Southern New Hampshire Planning Commission

CONGESTION MANAGEMENT PROCESS

DRAFT

October 2020

ABSTRACT

Utilizing travel time data from thousands of drivers, this report identifies varying levels of congestion along roadways, their causes, and recommends strategies to mitigate existing and future congested conditions.

NEW HAMPSHIRE SOUTHERN PLANNING COMMISSION

SNHPC

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1.0 Introduction

Motor vehicle congestion generally results when the utilization of a transportation facility (e.g. roadway, transit route, bikeway, sidewalk, trail, etc) exceeds its capacity to handle the traffic. The Federal Highway Administration (FHWA) has made it a priority to identify and mitigate congestion in urbanized areas through the Congestion Management Process (CMP).

In the metropolitan area including and surrounding the City of Manchester, New Hampshire, analyzing congestion on the roadway network helps to identify and target the mitigation measures that are necessary to maintain the mobility of people and freight in the region. As the Metropolitan Transportation Organization (MPO) charged with monitoring congestion in the region, the Southern New Hampshire Planning Commission (SNHPC) has developed this report with recommended strategies for congestion mitigation. The SNHPC coordinates with its member municipalities, adjacent MPOs, and the New Hampshire Department of Transportation (NHDOT) in planning and programming transportation projects in the region.

Interstate 293 Northbound at Exit 5 in the City of Manchester.

1.1 The SNHPC's Role in Congestion Management

The FHWA requires MPOs operating in a designated Transportation Management Area (TMA) to identify congested areas within their Urbanized Area (UZA) and to develop and implement congestion mitigation strategies. A TMA is an urbanized area with a population of over 200,000 persons as determined by the Census Bureau and designated by the Secretary of Transportation. The Nashua, New Hampshire UZA has been designated as a TMA as its population exceeds 200,000 persons. While the majority of the Nashua UZA, including the City of Nashua, is served by the Nashua Regional Planning Commission (NRPC), portions of the SNHPC communities of Auburn, Derry, Londonderry, and Windham are located within the Nashua UZA. Accordingly, in May 2018, the SNHPC executed a Memorandum of Understanding (MOU) with the NRPC and NHDOT regarding transportation planning and programming within the Nashua UZA.

The federal Congestion Management System (CMS) was first introduced as part of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and was envisioned as a systematic process for state departments of transportation (DOTs) and MPOs to provide information on transportation system performance and identify potential strategies to alleviate congestion and enhance mobility of people and goods. The Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users

(SAFETEA-LU) of 2005 changed the name of the CMS to the Congestion Management Process (CMP). While the CMS often was used as a stand-alone data analysis/planning exercise, the CMP was intended to be an *ongoing* process, fully integrated into the overall transportation planning process of both states and MPO regions. [1]

The Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012 preserved the existing regulations related to CMPs but increased the focus on a performance-based approach to decision making by establishing requirements related to the monitoring and reporting of congestion and travel time reliability performance measures. The Fixing America's Surface Transportation (FAST) Act of 2015 preserved these regulations and the performance monitoring requirements established under MAP-21 with respect to CMPs.

1.2 Requirements of a CMP

Federal requirements mandate that the CMP be part of an overall metropolitan transportation planning process that involves coordination with transportation system management and operations activities. Federal regulations do not establish CMP update cycles, though the four-or-five-year Metropolitan Transportation Plan (MTP) update cycle for MPOs provides a baseline for a reevaluation/update cycle in the absence of an explicit requirement.

> ***"The transportation planning process in a TMA shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, of new and existing transportation facilities […] through the use of travel demand reduction (including intercity bus operators, employer-based commuting programs such as a carpool program, vanpool program, transit benefit program, parking cash-out program, shuttle program, or telework program), job access projects, and operational management strategies."***
>
> *23 CFR 450.322(a) and (b)*
> *Metropolitan Transportation Planning, Congestion Management Process in Transportation Management Areas*

Pursuant to the requirements of 23 CFR 450.322, a Congestion Management Process shall include the following six elements:

1. Methods to monitor and evaluate the performance of the multimodal transportation system, identify the underlying causes of recurring and non-recurring congestion, identify and evaluate

[1] Federal Highway Administration (FHWA) 2011 CMP Guidebook, https://www.fhwa.dot.gov/planning/congestion_management_process/cmp_guidebook/

alternative strategies, provide information supporting the implementation of actions, and evaluate the effectiveness of implemented actions;

2. Definition of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures should be tailored to the specific needs of the area and established cooperatively by the State(s), affected MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area, including providers of public transportation;

3. Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area;

4. Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combinations of strategies, are some examples of what should be appropriately considered for each area:
   - (i) Demand management measures, including growth management, and congestion pricing;
   - (ii) Traffic operational improvements;
   - (iii) Public transportation improvements;
   - (iv) ITS technologies as related to the regional ITS architecture; and
   - (v) Where necessary, additional system capacity.

5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation; and

6. Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers and the public to provide guidance on selection of effective strategies for future implementation.

2.0 Overview of the CMP Process

The CMP is a systematic process of identifying congestion and its causes in the SNHPC region, applying congestion mitigation strategies to improve transportation system performance and reliability, and evaluating the effectiveness of implemented strategies. The FHWA's Congestion Management Process Guidebook details an eight-step process to be used in developing CMPs.

Step 1: Develop Regional Objectives for Congestion Management. Congestion management objectives should be developed with meaningful stakeholder participation and an understanding of the needs and desires of the public related to congestion.

Step 2: Define CMP Network. Define the geographic boundaries and the system components/network of facilities. Although CMPs focus primarily on motor vehicles on the road network, the CMP also should consider the transit, bicycle, and pedestrian movements on or connecting to the network.

Step 3: Develop Multimodal Performance Measures. Performance measures should be developed and used at the regional level to measure the performance of the system and at the local level (corridor, segment, intersection) to identify specific locations with congestion problems and measure the performance of individual segments and system elements.

Step 4: Collect Data/Monitor System Performance. Various agencies must collaborate to collect data, such as travel-time and crashes, and monitor system performance. These agencies may include, but not be limited to the SNHPC, NHDOT, and the Manchester Transit Authority (MTA).

Step 5: Analyze Congestion Problems and Needs. Raw data is translated into meaningful measures of performance to analyze congestion problems and needs. The analysis should include locations of major trip generators, seasonal traffic variations, time-of-day traffic variations, and separation of trip purpose.

Step 6: Identify and Assess Strategies. The analysis can then be used to identify and assess CMP strategies to effectively manage congestion and achieve congestion management objectives.

Step 7: Program and Implement Strategies. Critical for turning the recommended strategies of the CMP into solution-based projects and/or management processes.

Step 8: Evaluate Strategy Effectiveness. Process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures.

3.0 Regional Objectives for CMP in the SNHPC Region

This section defines what the SNHPC region aims to achieve with the updated 2020 CMP and sets the overall direction of the congestion mitigation effort. The primary purpose of the CMP is to measure and identify current and expected transportation system congestion through data collection, travel demand modeling, capacity analysis, and to use the information to aid in decision-making regarding project priories for the SNHPC region.

The regional goals for congestion management are tied directly to the goals and objectives developed by the SNHPC's MPO Policy Committee in the current SNHPC Metropolitan Transportation Plan (MTP). These goals were also informed by the SNHPC's Technical Advisory Committee (TAC), which consists of representatives from SNHPC municipalities and partner agencies.

The goals and objectives of the SNHPC's MTP are detailed below, and also serve as the goals and objectives for the CMP.

General Regional Transportation Goals and Objectives:

1. Achieve safer transportation for all users.
2. Work to reduce trips made by single occupancy-vehicles.
3. Promote increased availability of pedestrian and bicycle facilities.
4. Provide increased availability of public transportation.
5. Develop passenger rail to improve access and mobility and improve the economic vitality of the region.
6. Promote smart growth land use and transportation policies.
7. Identify and promote climate change adaptation in transportation planning and infrastructure.
8. Promote increased education about the region's transportation issues and alternatives.
9. Seek sustainable funding for transportation infrastructure.

Regional Highway Transportation Goals and Objectives:

1. Contribute to the development of an accessible and efficient system of streets and highways that provides travel choices ensuring safe, secure and cost-effective movement of motorized and non-motorized users throughout the region and incorporates a Complete Streets approach where applicable.
2. Enhance safe and efficient access to property by encouraging and assisting member communities to establish and enforce access management strategies and policies that strive to create a balance between mobility and access needs.
3. Continue long-range highway planning and short-term project programming based on Performance Based Planning and Programming (PBPP) principles on an area-wide scale to provide the framework for improvement program priorities, scheduling and funding.

4. Address congestion and fully develop the capacity and efficiency of the existing and future roadway infrastructure through a Congestion Management Process including promoting, implementing, and monitoring the success of congestion mitigation strategies.
5. Encourage recognition of the impacts and interrelationships of land use, public facilities and transportation activities and decisions.
6. Assist member communities in planning for an integrated highway network that encourages safe and efficient movement of people and freight by encouraging the establishment and use of functional highway classification systems.
7. Encourage and adopt land use policies to provide for transportation options and alternatives.
8. Encourage Bicycle-Friendly Communities.
9. Expand and support the development of additional transportation funding sources for municipalities.

Regional Rail Transportation Goals and Objectives:

1. Continue to develop and plan for the establishment of passenger rail service on the New Hampshire Capitol Corridor between Boston, MA and Concord, NH.
2. Facilitate and promote the expansion of passenger and freight rail transportation in the SNHPC region by maintaining a multi-modal planning approach.
3. Contribute to the development of policies and programs consistent with the New Hampshire State Rail Plan.
4. Support the growth of rail transportation as a response to the overdependence on highways and as a viable option for the movement of people and goods in the region.

Regional Goals and Objectives for Transportation and the Environment:

1. Encourage and facilitate public and private participation in ridesharing, telecommuting, Transportation Management Associations and Transportation Demand Management policies designed to reduce congestion, the demand for peak hour travel and dependence on the single-occupant automobile.
2. Protect and preserve the environment and ensure that the maximum practical environmental mitigation is incorporated into the planning process by consulting, as appropriate, with State and Federal agencies.
3. Encourage improvements to air quality and energy conservation through the use of alternatives to the single-occupant automobile.
4. Promote technologies for the development of alternative fuels for use in the transportation sector.
5. Contribute, in association with NHDOT, NHDES, FHWA, FTA, EPA and other New Hampshire MPOs, to the reduction of motor vehicle pollutant emissions by continuing to comply with standards as set forth in the Clean Air Act.
6. Consider issues of climate change in the planning process and support implementation of the New Hampshire Climate Action Plan.

Regional Goals and Objectives for Alternative Modes of Transportation:

1. Encourage the use of alternative modes of transportation such as walking and cycling through participation in a planning process that supports the development of a multi-modal transportation system for the region.
2. Facilitate the use of alternative modes of transportation and promote livable and sustainable communities by pursuing regional opportunities to plan for higher density mixed-use developments in town centers and other appropriate locations.
3. Ensure that pedestrian and bicycle transportation components are properly incorporated into the design of transportation infrastructure improvements.
4. Support investment in and assist member communities in pursuing funding for projects involving alternative modes of transportation within the region.
5. Encourage communities to adopt a Complete Streets policy, to routinely design and operate the entire right of way to enable safe access for all users, regardless of age, ability, or mode of transportation.

CMP Connection to Other SNHPC Regional Transportation Plan Goals and Objectives

Intelligent Transportation System (ITS) Architecture

The ITS Architecture for the SNHPC region defines ITS systems as "the application of advanced sensor, computer, electronics, and communication technologies and management strategies – in an integrated manner – to improve the safety and efficiency of the surface transportation system." The SNHPC ITS Architecture was adopted in April 2016 and identifies the planning and implementation needs of specific ITS technologies as strategies for managing congestion, improving safety, and addressing the transportation needs of the region.

The SNHPC ITS Architecture identifies the following goals, which are detailed below and are incorporated herein by reference as the goals and objectives for the CMP.

1. Promote the planning and implementation of ITS transportation infrastructure in an organized and coordinated fashion.
2. Facilitate the sharing of information and coordination of activities between transportation systems to efficiently operate and integrate ITS infrastructure.
3. Highlight additional needs for further integration and provide a framework for stakeholders to formulate goals and strategies designed to address transportation issues through the utilization of ITS.

4.0 Definition of the SNHPC Regional CMP Network

Through consultation with the SNHPC Technical Advisory Committee, MPO Policy Committee and partner agencies, the SNHPC has adopted a corridor-based approach to the development of the CMP. Specifically, nine corridors have been identified throughout the SNHPC metropolitan planning area that have the most significant recurring congestion and connect key activity and employment centers. These nine corridors are detailed below and comprise the SNHPC's CMP network.

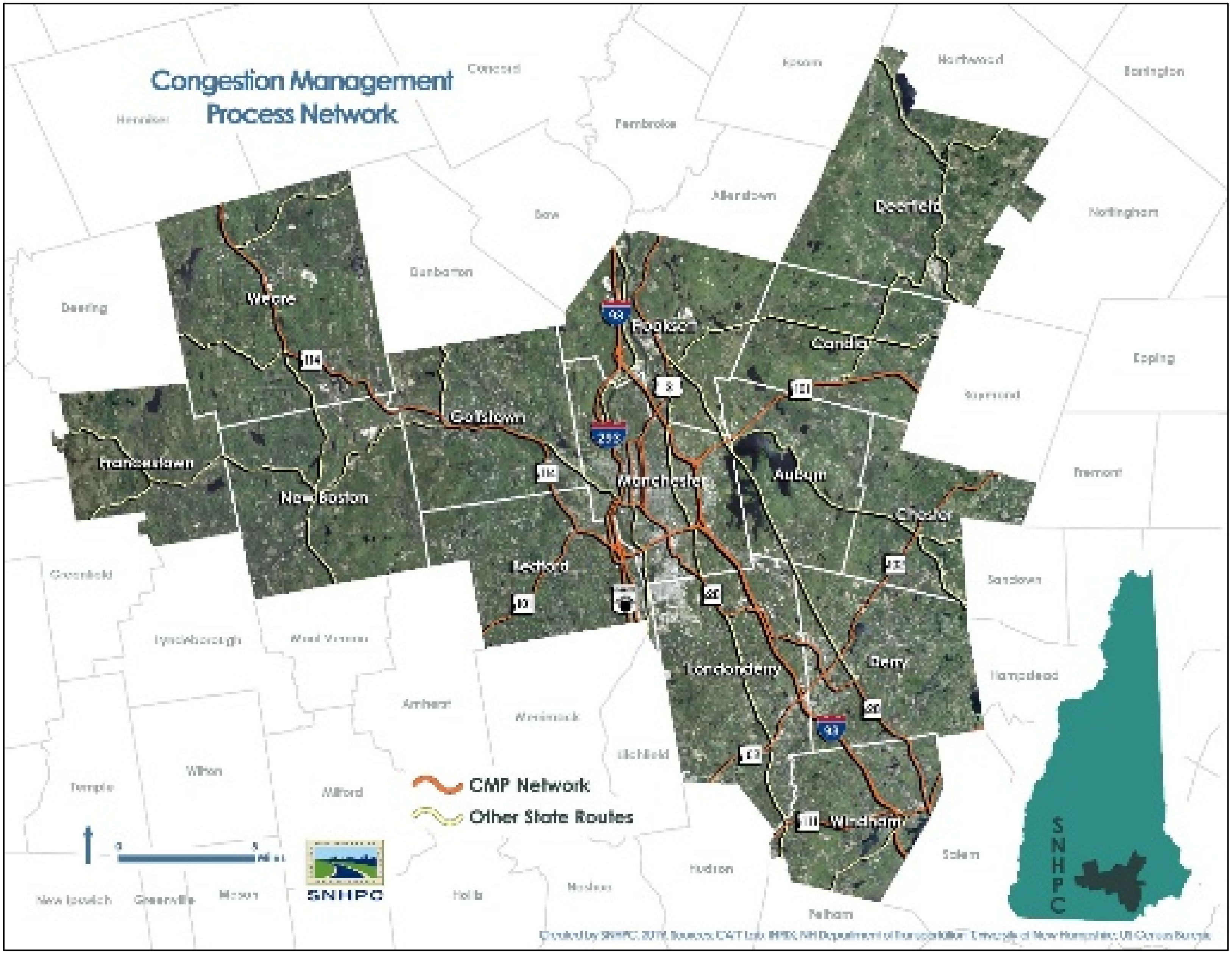
SNHPC CMP Network	
Roadway	**Designation**
Interstate 93	Interstate System/National Highway System
Interstate 293	Interstate System/National Highway System
FE. Everett Turnpike	National Highway System
NH Route 101	National Highway System
NH Route 114	National Highway System (Partially)
U.S. Route 3	National Highway System (Partially)
NH Route 28	National Highway System (Partially)
NH Route 102	National Highway System (Partially)
NH Route 111	National Highway System

Additionally, the analysis of these nine corridors presented in Section 7 of this document considers not only vehicle travel considerations, but pedestrian, bicycle, and transit considerations as well. Specifically, the following transit services have been considered in conjunction with the analysis of the CMP network:

- Manchester Transit Authority (MTA) Local and Regional Fixed-Route Transit Services;
- Greater Derry-Salem Cooperative Alliance for Regional Transportation (CART) Demand Response Transit Services;
- Boston Express Intercity Transit Service;
- Proposed Future Passenger Rail Services between Boston, MA and Manchester, NH; and
- Proposed Future Regional Transit Services Presented in the NHDOT Statewide Strategic Transit Assessment.

A map depicting the SNHPC regional CMP network is presented in Figure 4.0.1 below.

Figure 4.0.1 – SNHPC Regional CMP Network



5.0 Definition of Performance Measures

Pursuant to the requirements detailed in the Federal Highway Administration's (FHWA) final rule on System Performance (PM3), the SNHPC MPO Policy Committee has formally adopted a series of regional system performance targets. These targets are incorporated herein by reference as performance measures for the CMP. Specifically, regional targets were adopted for the following federally-required system performance measures:

- Level of Travel Time Reliability on the Interstate System (i.e. percentage of person-miles traveled on the Interstate that are reliable);
- Level of Travel Time Reliability on the non-Interstate National Highway System (i.e. Percentage of person-miles traveled on the non-Interstate National Highway System (NHS) that are reliable); and
- Truck Travel Time Reliability Index.

Level of Travel Time Reliability (LOTTR) is defined as the ratio of the longer travel times (80th percentile) to a "normal" travel time (50th percentile), using data from FHWA's National Performance Management Research Data Set (NPMRDS). Data are collected in 15-minute segments during all time periods between 6 AM and 8 PM local time. The measures are the percent of person-miles traveled on the relevant portion of the NHS that are reliable. Person-miles take into account the users of the NHS. Data to reflect the users can include bus, auto, and truck occupancy levels.

Source: FHWA

Freight movement is assessed by the TTTR Index. Reporting is divided into five periods: morning peak (6-10 a.m.), midday (10 a.m.-4 p.m.) and afternoon peak (4-8 p.m.) Mondays through Fridays; weekends (6 a.m.-8 p.m.); and overnights for all days (8 p.m.-6 a.m.). The TTTR ratio will be generated by dividing the 95th percentile time by the normal time (50th percentile) for each segment. The TTTR Index will be generated by multiplying each 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.

Source: FHWA

In summary, the adopted SNHPC regional system performance targets are detailed in the table below.

Figure 5.0.1 – SNHPC Adopted System Performance Targets

SNHPC Region Adopted System Performance Targets	
Interstate (Reliable Person-Miles Traveled)	95%
Non-Interstate NHS (Reliable Person-Miles Traveled)	85%
Interstate (Truck Travel Time Reliability)	1.65

6.0 Data and Monitoring of System Performance

The SNHPC utilizes the National Performance Monitoring and Research Data Set (NPMRDS) as the underlying data to quantify and evaluate congestion within the region. The NPMRDS data is sourced from thousands of vehicle probes (e.g. in-dash GPS systems and cellular phone applications). This data is sanctioned for use by the Federal Highway Administration for use in operations analysis and performance measurement.

Through an agreement with neighboring MPOs and Regional Planning Commissions in New Hampshire, the SNHPC participates in a cooperative purchase of expanded NPMRDS data and analytics tools, which in part, increases the data coverage to a level sufficient to analyze the nine corridors that comprise the SNHPC's CMP network.

6.1 Travel Time Index (TTI) Thresholds to Quantify Congestion

Using the NPMRDS data as a starting point, the SNHPC utilizes a measure called Travel Time Index (TTI) to quantify congestion. TTI is the ratio of observed speeds on a roadway to that roadway's reference (or free-flow) speed. For example, a trip that would take 10 minutes under free-flow conditions, but takes 20 minutes during the peak commuting hour would have a TTI of 2 (TTI=20min/10min). During the CMP process, the following classification of TTI was established to reflect region-specific congestion conditions as detailed in Figure 6.1.1 below.

Figure 6.1.1 – SNHPC Regional Congestion Thresholds

SNHPC Regional Congestion Thresholds			
Amount of Congestion	**Observed Speed**	**Average Free-flow-Speed**	**TTI**
No Congestion	10 min.	10 min.	≤ 1
Mild Congestion	12.5 min.	10 min.	>1≤ 1.25
Moderate Congestion	15 min.	10 min.	>1.25≤ 1.5
Congestion	15 plus min.	10 min.	>1.5

For roadways in the SNHPC region, TTI was calculated by determining the average speed of all vehicles on a road segment divided by the segment's free-flow speed. Weekdays from 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM were observed to capture peak commuter traffic in the AM and PM peak periods respectively. Hourly averages for traffic speeds and free-flow speeds were retrieved from the National Performance Management Research Data Set (NPMRDS) via the University of Maryland's CATT Lab. A time period of 18 months, January 2018 to July 2019, was considered due to small changes in the road network and data vendor. This subset alone represents around one million records. In some cases, listed free-flow speeds were adjusted, according to the type of road, to better replicate realistic travel speeds. A segment's TTI was then determined to be the median value over each three-hour peak period.

7.0 Analysis of Congestion and Identification of Strategies

The following section analyzes congestion on each of the SNHPC's nine CMP network corridors, and identifies a series of corridor-specific multimodal strategies to address the congestion. In addition to identifying the location(s) of congestion for each corridor, the prevailing causes of the congestion have also been identified. Figure 7.0.1 below summarizes each of the causes of congestion in the SNHPC region.

Figure 7.0.1 – Causes of Congestion in the SNHPC Region

Causes of Congestion		Definition
①	**Traffic Volume and Capacity Bottlenecks**	Capacity is the maximum amount of traffic capable of being handled by a given roadway section. Capacity is determined by a number of factors including the number of lanes, merge areas at interchanges, and roadway characteristics (e.g. grades, curves, and access points).
②	**Traffic Incidents**	Traffic incidents are events that disrupt the normal flow of traffic, usually by physical impedance in the travel lanes. Events such as vehicular crashes, breakdowns, and debris in travel lanes are the most common form of incidents.
③	**Work Zones**	Work zones are construction activities on the roadway that result in physical changes to the highway environment. These changes may include a reduction in the number or width of travel lanes, lane "shifts," lane diversions, reduction or elimination of shoulders, and temporary roadway closures.
④	**Weather**	Environmental conditions can lead to changes in driver behavior that affect traffic flow, such as slower traveling speeds and greater spacing of vehicles.
⑤	**Traffic Control Devices**	The intermittent disruption of traffic flow by control devices such as railroad grade crossings and poorly timed or uncoordinated traffic signals also contribute to congestion and travel time variability.
⑥	**Special Events**	Special events result in demand fluctuations whereby traffic flow in the vicinity of the event will be radically different from typical patterns. Special events occasionally cause surges in traffic demand that temporarily overwhelm the system.

Identify and Assess CMP Strategies

The following pages provide assessments of each of the nine regionally significant routes that comprise the SNHPC's CMP Network. Each corridor assessment includes an analysis of the morning (AM) and evening (PM) peak commute times and provides a visual method to identify the segments and intersections that have varying levels of congestion. For each corridor, a series of congestion management strategies are identified. These strategies include the following.

Figure 7.0.2 – Summary of CMP Strategies in the SNHPC Region

Roadway Management Strategies	
①	Traffic Signal Timing or Coordination Improvements
②	Traffic Signal Equipment Modernization
③	ITS- Traveler Information Devices
④	ITS- Communications Network and Roadway Monitoring
Transit and Travel Demand Management Strategies	
⑤	Parking Management
⑥	Dedicated Transit Lanes
⑦	Transit Service Expansion
⑧	Transit Signal Priority
⑨	Electronic Toll or Fare Collections
Physical Infrastructure Improvement Strategies	
⑩	Off-street Multi-use Path
⑪	On-street Bicycle Treatments
⑫	Park & Ride Facility
⑬	Access Management
⑭	Intersection/Interchange Reconfiguration or Improvements
⑮	Roundabout Conversion
⑯	Auxiliary/Acceleration/Deceleration Lanes or Ramp Improvements
⑰	New Grade-separated Intersections/Interchanges
⑱	New Travel Lanes
⑲	New Roadways
⑳	Engineering and/or Operations Study

7.1 Interstate 93 Congestion Locations and Causes

Within the SNHPC region, the Interstate 93 (I-93) corridor runs north-south through the towns of Windham, Derry, Londonderry, Manchester, and Hooksett. The mainline of I-93 from the Massachusetts state line to the intersection of I-293/NH Route 101 in Manchester has been under construction for much of the past decade, which will result in an expansion from two-lanes in each direction to four lanes. The completion of this expansion work is expected during FY 2021.

As detailed in Figures 7.1.1 and 7.1.2 on the following pages, the moderately congested northbound and southbound segments near Exit 4 and Exit 5 are, in part, likely a reflection of continuing construction work zones during the AM and PM commute periods which is exacerbated by heavy traffic volumes.

Further north in the region, local concerns are emerging about congestion issues in vicinity of the Exit 8 ramps with Wellington Road in Manchester. Additionally, there is sporadic congestion on Friday afternoons north of the Hooksett Toll Plaza into the Town of Bow. This congestion results from a capacity bottleneck at the Interstate 93/Interstate 89 interchange. While this bottleneck is outside of the SNHPC region, it is a concern for both the NH Department of Transportation and the neighboring Central NH Regional Planning Commission.

Following the completion of construction, the SNHPC will utilize travel time data from the National Performance Management Research Data Set (NPMRDS) to compare traffic flow on this corridor before and after the completion of construction. The corridor is currently served by intercity bus service connecting Manchester, North Londonderry (Exit 5) Londonderry (Exit 4) and Windham (Exit 3) with Boston's South Station and Logan Airport.

Interstate 93 Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
I-93 Exit 4 Vicinity	Weekday AM Peak Hour	SB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Work Zones
I-93 Exit 3 to Exit 4	Weekday PM Peak Hour	NB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Work Zones
I-93 Exit 5 Vicinity	Weekday PM Peak Hour	NB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Work Zones

Figure 7.1.1 - Interstate 93 AM Peak Period Congestion

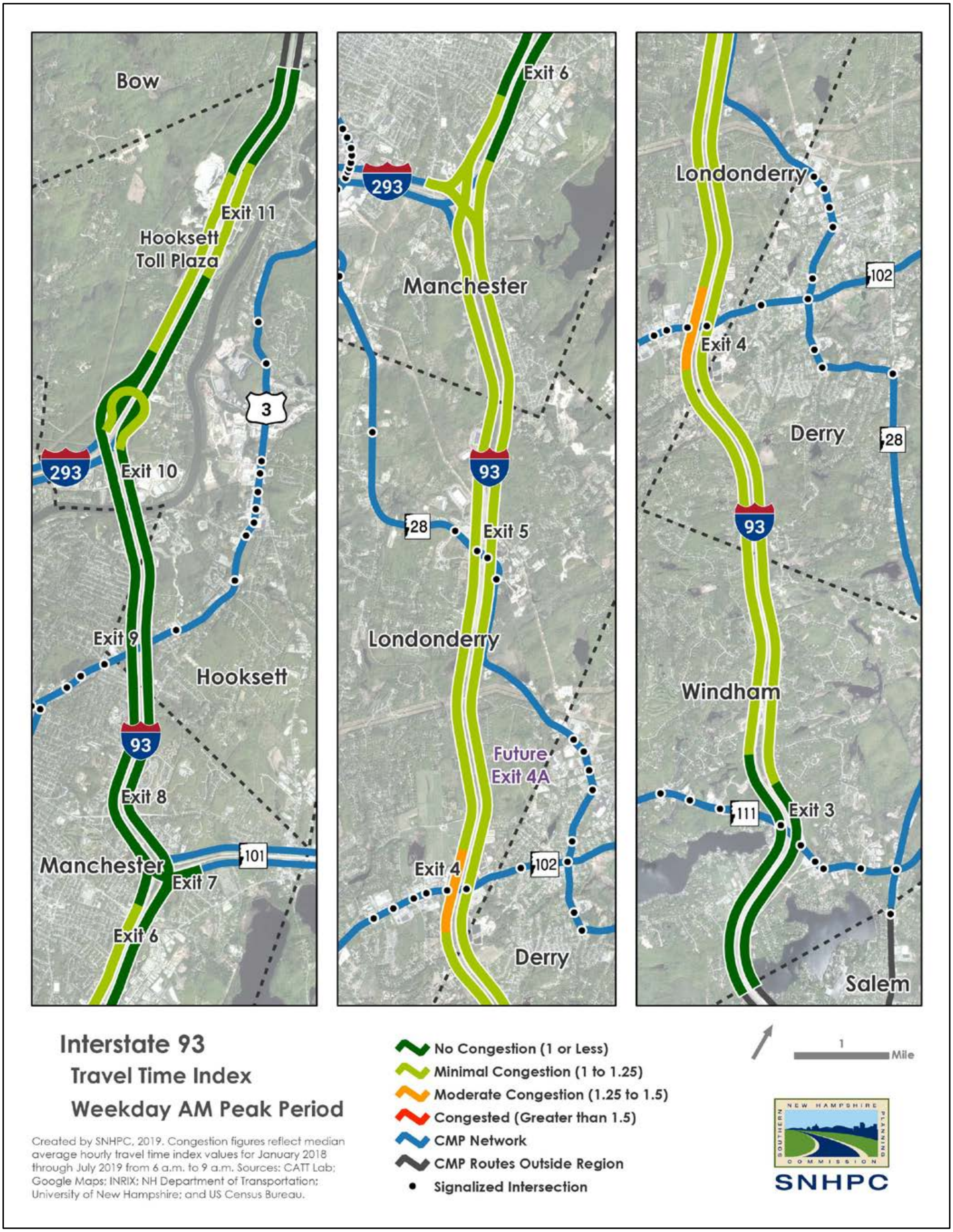
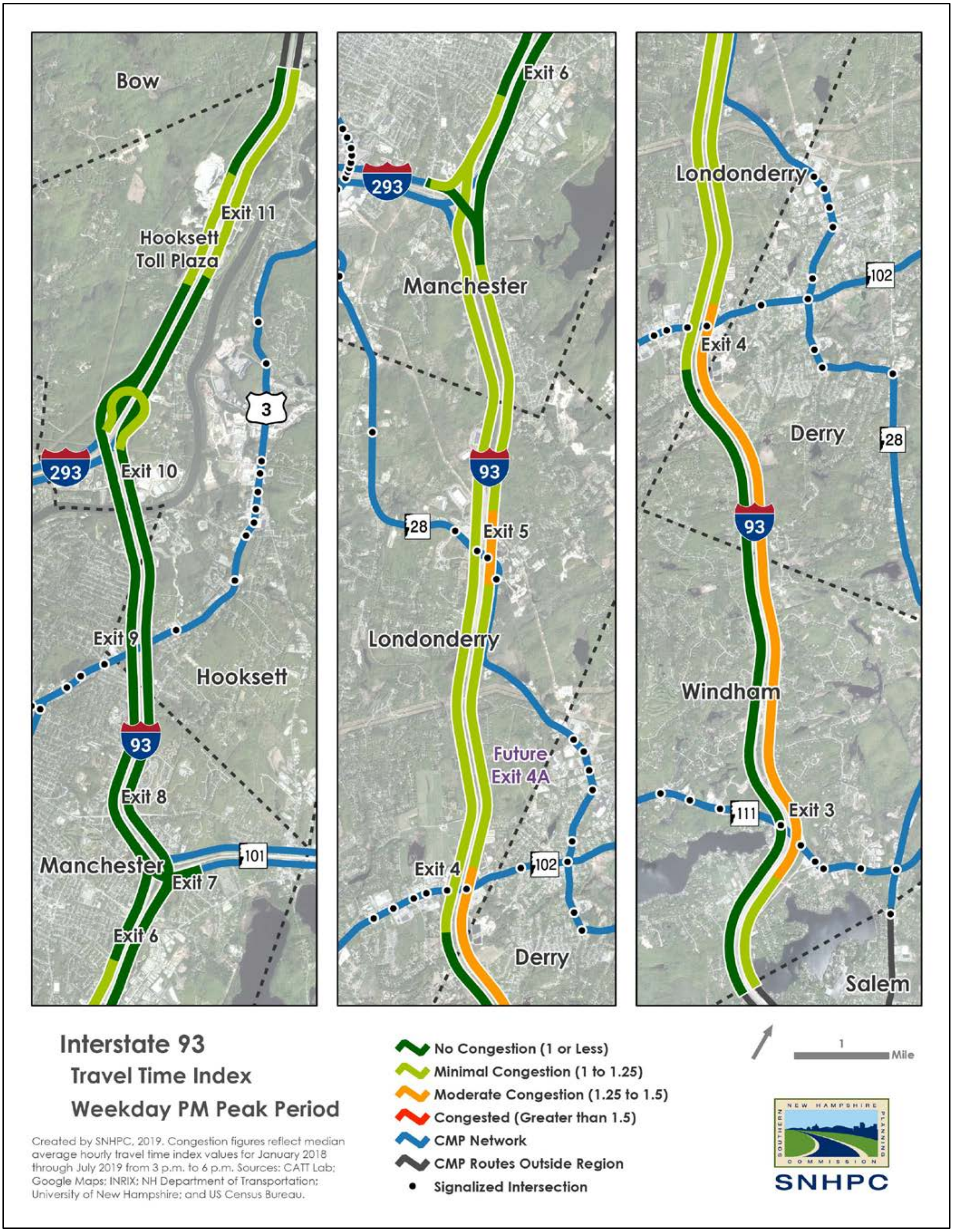


Figure 7.1.2 - Interstate 93 PM Peak Period Congestion



7.2 Interstate 93 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
  - Implement an adaptive signal control framework or other means of signal coordination at the I-93 Exit 8 ramp intersections at Wellington Road.
- **Strategy 3 - Traveler Information Devices**
  - Continue to deploy ITS traveler information devices, including variable message boards that display live travel time, incident, and other information for traveler route decision making.
- **Strategy 4 - Communications Network and Roadway Monitoring**
  - Deploy roadway monitoring infrastructure, including but not limited to closed-circuit video and sensors to provide real-time traffic information to the NHDOT Traffic Management Center.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
  - Implement the I-93 commuter transit service envisioned in the NHDOT Strategic Statewide Transit Assessment to connect Tuscan Village in Salem to downtown Manchester via Exit 3 in Windham and Exit 4 in Londonderry.
- **Strategy 9- Electronic Toll or Fare Collections**
  - Consider transitioning the Hooksett Toll Plaza to All Electronic Tolling.

Physical Infrastructure Improvement Strategies:

- **Strategy 14 – Intersection/Interchange Reconfiguration or Improvements**
  - Evaluate potential capacity improvements at the intersections of Wellington Road/I-93 NB Ramps and Wellington Road/I-93 SB Ramps in Manchester.
- **Strategy 17 – New Grade Separated Interchanges**
  - Complete the construction of I-93 Exit 4A in Derry and Londonderry.
- **Strategy 18 – New Travel Lanes**
  - Complete the expansion of I-93 to four lanes between Salem and Manchester.
- **Strategy 20 – Engineering and/or Operations Study**
  - Support the development of the Capitol Corridor Project Development Phase to determining the engineering needs and operational costs of implementing north-south commuter rail service connecting Manchester to Boston.

7.3 Interstate 293 Corridor Congestion Locations and Causes

Shaped like an 'L' on the south and west sides of the City of Manchester, Interstate 293 connects suburban and rural areas from the north along the west side of the Merrimack River through Manchester, and from the east and south via NH Route 101 and Interstate 93 respectively. At the "elbow," the north-south segment transitions and connects to NH Route 101 and the F.E. Everett Turnpike, which continues south to the Town of Merrimack and City of Nashua. This interchange between Interstate 293, NH Route 101, and the F.E. Everett Turnpike presents some of the most persistent congestion in the SNHPC region.

Generally, across the Interstate 293 corridor, moderate to congested conditions are most prevalent during the PM peak commuting period. In particular, acute queuing occurs at the Exit 6 (Amoskeag Circle) interchange, which sees traffic back up onto the northbound I-293 mainline during the PM peak period. This is a longstanding congestion and safety issue, and the SNHPC has participated in the development of a project to convert Exit 6 to a Single Point Urban Interchange. The construction of that project is currently scheduled for FY 2025-2028.

The Exit 4 (Queen City Avenue) interchange also experiences acute queuing during the PM peak commuting period in the southbound direction, and this congestion is exacerbated by capacity issues on the adjacent Second Street (U.S. Route 3). To address these issues, an engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange is needed, which would consider mainline expansion to three lanes and evaluate alternatives for the reconfiguration of both I-293 Exit 4 and the I-293/NH Route 101/F.E. Everett Turnpike interchange.

<table>
<tr><th colspan="5">Interstate 293 Congestion Locations and Causes</th></tr>
<tr><th>Location</th><th>Period</th><th>Direction</th><th>Congestion</th><th>Causes of Congestion</th></tr>
<tr><td rowspan="2">I-293 Exit 6 Vicinity</td><td rowspan="2">Weekday PM Peak Hour</td><td rowspan="2">NB</td><td rowspan="2">Moderate</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
<tr><td rowspan="3">I-293 Exit 4 Vicinity</td><td rowspan="3">Weekday PM Peak Hour</td><td rowspan="3">SB</td><td rowspan="3">Moderate</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
<tr><td>Special Events</td></tr>
<tr><td rowspan="3">I-293/NH Route 101/FEET</td><td rowspan="3">Weekday PM Peak Hour</td><td rowspan="3">SB</td><td rowspan="3">Moderate to Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
<tr><td>Work Zones</td></tr>
</table>

Figure 7.3.1 - Interstate 293 AM Peak Period Congestion

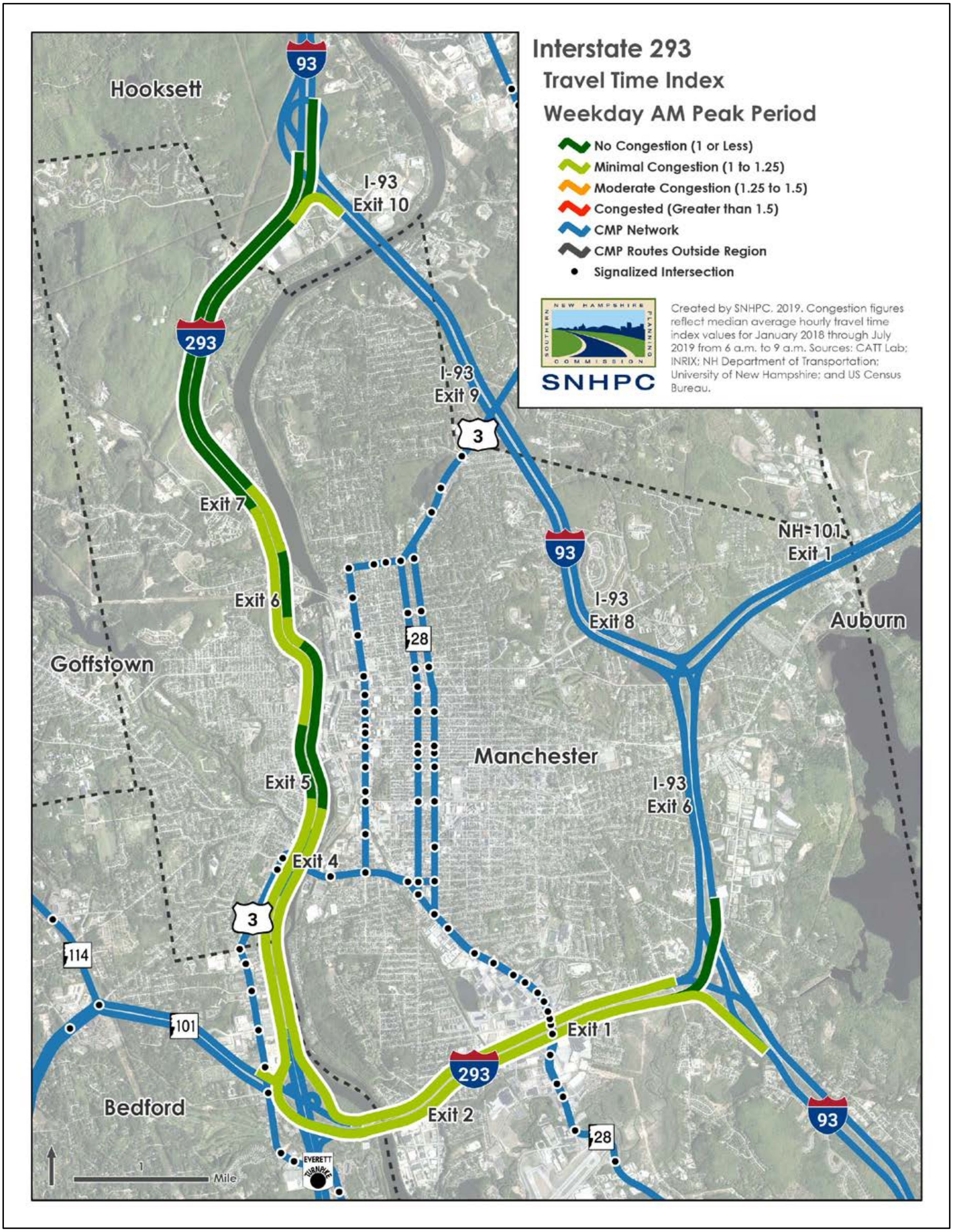
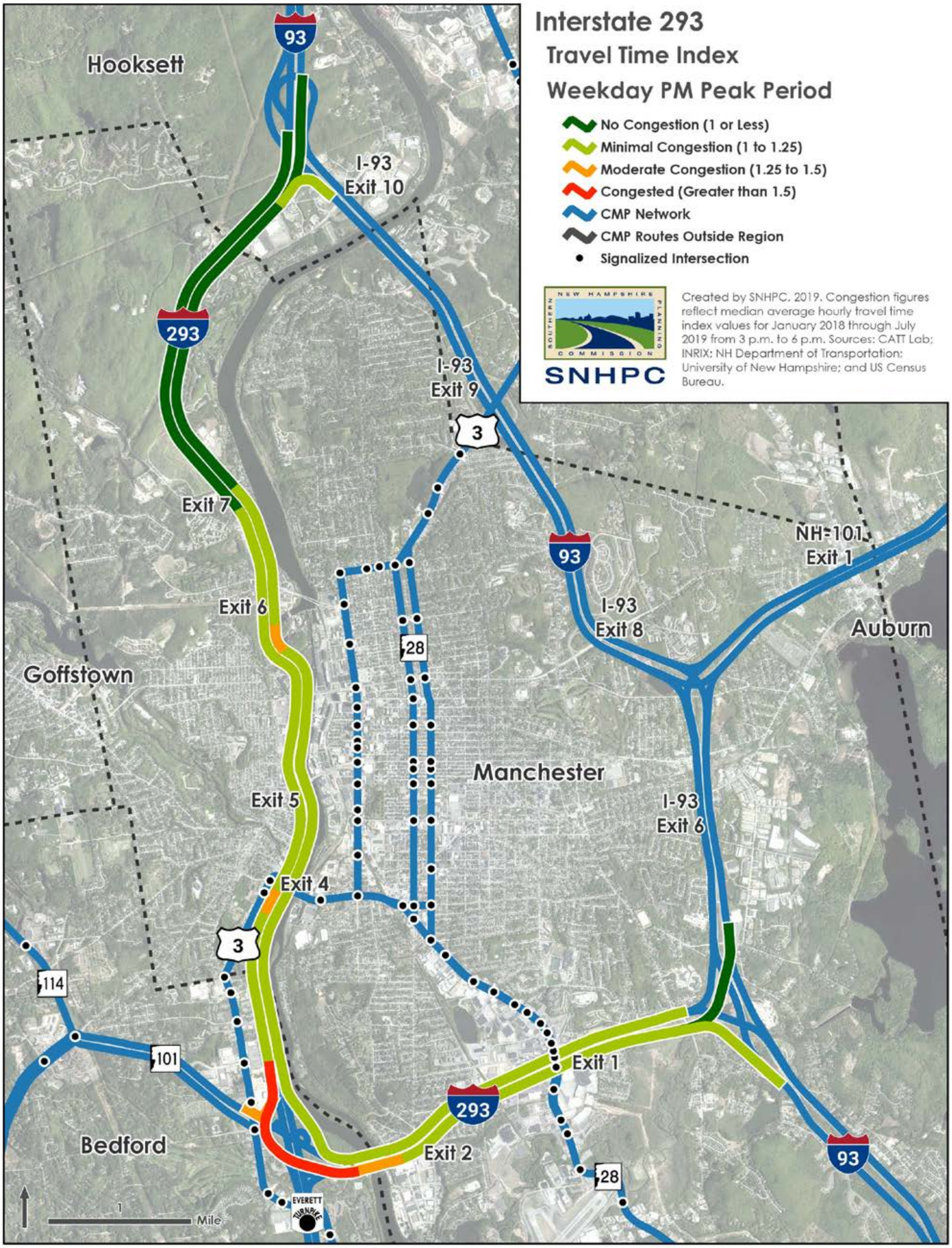


Figure 7.3.2 - Interstate 293 PM Peak Period Congestion



7.4 Interstate 293 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 3 - Traveler Information Devices**
  - Continue to deploy ITS traveler information devices, including variable message boards that display live travel time, incident, and other information for traveler route decision making.
- **Strategy 4 - Communications Network and Roadway Monitoring**
  - Deploy roadway monitoring infrastructure, including but not limited to closed-circuit video and sensors to provide real-time traffic information to the NHDOT Traffic Management Center.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
  - Evaluate the feasibility of establishing commuter transit service to the Manchester Millyard from the I-293 corridor.

Physical Infrastructure Improvement Strategies:

- **Strategy 12- Park & Ride Facility**
  - Identify potential park-and-ride facility locations in the area around the I-293/NH Route 101/F.E. Everett Turnpike interchange and study the feasibility of constructing a facility.
- **Strategy 14 – Intersection/Interchange Reconfiguration or Improvements**
  - Complete construction on the pending reconfiguration of I-293 Exit 6.
  - Reconfigure the interchange of I-293 Exit 4.
  - Reconfigure the interchange of I-293/NH Route 101/F.E. Everett Turnpike.
- **Strategy 17 – New Grade Separated Interchanges**
  - Complete construction on the pending I-293 Exit 7 interchange relocation.
- **Strategy 18 – New Travel Lanes**
  - Complete the pending expansion of the I-293 mainline to 3 lanes in each direction from north of Exit 5 through the relocated Exit 7.
  - Evaluate the feasibility of expanding the I-293 mainline to 3 lanes in each direction from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange.
- **Strategy 20 - Engineering and/or Operations Study**
  - Support an engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange to consider mainline expansion to 3 lanes and evaluate alternatives for the reconfiguration of both I-293 Exit 4 and the I-293/NH Route 101/F.E. Everett Turnpike interchange.

7.5 F.E. Everett Turnpike Corridor Congestion Locations and Causes

The original north-south highway connecting central New Hampshire with U.S. Route 3 in Massachusetts, the F.E. Everett Turnpike transitions from I-293 south of Route 101. While only a small portion of the overall F.E Everett Turnpike is in the SNHPC region, specifically the section through the Town of Bedford, it is a highway of statewide importance connecting Manchester, Concord, and northern New Hampshire to the City of Nashua and Greater Boston to the south. The existing "barrier" toll booths at the Bedford Toll Plaza still require a slow down for EZ Pass, or full stop for cash toll paying, which causes persistent congestion on the turnpike mainline. The NHDOT is currently developing a project to convert this toll plaza to All Electronic Tolling to mitigate this congestion and improve safety in the vicinity of the Bedford Toll Plaza.

The roadway necks down from 4-lanes in each direction to 2-lanes just south of the South River Road (U.S. Route 3) bridge overpass. To address these congestion issues, the NHDOT has been developing a project to widen all two-lane sections of the F.E. Everett Turnpike to three lanes in each direction from Exit 8 in Nashua to the I-293 Interchange in Bedford. This project is scheduled for construction from FY 2021-2025.

Additionally, as previously mentioned, the interchange between Interstate 293, NH Route 101, and the F.E. Everett Turnpike presents some of the most persistent congestion in the SNHPC region. The aforementioned engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange would, in part, evaluate alternatives for the reconfiguration of the I-293/NH Route 101/F.E. Everett Turnpike interchange.

F.E. Everett Turnpike Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
FEET/I-293 Ramp	Weekday PM Peak Hour	NB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
FEET/NH Route 101 Ramp	Weekday AM and PM Peak Hour	WB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
Bedford Toll Plaza	Weekday AM Peak Hour	SB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Traffic Control Devices

Figure 7.5.1 – F.E. Everett Turnpike AM Peak Period Congestion

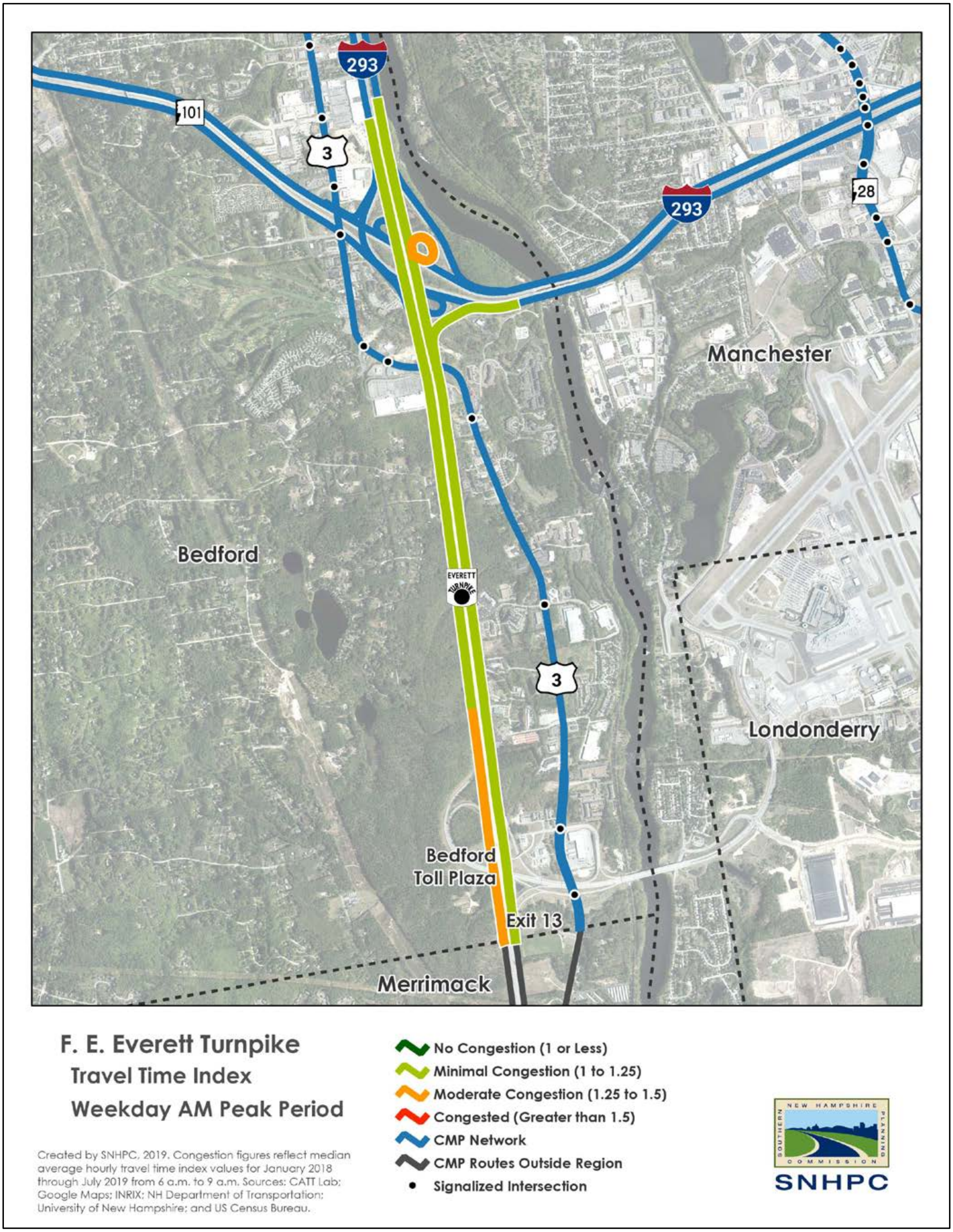
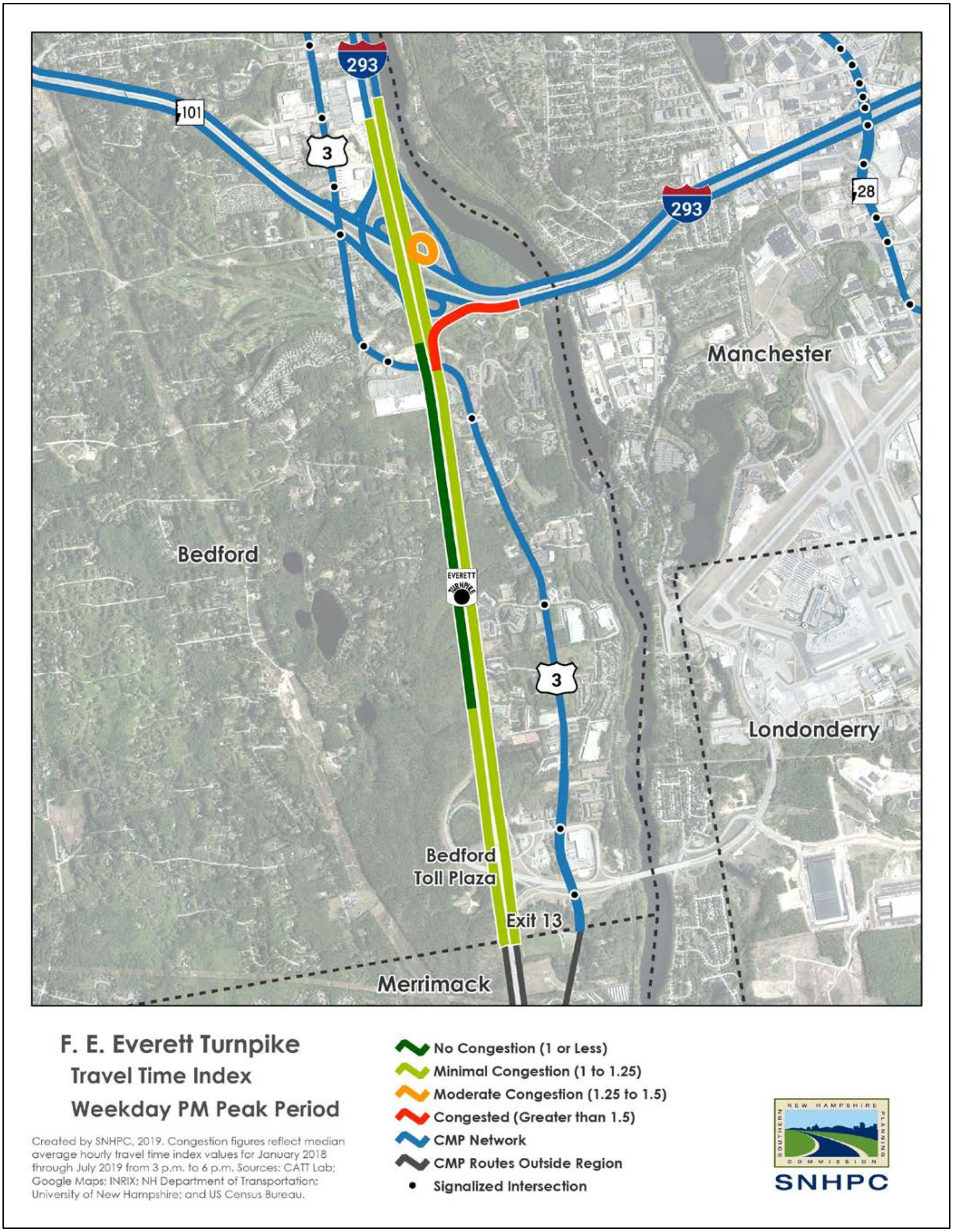


Figure 7.5.2 – F.E. Everett Turnpike PM Peak Period Congestion



7.6 F.E. Everett Turnpike Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 3 - Traveler Information Devices**
    - o Continue to deploy ITS traveler information devices, including variable message boards that display live travel time, incident, and other information for traveler route decision making.
- **Strategy 4 - Communications Network and Roadway Monitoring**
    - o Deploy roadway monitoring infrastructure, including but not limited to closed-circuit video and sensors to provide real-time traffic information to the NHDOT Traffic Management Center.

Transit and Travel Demand Management Strategies:

- **Strategy 9- Electronic Toll or Fare Collections**
    - o Implement All Electronic Tolling at the Bedford Toll Plaza.

Physical Infrastructure Improvement Strategies:

- **Strategy 18 – New Travel Lanes**
    - o Complete construction of F.E. Everett Turnpike mainline expansion to three lanes in each direction from Exit 8 Nashua to the I-293/NH Route 101/F.E. Everett Turnpike interchange.
- **Strategy 20 - Engineering and/or Operations Study**
    - o Support an engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange which would, in part, evaluate alternatives for the reconfiguration of the I-293/NH Route 101/F.E. Everett Turnpike interchange.

7.7 NH Route 101 Corridor Congestion Locations and Causes

The NH Route 101 corridor runs east-west from the Seacoast to Keene and bisects the SNHPC region. East of the City of Manchester, NH Route 101 is a divided 4-lane, limited-access highway. West of the City of Manchester, NH Route 101 continues into the Town of Bedford where it transitions to a two-way highway connecting to the Town of Amherst, Town of Milford, and points west.

The divided limited access section of NH Route 101 east of Interstate 93 does not currently experience persistent congested conditions, although it experiences sporadic congestion during peak commuting times and when traffic incidents occur. In this section of the corridor, ITS traveler information and roadway monitoring infrastructure should continue to be improved. As traffic volumes have increased in the section of the corridor in recent years, the SNHPC will continue to utilize National Performance Management Research Data Set (NPMRDS) to monitor any emerging congestion issues.

West of the City of Manchester, a recent capacity improvement constructed in FY 2018-2019 from NH Route 114 to Wallace Road should improve conditions in this historically congested segment of the corridor. However, the intersection of NH Route 101/NH Route 114 remains a significant capacity bottleneck, where a future grade separated interchange may be warranted.

Additionally, as previously mentioned, the interchange between Interstate 293, NH Route 101, and the F.E. Everett Turnpike presents some of the most persistent congestion in the SNHPC region. The aforementioned engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange would, in part, evaluate alternatives for the reconfiguration of the I-293/NH Route 101/F.E. Everett Turnpike interchange.

<table>
<tr><th colspan="5">NH Route 101 Congestion Locations and Causes</th></tr>
<tr><th>Location</th><th>Period</th><th>Direction</th><th>Congestion</th><th>Causes of Congestion</th></tr>
<tr><td rowspan="3">Wallace Road to NH 114</td><td rowspan="3">Weekday AM and PM Peak Hour</td><td rowspan="3">EB and WB</td><td rowspan="3">Moderate to Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Work Zones</td></tr>
<tr><td>Traffic Control Devices</td></tr>
<tr><td>NH 114 to Kilton Road</td><td>Weekday AM and PM Peak Hour</td><td>WB</td><td>Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td rowspan="2">NH Route 101/I-293 Ramp</td><td rowspan="2">Weekday AM and PM Peak Hour</td><td rowspan="2">NB</td><td rowspan="2">Moderate to Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
</table>

Figure 7.7.1 – NH Route 101 AM Peak Period Congestion

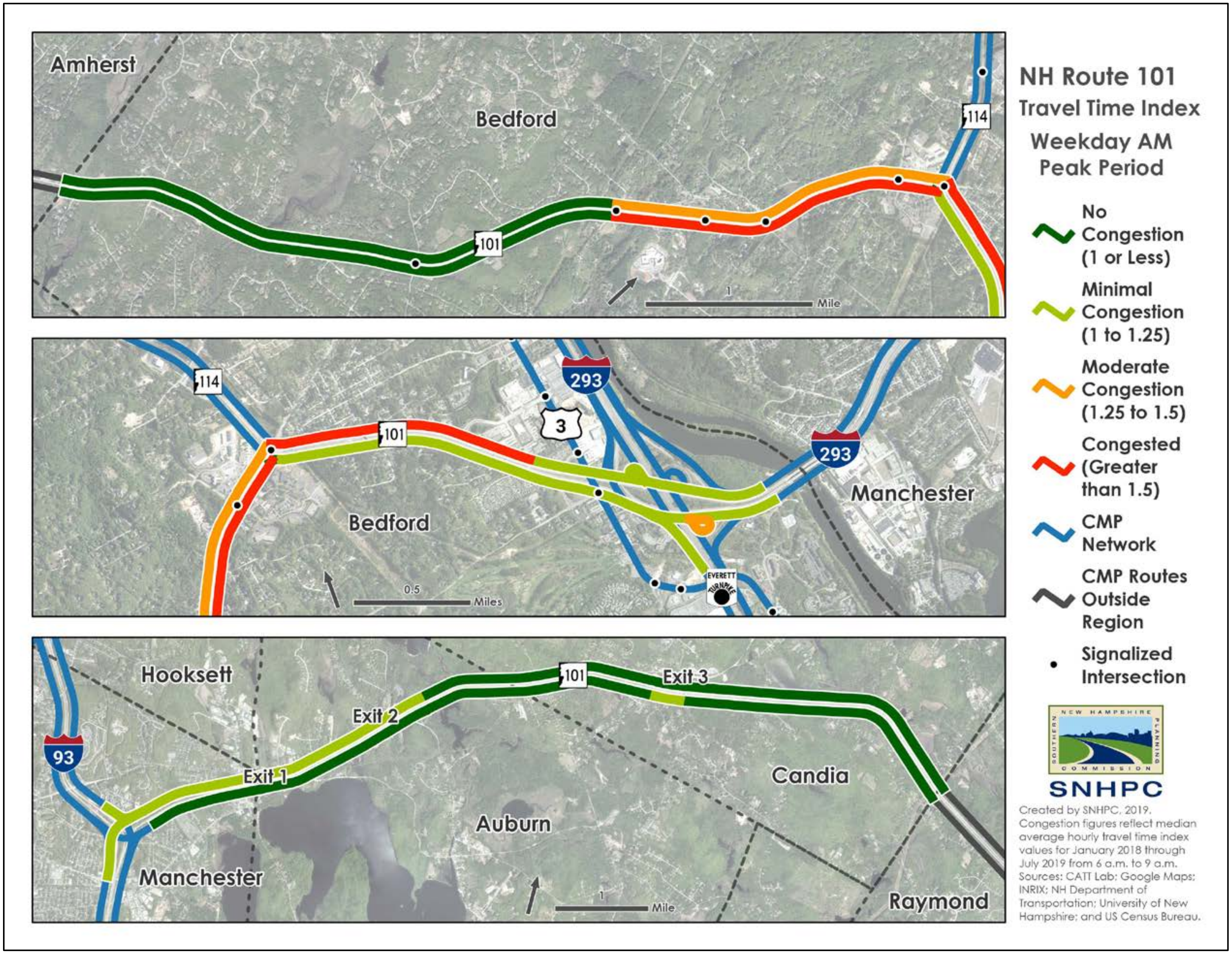
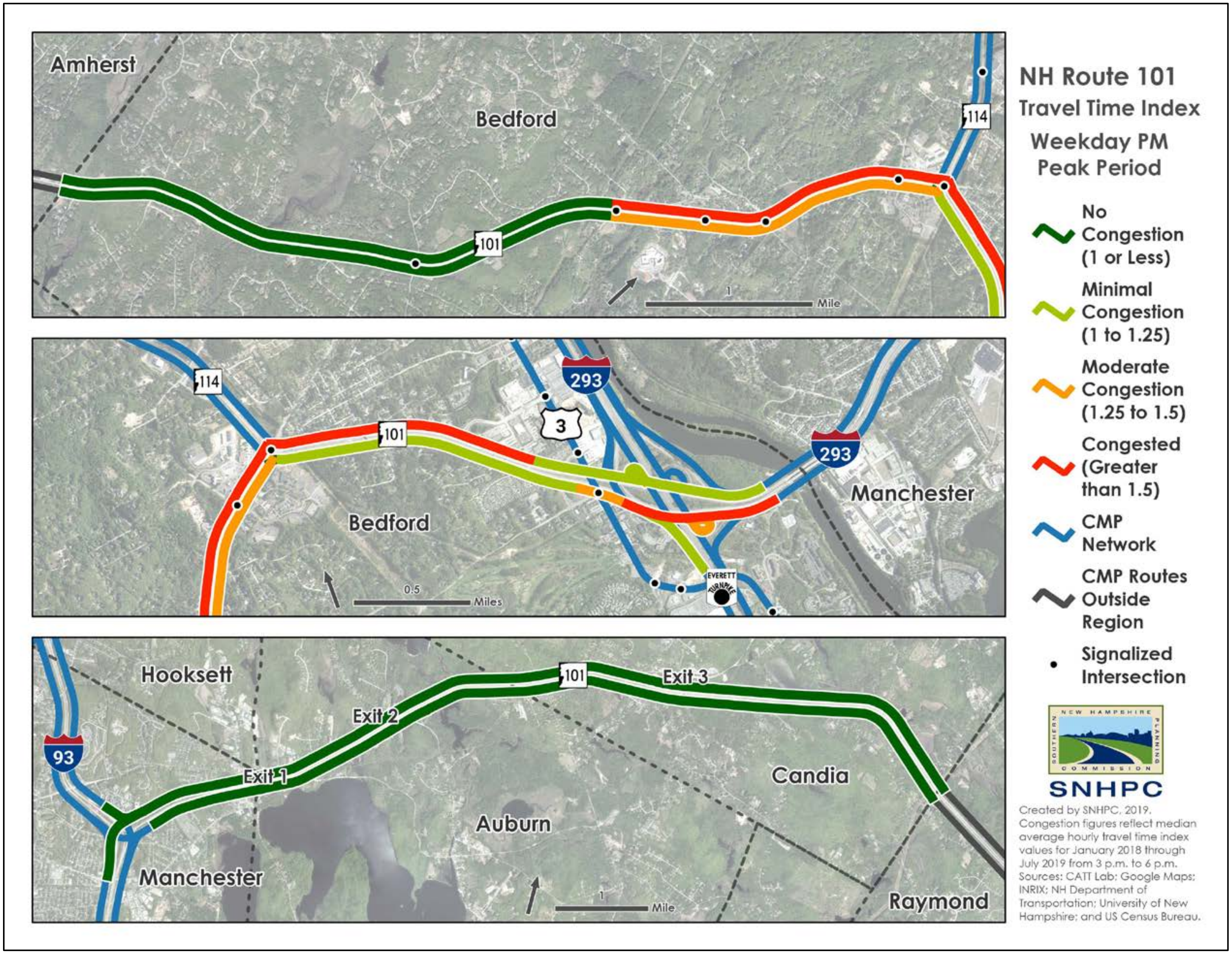


Figure 7.7.2 – NH Route 101 PM Peak Period Congestion



7.8 NH Route 101 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
  - Evaluate the feasibility of implementing an adaptive signal control system at the intersection of NH Route 101/NH Route 114/Boynton Street and adjacent signalized intersections.
- **Strategy 3 - Traveler Information Devices**
  - Continue to deploy ITS traveler information devices, including variable message boards that display live travel time, incident, and other information for traveler route decision making, with an emphasis on the limited access section of NH Route 101 east of Manchester.
- **Strategy 4 - Communications Network and Roadway Monitoring**
  - Deploy roadway monitoring infrastructure, including but not limited to closed-circuit video and sensors to provide real-time traffic information to the NHDOT Traffic Management Center, with an emphasis on the limited access section of NH Route 101 east of Manchester.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
  - Implement the NH Route 101 commuter transit service envisioned in the NHDOT Strategic Statewide Transit Assessment to connect Portsmouth with Manchester, including connections to the Portsmouth Transportation Center and park-and-ride facilities in Hampton, Epping, and Raymond.

Physical Infrastructure Improvement Strategies:

- **Strategy 10 - Off-street Multi-use Path**
  - Construct a 10’ Multi-use Path along NH Route 101 from Wayside Drive in Bedford to the Amherst Town Line.
- **Strategy 18 – New Travel Lanes**
  - Complete a capacity expansion of NH Route 101 from Wallace Road to the Amherst Town Line.
- **Strategy 20 - Engineering and/or Operations Study**
  - Support an engineering study that would consider grade-separated design alternatives at the intersection of NH Route 101/NH Route 114/Boynton Street in Bedford.
  - Support an engineering study of Second Street and the I-293 corridor from Exit 5 to the I-293/NH Route 101/F.E. Everett Turnpike interchange which would, in part, evaluate alternatives for the reconfiguration of the I-293/NH Route 101/F.E. Everett Turnpike interchange.

7.9 NH Route 114 Corridor Congestion Locations and Causes

NH Route 114 is a key arterial roadway connecting the towns of Weare, New Boston, Goffstown, and Bedford to the City of Manchester. Congestion on the NH Route 114 corridor is currently limited to key intersections in Goffstown (High, Pleasant, and NH Route 114A) and Bedford (NH Route 101 and New Boston Road).

The SNHPC has coordinated with the Town of Bedford, Town of Goffstown, and NHDOT to program a corridor study of a portion of NH Route 114 from NH Route 101 in Bedford to Henry Bridge Road in Goffstown to identify potential operational and capacity improvements. That corridor study is currently scheduled to be completed during FY 2021.

The NH Route 114 corridor has never had fixed route transit service. However, the recent success of the Town of Goffstown's demand response shuttle service has sparked interest in the continued development of public transportation options along the NH Route 114 corridor. As the towns of Weare, New Boston, Goffstown, and Bedford continue to grow, commuter bus service along the NH Route 114 corridor linking these communities to Manchester may become viable.

<table>
<tr><th colspan="5">NH Route 114 Congestion Locations and Causes</th></tr>
<tr><th>Location</th><th>Period</th><th>Direction</th><th>Congestion</th><th>Causes of Congestion</th></tr>
<tr><td rowspan="3">High Street to Pleasant Street</td><td rowspan="3">Weekday AM and PM Peak Hour</td><td rowspan="3">WB</td><td rowspan="3">Moderate</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
<tr><td>Traffic Control Devices</td></tr>
<tr><td rowspan="3">NH 114/NH 114A Intersection</td><td rowspan="3">Weekday AM and PM Peak Hour</td><td rowspan="3">WB</td><td rowspan="3">Moderate to Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Incidents</td></tr>
<tr><td>Traffic Control Devices</td></tr>
<tr><td rowspan="2">NH Route 101 to New Boston Rd.</td><td rowspan="2">Weekday AM and PM Peak Hour</td><td rowspan="2">EB and WB</td><td rowspan="2">Moderate to Congested</td><td>Traffic Volume and Capacity Bottlenecks</td></tr>
<tr><td>Traffic Control Devices</td></tr>
</table>

Figure 7.9.1 – NH Route 114 AM Peak Period Congestion

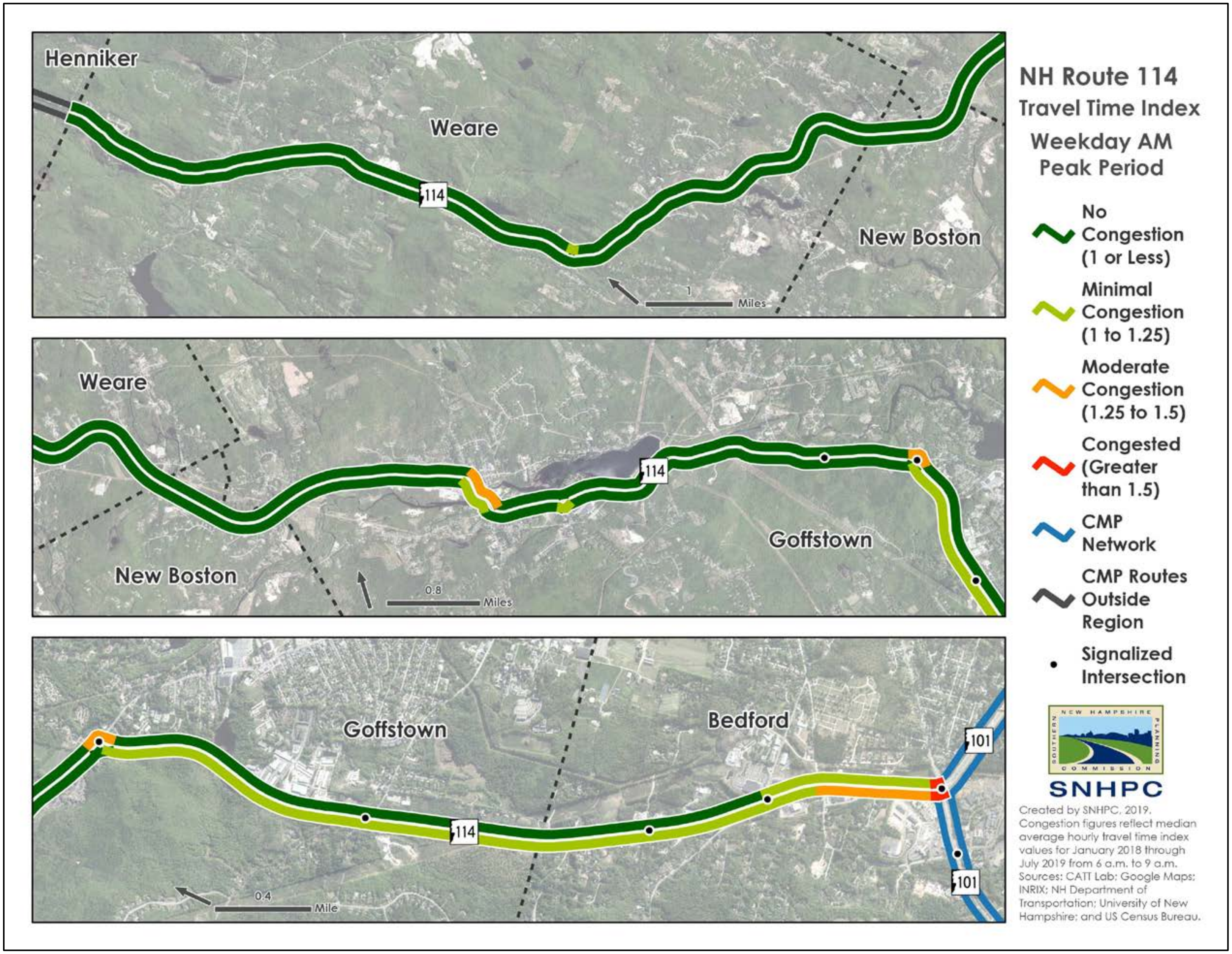
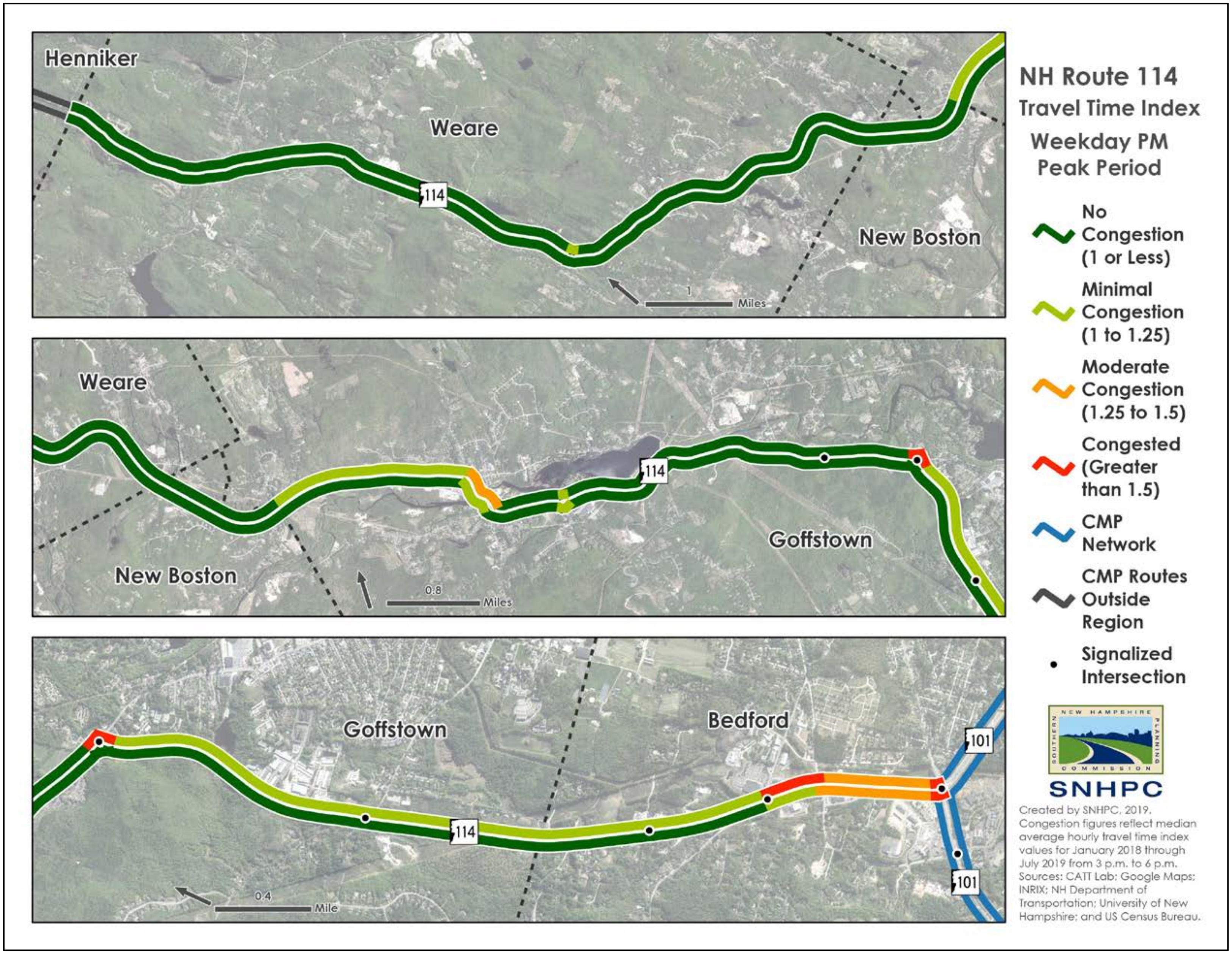


Figure 7.9.2 – NH Route 114 PM Peak Period Congestion



7.10 NH Route 114 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
  - Evaluate the feasibility of implementing an adaptive signal control system at the intersection of NH Route 101/NH Route 114/Boynton Street and adjacent signalized intersections on NH Route 114 in Bedford.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
  - Extend commuter bus service along the NH Route 114 corridor linking Weare and Goffstown to Bedford and Manchester.
- **Strategy 12- Park & Ride Facility**
  - Identify potential park-and-ride facility locations on the NH Route 114 corridor and study the feasibility of developing lots with access to the trail network and potential commuter bus stop locations.

Physical Infrastructure Improvement Strategies:

- **Strategy 20 - Engineering and/or Operations Study**
  - Complete the pending corridor study of NH Route 114 from NH Route 101 in Bedford to Henry Bridge Road in Goffstown to identify potential operational and capacity improvements.
  - Support an engineering study that would consider grade-separated design alternatives at the intersection of NH Route 101/NH Route 114/Boynton Street in Bedford.

7.11 U.S. Route 3 Corridor Congestion Locations and Causes

A major north-south route, U.S Route 3 connects northern communities, including Concord, Pembroke, Allenstown, and Hooksett to the City of Manchester's downtown area. Beyond downtown Manchester, U.S. Route 3 continues south, crossing the Merrimack River and becoming River Road in Bedford. The road then continues south, paralleling the F.E. Everett Turnpike into the Town of Merrimack and City of Nashua.

The Elm Street section of the U.S. Route 3 corridor (i.e. the heart of the City of Manchester's downtown area between Salmon Street and Queen City Avenue) is congested for its entirely as a result of the volume of traffic coupled with numerous signalized intersections and frequent parking maneuvers to access stores, businesses and offices. This congestion is amplified by regional or local special events which occur frequently and sometimes require the rerouting of traffic from expected travel routes.

To some extent, there is a level of tolerance for typical daily congestion in downtown districts, as travelers expect such traffic conditions. As such, the elimination of congestion is not a realistic goal for this portion of the corridor. However, traffic operations may still be improved with the implementation of the strategies identified herein; while others may also increase mobility for pedestrian, bicycles, and transit riders. Shifting even a small percentage of the overall vehicle trips to walking, biking, and transit rides would help reduce congested conditions.

Both north and south of the Elm Street section of U.S. Route 3, the road transitions into more suburban environments. North of Elm Street, U.S. Route 3 intersects with the busy intersection of NH Route 28 (Beech Street) and becomes known Hooksett Road. This area is characterized by a series of signalized intersections accommodating automobile-oriented commercial development in the vicinity of I-93 Exit 9 before continuing into the Town of Hooksett. Conditions in this section of the corridor range from moderate to full congestion.

South of Elm Street, the roadway again transitions to a more suburban character with mixed use development. Turning west towards the Merrimack River, U.S. Route 3 transitions to Queen City Avenue. While this area has more limited adjacent access points and includes access management improvements at the Elliot Hospital and the area around Sundial Avenue, conditions remain fully congested.

Across the Merrimack River to the west, U.S. Route 3 becomes Second Street. This area is characterized by a series of signalized intersections accommodating automobile-oriented commercial development including retail shopping plazas mixed with businesses of various sizes. Once U.S. Route 3 enters the Town of Bedford, the adjacent land uses completely transition to suburban development as most businesses and residents are set back from the roadway. Conditions in this section of the corridor range from moderate to full congestion.

Known as South River Road in Bedford, U.S. Route 3 makes a final transition from a fully developed suburban commercial area to a medium density residential area near the Bedford/Merrimack town line. However, this area portion the corridor is experiencing significant development pressure and is growing rapidly. In particular, a portion of the area between Hawthorne Drive and the Manchester Airport Access Road is already experiencing moderate congestion northbound during the PM peak period, and it is expected that those conditions will worsen over time. To address this, the SNHPC has worked with the Town of Bedford and NHDOT to program a widening project in this segment of the corridor. The project is currently scheduled for construction in FY 2026.

Areas of the U.S. Route 3 corridor, particularly in downtown Manchester, are served by fixed route public transportation provided by the Manchester Transit Authority. However, in many cases, the headways on these fixed routes are 60 minutes. As such, an important strategy detailed herein is to coordinate with the Manchester Transit Authority to expand the frequency of fixed route services to a 30-minute (or better) headway.

U.S. Route 3 Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
Hooksett T/L to Beech Street	Weekday AM and PM Peak Hour	NB and SB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Traffic Control Devices
Beech Street to Salmon Street	Weekday AM and PM Peak Hour	NB and SB	Congested	Traffic Volume and Capacity Bottlenecks
				Special Events
				Traffic Incidents
				Traffic Control Devices
Salmon St. to Queen City Ave.	Weekday AM and PM Peak Hour	NB and SB	Congested	Traffic Volume and Capacity Bottlenecks
				Special Events
				Traffic Incidents
				Traffic Control Devices
Queen City Ave to NH Route 101	Weekday AM and PM Peak Hour	NB and SB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Special Events
				Traffic Incidents
				Traffic Control Devices
NH Route 101 to Merrimack T/L	Weekday PM Peak Hour	NB	Minimal to Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents

Figure 7.11.1 – U.S. Route 3 AM Peak Period Congestion

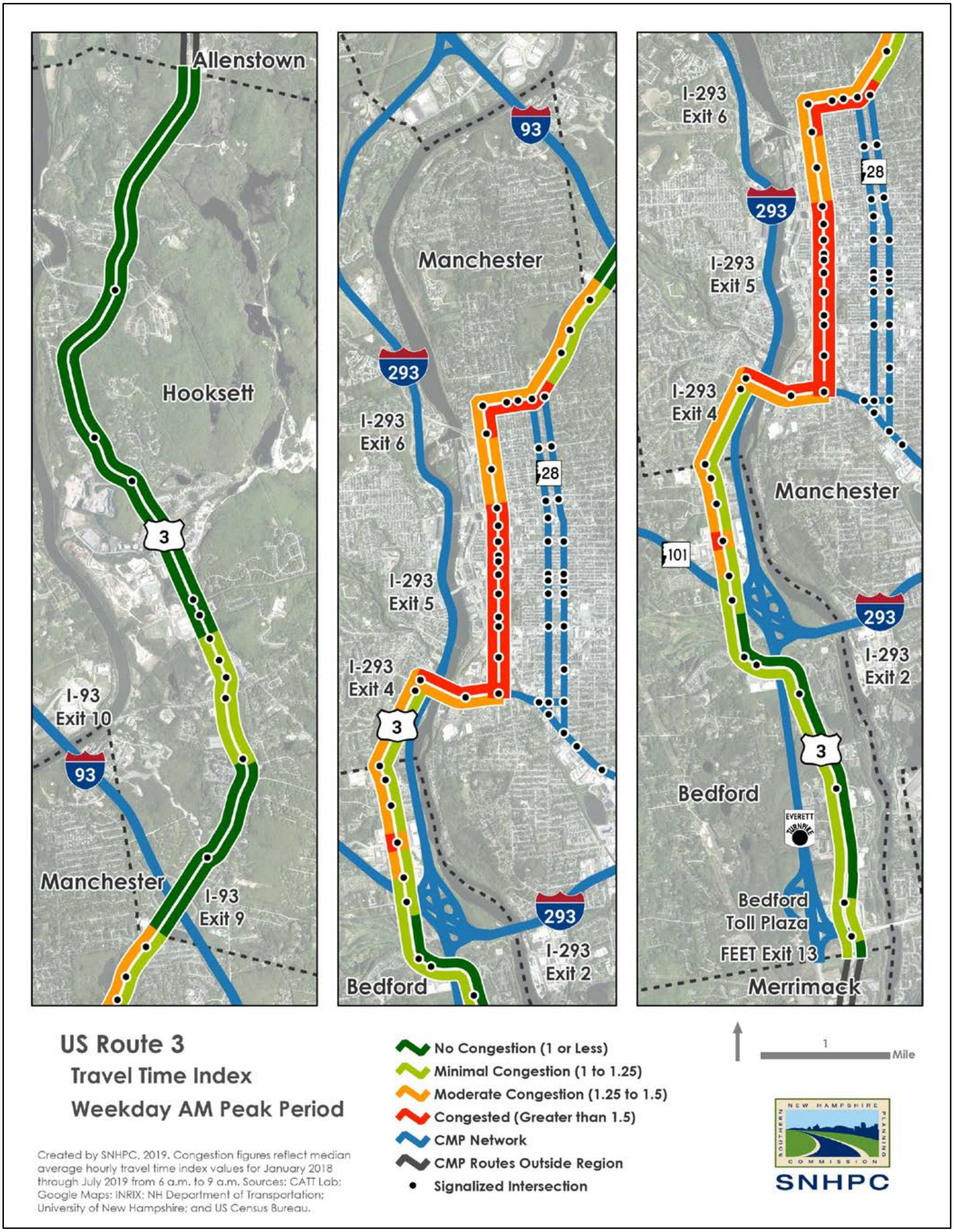
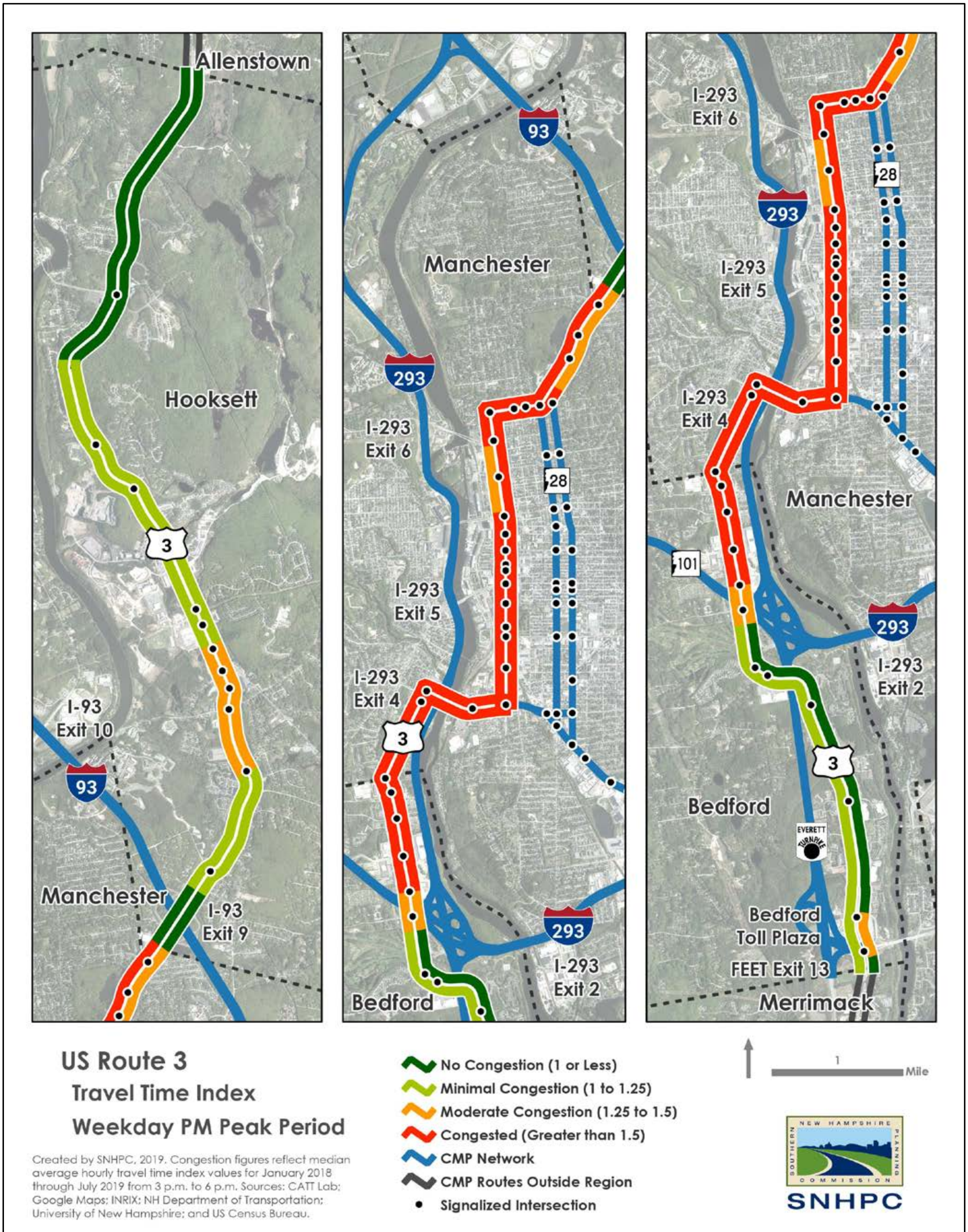


Figure 7.11.2 – U.S. Route 3 PM Peak Period Congestion



7.12 U.S. Route 3 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
  - Implement adaptive signal control or signal performance measures on the signalized River Road (Bedford), Second Street (Manchester), Hooksett Road (Manchester), Elm Street (Manchester), and Hooksett Road (Hooksett) sections of the U.S. Route 3 Corridor.
- **Strategy 2 - Traffic Signal Equipment Modernization**
  - Upgrade signal controller capabilities to enable adaptive control and multimodal traffic detection where needed on the signalized River Road (Bedford), Second Street (Manchester), Hooksett Road (Manchester), Elm Street (Manchester), and Hooksett Road (Hooksett) sections of the U.S. Route 3 Corridor.

Transit and Travel Demand Management Strategies:

- **Strategy 5 - Parking Management**
  - Evaluate and implement parking optimization opportunities including increasing parking capacity on side streets, removing spaces on the U.S. Route 3 mainline, and implementing back-in parking where safe and feasible.
- **Strategy 7 - Transit Service Expansion**
  - Increase headway frequencies to a minimum of 30 minutes on Manchester Transit Authority fixed routes serving the Second Street and Elm Street sections of the U.S. Route 3 Corridor.
  - Evaluate the feasibility of extending fixed route service from Downtown Manchester to Hooksett along the Hooksett Road section of the U.S. Route 3 corridor.
  - Coordinate with the Town of Bedford to consider an expansion of transit service along the River Road section of the U.S. Route 3 corridor.
- **Strategy 8 - Transit Signal Priority**
  - Implement Transit Signal Priority capability on the Second Street (Manchester), Elm Street (Manchester), and River Road (Bedford) sections of the U.S. Route 3 Corridor where fixed-route Manchester Transit Authority service is in place. This technology enables signals to extend green time or return to green faster for transit vehicles, which results in improved on-schedule performance.

Physical Infrastructure Improvement Strategies:

- **Strategy 11 - On-street Bicycle Treatments**
  - Develop a bicycle lane on U.S Route 3 in Bedford from the Merrimack Town Line to the Manchester City Line as identified in the Bedford Pedestrian and Bicycle Connectivity Master Plan.
  - Implement complete streets improvements on the Second Street (Manchester) section of U.S. Route 3 as identified in the Second Street Corridor Study.

- **Strategy 13 - Access Management**
  - Implement the access management recommendations detailed in the U.S. Route 3 Corridor Study (Hooksett) and U.S. Route 3 Corridor Management Plan (Bedford), and coordinate with the City of Manchester to identify feasible access management strategies on the Second Street, Elm Street and Hooksett Road sections of the corridor.
  - In areas where the NHDOT has jurisdiction over driveway permitting on the U.S. Route 3 corridor, encourage the affected municipalities to enter into an Access Management Memorandum of Understanding (MOU) with the NHDOT.
- **Strategy 14 – Intersection/Interchange Reconfiguration or Improvements**
  - Provide overhead signage and more distinct turn-lane markings at intersections, including at Beech Street in Manchester.
- **Strategy 18 – New Travel Lanes**
  - Add travel lanes on the River Road Section of U.S. Route 3 between Hawthorne Drive and the Manchester Airport Access Road in Bedford.
  - Add travel lanes on the Hooksett Road Section of U.S. Route 3/NH Route 28 between NH Route 27/Whitehall Road/Martin’s Ferry Road to West Alice Avenue in Hooksett.

7.13 NH Route 28 Corridor Congestion Locations and Causes

NH Route 28 begins at U.S. Route 3 in downtown Manchester and runs north-south to the Manchester-Boston Regional Airport, the towns of Londonderry, Derry, Windham and Salem, and ultimately into the State of Massachusetts. Paralleling Interstate 93, the route serves as important commercial corridor and is susceptible to traffic resulting from events in downtown Manchester.

From U.S. Route 3 to Cilley Road, NH Route 28 is comprised of separated, two-lane, one-way roadways known locally as Beech Street and Maple Street. While the existing geometry in this segment provides ample capacity, numerous signalized intersections in the corridor slow traffic and result in moderate congestion south of Lake Avenue.

South of Cilley Road, NH Route 28 is known locally as South Willow Street. The South Willow Street portion of the NH Route 28 corridor from Cilley Road to the I-293 Exit 1 interchange features many regional retail, commercial, and office traffic generators, and is one of the most congested segments of roadway anywhere in the SNHPC region.

Continuing south from I-293 Exit 1, NH Route 28 passes the east side of the Manchester-Boston Regional Airport and provides access to Harvey Road and the freight warehousing and industrial areas surrounding the airport. During PM peak hour conditions, this area experiences persistent congestion in the northbound direction.

Beyond the airport, NH Route 28 continues south into the Town of Londonderry. The roadway generally functions well throughout the Town of Londonderry, with the exception of the I-93 Exit 5 interchange, which is shown to have persistent congestion in both the AM and PM peak periods. However, this interchange has also been affected by the ongoing Interstate 93 expansion project and some of this congestion may be related to work zones in the area. Following the completion of construction, the SNHPC will utilize travel time data from the National Performance Management Research Data Set (NPMRDS) to compare traffic flow in the vicinity of I-93 Exit 5 before and after the completion of construction.

Continuing south into the Town of Derry, the NH Route 28 corridor experiences congested conditions both in the AM and PM peak hours from Tsienneto Road through the intersection of NH Route 28/NH Route 102. This is the center of Derry’s downtown area, and this congestion is the result of a combination of high traffic volumes and roadway capacity limitations.

South of the intersection of NH Route 102, the NH Route 28 corridor functions well through the southern portion of the Town of Derry and the Northern portion of the Town of Windham. However, the intersection of NH Route 28/NH Route 111 in Windham does experience congested conditions both in the AM and PM peak hour due to high traffic volumes causing delays and queuing at this signalized intersection.

NH Route 28 Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
Lake Ave to Cilley Road	Weekday AM and PM Peak Hour	NB and SB	Moderate	Traffic Control Devices
				Traffic Incidents
				Special Events
Cilley Road to I-293 Exit 1	Weekday AM and PM Peak Hour	NB and SB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Traffic Control Devices
I-293 Exit 1 to Londonderry T/L	Weekday PM Peak Hour	NB and SB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Traffic Control Devices
I-93 Exit 5	Weekday AM and PM Peak Hour	NB and SB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
				Work Zone
Stonehenge Road to Tsienneto Road	Weekday PM Peak Hour	NB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
Tsienneto Road to NH Route 102	Weekday AM and PM Peak Hour	NB and SB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
NH Route 102 to Kendall Pond Road	Weekday PM Peak Hour	NB and SB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
NH Route 111 to Salem T/L	Weekday AM and PM Peak Hour	NB and SB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices

Figure 7.13.1 – NH Route 28 AM Peak Period Congestion

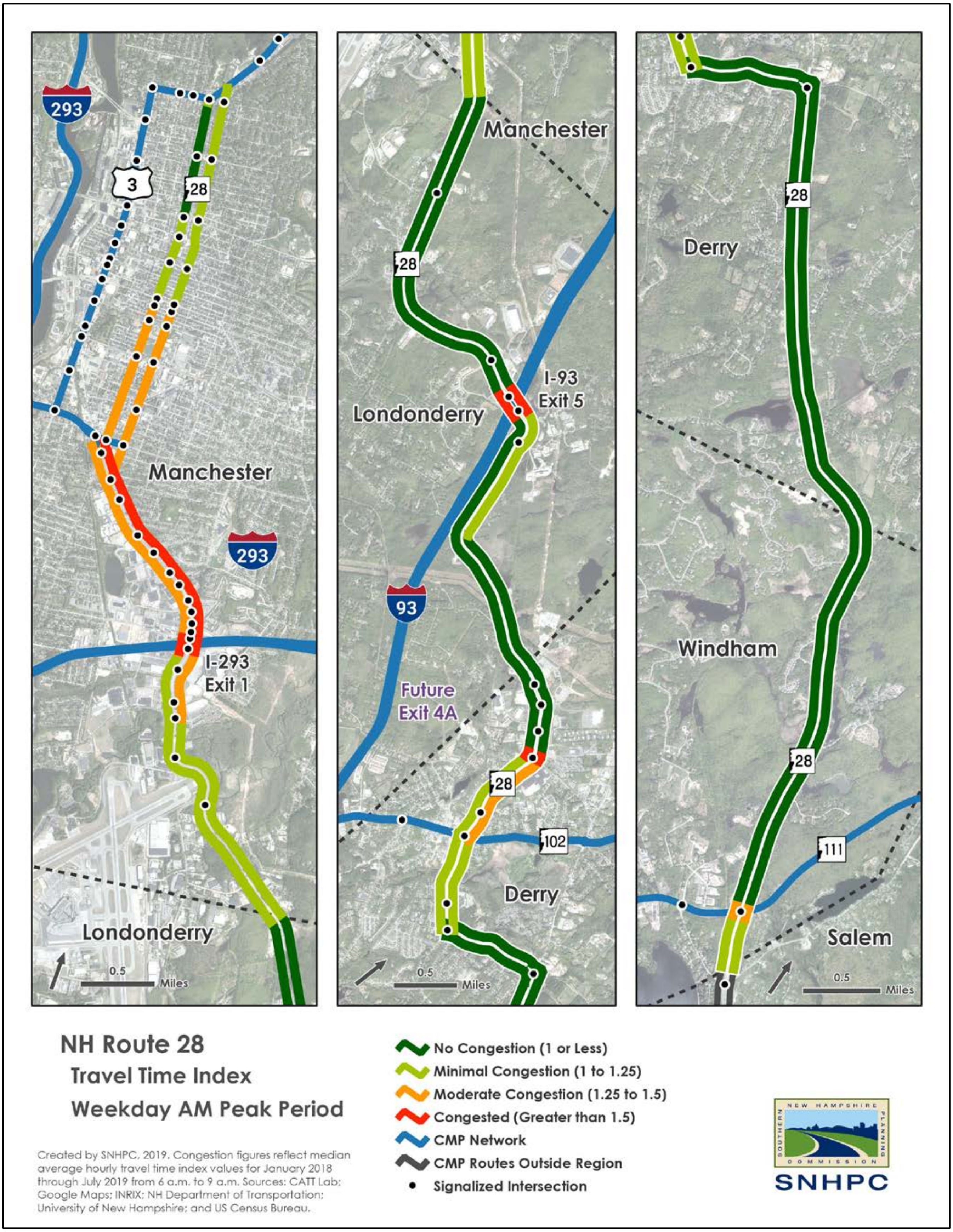
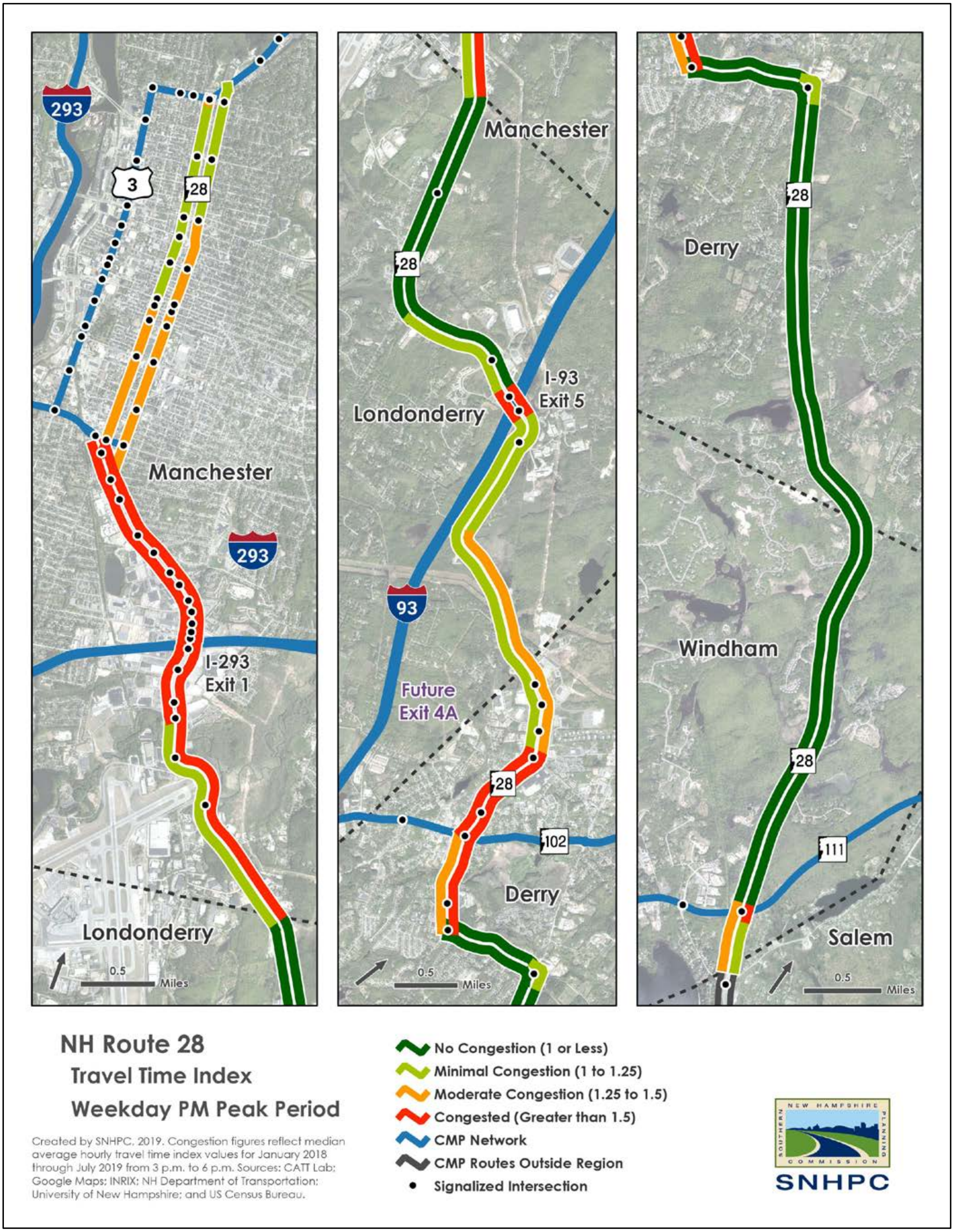


Figure 7.13.2 – NH Route 28 PM Peak Period Congestion



7.14 NH Route 28 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
  - Implement adaptive signal control or signal performance measures on the Beech and Maple Street (Manchester), South Willow Street (Manchester), and Crystal Avenue (Derry) sections of the NH Route 28 Corridor.
- **Strategy 2 - Traffic Signal Equipment Modernization**
  - Upgrade signal controller capabilities to enable adaptive control and multimodal traffic detection where needed on the Beech and Maple Street (Manchester), South Willow Street (Manchester), and Crystal Avenue (Derry) sections of the NH Route 28 Corridor.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
  - Extend the operating hours of Manchester Transit Authority fixed routes serving the South Willow Street section of the NH Route 28 Corridor to 8:00 PM on weekdays.
  - Convert the existing Derry-Londonderry demand response transit shuttle into a fixed-route or flex-route serving the Derry downtown area and providing connections to Londonderry and Manchester Transit Authority fixed route services.
- **Strategy 8 - Transit Signal Priority**
  - Implement Transit Signal Priority capability on the South Willow Street (Manchester), section of the NH Route 28 Corridor where fixed-route Manchester Transit Authority service is in place. This technology enables signals to extend green time or return to green faster for transit vehicles, which results in improved on-schedule performance.

Physical Infrastructure Improvement Strategies:

- **Strategy 10 – Off-street Multi-use Path**
  - Complete the development of the Derry and Londonderry Rail Trails, which run parallel to NH Route 28 and are part of the Granite State Rail Trail initiative.
  - Convert a portion of the former Manchester-Lawrence Railroad to a paved, multi-use path from South Commercial Street to Queen City Avenue.
- **Strategy 11 - On-street Bicycle Treatments**
  - Evaluate the feasibility of creating dedicated bicycle lanes on the Beech and Maple Street section of the corridor.
  - Add bicycle markings and provide wider shoulders where necessary to accommodate bicycle commuting between Derry and Manchester.
- **Strategy 13 - Access Management**
  - Coordinate with the City of Manchester to identify feasible access management strategies on the Beech/Maple and South Willow Street sections of the NH Route 28 corridor.

    - Coordinate with the Town of Derry to identify feasible access management strategies on the Crystal Avenue section of the NH Route 28 corridor.
    - In areas where the NHDOT has jurisdiction over driveway permitting on the NH Route 28 corridor, encourage the affected municipalities to enter into an Access Management Memorandum of Understanding (MOU) with the NHDOT.
- **Strategy 14 – Intersection/Interchange Reconfiguration or Improvements**
    - Implement pending improvement project at the I-293 Exit 1/NH Route 28 interchange, which is currently scheduled for construction in FY 2028.
- **Strategy 15 – Roundabout Conversion**
    - Convert the Queen City Ave/Cilley Road/South Willow Street interchange in Manchester to a dual roundabout system as proposed in the City of Manchester's most recent BUILD grant application.
- **Strategy 16 – Auxiliary/Acceleration/Deceleration Lanes or Ramp Improvements**
    - Provide ramp extensions at the I-293 Exit 1/NH Route 28 interchange.
- **Strategy 17 – New Grade Separated Interchanges**
    - Complete the pending construction of I-93 Exit 4A in Derry and Londonderry to reduce congestion throughout downtown Derry, including on NH Route 28.
- **Strategy 18 – New Travel Lanes**
    - Add roadway capacity from NH Route 28/Symmes Drive/Vista Ridge Drive to the intersection of NH Route 28/NH Route 128.
- **Strategy 19 – New Roadways**
    - Establish a new north-south roadway from South Commercial Street to Sundial Avenue in Manchester as proposed in the Manchester Transit-oriented Development Plan.
- **Strategy 20 – Engineering and/or Operations Study**
    - Conduct an engineering study of the intersection of U.S. Route 3/NH Route 28/Webster Street in Manchester to identify potential operational improvements.

7.15 NH Route 102 Corridor Congestion Locations and Causes

NH Route 102 is a key regional arterial roadway that connects the towns of Chester, Derry, and Londonderry to Interstate 93. The towns of Derry and Londonderry have experienced significant population and traffic growth in recent years that has resulted in persistent congestion from NH Route 128 to I-93 Exit 4 in Londonderry and from I-93 Exit 4 to NH Route 28 in downtown Derry.

The Interstate 93 Exit 4 interchange area has recently been reconstructed and improved as part of the Interstate 93 expansion project. While the improvements to Exit 4 should benefit operations on the NH Route 102 corridor in the future, the pending construction of a new interchange known as I-93 Exit 4A is expected to have the most significant impact for reducing congestion on NH Route 102 as the project will add a new roadway connection to downtown Derry.

In Londonderry, the SNHPC and Town of Londonderry have identified the need to add additional travel lanes on NH Route 102 from the I-93 Exit 4 interchange to the intersection of NH Route 128 as a means of addressing persistent congestion in this area. Additionally, adaptive signal control or signal performance measures are recommended for signalized intersections in this segment of the corridor.

NH Route 102 Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
NH Route 128 to I-93 Exit 4	Weekday PM Peak Hour	EB and WB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
I-93 Exit 4 Vicinity	Weekday AM and PM Peak Hour	EB and WB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
I-93 Exit 4 to NH Route 28	Weekday AM and PM Peak Hour	EB and WB	Moderate (WB) to Congested (EB)	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents
				Traffic Control Devices
NH Route 102/NH Route 28B Intersection	Weekday AM and PM Peak Hour	EB and WB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Incidents

Figure 7.15.1 – NH Route 102 AM Peak Period Congestion

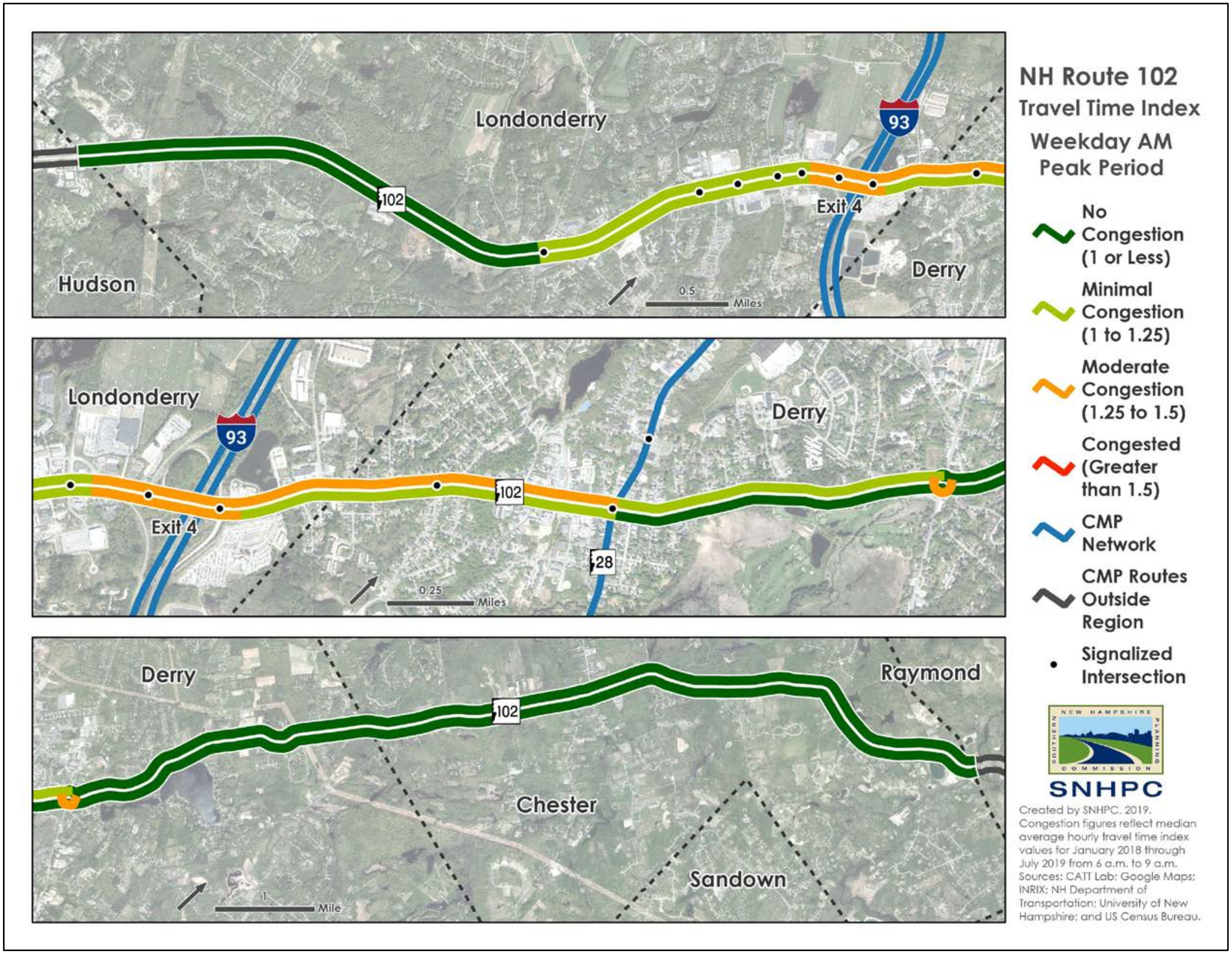
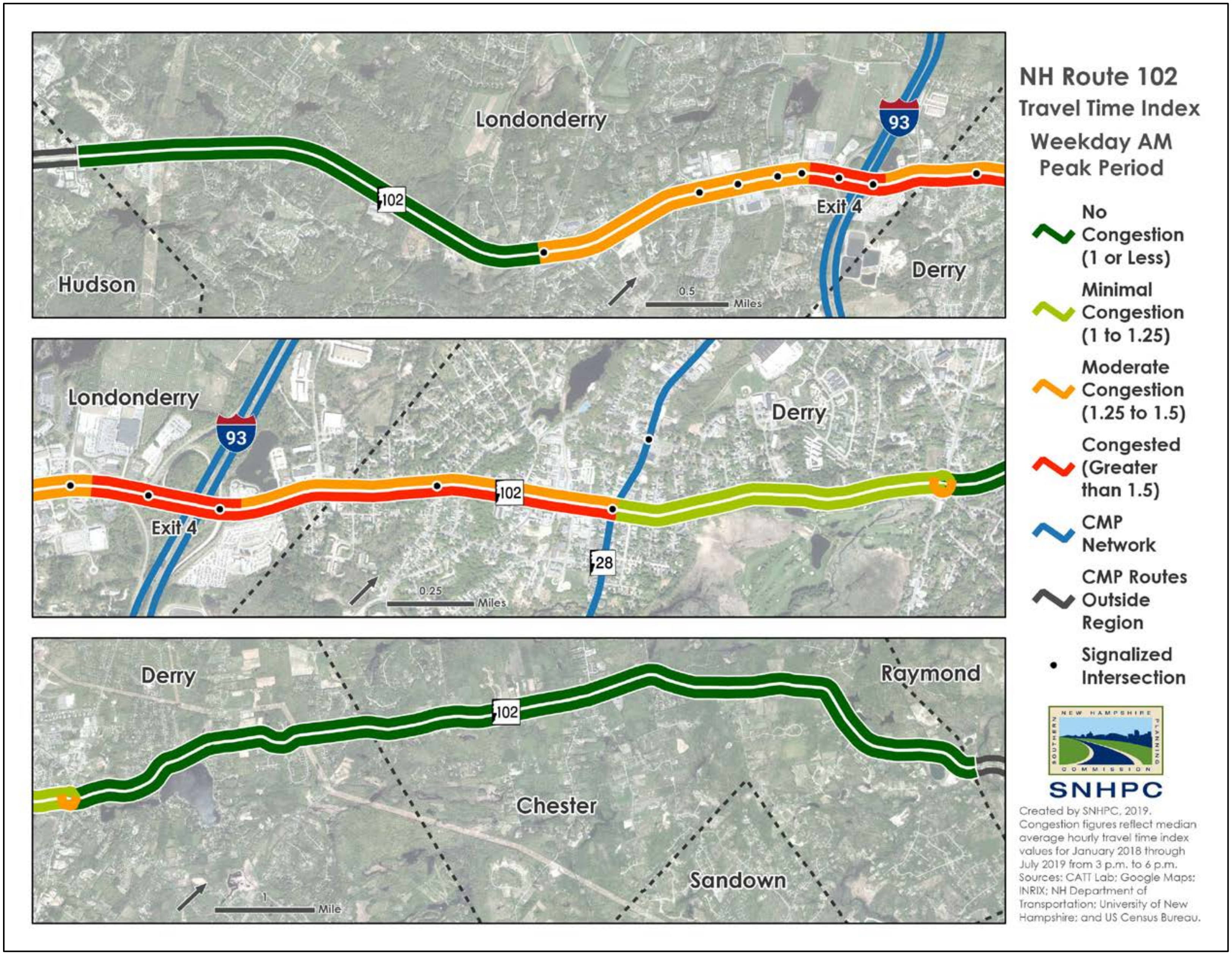


Figure 7.15.2 – NH Route 102 PM Peak Period Congestion



7.16 NH Route 102 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
    - Evaluate the feasibility of implementing an adaptive signal control system or signal performance measures on NH Route 102 from I-93 Exit 4 to NH Route 128.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
    - Implement the I-93 commuter transit service envisioned in the NHDOT Strategic Statewide Transit Assessment to connect Tuscan Village in Salem to downtown Manchester via Exit 3 in Windham and Exit 4 in Londonderry, as this service could help to mitigate congestion in the vicinity of NH Route 102/I-93 Exit 4.

Physical Infrastructure Improvement Strategies:

- **Strategy 11- On-street Bicycle Treatments**
    - Improve on-street bicycle treatments on NH Route 102 in downtown Derry, including considering bicycle lanes and adding bicycle racks.
- **Strategy 17 – New Grade Separated Interchanges**
    - Complete the construction of I-93 Exit 4A in Derry and Londonderry to reduce congestion on NH Route 102 from I-93 to downtown Derry.
- **Strategy 18 – New Travel Lanes**
    - Add travel lanes on NH Route 102 from I-93 Exit 4 to NH Route 128.
- **Strategy 20 – Engineering and/or Operations Study**
    - Complete an engineering study of the intersection of NH Route 102/NH Route 28B in Derry to identify potential operational or design improvements.

7.17 NH Route 111 Corridor Congestion Locations and Causes

NH Route 111 is an important arterial roadway that connects the southernmost communities in the SNHPC region, including the towns of Windham and Derry to I-93, the Town of Salem to the east, and the City of Nashua to the west. In particular, the Town of Windham has experienced significant population growth in recent years that has substantially increased traffic volumes on the NH Route 111 corridor.

The Interstate 93 Exit 3 interchange area was completely modernized as part of the Interstate 93 expansion project, and this work included the construction of a new 140 space park and ride facility. While there is no current transit service serving the NH Route 111 corridor, the recently completed NHDOT Statewide Strategic Transit Assessment does identify a potential transit service expansion from Salem to Nashua through the Town of Windham.

In conjunction with the NHDOT, SNHPC, and Rockingham Planning Commission, the Town completed a corridor study and has endorsed a preferred alternative that includes expanding NH Route 111 to a divided, four-lane highway from I-93 Exit 3 through Hardwood Road, with roundabout conversions at the intersections of Wall Street, Windham Village Green, North Lowell Road, and Hardwood Road.

NH Route 111 Congestion Locations and Causes				
Location	**Period**	**Direction**	**Congestion**	**Causes of Congestion**
NH Route 111/NH Route 128 Intersection	Weekday AM and PM Peak Hour	EB and WB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
NH Route 128 to Hardwood Road	Weekday AM Peak Hour	EB	Moderate	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
Hardwood Road to I-93 Exit 3	Weekday PM Peak Hour	WB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
I-93 Exit 3 to NH Route 28	Weekday AM and PM Peak Hour	EB and WB	Moderate to Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices
NH Route 111/NH Route 28 Intersection	Weekday AM and PM Peak Hour	EB and WB	Congested	Traffic Volume and Capacity Bottlenecks
				Traffic Control Devices

Figure 7.17.1 – NH Route 111 AM Peak Period Congestion

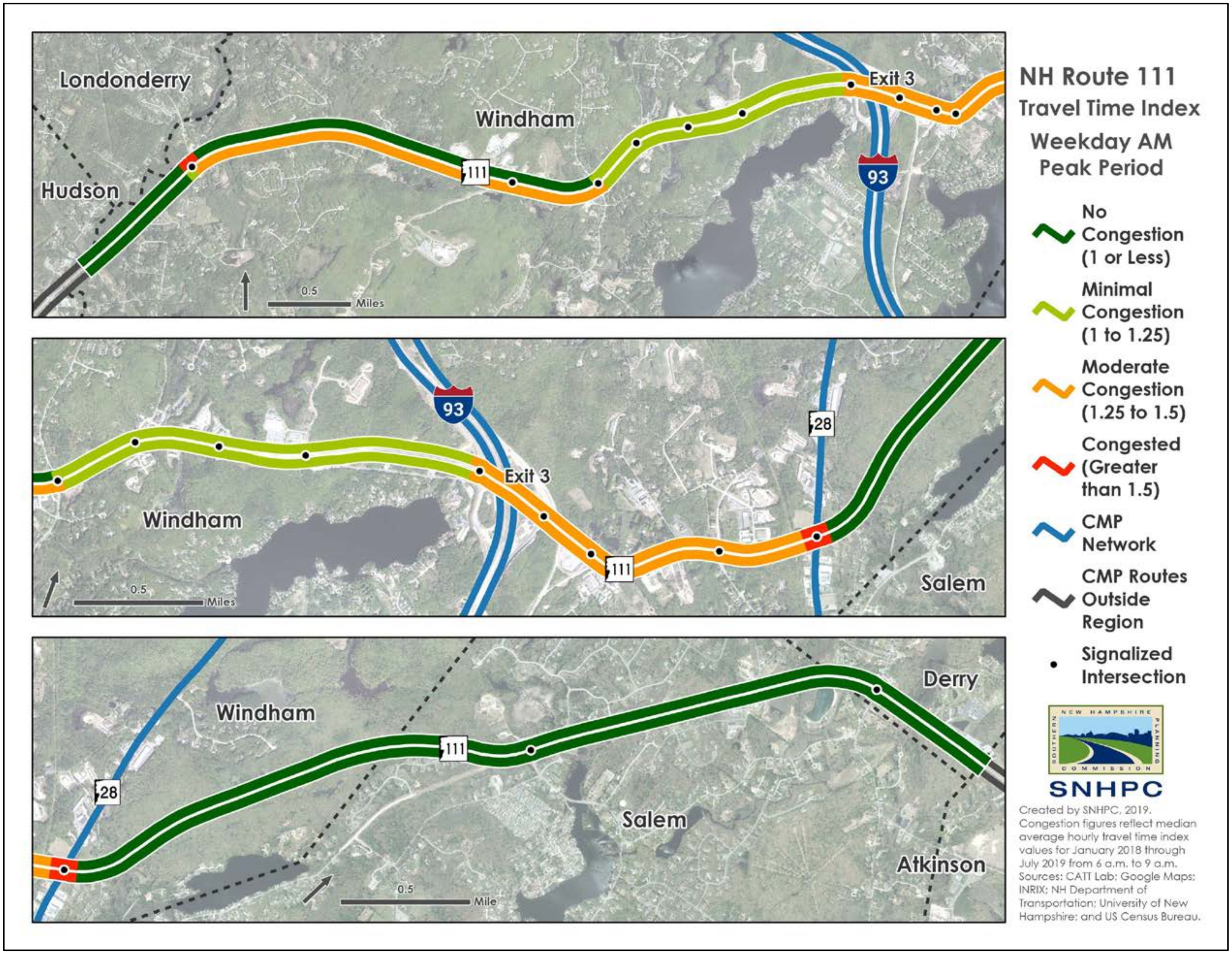
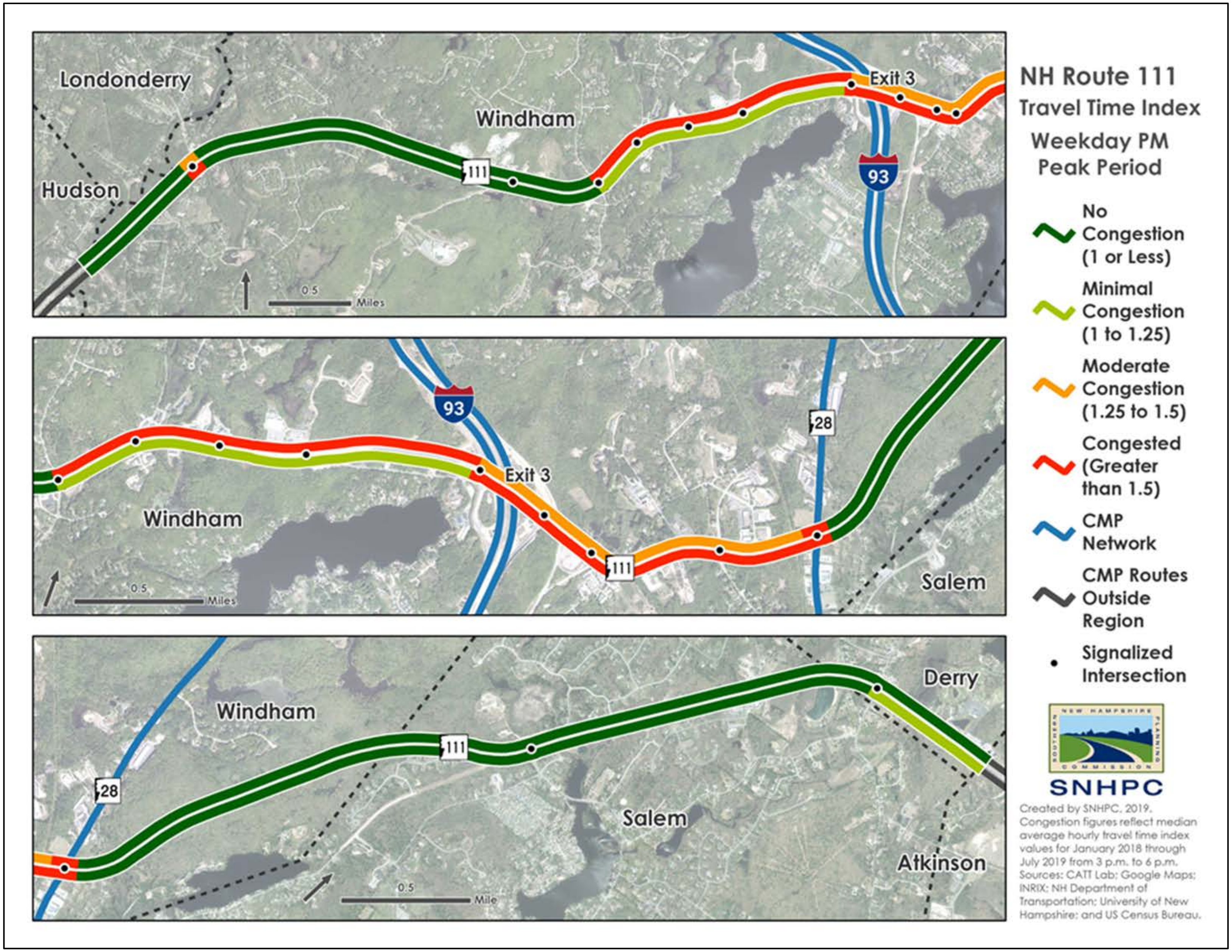


Figure 7.17.2 – NH Route 111 PM Peak Period Congestion



7.18 NH Route 111 Corridor Congestion Management Strategies

Roadway Management Strategies:

- **Strategy 1 – Traffic Signal Timing or Coordination Improvements**
    - Evaluate the feasibility of implementing an adaptive signal control system or signal performance measures from the NH Route 111/NH Route 28 intersection to the I-93 Exit 3 Interchange.

Transit and Travel Demand Management Strategies:

- **Strategy 7 - Transit Service Expansion**
    - Develop transit service along the NH Route 111 corridor linking Salem and Nashua via the Town of Windham as identified in the NHDOT Strategic Statewide Transit Assessment.

Physical Infrastructure Improvement Strategies:

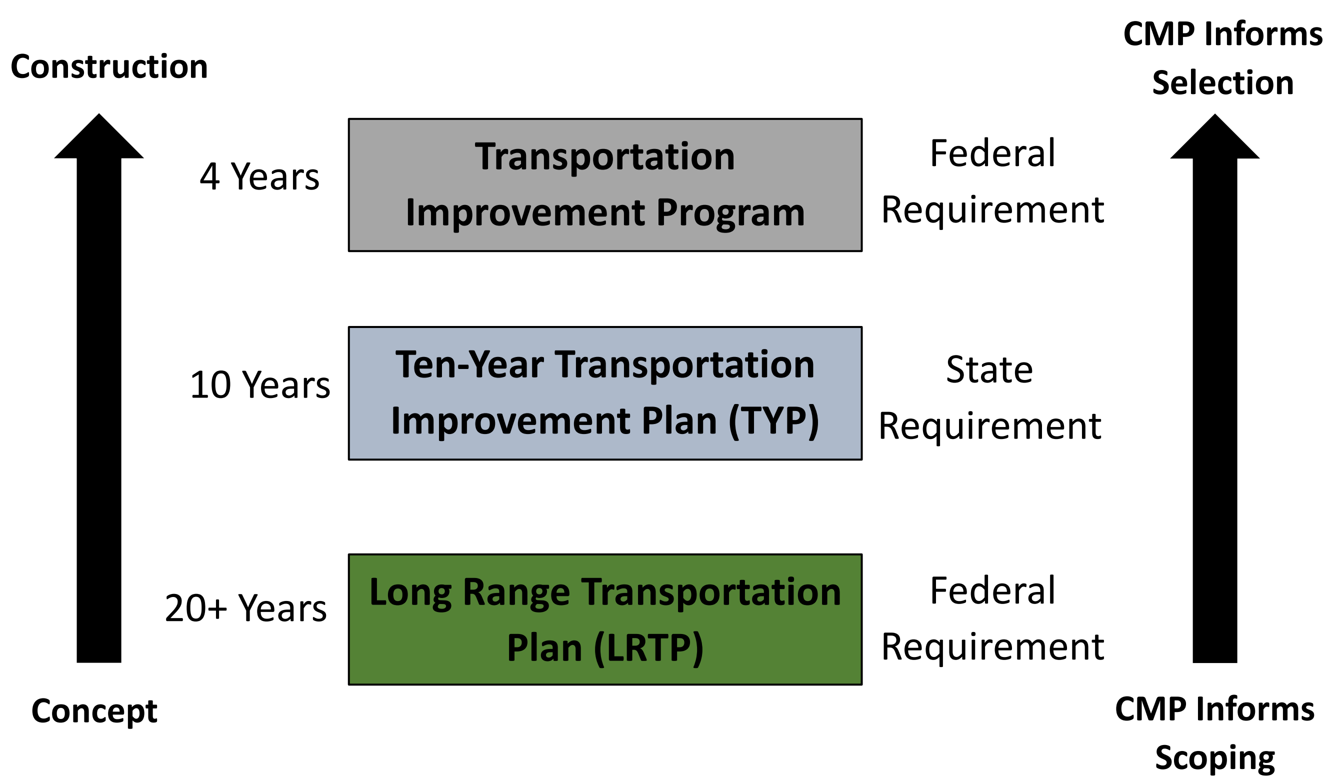
- **Strategy 15 – Roundabout Conversion**
    - Convert the intersections of NH Route 111/Wall Street, NH Route 111/Windham Village Green, NH Route 111/North Lowell Road, and NH Route 111/Hardwood Road to roundabouts.
- **Strategy 18 – New Travel Lanes**
    - Add travel lanes on NH Route 111 from I-93 Exit 3 through the intersection of NH Route 111/Hardwood Road.

8.0 Programming and Implementation of Strategies

This section outlines the process for using the results of the CMP report process for prioritizing, programming, and implementing congestion mitigation improvements. The previous section analyzed the CMP network for the SNHPC region and developed specific congestion strategies for the various routes, segments, and modes. The analysis addresses both directional and segment congestion and identified localized strategies as congestion causes and characteristics change. These strategies inform the SNHPC and its member municipalities on potential strategies to include in projects for the Transportation Improvement Program (TIP) and other competitive funding opportunities.

Like other planning documents, the CMP is intended to be used in conjunction with other regional plans to inform transportation investments. The iterative nature of the CMP, and the ability to evaluate changing conditions utilizing extensive and defensible NPMRDS data, allows SNHPC planners and municipalities to monitor, understand, and measure progress on congestion throughout the CMP network. This information provides a key tool for evaluating the importance and priority of projects, and ranking projects for funding through the SNHPC's prioritization process.

The CMP is a step in a cycle starting and ending with the Metropolitan Transportation Plan (MTP). The MTP sets the overall transportation policy direction for the region, identifying goals and objectives as well as the direction for all other program areas. The CMP, modal studies, corridor studies, and other local area plans provide a deeper understanding of geographic and program-specific issues and strategies.



9.0 Evaluation of Strategy Effectiveness

In future years, the SNHPC will work to evaluate the transportation system performance across the CMP network and work toward implementation of the identified strategies detailed herein. The SNHPC will continue to utilize the National Performance Monitoring and Research Data Set (NPMRDS) as the underlying data to quantify and evaluate congestion within the region.

Specifically, as a means of evaluating strategy effectiveness, the SNHPC commits to the following action items:

- **Strategy Evaluation Action Item #1:** Continue to participate with neighboring MPOs and Regional Planning Commissions in an annual cooperative purchase of expanded NPMRDS data and analytics tools to ensure that changes to congestion conditions on the SNHPC's CMP network can be appropriately monitored.

- **Strategy Evaluation Action Item #2:** Update the SNHPC's adopted system performance targets for Level of Travel Time Reliability and Truck Travel Time Reliability with any update to the SNHPC Transportation Improvement Program, Metropolitan Transportation Plan, or Congestion Management Process.

- **Strategy Evaluation Action Item #3:** Update the SNHPC Congestion Management Process at least every five (5) years and include an analysis of strategy effectiveness with each update.

- **Strategy Evaluation Action Item #4:** Coordinate with neighboring MPOs, the NHDOT, and other state and federal partner agencies on a cooperative analysis of CMP strategy effectiveness through the monthly Partnering for Performance New Hampshire (PFPNH) workgroup.

- **Strategy Evaluation Action Item #5:** Consider establishing additional, voluntary performance measures for congestion management that can be defensibly quantified/measured using the NPMRDS or other available data sources.