2030 benchmark year. The segment of Route 9 in Northborough continues to show V/C ratios over 0.80 during both peaks.

In Shrewsbury, during both the morning and evening peak travel periods, V/C ratios in exceeding 0.80 continue to be seen along the Route 9 corridor from Lake Quinsigamond through to Route 140. Similarly, US Route 20 continues to see V/C ratios over 0.80 between the Worcester line and Lake Street during both peak travel periods, also impacting the segment of Lake Street. Northbound Route 140 approaching Main Street in the town center has V/C ratios exceeding 0.80 during both peak travel periods as does the segment of Route 140 south of US Route 20 to the Grafton town line. Further, the portion of Main Street between I-290 and Old Mill Road continues to experience V/C ratios over 0.80 during both peak travel periods.

In the host community of Westborough under 2030 conditions, the Route 9 corridor continues to show V/C ratios exceeding 0.80 between Lyman Street and the I-495 interchange & Southborough town line during the morning peak period, the same condition spreading westerly during the evening peak travel period to Otis Street. As detailed prior, lengthy segments of both the Route 30 and Route 135 corridors exhibit V/C ratios over 0.80 during both peak travel periods. Notably, the projected 2030 conditions also indicate an expansion, or "spill-over", of peak travel period congestion along these roadways and others, at times seemingly unattractive local streets, perhaps indicative of likely future year cut-through traffic. As before, Lyman Street continues to experience V/C ratios greater than 0.80 during both peaks while, in 2030, a minimal segment of Flanders Road now shows V/C ratios exceeding 0.80 during both peak travel periods.

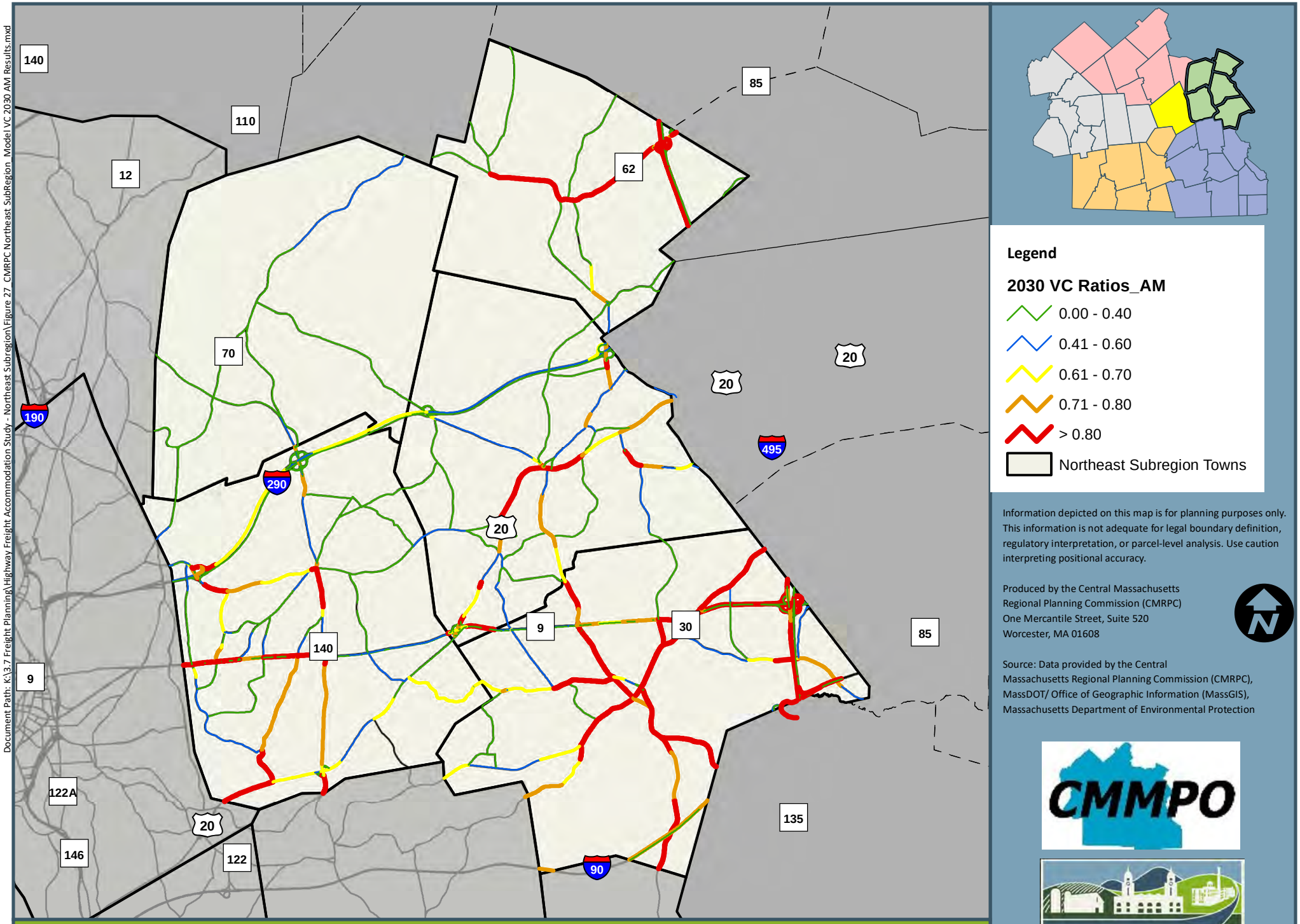
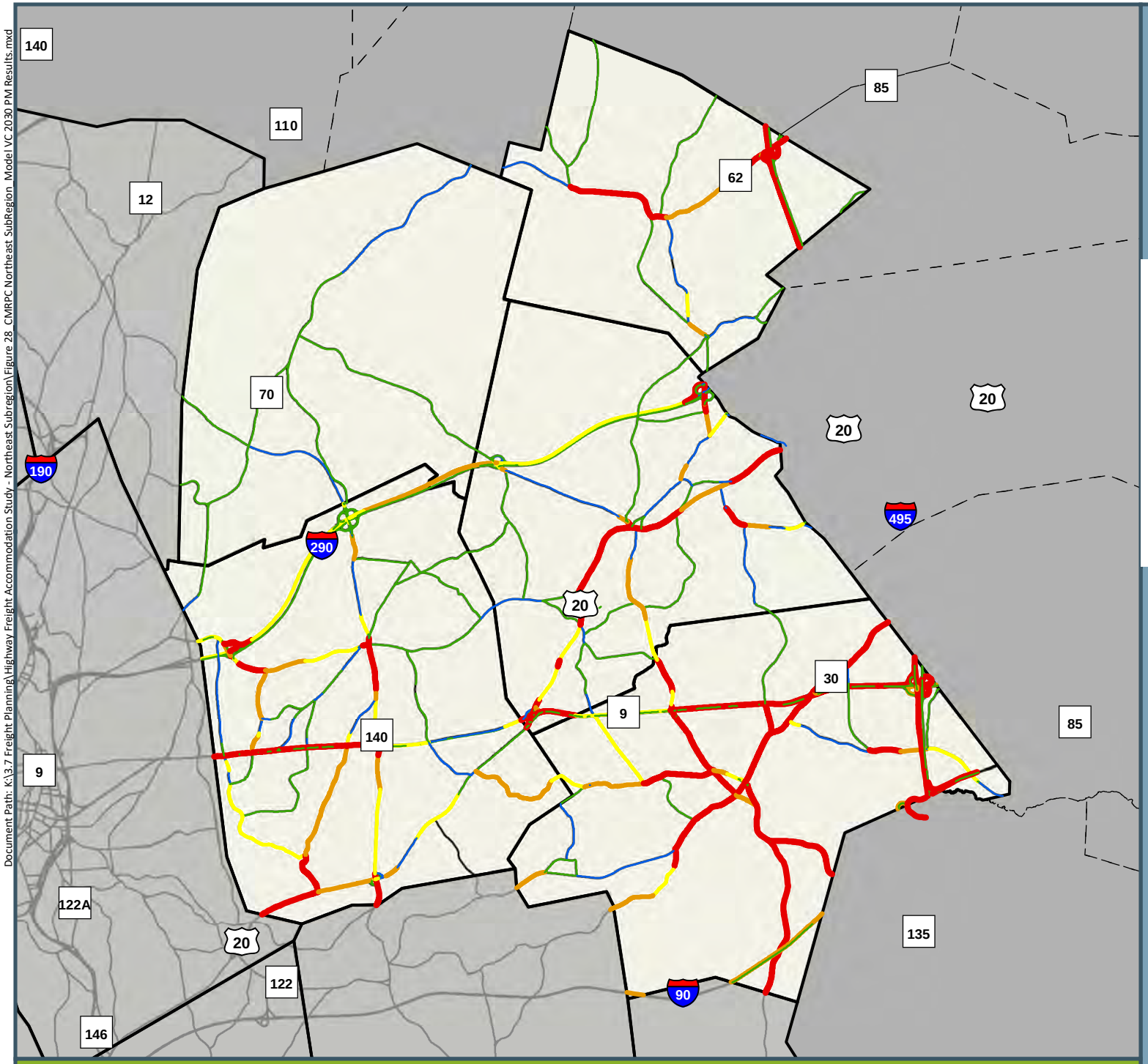


FIGURE 27 - NORTHEAST SUBREGION PROJECTED 2030 V/C RATIOS, AM PEAK PERIOD



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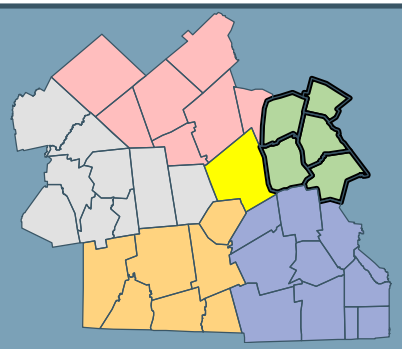

Legend

2030 VC Ratios_PM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Northeast Subregion Towns

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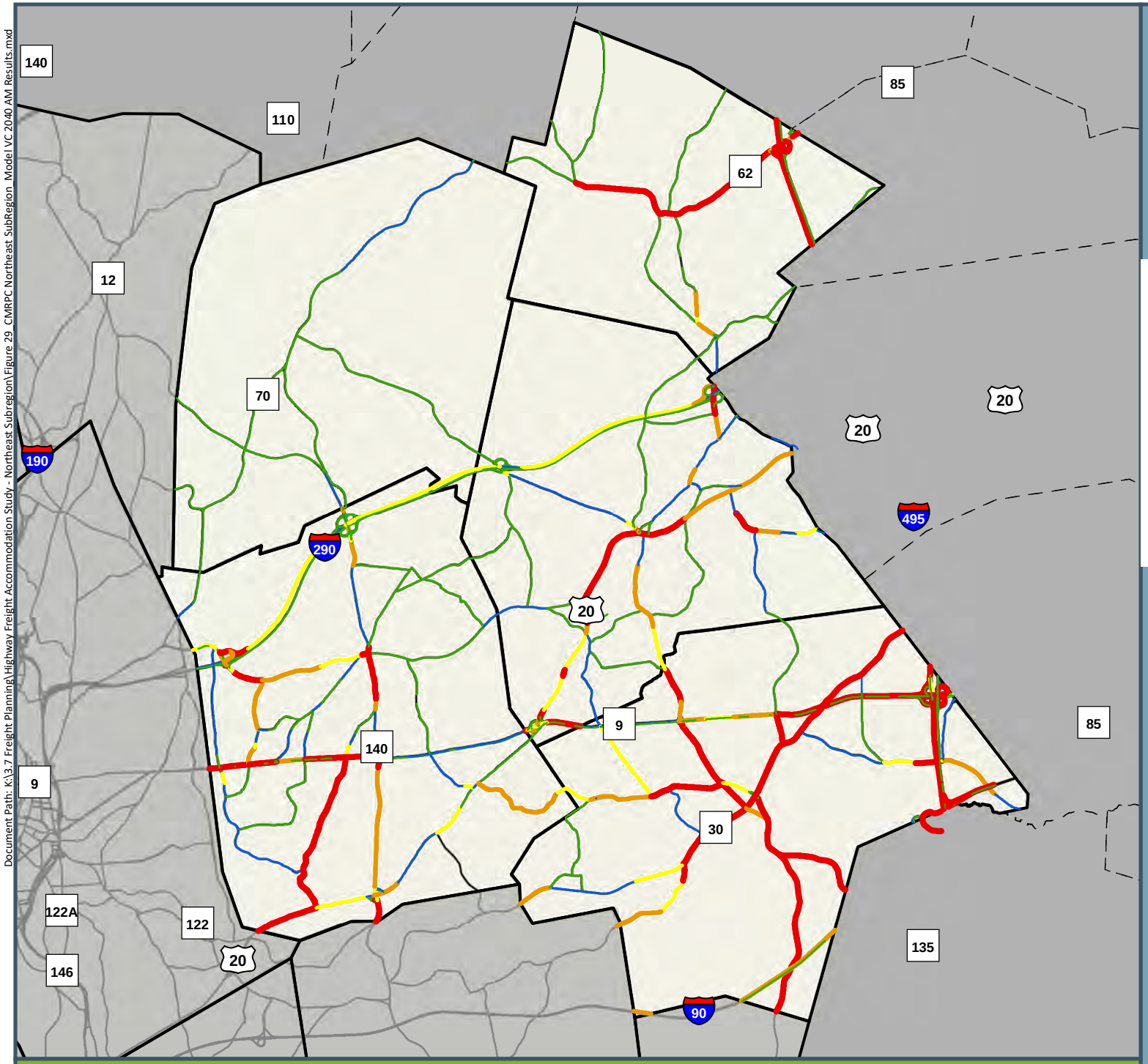
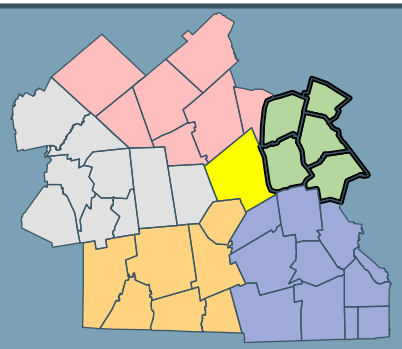
FIGURE 28 - NORTHEAST SUBREGION EXISTING 2030 V/C RATIOS, PM PEAK PERIOD

Under the projected 2040 scenario, shown in **Figures 29 & 30**, essentially the same highway corridors in the Northeast planning subregion identified above continue to experience V/C ratios in excess of 0.80. Throughout the Northeast subregion's highway network during both projected 2040 peak travel periods, calculated V/C ratios rise relative to the modest increases in VMT anticipated between 2030 and 2040 at the present time. Congested conditions are anticipated to spread, but to a lesser extent than in the previous decade. Notably, during the AM peak travel period, an expansion, or "spill-over", of congestion to other roadway segments and roadways occurs in Shrewsbury along Lake Street during the morning peak and spreads along Main Street near Old Mill Road during the evening peak as well as in Westborough on Fisher Street, also during the evening peak. Notably, in each of the five town centers as well as in the vicinity of other commercially oriented areas in the Northeast subregion, future year congestion could spread to, at times, seemingly unattractive local streets, likely indicative of imminent cut-through traffic.





Legend

2040 VC Ratios_AM

- 0.00 - 0.40
- 0.41 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- > 0.80
- Northeast Subregion Towns

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One Mercantile Street, Suite 520
Worcester, MA 01608

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), MassDOT/ Office of Geographic Information (MassGIS), Massachusetts Department of Environmental Protection

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FIGURE 29 - NORTHEAST SUBREGION PROJECTED 2040 V/C RATIOS, AM PEAK PERIOD

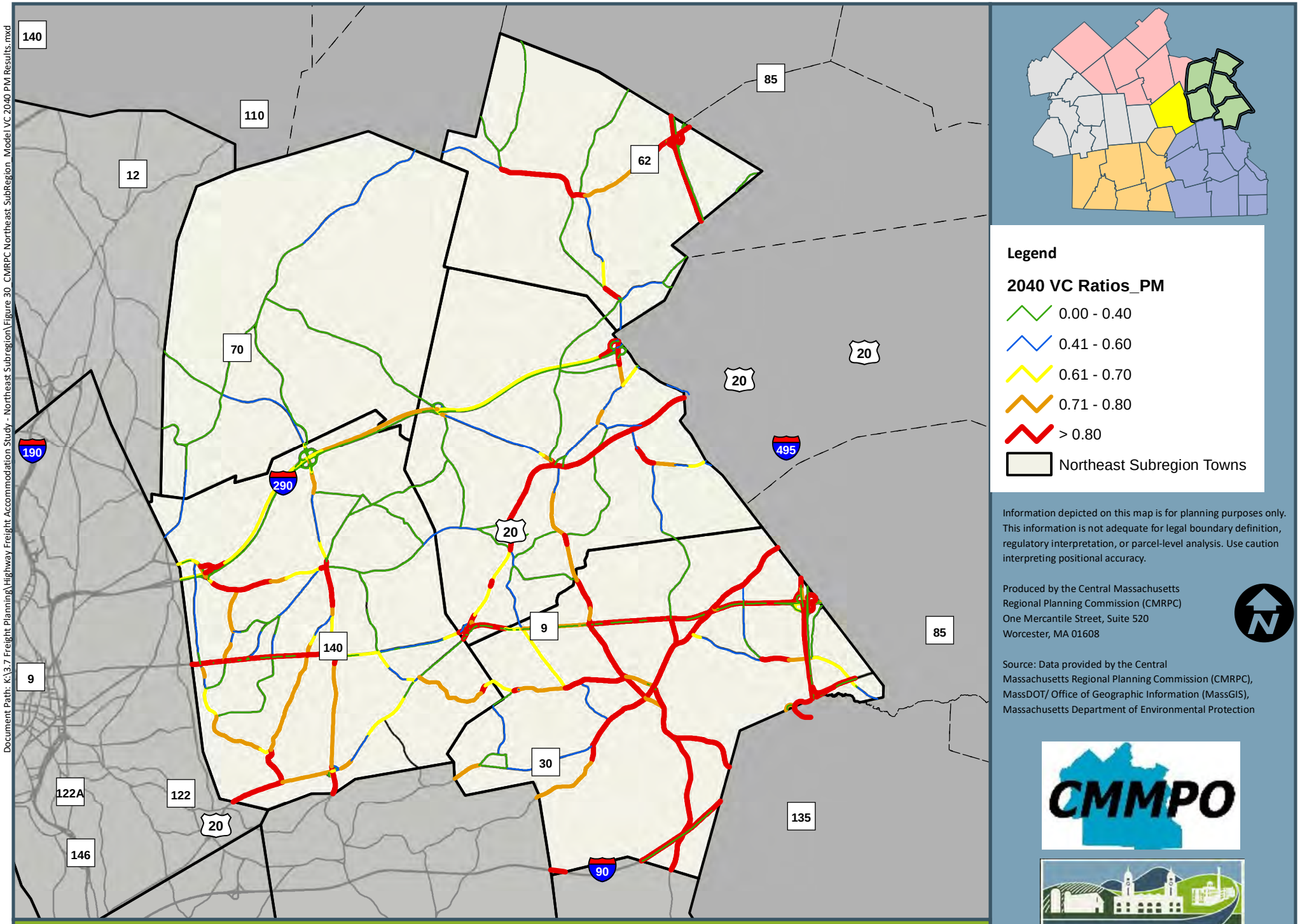

FIGURE 30 - NORTHEAST SUBREGION PROJECTED 2040 V/C RATIOS, PM PEAK PERIOD

Lastly, under the projected 2050 scenario, shown in **Figures 31 & 32**, largely the same highway segments in the Northeast planning subregion discussed above continue to experience V/C ratios in excess of 0.80. Certainly, much less is known at this time concerning future land use development trends and resulting travel patterns that may be experienced within the Northeast subregion during the decade between 2040 and 2050. However, it appears that congested conditions are anticipated to spread, or "spill-over", during the evening peak travel period in the Westborough on both Fisher Street and a segment of Route 30 in the southwestern part of the community at the Grafton town line. Again, as previously mentioned, recurring congested conditions perhaps may spread to seemingly unattractive local streets, indicative of the potential for future year cut-through traffic.

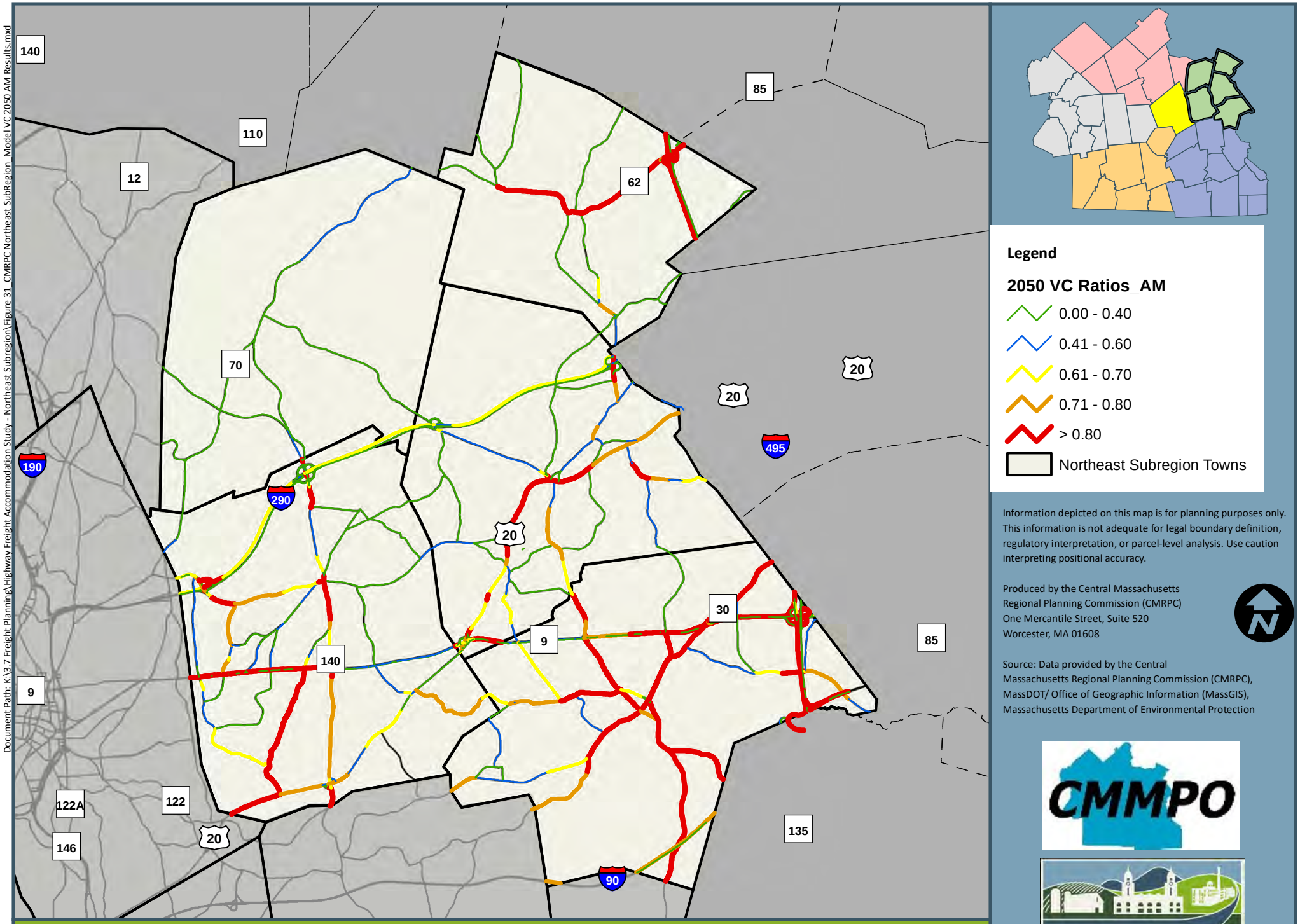

FIGURE 31 - NORTHEAST SUBREGION PROJECTED 2050 V/C RATIOS, AM PEAK PERIOD

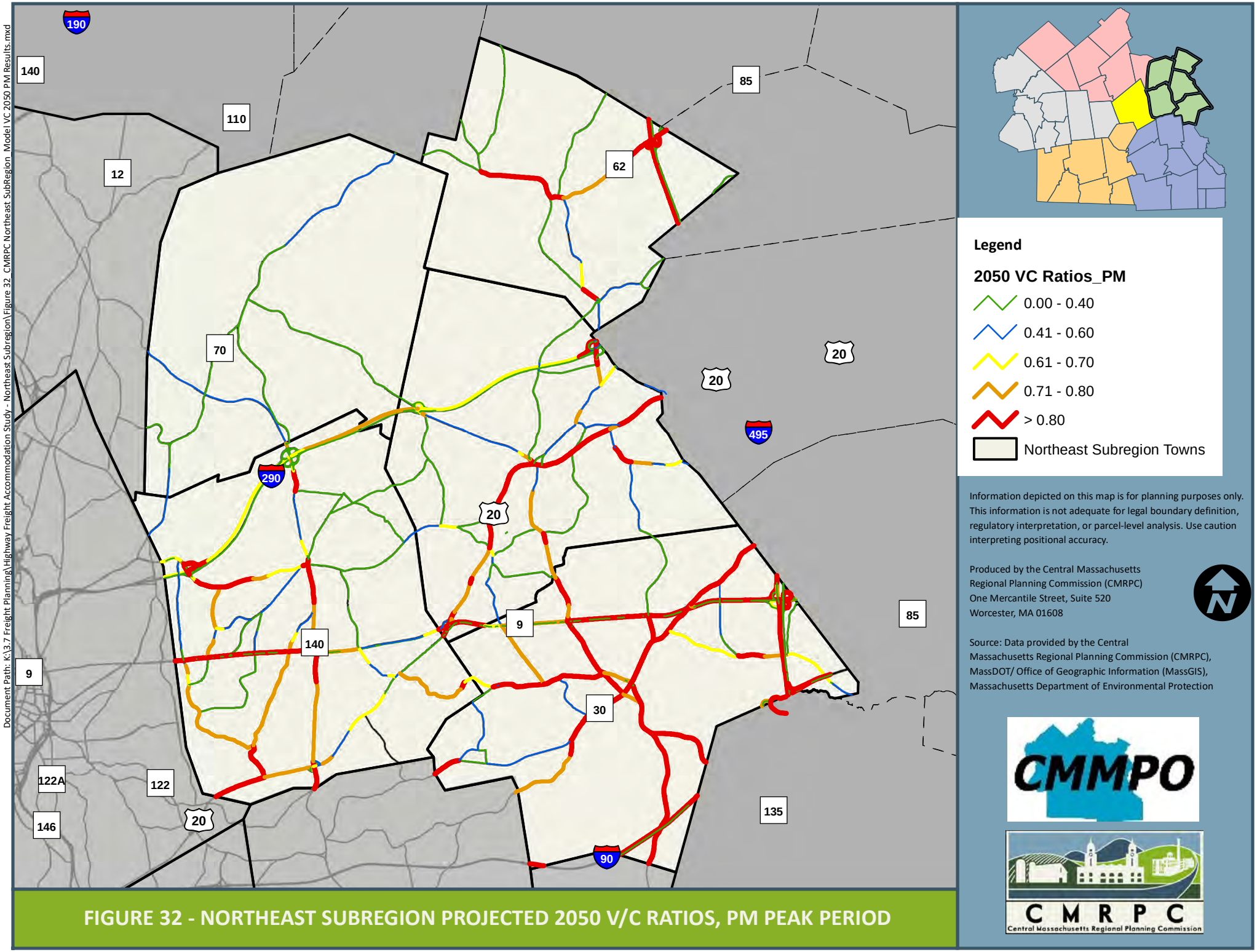

FIGURE 32 - NORTHEAST SUBREGION PROJECTED 2050 V/C RATIOS, PM PEAK PERIOD

Potential Highway "Bottleneck" Segments in the Northeast Subregion

The Travel Demand Model software, or "Model", was also used to identify potential "Bottleneck" segments on the Northeast subregion's federal-aid highways and other major locally maintained roads. This analysis is based on the number of "Origin/Destination" (O/D) pairs using the highway network. The "Origin" is the location of the beginning of a vehicle trip. The "Destination" is the location of the end of the vehicle trip. This analysis is customized to the CMRPC region's Model which has a definitive number of calculated O/D pairs: 837,225. In a relative sense, Models for larger planning areas would have more O/D pairs, such as the greater Boston region. Conversely, smaller planning regions would have fewer O/D pairs, such as Franklin County in western Massachusetts.

Three (3) Scenarios were analyzed: "Stage 1", "Stage 2" & "Stage 3". The "Stage 1" Scenario Model results indicate where there are over 5,000 O/D pairs estimated to be using a particular segment of highway in both the suburban and rural areas of the Northeast subregion. Under the "Stage 2" Scenario, Model results identify where there are over 7,500 O/D pairs using a particular highway segment in the Northeast subregion. Finally, a "Stage 3" Scenario shows where there are over 10,000 O/D pairs using the major federal-aid highways in the Northeast planning subregion. Additionally, there are 955 transportation analysis zones (TAZs) in the Model which translates to 912,025 O/D pairs. Highways identified under the Stage 3 Scenario serve approximately 1% of the O/D pairs.

The results of the three (3) analyzed Scenarios are shown on **Figure 33**. The figure shows *potential* Model-derived highway Bottleneck segments in the Northeast planning subregion. Potential Bottleneck segments, identified in all communities in the Northeast subregion except for the town of Berlin, affect all traffic using the highway network, including the range of heavy vehicles transporting a wide array of freight. The major State Numbered Routes and other highways in the Northeast subregion highlighted by this Model analysis include the entirety of Route 140 through Boylston that shows a Stage 1 level of O/D pair attractiveness. Further, a short segment of Route 140, just north of the I-290 interchange, is seen to exhibit both Stage 2 and, briefly, Stage 3 O/D pair characteristics near the major site drive of a number of sizable distribution centers.

The segment of Route 9 in the southwest corner of Northborough exhibits solid Stage 3 O/D pair attractiveness. Elsewhere in Northborough, parts of US Route 20 near Times Square and in the town center, most of Church Street as well as a short segment of Solomon Pond Road show Stage 1 O/D pair attractiveness.

In the town of Shrewsbury, the entirety of Route 9 indicates a constant Stage 3 level of attractiveness as does the segment of Main Street between the I-290 eastbound ramps and Old Mill Road. Stage 2 O/D pair attractiveness is evident on a short segment of Main Street, in the

town center and the segment of Route 140 south of US Route 20. Additionally, Stage 1 conditions are seen on Main Street both north of the I-290 interchange and approaching the town center. Further, Stage 1 conditions are also seen on Route 140 just south of the I-290 interchange and on the northbound approach to the town center. In addition, the entirety of US Route 20 through Shrewsbury indicates a solid Stage 1 level of attractiveness.

Finally, in Westborough, the entirety of Route 9 indicates a Stage 1 attractiveness while most segments of Route 9 in town show both Stage 2 and Stage 3 levels of O/D pair attractiveness. Elsewhere in this host community, Route 30 has two short segments exhibiting a Stage 1 attractiveness, one near the Flanders Road intersection and the other just east of the town center.

As such, travel conditions in the Northeast planning subregion, particularly on the length of Route 9 through the study area, need to be monitored on a continued, periodic basis to verify Model results based on observed conditions in the field. Analytical estimates often need to be verified, perhaps through Travel Time & Delay studies conducted by a survey vehicle during both peak and off-peak travel periods. If congestion based on roadway capacity constraints becomes apparent on an ongoing, reoccurring basis, then the consideration of improvements will become more apparent. Such improvements could be targeted towards those highway segments experiencing regular, reoccurring congestion-related incidents, delays, etc. Again, all vehicles, including those heavy vehicles carrying freight, are impacted by the potentially sluggish projected travel conditions.

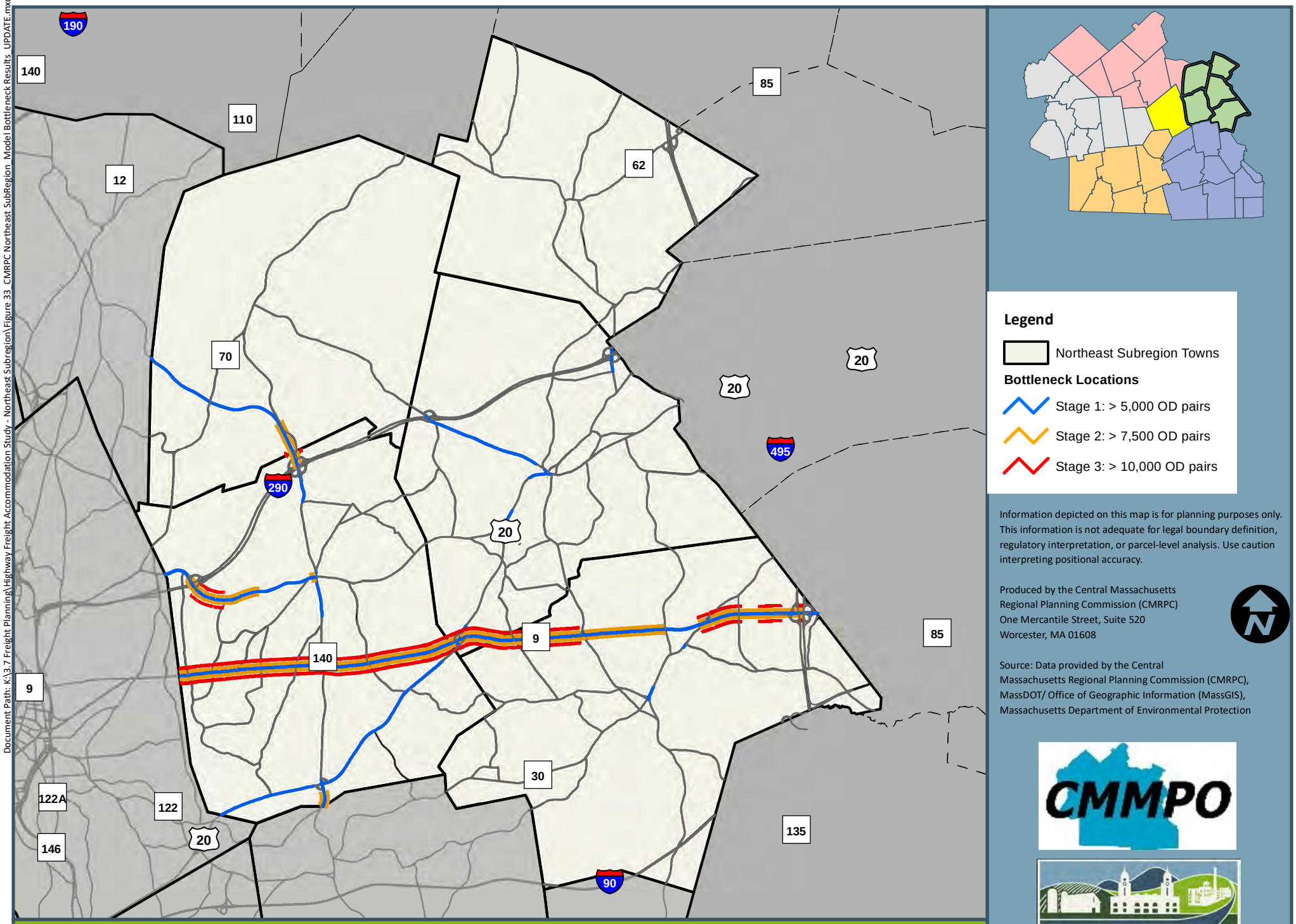

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FIGURE 33 - POTENTIAL HIGHWAY "BOTTLENECK" SEGMENTS IN THE NORTHEAST SUBREGION

5.0 Summary of Findings

Table 15 contains a summary of findings extracted from the range of maps previously presented. The information is summarized by Northeast subregion host community and then by each State Numbered Route within the community. For some of the columns, as explained earlier, there was no sufficient data yet available. Further, some of the columns have multiple findings listed while other columns contain a range of findings such as overall traffic volumes as well as heavy vehicle volumes. The information within the table includes:

- Highway federal-aid eligibility
- Highway Ownership
- Regional Environmental Justice Plus (REJ+) Populations
- Critical Freight Corridor
- Transportation Improvement Program (TIP) Projects
- Traffic volume
- Heavy vehicle volume
- Heavy vehicle volume (northbound/eastbound)
- Heavy vehicle volume (southbound/westbound)
- Heavy vehicle percentage
- Average AM travel speeds
- Average PM travel speeds
- CMP Congested intersections
- Highway Safety Improvement Program (HSIP) crash clusters
- Pavement condition
- Bridges and culverts
- Management Systems data integration
- Environmental Profiles
- Evacuation Routes
- Hazardous Dams
- Locally-identified hazards and vulnerable infrastructure

The following are observations concerning each Northeast subregion host community that pertain to the above listed information categories:

Berlin

State Numbered Route 62 is in the town of Berlin. There are no REJ+ populations, Critical Freight Corridors or programmed TIP projects within Berlin. Route 62 traffic volumes range

from 4,500 to 13,375 vpd and approximately 12% to 18% are heavy vehicles. There are no known congested intersections or HSIP crash clusters in Berlin. Regarding pavement conditions, Route 62 was observed to be between fair and excellent condition. There are no bridges on Route 62 in Berlin. Resulting from the Management Systems integration exercise, most of Route 62 is considered "Tier 2", or medium priority. There are no hazardous dams near Route 62. Lastly, a number of locally-identified vulnerable critical infrastructure and hazards are located near Route 62 in the host community of Berlin.

Boylston

State Numbered Routes 70 and 140 are in the town of Boylston. There are currently no REJ+ populations, Critical Freight Corridors, or TIP projects within the town of Boylston. The highest daily traffic volumes observed in Boylston are found on Route 140, with over 10,000 vpd. Route 140 also carries over 11% heavy vehicles daily. There are no identified congested intersections or HSIP crash clusters on either of the State Numbered Routes in Boylston. Both Route 70 and Route 140 pavement were observed to be in good to excellent condition. There are no bridges or major culverts located along Route 70 or Route 140. As a result of the Management Systems integration exercise one (1) "Tier 2" rated segment, or medium priority, has been identified on Route 140. Also, there is one (1) Low Hazard dam and one (1) High Hazard dam near Route 70 while Route 140 has one (1) nearby Low Hazard dam. Additionally, some locally-identified hazards and vulnerable critical infrastructure are located near both Routes 70 and 140.

Northborough

In the town of Northborough, the State Numbered Routes are Route 9 and Route 135 along with US Route 20. There are currently no REJ+ populations, Critical Freight Corridors, or programmed TIP projects within Northborough. Route 9 has the highest daily traffic volumes in this host community with over 32,000 vpd traveling through the southwest corner of the town. US Route 20 has the highest heavy vehicle percentages with up to 20% daily. There are no identified congested intersections or HSIP crash clusters within this host community. All State Numbered Routes were observed to be in good or excellent condition. There is one (1) bridge on each State Numbered Route while US Route 20 also has two (2) short span bridges and one (1) major culvert. Resulting from the Management Systems integration exercise, "Tier 2" segments, deemed medium priority, were identified on both Route 9 and US Route 20. There is a variety of hazardous dams near US Route 20 in Northborough. Lastly, there exist locally-identified hazards and vulnerable infrastructure near each of these major highways in Northborough.

Shrewsbury

State Numbered Routes 9, 70, 140 and US Route 20 are within the host community of Shrewsbury. There are REJ+ populations near all of these major highways with the exception of Route 70. There are no Critical Freight Corridors within the town of Shrewsbury. There are two (2) programmed TIP projects for US Route 20. One project is at the intersection of Grafton Street and the limits for the other are between South Street and the Northborough town line. Route 9 accommodates the highest traffic volumes with over 29,000 vpd. Regarding daily heavy vehicles, Route 140 sees up to 20% daily, being a popular north-south freight route. There is one (1) identified congested intersection located on Route 140 at Main Street in the town center. As for HSIP crash clusters, there is one (1) along Route 9 and two (2) along US Route 20 in Shrewsbury. Regarding pavement, Route 9 was observed to be in good or excellent condition, Route 70 was in poor or good condition, Route 140 was observed to be in fair, good, or excellent condition and US Route 20 was in good condition. There are three (3) bridges on Route 9, one (1) short span bridge on Route 70, two (2) bridges and one (1) major culvert on Route 140 and one (1) bridge and three (3) short span bridges on US Route 20. One of the Route 140 bridges has been identified as structurally deficient. Resulting from the Management Systems integration exercise, multiple "Tier 2" or medium priority segments have been identified on Routes 9, 140, and US Route 20. There are Low Hazard dams nearby both Route 70 and US Route 20. Lastly, there exist locally-identified hazards and vulnerable critical infrastructure near each of these State and US Numbered Routes in Shrewsbury.

Westborough

In the town of Westborough, the State Numbered Routes are Route 9, Route 30, and Route 135. There are REJ+ populations nearby all three (3) State Numbered Routes. There are no Critical Freight Corridors within the town of Westborough along the State Numbered Routes. There is a programmed TIP highway improvement project on Route 30 currently listed for FFY 2029. Route 9 accommodates the highest observed daily traffic volumes in Westborough with over 41,000 vpd. Route 135 has the highest heavy vehicle percentage with 15% daily. There are two (2) identified congested intersections in Westborough, one each on Route 9 and Route 30. There are also two (2) HSIP crash clusters located on Route 9 at the Otis Street and Lyman Street intersections. Route 9 pavement was observed to be in excellent condition while Route 30 was observed to be in fair to good condition while Route 135 exhibits a mixture of pavement conditions. There are three (3) bridges on Route 9 and one (1) bridge on Route 135. The Management Systems integration exercise showed four (4) identified "Tier 2" rated highway segments, on both Route 9 and Route 30. Lastly, there are locally-identified hazards and vulnerable critical infrastructure near each of these State Numbered Routes.

Table 15 - Summary of Findings

Host Community	Route #	Fed-Aid Eligible	Highway Ownership	REJ+ Populations	Critical Freight Corridor	TIP Projects	Traffic Volume	Heavy Vehicle Volume	Heavy Vehicle Volume (NB/EB)	Heavy Vehicle Volume (SB/WB)	Heavy Vehicle %	Average Travel Speeds (AM)	Average Travel Speeds (PM)	CMP Congested Intersections	HSIP Crash Clusters	Pavement Condition	Bridges & Culverts	Management Systems Data Integration	Environmental Profiles	Evacuation Route	Dams	Locally-Identified Hazards & Vulnerable Infrastructure
Berlin	62	Yes	MassDOT & Town	No	No	No	4,500 - 13,375	1,400 - 1,720	690 - 870	710 - 850	12% - 18%	23 - 41 MPH	23 - 41 MPH	No	No	Fair / Good / Excellent	None	Tiers 2 & 3	Nearby recreation, conservation & open space areas, wetlands, potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
Boylston	70	Yes	MassDOT	No	No	No	4,600 - 7,200	350 - 600	165 - 300	185 - 300	6% - 12%	31 - 45 MPH	33 - 45 MPH	No	No	Good / Excellent	None	Tier 3	Nearby conservation, recreation, open space & water supply areas, wetlands, vernal and potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Low & High Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	140	Yes	Town	No	No	No	10,125 - 18,415	1,960 - 2,160	1,000 - 1,160	960 - 1,000	11% - 20%	29 - 46 MPH	31 - 44 MPH	No	No	Good / Excellent	None	Tiers 2 & 3	Nearby recreation, open space & water supply areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 year flood zones.	Primary	Nearby Low Hazard Dam	Nearby Hazards & Vulnerable Critical Infrastructure
Northborough	9	Yes	MassDOT	No	No	No	32,000 - 52,500	No Data	No Data	No Data	No Data	No Data	No Data	No	No	Excellent	1 Bridge	Tier 2	Nearby wetlands, potential vernal pools, and 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	20	Yes	MassDOT	No	No	No	12,445 - 19,200	960 - 1,750	460 - 770	500 - 980	7% - 20%	11 - 44 MPH	9 - 45 MPH	No	No	Good / Excellent	1 Bridge, 2 Short Span Bridges, 1 Culvert	Tiers 2 & 3	Nearby conservation, recreation, open space & water supply areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Low, Significant, & High Hazard Dams	Nearby Hazards & Vulnerable Critical Infrastructure
	135	Yes	Town	No	No	No	7,900 - 9,250	760 - 1,215	375 - 545	385 - 670	9% - 13%	No Data	No Data	No	No	Good	1 Bridge	Tier 3	Nearby recreation & open space areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
Shrewsbury	9	Yes	MassDOT	Yes	No	No	29,170 - 41,270	No Data	No Data	No Data	No Data	12 - 48 MPH	14 - 45 MPH	No	Yes	Good / Excellent	3 Bridges	Tiers 2 & 3	Nearby conservation & recreation areas, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	20	Yes	MassDOT	Yes	No	Yes	18,000 - 28,970	No Data	No Data	No Data	No Data	No Data	No Data	No	Yes	Good	1 Bridge, 3 Short Span Bridges	Tiers 2 & 3	Nearby conservation & recreation areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 & 500 year flood zones.	Primary	Nearby Low Hazard Dam	Nearby Hazards & Vulnerable Critical Infrastructure
	70	Yes	MassDOT	No	No	No	5,680 - 6,200	350 - 490	165 - 265	185 - 225	6% - 9%	40 - 42 MPH	38 - 42 MPH	No	No	Poor / Good	1 Short Span Bridge	Tier 3	Nearby conservation area, wetlands, potential vernal pools, rare species habitat, and 100 year flood zones.	Secondary	Nearby Low Hazard Dam	Nearby Vulnerable Critical Infrastructure
	140	Yes	MassDOT & Town	Yes	No	No	10,650 - 16,500	1,700 - 2,800	800 - 1,720	900 - 1,080	10% - 20%	17 - 45 MPH	20 - 48 MPH	Yes	No	Fair / Good / Excellent	2 Bridges (1SD), 1 Culvert	Tiers 2 & 3	Nearby conservation, recreation, open space & water supply areas, wetlands, potential vernal pools, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
Westborough	9	Yes	MassDOT	Yes	No	No	41,340 - 52,500	No Data	No Data	No Data	No Data	33 - 50 MPH	21 - 52 MPH	Yes	Yes	Excellent	3 Bridges	Tiers 2 & 3	Nearby conservation, recreation, open space & water supply areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 year floods zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	30	Yes	MassDOT & Town	Yes	No	Yes	5,800 - 17,965	280 - 1,285	125 - 660	155 - 625	4% - 9%	19 - 39 MPH	8 - 39 MPH	Yes	No	Fair / Good	None	Tiers 2 & 3	Nearby conservation, recreation, open space & water supply areas, wetlands, vernal & potential vernal pools, and 100 & 500 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure
	135	Yes	MassDOT & Town	Yes	No	No	5,610 - 13,460	855	510	345	15%	11 - 37 MPH	19 - 40 MPH	No	No	Fair / Good / Excellent	1 Bridge	Tier 3	Nearby conservation, recreation, open space & water supply areas, wetlands, vernal & potential vernal pools, rare species habitat, and 100 year flood zones.	Primary	None	Nearby Hazards & Vulnerable Critical Infrastructure

6.0 Suggested Improvement Options

Based on the previous Summary of Findings section, several suggested improvement options have been compiled for consideration by both MassDOT and the five (5) host communities in the Northeast planning subregion. The following **Figure 34** summarizes suggested priority infrastructure improvements for each of the towns. Highway segments that are on the federal-aid network are eligible for potential future-year project funding through the CMMPO's Transportation Improvement Program (TIP). Other available improvement funding resources also have the potential to be applied to eligible improvement projects, such as various federal & state grant opportunities and state-provided Chapter 90 funds.

6.1 Northeast Subregion-Wide Improvement Options

- In the spirit of Jason's Law, contemplate revised local policy and strongly consider truck parking-friendly bylaws that allow for federally required driver rest periods for long distance truckers at key commercial and/or industrial locations in each of the host communities.
- Potential improvement of truck turning radii at major intersections, limited box widening where necessary, the installation of truck climbing lanes on steep grades as well as the elimination of hazardous highway curves.
- Check and optimize traffic signal timing & phasing at high-volume signalized intersections.
- Maintain all pavement to a condition of "Good" or above. Pavement conditions are especially critical on State Numbered Routes.
- Address all structurally deficient (SD) bridges. In addition, address those bridges with posted weight limits associated with reduced load-carrying capabilities.
- Numerous culverts need attention in the Northeast transportation planning subregion. As such, commence corridor-wide and/or town-wide culvert assessment programs that can allow for the future targeted replacement of key vulnerable drainage system components. *(The CMRPC transportation staff is available to discuss this program further.)*
- Improve/repair the hazardous dams identified in the Northeast subregion, especially those located upstream of State Numbered Routes.

6.2 Northeast Subregion Host Community Improvement Options

Berlin

- Maintain pavement in good to excellent condition for all State Numbered Routes.

- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on Route 62.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Boylston

- Maintain pavement in good to excellent condition for all State Numbered Routes.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segment on Route 140.
- Consider improving all High Hazard dams in the community, specifically near and upstream of Route 70.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Northborough

- Maintain pavement in good to excellent condition for all State Numbered Routes.
- Consider improving all High Hazard dams in the community, specifically near and upstream of US Route 20.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on both Route 9 and US Route 20.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Shrewsbury

- Improve the poor pavement segments identified on Route 70 near the Worcester City Line.
- Consider improvements at the identified congested intersection at Route 140 and Main Street in the town center.
- Improve the identified HSIP crash cluster on Route 9 at the Lake Street intersection.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on Route 9, Route 140 and US Route 20.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

Westborough

- Maintain pavement in good to excellent condition for all State Numbered Routes.

- Consider improvements at the identified congested intersections at Route 9/Lyman Street and Route 30/Church Street.
- Improve the two (2) identified HSIP crash clusters on Route 9/Lyman Street and Route 9/Otis Street intersections.
- Consider improving the Management Systems data integration exercise-identified Tier 2 priority segments on both Route 9 and Route 30.
- Consider any nearby locally-identified hazards and vulnerable critical infrastructure that could potentially be impacted by the suggested subregion-wide improvement options.

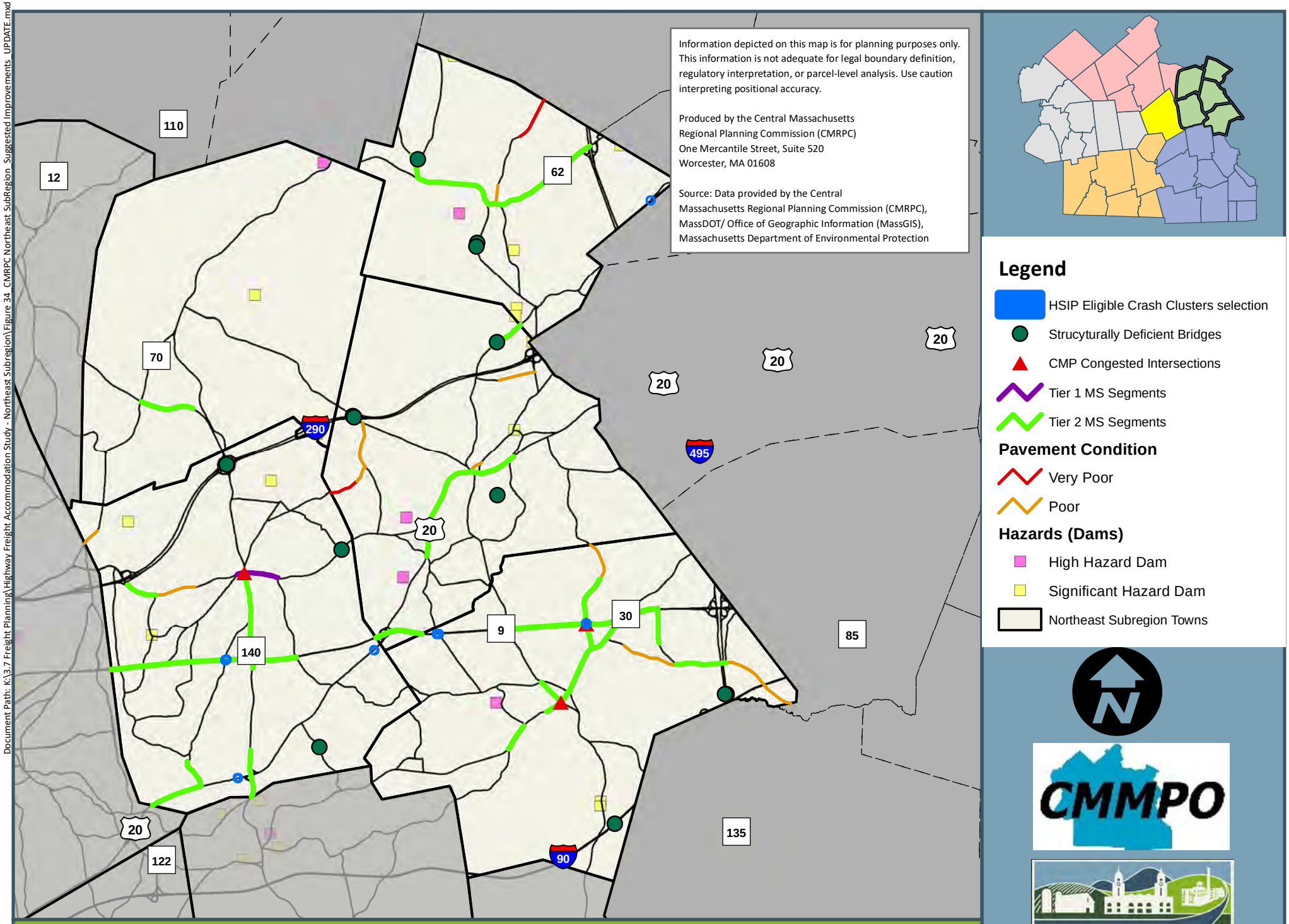

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FIGURE 34 - NORTHEAST SUBREGION COMMUNITY SUGGESTED PRIORITY INFRASTRUCTURE IMPROVEMENTS

Central Massachusetts Regional Planning Commission

Member Communities

Auburn	Northborough
Barre	Northbridge
Berlin	Oakham
Blackstone	Oxford
Boylston	Paxton
Brookfield	Princeton
Charlton	Rutland
Douglas	Shrewsbury
Dudley	Southbridge
East Brookfield	Spencer
Grafton	Sturbridge
Hardwick	Sutton
Holden	Upton
Hopedale	Uxbridge
Leicester	Warren
Mendon	Webster
Millbury	West Boylston
Millville	West Brookfield
New Braintree	Westborough
North Brookfield	Worcester

Central Mass Regional Planning Commission

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