Congestion Management Process

2018

Greater Bridgeport and Valley Metropolitan Planning Organization

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1.0 Introduction:

A Congestion Management Process (CMP) is required for any Metropolitan Planning Organization (MPO) that includes an urbanized area exceeding 200,000 known as a Transportation Management Area (TMAs). The Greater Bridgeport Valley MPO includes the Bridgeport-Stamford Urbanized Area, thus requiring a CMP. The Congestion Management Process (CMP) is a data driven approach for managing congestion that utilizes current data, including performance measures, to assess alternative strategies for congestion management. The CMP provides strategies to be included in the Metropolitan Transportation Plan (MTP) to secure future funding. As such, it should be updated to provide relevant recent data to update the MTP. Due to newly available datasets, this CMP represents a major update to previous plans and will be used as a benchmark for future CMPs for the Region.

This CMP will focus on ten towns that comprise the Greater Bridgeport and Valley MPO (Ansonia, Bridgeport, Derby, Easton, Fairfield, Monroe, Seymour, Shelton, Stratford, and Trumbull). Due to scheduling conflicts with surrounding MPOs, a TMA-wide CMP was not able to be completed at this time. Over the next year the other MPOs will be updating their CMP and the Greater Bridgeport and Valley Region will work closely with them to create a TMA-wide CMP. At that time, this CMP will be amended to reflect a TMA-wide CMP.

The elements of the CMP are as follows:

- Develop regional objectives for congestions management
- Define CMP network
- Develop multimodal performance measures
    - Collect data/calculate performance measures
    - Analyze congestion problems and needs
- Develop Strategies
- Program and Implement Strategies
- Evaluate Strategy Effectiveness

2.0 Objectives:

This CMP will provide an analytical process for understanding congestion and developing mitigating strategies in the Greater Bridgeport and Valley Region.

The primary objectives will be:

- Determine the highway & transit CMP network
- Calculate current congestion through performance measures
- Develop strategies to reduce congestion
    - Increase Non-Single Occupancey Vehicle usage
    - Increase Level of Travel Time Reliability
    - Increase Truck Travel Time Reliability
    - Decrease Peak Hour Excessive Delay

3.0 CMP Network:

This Bridgeport-Stamford Urbanized Area (BS-UZA) encompasses five MPOs in southwestern Connecticut; Housatonic Valley, Southwestern, Greater Bridgeport and Valley, Central Naugatuck Valley and South Central. The MPOs do not share boundaries with the Council of Governments in CT so the same BS-UZA encompasses four COGs; Western CT, Naugatuck Valley, CT Metropolitan, and South Central CT.

A TMA-wide CMP that covers the entire BS-UZA would have been preferred but unfortunately at this time different update schedules between MPOs prevented the creation of one CMP. This CMP will focus on the Greater Bridgeport and Valley MPO but methodologies have been discussed and agreed upon between staff of the Greater Bridgeport and Valley, Central Naugatuck Valley, Housatonic Valley, and Southwestern MPOs. These agreed upon methodologies will permit this CMP to be amended in 2019 to include all the MPOs that encompass the B-S UZA to indeed create one TMA-wide CMP.

The Greater Bridgeport and Valley Region consists of 10 towns in southwestern Connecticut split between two Council of Governments. Six municipalities make up the CT Metropolitan COG and four municipalities are part of the Naugatuck Valley COG. The Region includes CTs largest city, Bridgeport, and the entire MPO has a total population of 413,512.

The Region has a high volume of vehicular traffic and is criss-crossed by multiple expressways. Traversing east to west are I-95 and CT-15. Traveling north to south are CT-25 and CT-8. US Route 1 also traverses the southern portion of the Region from east to west. Numerous other state routes cover the region. (Figure 3.1)

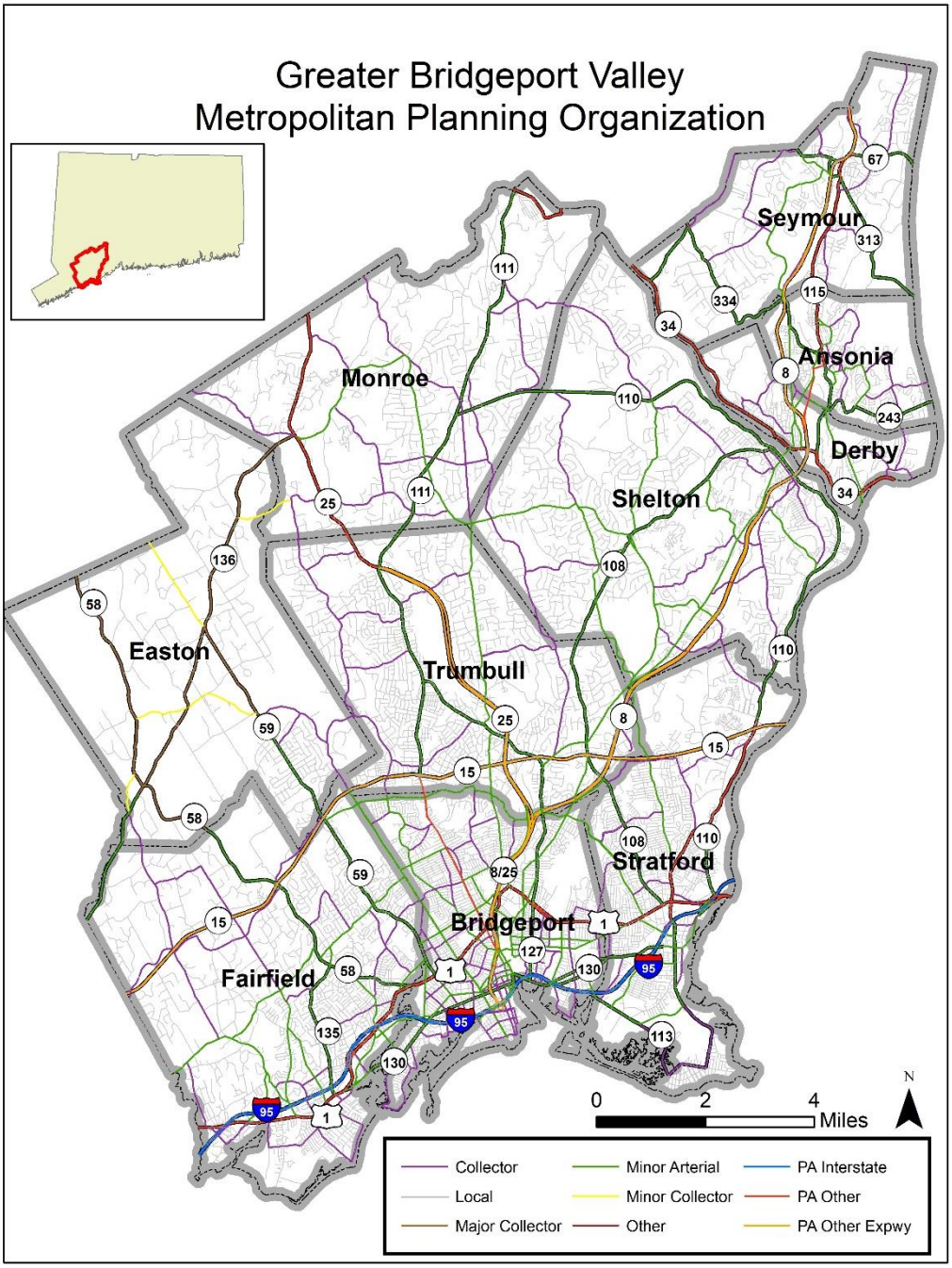


Figure 3.1: Greater Bridgeport and Valley Road Network

Transit is also available in the Greater Bridgeport and Valley Region. While this CMP will not focus on transit directly, improvements made to transit could increase the number of non-single occupancy vehicles potentially mitigating congestion. Over the next couple of years, the Greater Bridgeport and Valley Region will develop performance measures for transit that can be included in the next CMP. Greater Bridgeport Transit provides bus service throughout the Region and one route connects to the

neighboring Southwestern and South Central MPOs. Rail travels east-west and provides travel to NYC and New Haven on Metro-North as well as Amtrak service to other parts of the country (Figure 3.2).

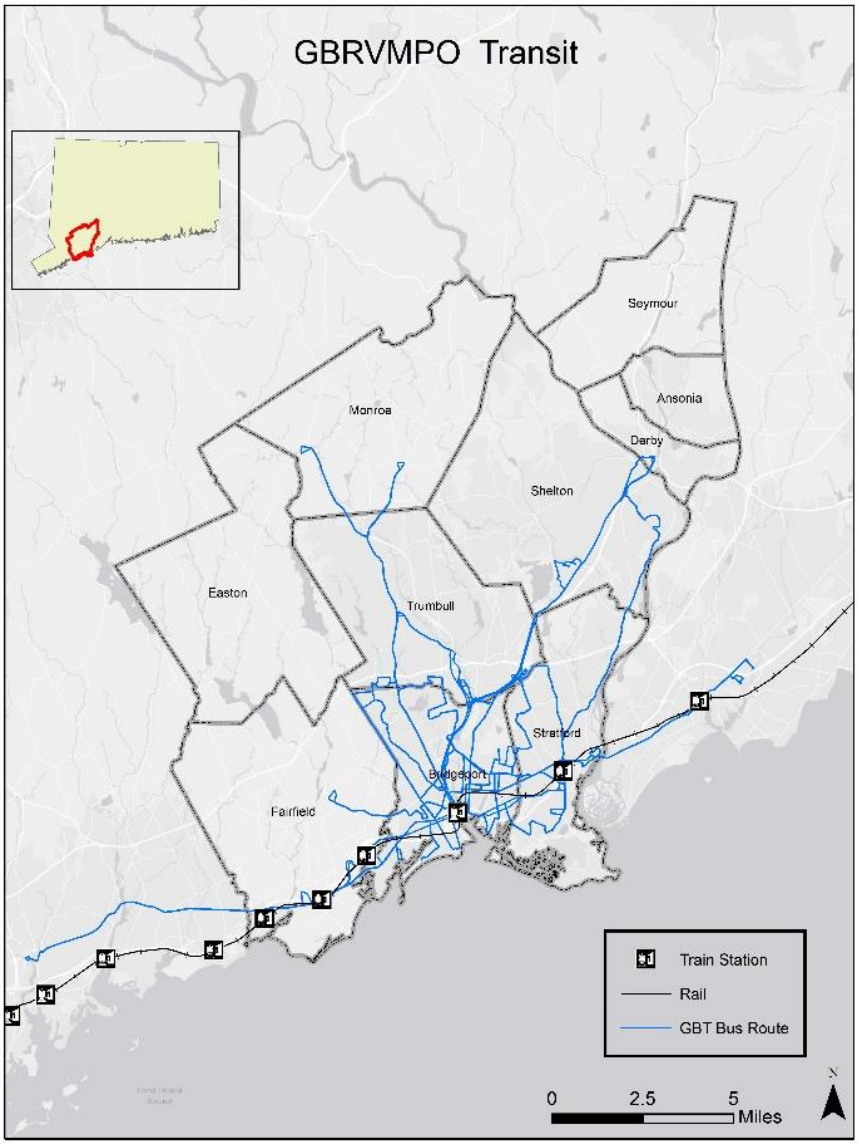


Figure 3.2: Transit

This CMP will focus on road segments that are included in the FHWA National Performance Management Research Data Set (NPMRDS). This dataset encompasses all segments in the enhanced National Highway System along with some additional intersecting road segments. The analysis of this study will focus on the large continuous segments that had reliable data in the NPMRDS for 2017 (Figure 3.3). For each roadway a congestion graph was generated to display the speed variation throughout the route and time of day. These graphs were generated from NPMRDS data collected Monday through Friday for all of 2017.

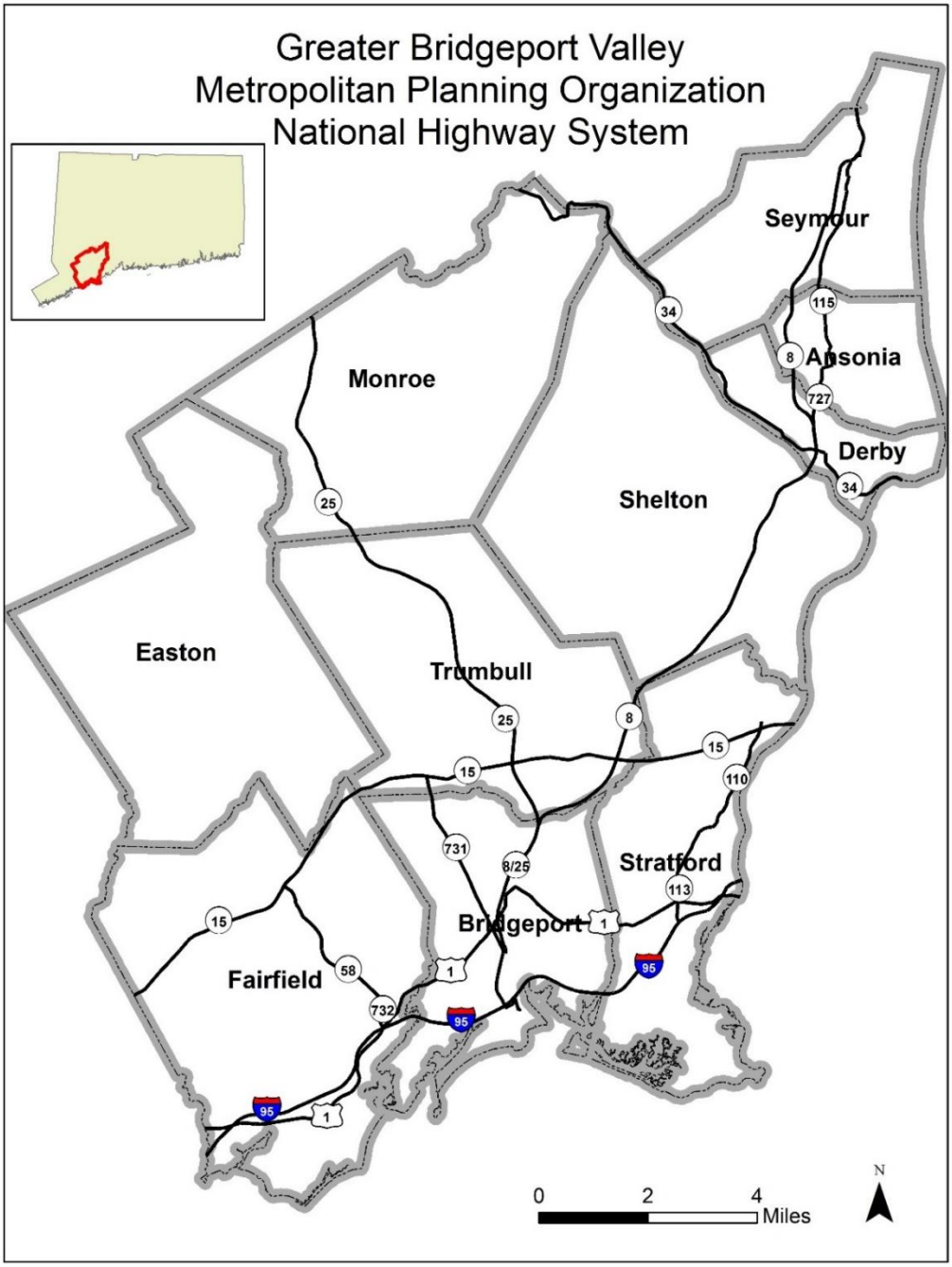


Figure 3.3: National Highway System in the Greater Bridgeport and Valley Region

3.1 Principal Arterials: Interstate

Interstate 95 runs east-west through three municipalities in the Greater Bridgeport and Valley Region: Stratford, Bridgeport and Fairfield. Within Connecticut, I-95 links the region with Stamford and Norwalk in southwestern Fairfield County. Travelling east, I-95 provides access to New Haven and major cities

throughout New England, such as Boston and Providence. Most critical to the economy of the Region is the connection that I-95 provides to the New York Metropolitan area, and the eastern seaboard from Maine to Florida.

Along most of the 12+ miles that run the through Region, I-95 is made up of three lanes running in each direction. I-95 widens to four travel lanes in one or both directions between exits 25 and 29 which include the Fairfield-Bridgeport line, Downtown Bridgeport, and the Exit 27A interchange to Route 8/25.

In the congestion graph, speed decreases west of the Route 8 interchange in Bridgeport. This traffic is worse southbound during the morning peak as commuters travel to work and worst northbound during the afternoon peak as commuters return home (Figure 3.4).

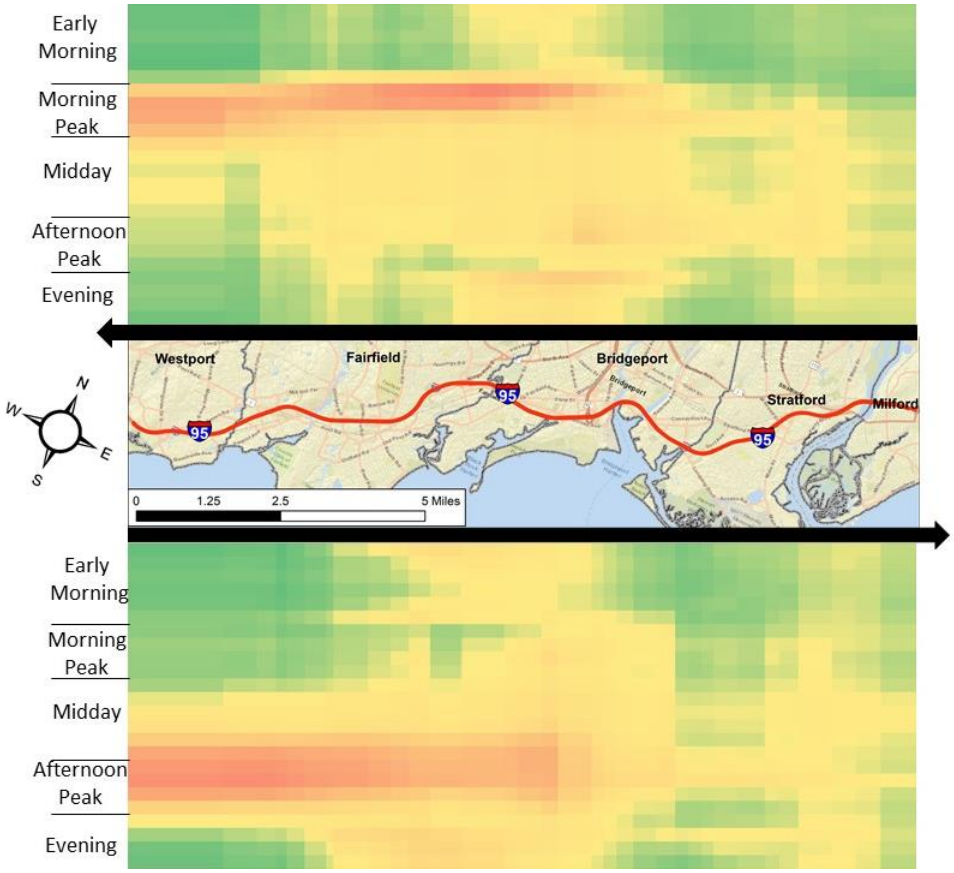


Figure 3.4: I-95 Congestion Graph

3.2 Principal Arterials: Other freeways and expressways

Route 15/Merritt Parkway: Route 15, or the Merritt Parkway is a limited access, principal expressway that runs 14 miles east-west through Stratford, Trumbull and Fairfield with two lanes in each direction. Like I-95, the Merritt provides a critical link to western Fairfield County and New York. East of the Housatonic River (in Stratford), Route 15 continues as the Wilbur Cross Parkway and the Berlin Turnpike, which provides access to central Connecticut, Hartford, and I-91.

As a transportation facility designed in the 1930s, a number of the Parkway's historic features limit its utility in the 21st century. Commercial and oversized vehicles are prohibited from the Parkway due to the low clearances of the historic Art Deco bridges. Tight curves and limited sight lines supports a maximum speed of 55 miles per hour. Two travel lanes in each direction is often insufficient to address the volume of traffic. Recent projects have utilized a context sensitive approach that balances historic preservation and enhancement with improving safety and mitigating congestion.

Speed reduction occurs west of the Route 8 intersection similarly to I-95. Congestion is greatest southbound during the morning peak and northbound during the afternoon peak (Figure 3.5).

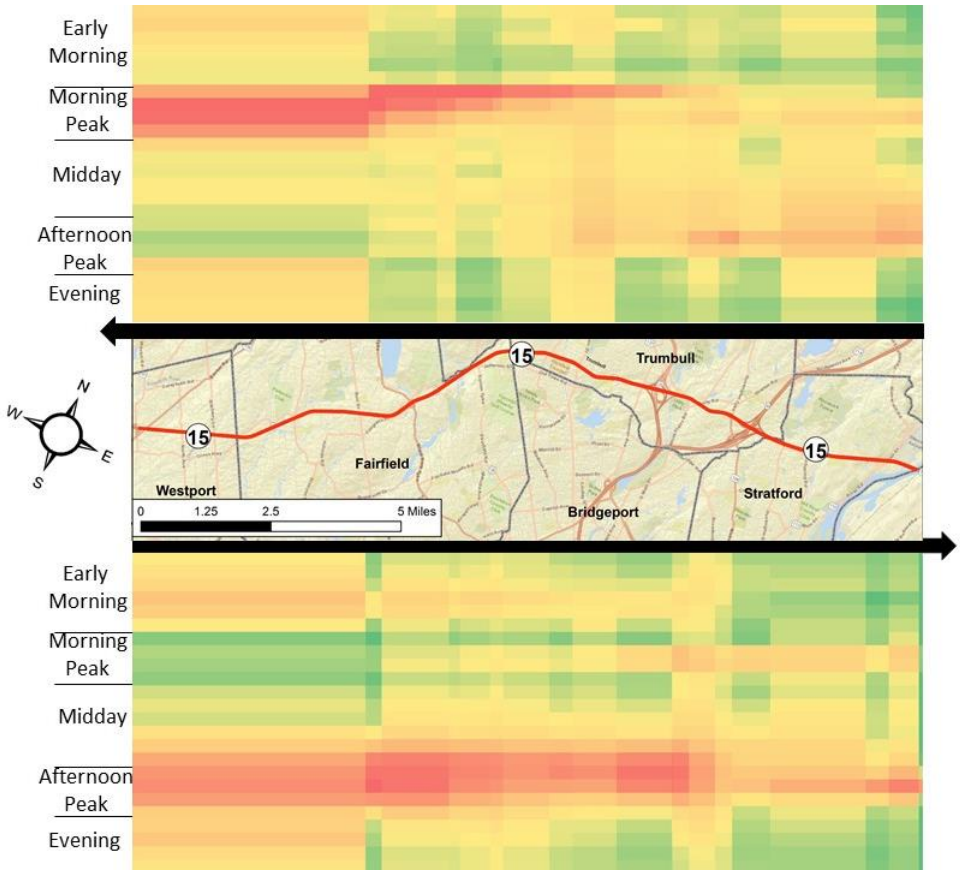


Figure 3.5: Route 15 Congestion Graph

Route 8 is the Region's north-south limited access expressway and runs north through Bridgeport (as 8-25), Trumbull, Stratford, Shelton, Derby, Ansonia and Seymour, a total of approximately 20 miles. At it's southern termination in Bridgeport, Route 8-25 connects to I-95. In northern Bridgeport, Route 8-25 splits into Route 8 (northeast toward Trumbull, Stratford, Shelton, Derby, Ansonia and Seymour) with access to Route 15 north and Route 25 (northeast to Trumbull and Monroe) with access to Route 15 south. Farther north, Route 8 links to Route 34 in Shelton. Outside of the Region, Route 8 intersects I-84 in Waterbury and continues north with access to Torrington, Greater Litchfield County, and southwest Massachusetts.

As Route 8-25, primarily three or four travel lanes are provided in each direction. After the Route 25/Route 15 split, Route 8 is composed of two travel lanes in each direction.

On Route 8 speed is reduced as drivers approach the I-95 interchange throughout the day but is exacerbated during morning and afternoon peaks. There also is a slowdown through downtown Derby during the morning peak. Northbound speed reduction also occurs as commuters enter Route 8/25 from I-95 while most of the congestion occurs in Shelton during the afternoon peak (Figure 3.6).

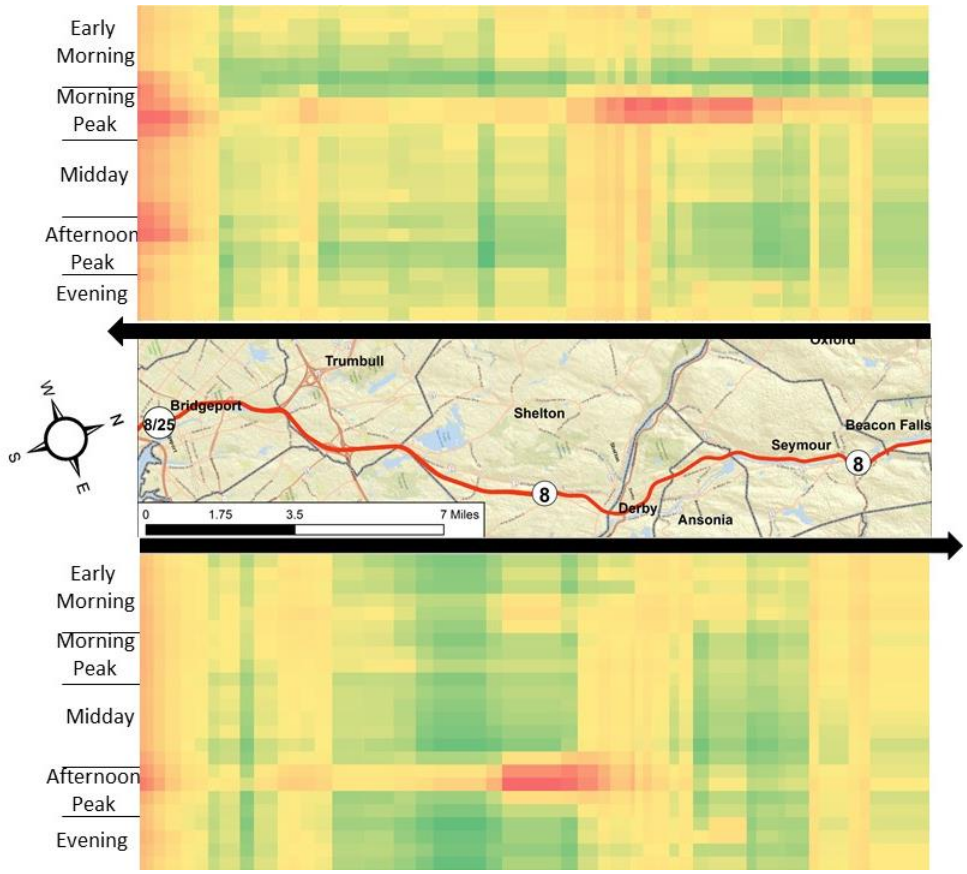


Figure 3.6: Route 8 Congestion Graph

Route 25: After splitting with Route 8, Route 25 continues northbound as a limited-access expressway through Trumbull for 6.7 miles. North of the Route 111 intersection, Route 25 functions as a principal arterial that provides access to commercial, office and industrial developments in Monroe (4.5 miles). Route 25 also serves as a connection to I-84 in Newtown.

The limited access portion of Route 25 provides three travel lanes in each direction. North of Route 111, the road narrows to a single lane of travel in each direction. Although turn lanes are provided at several signalized intersections, the two travel lanes often do not provide sufficient capacity for the volume of traffic on Route 25.

On Route 25 speed is greatly reduced north of the intersection with Route 111. This is where the Route is a principal arterial instead of an interstate. Speed is also reduced as cars approach or leave the Route 111 intersection (Figure 3.7).

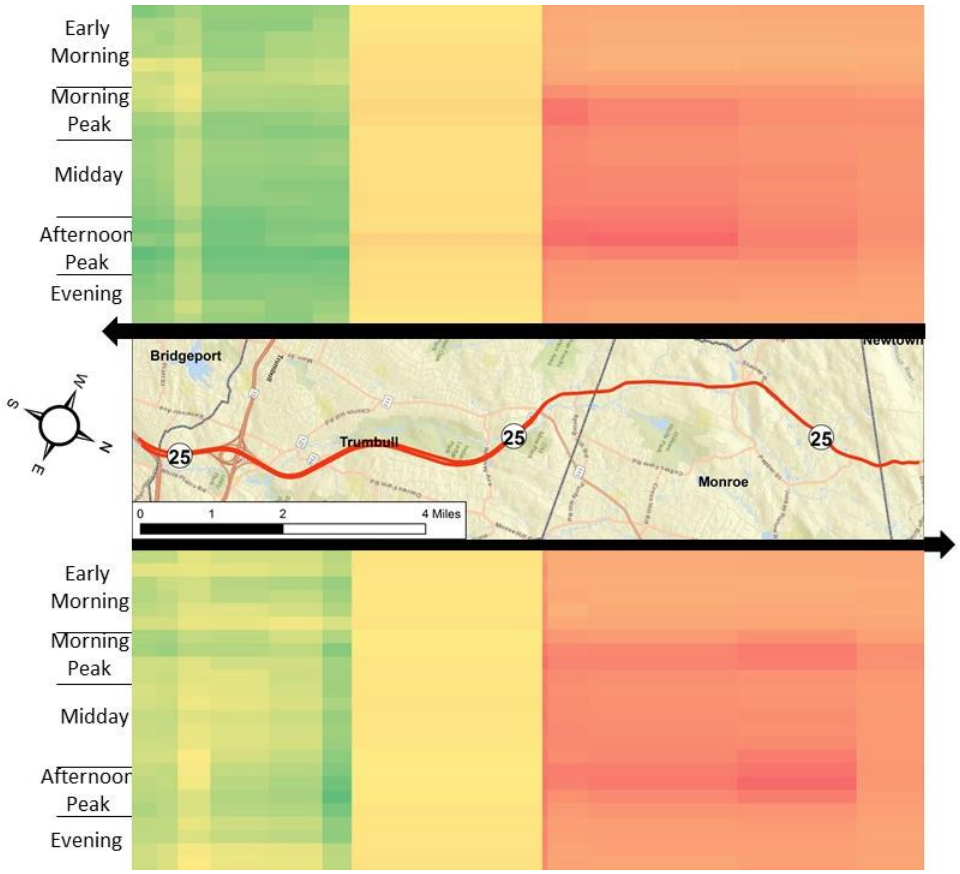


Figure 3.7: Route 25 Congestion Graph

Due to the severe congestion on Route 25, MetroCOG, and the Towns of Monroe and Trumbull partnered to conduct the Route 25 and 111 Engineering and Planning Study. The study has identified multiple strategies to improve traffic operations along the Route 25 and 111 corridors in northern Trumbull and Monroe, especially during peak commuting hours. These strategies were added to this CMP.

3.3 Principal Arterials: Other/NHS

US Route 1: is a principal arterial that runs about 12 miles west-east through the region's three coastal municipalities: Fairfield, Bridgeport and Stratford. Route 1 runs roughly parallel to much of I-95 and like I-95, it is a critical link along the eastern seaboard from Maine to Florida. In Connecticut, Route 1 functions as a west-east commercial corridor that links the shoreline communities of Long Island Sound.

In the Greater Bridgeport Valley Region, Route 1 alternates between one or two travel lanes for each direction of traffic. Turn lanes are not consistently provided at signalized intersections. In addition, unsignalized intersections and numerous driveways cause further congestion.

On Route 1 speeds are reduced during daytime hours in both the northbound and southbound directions. The slowest speeds occur through downtown Fairfield, and downtown Bridgeport through Main St in Stratford. (Figure 3.8). A safety study was initiated in 2018 due to safety concerns and how difficult the roadway is to navigate. Concepts should be completed in 2019 or 2020 and may be included in the next CMP.

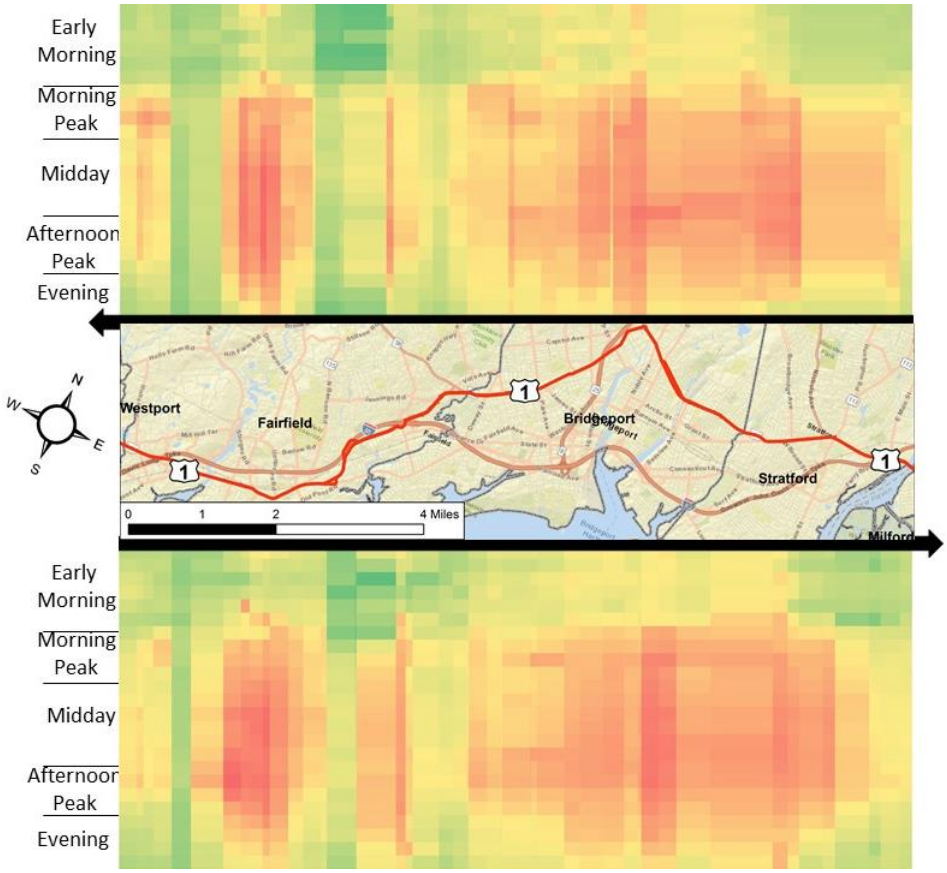


Figure 3.8: Route 1 Congestion Graph

CT Route 34: a principal arterial that runs west from I-84 in Newtown to New Haven in the east. In the Greater Bridgeport Valley Region, Route 34 runs through the northern tip of Monroe and across the Housatonic River via the Stevenson Dam Bridge (to Oxford). Route 34 follows the Housatonic south-east into Seymour and continues into downtown Derby. In Derby, Route 34 intersects Route 8. West of Route 8, 34 is made up of a total of two travel lanes. East of 8, Route 34 is made up of two travel lanes in each direction.

On Route 34 speed is reduced during the morning and afternoon peaks in both the eastbound and westbound direction. There is also a general slowdown through the commercial area in downtown Derby (Figure 3.9).

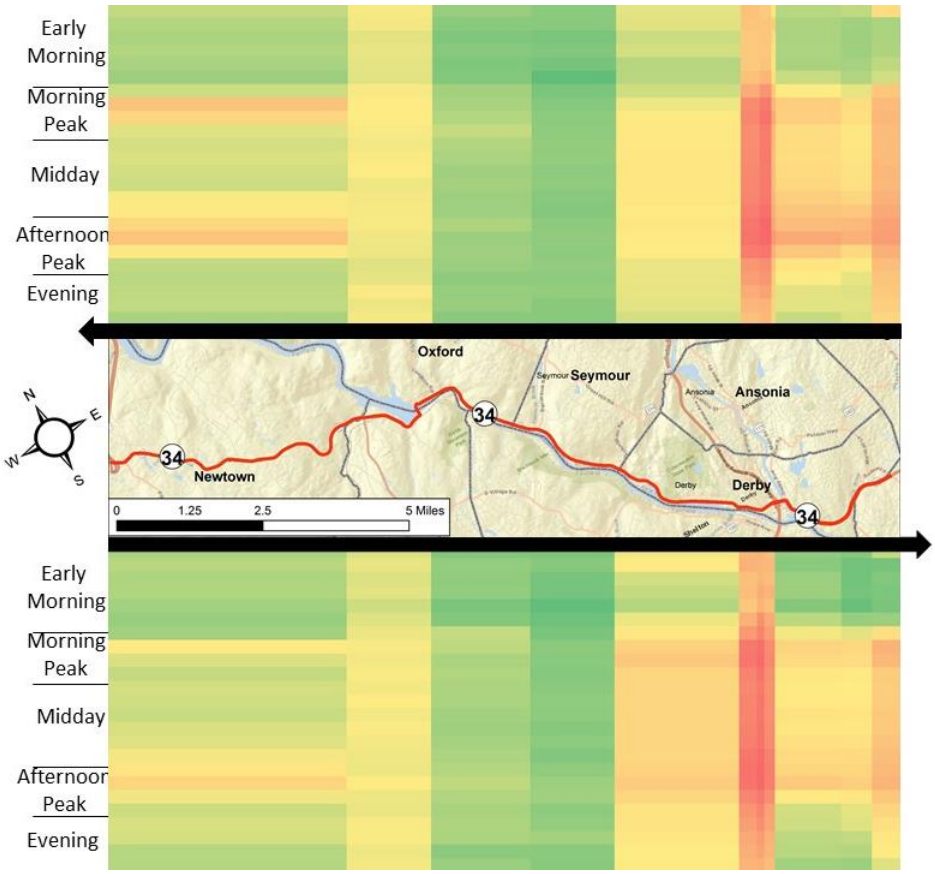


Figure 3.9: Route 34 Congestion Graph

Route 58: Functions as a minor arterial for a mile east-west between Route 1 (at the Bridgeport border) and State Route 732 in Fairfield. Between its intersection with State Route 732 and Route 15, Route 58 (Black Rock Turnpike) functions as a principal arterial that connects multiple shopping centers in a busy commercial corridor and runs approximately 2.4 miles east to northwest. After its intersection with Route 15, Route 58 becomes a minor arterial for 1.75 miles into Easton. In Easton, Route 58 is a designated scenic road and functions as a major rural collector that runs between 5 and 6 miles south-north to the Redding border. This CMP will focus on the 3.4 mile stretch in Fairfield from Route 1 to Route 15 as this is the section included in the NHS and NPMRDS dataset. This section is 2 lanes for the majority but expands to 2 lanes in each direction in the commercialized area between Burroughs Rd and Samp Mortar Dr.

Speeds are reduced in the southern section of Rt 58 as it goes through a dense commercial area before it intersects Route 1. This slowdown occurs in both northbound and southbound directions (Figure 3.10).

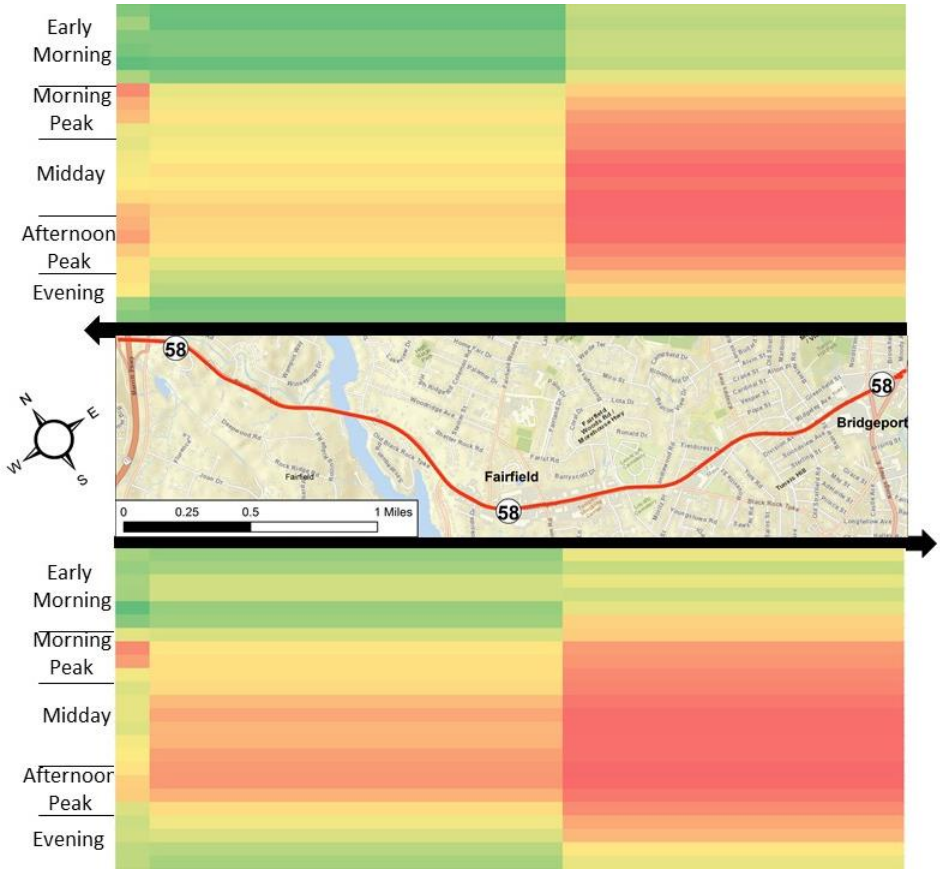


Figure 3.10: Route 58 Congestion Graph

Due to safety and congestion issues along the commercial portion of Route 58 (Black Rock Turnpike), MetroCOG, and the Town of Fairfield partnered to conduct a Safety Study, which will be completed in early 2019. The strategies identified through the study will be added to this CMP in a future update.

CT Route 110: runs south to north through Stratford and Shelton then east to west through Shelton and Monroe as a minor and principal arterial. The south-north portion of Route 110 roughly follows the Housatonic River. Route 110 begins at Route 1 in Stratford as a minor arterial. Between its intersection with Route 113 and Route 15, the road functions as a principal arterial and provides access to offices, retailers and a major regional employer (Sikorsky). Route 110 continues north into Shelton as a minor arterial and intersects Route 8. Near Indian Wells State Park, the road begins to run east-west toward Monroe. Route 110 ends at its intersection with Route 111 in Monroe. This CMP will focus on a 3.3 mile stretch that has NPMRDS data which is north of the intersection with 113 to the intersection of Soundridge Rd.

Speeds are reduced on Route 110 around the Rt 15 interchange. In this area there are several closely spaced lights that impede traffic flow. There is also commuter related congestion north of Rt 15 due to employees entering/exiting Sikorsky headquarters. The slowest traffic occurs traveling southbound as employees exit in the afternoon and head to Rt 15 (Figure 3.11). Due to the severe peak period traffic congestion, extensive backups and minimal bicycle/pedestrian facilities on Route 110 in Stratford's Main

Street/Warner Hill Road/Route 15 area, a Planning and Engineering Study was conducted and completed in early 2017. Concepts developed to improve access to businesses and employers, reduce future congestion and increase the safety of transportation mode are included in this CMP.

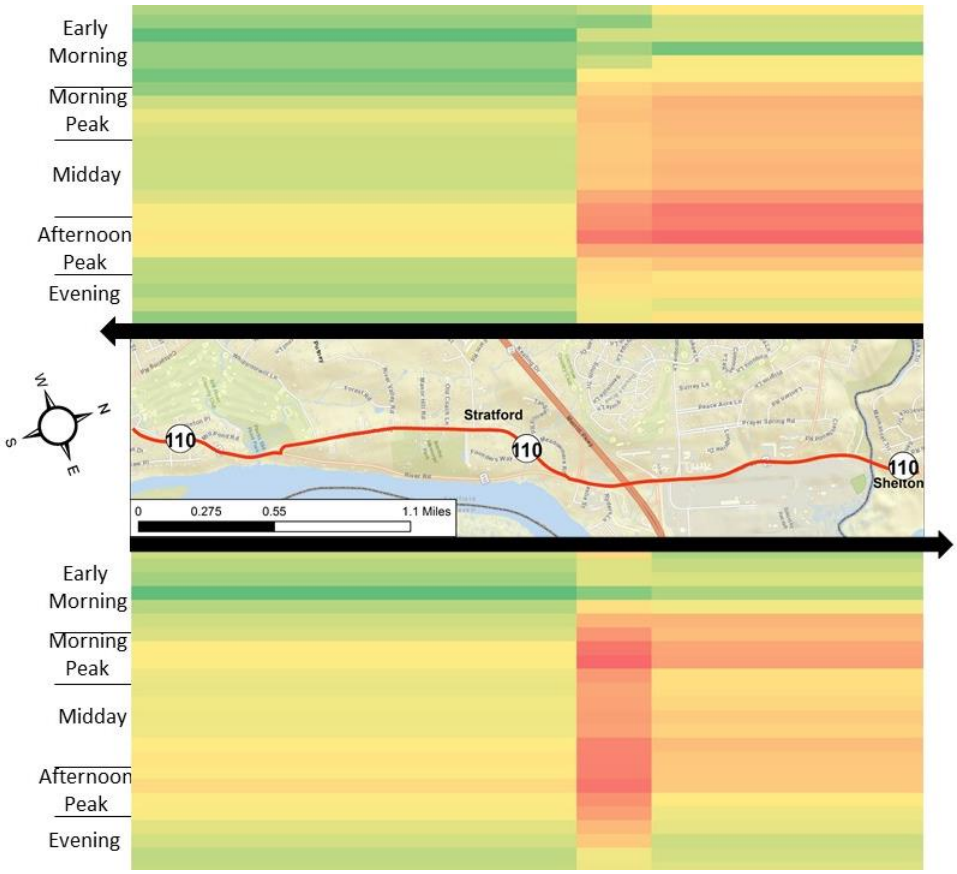


Figure 3.11: Route 110 Congestion Graph

CT Route 113: A small portion of Route 113 begins in Bridgeport as a minor arterial with access to I-95 southbound. Continuing south and east into Stratford, Route 113 functions as a major collector and runs adjacent to the Sikorsky Memorial Airport in Stratford's Lordship Neighborhood. Route 113 continues as a minor arterial and heads north through several commercial and industrial areas into Downtown Stratford. In Downtown Stratford, Route 113/Main Street is classified as a principal arterial and provides access to the Metro-North rail station, Route 1 and several neighborhood and commercial centers. Route 113 terminates at Route 110. Route 113 is 8.3 miles long, but this CMP will focus on the 2.6-mile principal arterial other segment which is Main St in downtown Stratford. Speed is reduced during the day south of I-95 past US 1 north to Paradise Green. This is a highly developed area with multiple commercial properties along with town facilities such as town hall/ Stratford High School/ Stratford Fire & EMS (Figure 3.12).

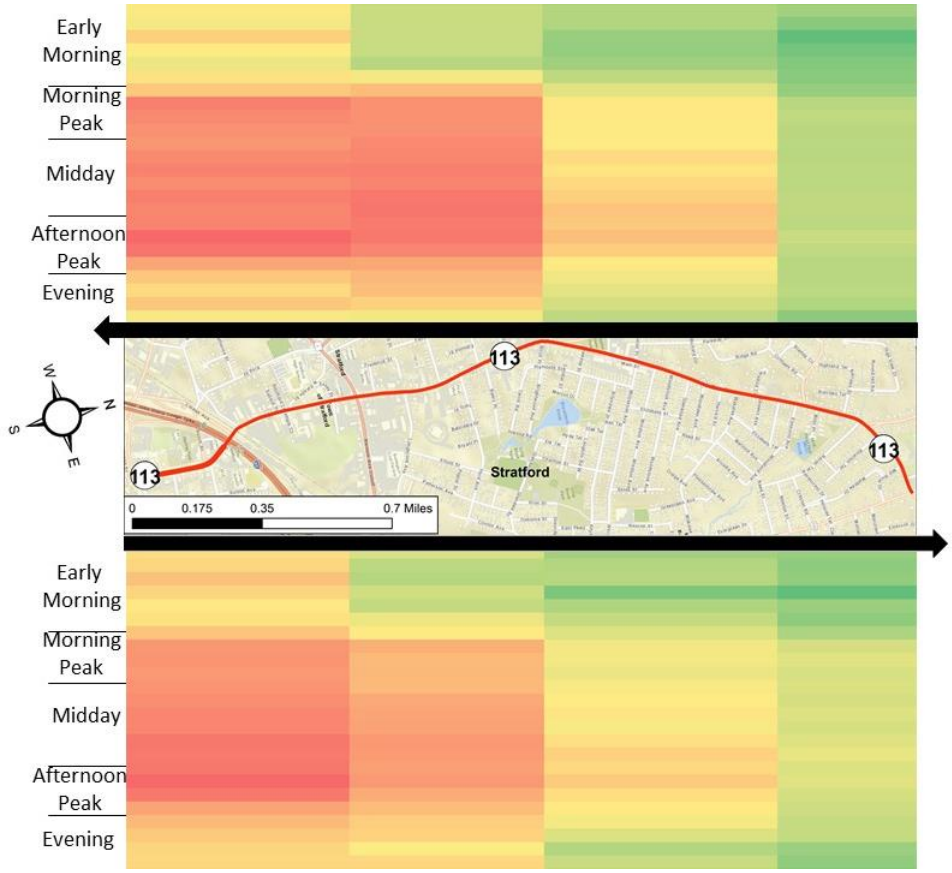


Figure 3.12: Route 113 Congestion Graph

CT Route 115: Beginning in Derby and terminating roughly 5.5 miles north in downtown Seymour, Route 115 runs parallel to Route 8 on the eastern side of the Naugatuck River. From opposite the Derby-Shelton Train Station, Route 115 runs north as a minor arterial. In Ansonia, at the intersection with SR 727 at Bridge Street, Route 115 becomes a Principal Arterial. Route 115 continues north, coinciding with Main Street, Ansonia and Seymour. In this sense, Route 115 links the lower Naugatuck Valley downtowns and commercial districts. The terminus of Route 115 at Route 67 in Seymour, lies in between the Route 8 Interchange 22 northbound and southbound ramps.

This CMP will focus on the 4-mile principal arterial other segment that connects State Route 727 to Route 8. This segment is part of the NHS and has NPMRDS data.

Speed is reduced on Route 115 through downtown Ansonia and downtown Seymour (Figure 3.13).

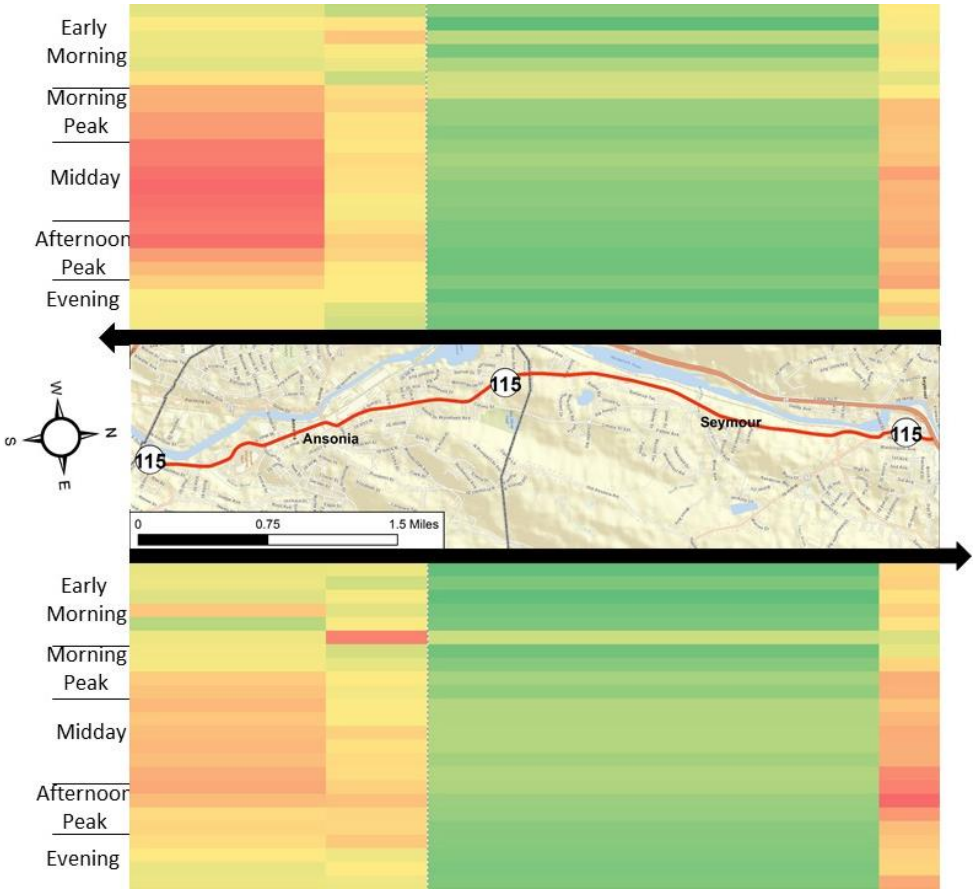


Figure 3.13: Route 115 Congestion Graph

Route 727 (Pershing Dr): SR 727 is a principal arterial that runs from Route 8 Interchange 16 north along Pershing Drive. At Bridge Street, in Ansonia, SR 727 turns east before terminating at the intersection with Route 115 (Main Street). Pershing Drive is a major commercial corridor, connecting downtown Ansonia with Route 8.

A congestion graph was not suitable for this small section of roadway but will be included in the regional analysis.

Route 731: is a principal arterial that runs south-north from Downtown Bridgeport to the Trumbull interchange with Route 15 (as Main Street in both municipalities). Route 731 provides access to Route 8/25 in Bridgeport and Route 15 in Trumbull (where it becomes Route 111). Route 731 connects numerous commercial centers in Bridgeport. A regional shopping center (the Trumbull mall) is also located along Route 731 in Trumbull, in close proximity to the Bridgeport line.

Speed is reduced along Route 731 near Route 8/25 in Bridgeport and near the Trumbull/Bridgeport town line (Figure 3.14).

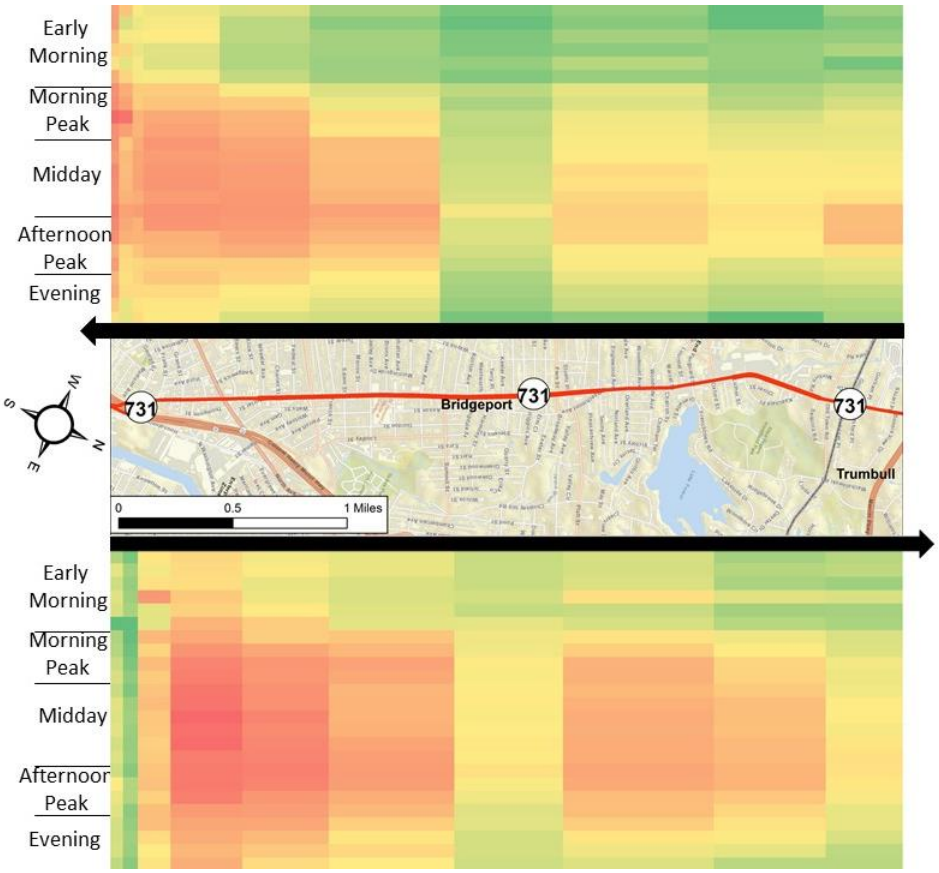


Figure 3.14: Route 731 Congestion Graph

Route 732 is a 1-mile principal arterial located in Fairfield that runs south-north from Route 1/King's Highway to Route 58/Black Rock Turnpike. The road provides connections to I-95 and commercial areas in the eastern half of the town. A congestion graph was not suitable for this small section of roadway, but it will be part of the regional analysis.

4.0 Performance Measures:

Four performance measures were calculated for this Congestion Management Process. Non-SOV travel, Level of Travel Time Reliability, Truck Travel Time Reliability, and Peak Hour Excessive Delay.

4.1 Datasets:

Two datasets were used for these four performance measures. The Non-SOV travel was calculated by using Census Means of Transportation to Work information. For this analysis the information from the 2000 census was used as well as the American Community Survey 5-year estimates form 2005-2011 and 2012-2016.

The other three performance measures were calculated using the National Performance Management Research Data Set (NPMRDS). This dataset was procured and sponsored by the Federal Highway

Administration and made available through the Regional Integrated Transportation Information System (RITIS). The NPMRDS dataset includes speeds and travel times at 5-minute intervals for passenger vehicles and trucks on over 400,000 road segments. From 2011-2017 the travel information was provided by HERE but in the 2017 FHWA selected INRIX to be the new provider. Speed and time travel data were collected using millions of connected vehicles, trucks and mobile devices. This analysis focused on 2017 so will only use the information provided by INRIX.

The NPMRDS data is provided in three separate formats; passenger cars only, trucks only, and passenger cars and trucks. For this CMP, all three datasets were downloaded for 2017 in 15-minute averages.

4.2 Non-SOV

The Non-SOV measure was calculated to assess the use of other modes of transportation besides single occupancy vehicle travel in the Greater Bridgeport and Valley Region. These other modes include transit, bicycle, or pedestrian travel.

Methodology:

The Non-Single Occupancy Vehicle (Non-SOV) measure is the percentage of the population that does not drive to work alone, including individuals who carpool or use mass transit. This metric was calculated using the 2000 census, 2011 ACS 5-year estimate and 2016 ACS 5-year estimate.

Using the census information, the Non-SOV measure was calculated using the formula below.

((Total Number of Drivers – Number of Drivers that Drive Alone) / Total # Drivers)* 100 = % Non SOV

The census datasets also provided the margin of error for each reported field which was utilized to calculate the margin of error for the Non-SOV measure.

Results:

In the Greater Bridgeport and Valley Region the Non-SOV measure was 24.04 % in 2016. There was a 2.87% increase since 2000 (Table 4.1; Figure 4.1).

Table 4.1: Non-SOV Travel

Percent Non-Single Occupancy Vehicle GBVMPO

	Total	Total; MOE	Drive Alone	Drive Alone; MOE	Non-SOV	Non-SOV; MOE	% Non-SOV	% Non-SOV; MOE
2000 Census	177,479	N/A	139,899	N/A	37,580	N/A	21.17%	N/A
2011 ACS 5yr	186,987	2018.86	143,678	1951.08	43,309	2,807.58	23.16%	1.48%
2016 ACS 5yr	195,262	2052.53	148,316	2228.73	46,964	3,039.87	24.04%	1.53%

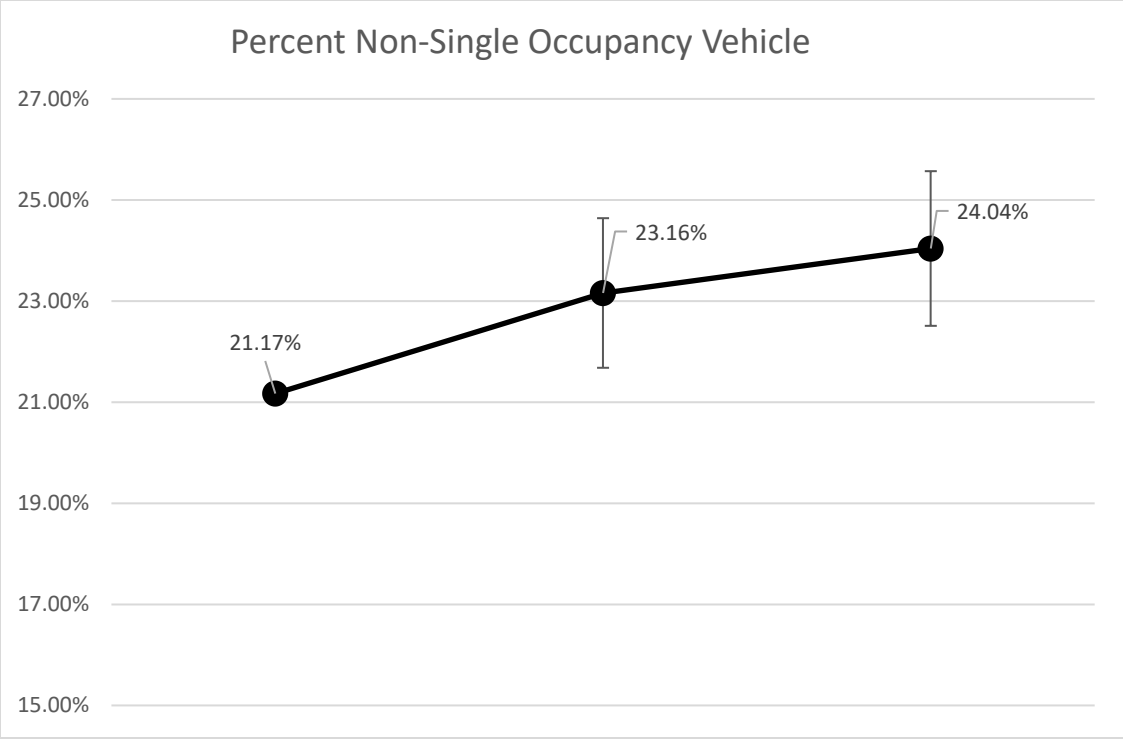


Figure 4.1: Non-SOV Travel

4.3 Level of Travel Time Reliability (LOTTR):

Highway travel time reliability is closely related to congestion and is greatly influenced by the complex interactions of traffic demand, physical capacity, and roadway "events." Travel time reliability is a significant aspect of transportation system performance. The FHWA explains the importance of this metric:

> *"Travel time reliability is significant to many transportation system users, whether they are vehicle drivers, transit riders, freight shippers, or even air travelers. Personal and business travelers value reliability because it allows them to make better use of their own time. Shippers and freight carriers require predictable travel times to remain competitive."*[1]

Operational-improvement, capacity-expansion, and to a certain degree highway road and bridge condition improvement projects, impact both congestion and system reliability. Demand-management initiatives also impact system reliability.

Methodology:

The level of travel time reliability (LOTTR) is expressed as a ratio of the 80th percentile travel time of a reporting segment to the "normal" (50th percentile) travel time of a reporting segment occurring

[1] See the FHWA's "Travel Time Reliability: Making It There on Time, All the Time" at https://ops.fhwa.dot.gov/publications/tt_reliability/TTR_Report.htm#WhatisTTR

throughout a full calendar year. Segments that have a ratio less than 1.5 are considered "reliable." The performance measure, as defined in Title 23 CFR 490.507, is the percent of the person-miles traveled on the Interstate section and the non-Interstate NHS that are reliable.

- "Normal" travel time (50th percentile): 50% of the times are shorter in duration and 50% are longer.
- 80th percentile travel time: Longer travel times. 80% of the travel times are shorter in duration and 20% are longer.
- The longest travel times are in the 100th percentile.

Travel times were downloaded in 15 minute intervals for each reporting segment from the NPMRDS. LOTTR was calculated for four time periods:

- AM Peak (Monday-Friday 6 am to 10 am)
- Midday (Monday-Friday 10 am to 4 pm)
- PM Peak (Monday-Friday 4 pm to 8 pm)
- Weekends (Saturday – Sunday 6 am to 8 pm)

If LOTTR was over 1.5 during any of the four time periods, the segment was considered unreliable. The person miles traveled for each segment was then calculated by multiplying the segment length by the annual traffic (AADT * 365) and the occupancy factor.

(Length * Annual Traffic * Occupancy Factor) = Person Miles Traveled

The sum of all the person miles traveled on reliable segments was then divided by the person miles traveled on all roadways to provide the percentage of reliability for the Region (Figure 4.2).

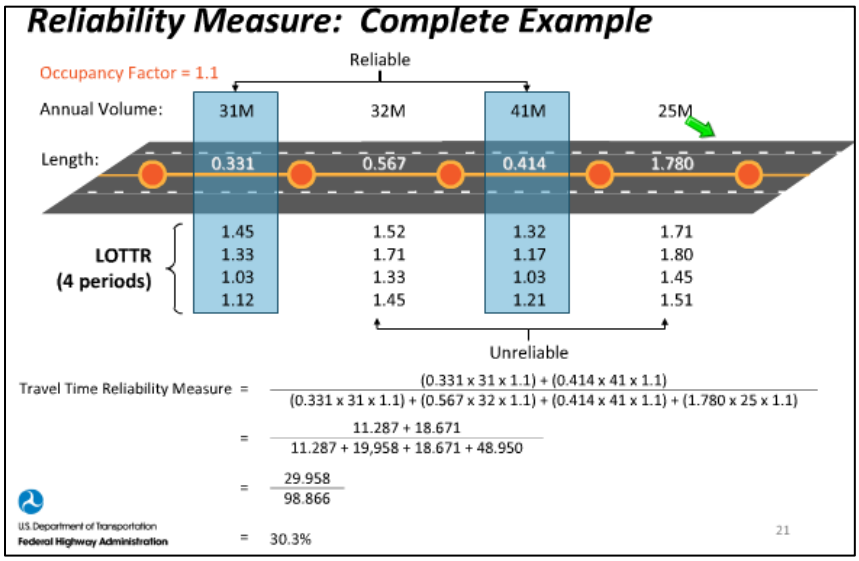


Figure 4.2: Federal Highway Administration LOTTR Example

Results:

The LOTTR (Level of Travel Time Reliability) measure for the region was 69.9%. That is, 69.9% of the NHS person miles traveled were reliable. The map below shows the NHS segments that were calculated as reliable or unreliable (Figure 4.3).

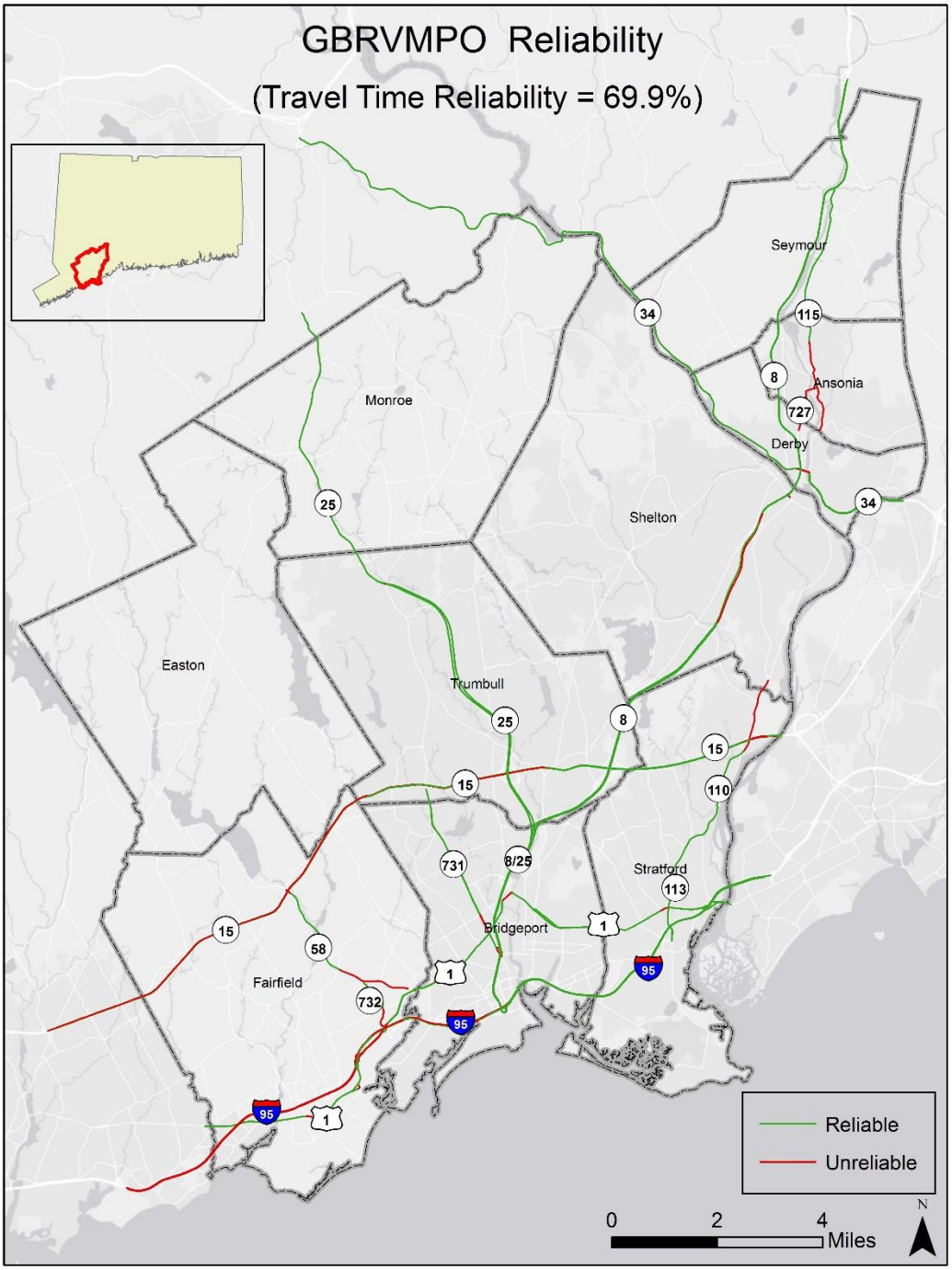


Figure 4.3: Travel Time Reliability

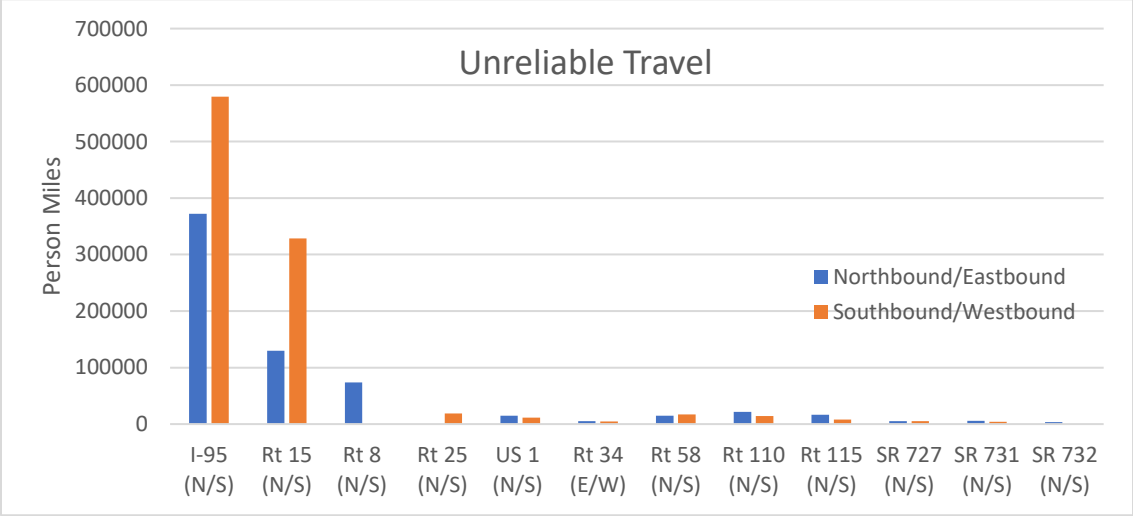
By comparison the following targets were adopted by the CTDOT on May 20, 2018 and by the GBVMPO on August 30, 2018 (Table 4.2):

Table 4.2: CTDOT System Reliability Targets

FHWA Measure for System Reliability:	**Baseline Condition (State)**	**2-year targets (2020)**	**4-year targets (2022)**	**Current Condition GBVMPO**
% person-miles of Interstate NHS that are "reliable"	78.3%	75.2%	72.1%	69.9%

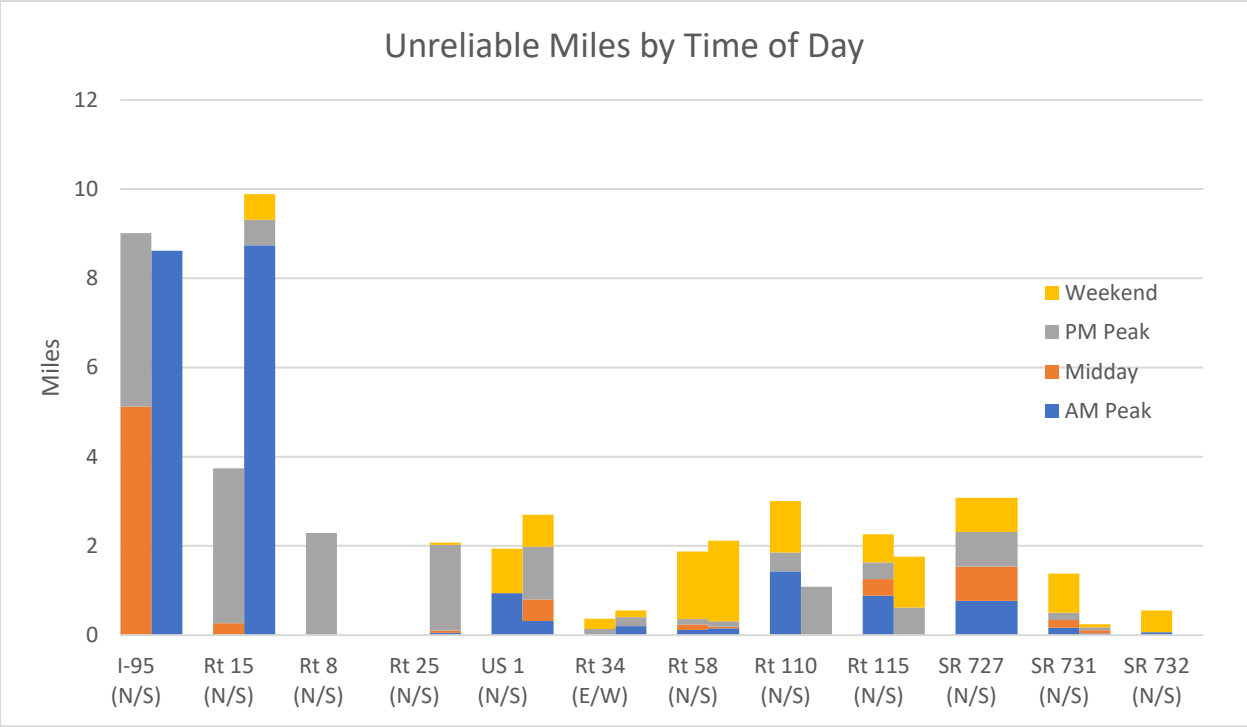
Most of the unreliable person miles in the region are confined to I-95 and Route 15. This can be attributed to the high volume of traffic on these two roadways. The unreliable segments for I-95 are south of the intersection with Route 8 in Bridgeport. Route 15 has unreliable segments in Fairfield, near the Rt 25 interchange, and near the Sikorsky bridge (Table 4.3).

Table 4.3: Unreliable Travel by Route



The LOTTR analysis was calculated for four different time periods (AM Peak, Midday, PM Peak, Weekday) allowing for the breakdown of unreliable segments by time period. In the chart below, unreliable segments, LOTTR >1.5, for each time period were summed by total mileage. This was done instead of using person miles since we were looking at specific time of day instead of the entire day (Table 4.4).

Table 4.4: Unreliable Miles by Time of Day



I-95 and Route 15 have the largest amount of unreliable road mileage in both northbound and southbound directions. This compliments the previous chart which also indicates that I-95 and Route 15 have the most unreliable person miles. Both roadways are unreliable southbound during the AM peak and unreliable northbound during midday and PM peaks. Only Route 15 southbound had a small amount of unreliable roadway during the weekend hours, indicating that most of the unreliability can be attributed to weekday commuters.

Route 8 was only unreliable northbound during the PM peak while Route 25 was only unreliable southbound during the PM peak. The other routes, which are not interstates or expressways, all had some unreliability during the weekend hours. Route 110 southbound was the only non-expressway that was not unreliable on weekends, as it was unreliable only during PM peak hours during the week. Most of the unreliable hours on Route 58 occurred on the weekend.

4.4 Truck Travel Time Reliability (TTTR):

Freight movement is assessed by the Truck Travel Time Reliability (TTTR) index. The Truck Travel Time Reliability metric is the ratio of long travel times (95th percentile) to a normal travel time (50th percentile). This measure considers factors that are unique to the trucking industry. The unusual characteristics of truck freight include:

- Use of the system during all hours of the day;

- High percentage of travel in off-peak periods; and
- Need for shippers and receivers to factor in more 'buffer' time into their logistics planning for on-time arrivals.

Methodology:

FHWA defines the reliable TTTR as less than 1.5; the comparison between the 50th and 95th percentiles is reliable if it is less than 1.5.

- "Normal" travel time (50th percentile): 50% of the times are shorter in duration and 50% are longer.
- 95th percentile travel time: Longer travel times. 95% of the travel times are shorter in duration and 5% are longer.
- The longest travel times are in the 100th percentile.

The TTTR is a measure of truck travel time reliability, not congestion. Segments of the highway that are regularly and predictably congested will not have a high TTTR index number. Rather, those segments of highway where delays are unpredictable and severe are scored highest. Prioritizing reliability over congestion came from stakeholder outreach with the freight industry where predictability was deemed more important for scheduling. The TTTR index only applies to roads on the National Highway System. The time period with the highest TTTR is used to determine the overall segment's TTTR, which is weighted by the segment length. The TTTR five statutorily defined time periods are:

- AM peak period (Monday – Friday 6 am – 10 am)
- Mid-day period (Monday – Friday 10am – 4pm)
- PM peak period (Monday – Friday 4pm – 8pm)
- Overnight (All Days 8pm – 6am)
- Weekends (Saturday – Sunday 6am – 8pm)

TTTR was calculated using the truck data from the NPRMDS. For segments that had no truck travel the travel time from all available vehicles was used. Route 15 was removed from the analysis as trucks are not permitted.

For each segment the maximum TTTR value over the five time periods was then used to calculate the overall TTTR for the region. For each segment the max TTTR was multiplied by the segment length to calculate a weighted average. Then the sum of the weighted averages was divided by the total length of the NHS segments to give a final TTTR score.

$$\frac{\text{Sum (Max TTTR * Segment Length)}}{\text{Total Length}} = \text{TTTR}$$

Results

The Truck Travel Time Reliability was calculated to be 2.35 for the region. Similarly to LOTTR, a score of 1.5 represents reliable travel. (Figure 4.4).

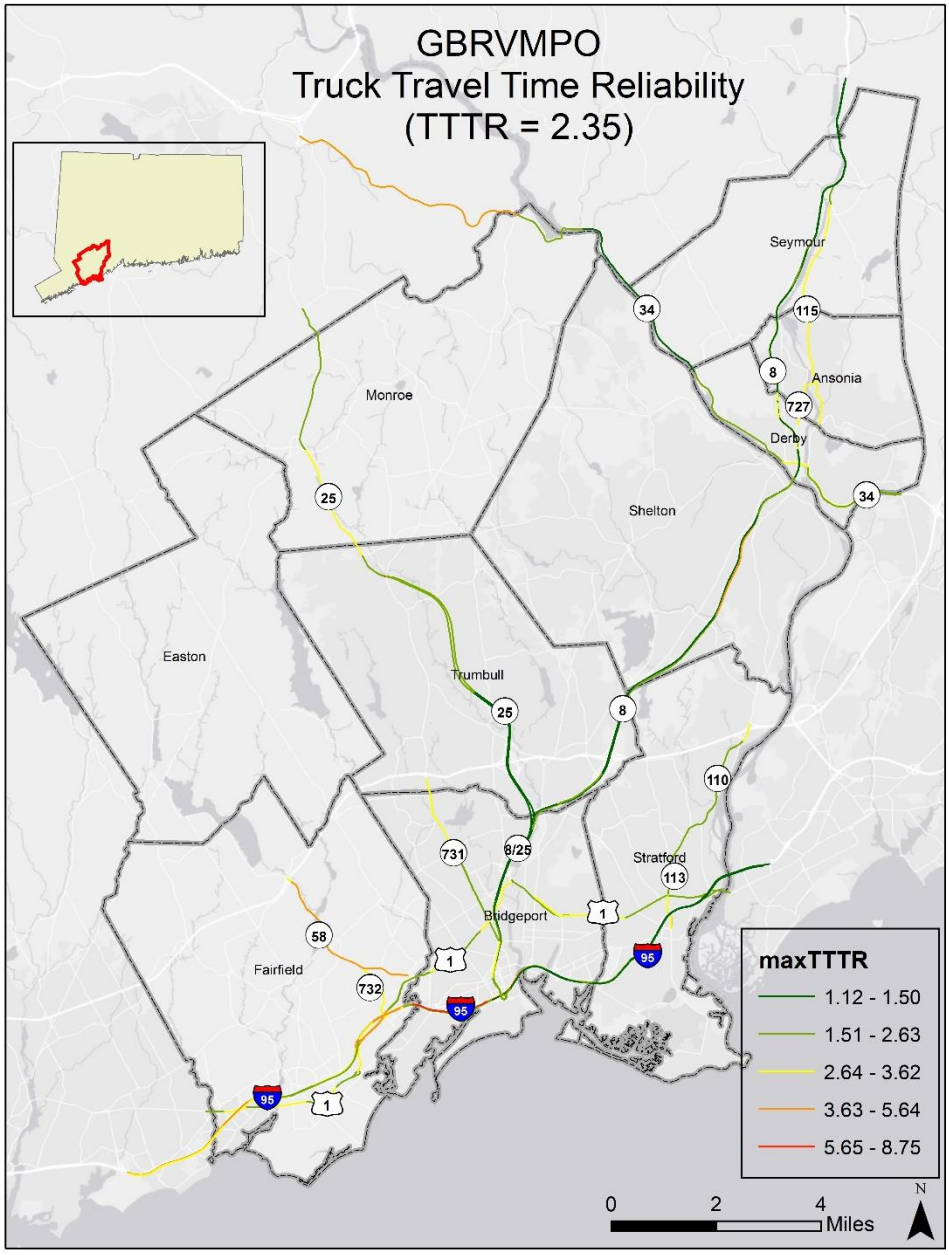


Figure 4.4: Truck Travel Time Reliability

By comparison, the following targets were adopted by the CTDOT on May 20, 2018 and by the GBVMPO on August 30, 2018 (Table 4.5):

Table 4.5: CTDOT Freight Reliability Targets

FHWA Measure for Freight Reliability: Interstate NHS	**Baseline Condition (State)**	**2-year targets (2020)**	**4-year targets (2022)**	**Current Condition GBVMPO**
Truck Travel Time Reliability (TTTR) Index	1.75	1.79	1.83	2.35

Only 93 out of 350 segments had a max TTTR of less than 1.5. These segments included I-95 east of Route 8, most of Route 8, and small sections on Route 34 and Route 25 (dark green in the map above). All other TMCs had unreliable truck travel. The worst truck travel reliability in the region can be found on I-95 southbound between the Route 8 interchange and Route 1 in Fairfield.

4.5 Peak Hour Excessive Delay (PHED):

The Peak Hour Excessive Delay measure was calculated to assess recurring congestion during commuting hours in the Greater Bridgeport and Valley Region.

Methodology

PHED was calculated using all vehicles available in the NPMRDS between 6 am – 10 am and 4 pm – 8 pm weekdays through 2017. The PHED measure calculates the amount of person time spent in excessive delay. The calculation compares actual travel speed to the official speed limit of each TMC segment. Speed limits were provided by the CT Department of Transportation and conflated to the TMC segments. In cases where the CT DOT roadways did not have the same endpoints as the TMC segments, a weighted average speed from the CT DOT data was used for the TMC speed. Excessive delay is defined as when the travel speed was below 60% of the speed limit or 20 mph.

The number of hours of excessive delay were multiplied by the average yearly traffic (AADT * 365) to calculate the annual hours of delay per each segment. These were then summed to calculate the annual hours of excessive delay for the Region. Dividing the annual hours of excessive delay for the Region by the Region's population (413,512) provided the annual hours of peak excessive delay per capita.

Results

Th annual hours of peak hour excessive delay per capita for the region was 5.1. This calculation was derived from analysis of delay divided by the total population of the MPO. There were 2,093,171 hours of excessive delay in the MPO region.

High excessive delay occurred in some of the same areas that had high LOTTR and TTTR values such as I-95 and Route 15 in Fairfield. This indicates that these roadways experience both recurring and non-recurring events that delay travel over time (Figure 4.6).

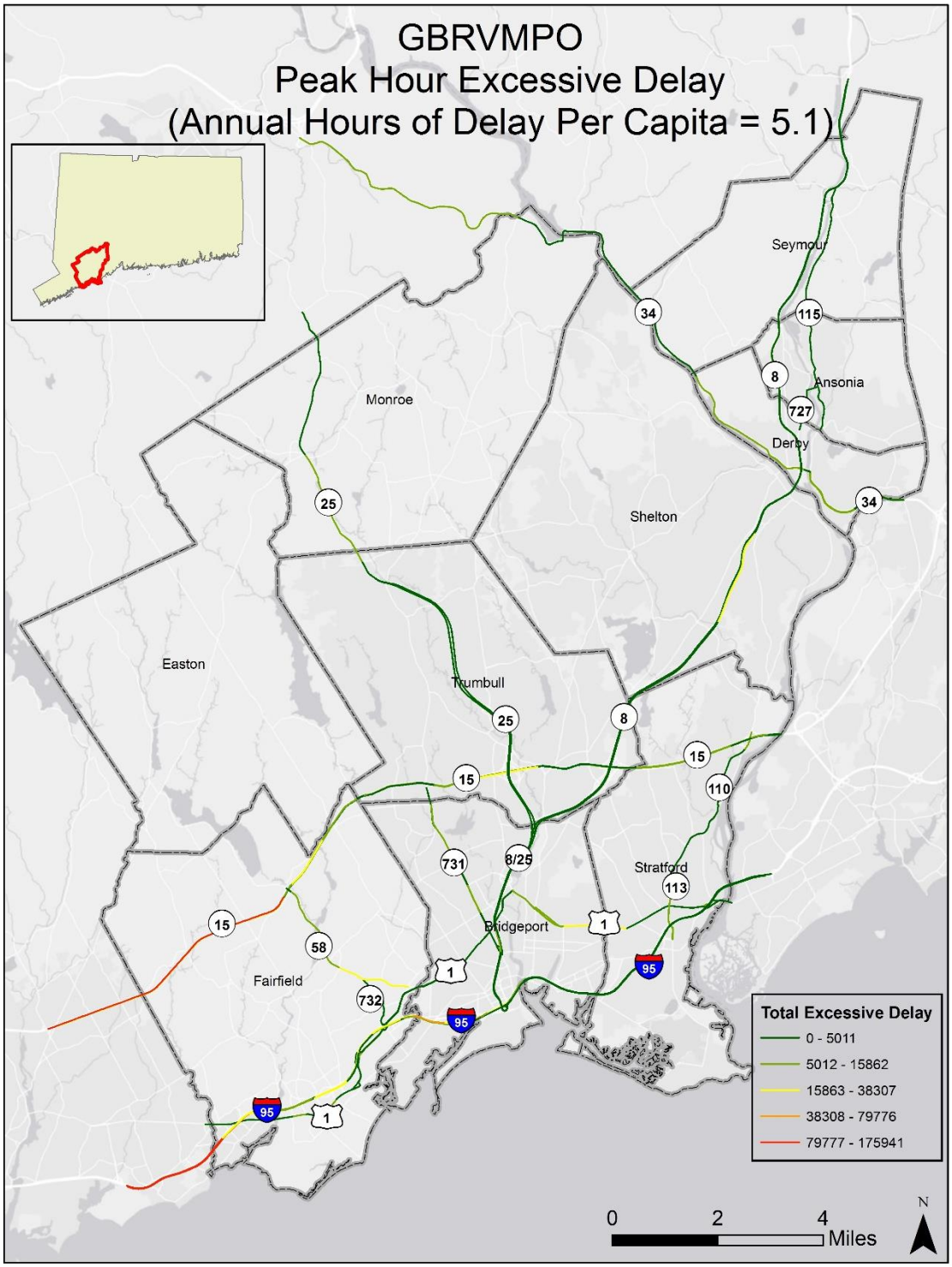


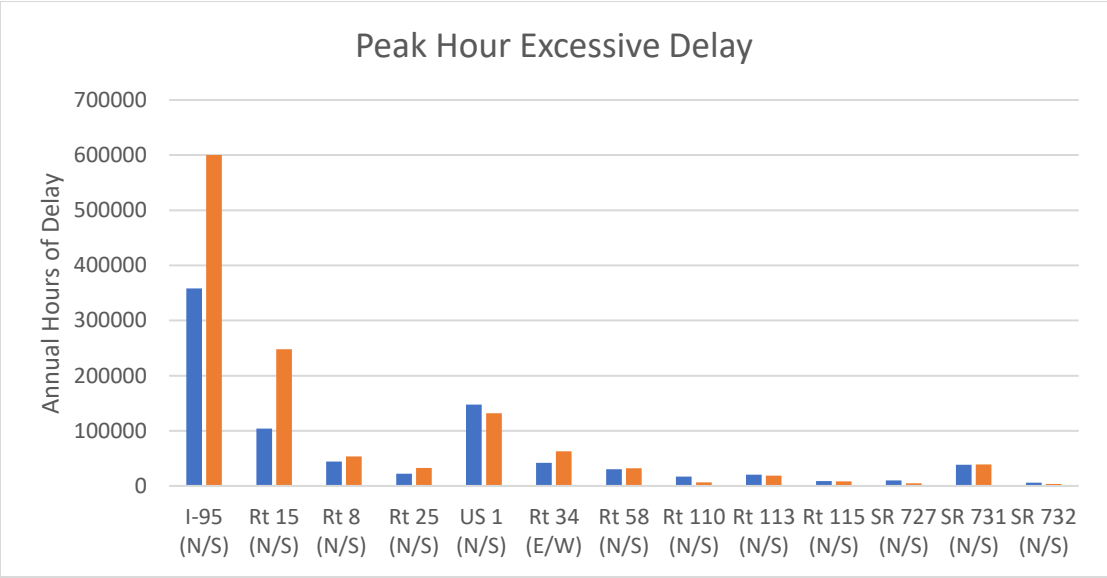
Figure 4.5: Peak Hour Excessive Delay

I-95 and Route15 account for 1,310,425 hours of delay annually, 62.7% of the total delay in the Region. US 1 also had 279,439 hours of delay, 13.3% of delay for the Region. Most of the delay on these

roadways occurred west of Route 8. The other 24% of delay in the Region were spread out over the remaining NHS segments (Table 4.6).

In the future, this metric will be compared across time.

Table 4.6: Peak Hour Excessive Delay



5.0 Strategies:

The Congestion Management Process is a data driven approach to develop strategies to mitigate congestion. The performance measures indicate that recurring and non-recurring congestion heavily impact the Region, especially in the western half. The following mitigation strategies are designed to improve travel in the Region that will improve the performance measures in the next CMP by

- Increasing Non-Single Occupancey Vehicle usage
- Increasing Level of Travel Time Reliability
- Increasing Truck Travel Time Reliability
- Decreasing Peak Hour Excessive Delay

The following strategies will be broken down into the four following categories.

- Demand Management Strategies
- Public Transportation Strategies
- Traffic Operations Strategies
- Road Capacity

These strategies can all be found with greater detail in the 2019 Greater Bridgeport and Valley Metropolitan Transportation Plan.

5.1 Demand Management Strategies:

These strategies can help reduce the number of vehicles on the roadway, especially during peak travel periods. These actions may not pertain to a specific section of roadway included in the CMP analysis but are rather more general practices that can be applied to the Region. The projects described below have been identified as strategies that align with promoting alternatives to SOV travel, such as:

- Encourage Access to Transit
- Trail Improvements
- Complete Streets and other Pedestrian Improvements

Encourage Access to Transit:

- Ash Creek Pedestrian Bridge will provide pedestrian access from Bridgeport's Black Rock Neighborhood to the Fairfield Metro Rail Station.
- These projects will improve access to the ferry, bus station and rail station in Downtown Bridgeport:
    - The Bridgeport Port Authority parking garage. BPA acquired the land needed to construct the garage from the adjacent power generating facility. The project will provide about 200 parking spaces for ferry customers at the dock with a pedestrian connection to the terminal building.
    - Bridgeport Intermodal Center project. Includes new Water Street dock access, enhanced signage/wayfinding, lighting, streetscape, harbor walk, pedestrian linkages, traffic calming, artwork, bicycle routes and renovations to rail station.

Trail Improvements:

Pequonnock River Trail

- A 3.3 mile bicycle path in Bridgeport between Beardsley Park and Seaside Park will improve access throughout the City and will also strengthen access to the bus station, rail station and ferry terminal.
- Linkages in Monroe and Trumbull will provide non-motorized access between commercial, recreational and residential areas.

Housatonic River Greenway

- A fully connected facility that runs through Stratford in a north-south alignment will include connections to Stratford Center (and the rail station), Roosevelt Forest, the Housatonic River, the East Coast Greenway, and other local points of interest.

Naugatuck River Greenway

Ansonia:

- The Ansonia Riverwalk Greenway will provide connections throughout Ansonia (along the Naugatuck River), to the downtown and to adjacent towns. Pedestrian & streetscape enhancements in downtown Ansonia will further improve connectivity within the Downtown and to the rail station.
- East Main Street pedestrian improvement project to formalize on-street parking, and improve pedestrian access and mobility throughout the East Main Street corridor.
- South Cliff / State Street Safety Improvement Project to improve pedestrian access and mobility in the State Street and South Cliff Street neighborhood.

Seymour:

- Construct pedestrian & streetscape enhancements in downtown Seymour; construct pedestrian bridge over the Naugatuck River at Tingue Dam.
- Connect sidewalks along Church Street from the Seymour Library to Route 67.

Shelton River Walk

- Widen Canal Street & install various pedestrian & bicycle facilities & amenities.
- Extend river walk along Canal Street West; construct pedestrian improvements on Wooster Street & provide connections into Riverview Park.
-

Other Trails

- A region-wide multi-use trail and bicycle route network will improve connectivity throughout the Region.
- A multi-use trail on Rt. 59, Centre Rd. and Morehouse Rd. in Easton will provide access to the Town Hall/Library, Staples Elementary school, and the Town Center. Students will have safe access from home to school by walking/biking.
- The RT 34-Derby Greenway Connection will connect the Derby Greenway to the Derby-Shelton rail station.

Complete Streets and Pedestrian Improvements

Complete Streets

- Easton Town Center (Rt. 59 at Center Rd.): pedestrian enhancements, bicycle facilities, streetscapes, ADA compliant features and traffic calming measures.
- Route 1 in Southport: combine confusing traffic islands by eliminating some access lanes, realign intersections, reduce excessive pavement width, consider bike lanes, and increase green infrastructure and landscaping. Includes streetscape, transit and pedestrian improvements. The

Town was recently awarded a Community Connectivity grant to jump start this long-term project. Recommendations were based on a 2017 Road Safety Audit.

- Implement Stratford's Complete Streets Plan for the Stratford Center area, as described in the Active Transportation section. Stratford.
- Other locations in Stratford that can benefit from a Complete Streets implementation including Honeyspot Road, Barnum Avenue (Route 1), Stratford Ave (Route 130) and Lordship Boulevard (Route 130).
- Trumbull: install traffic light at the intersection of Rt. 111 and Whitney Ave. Includes a Complete Street concepts with sidewalks to connect major commercial development to residential developments.

Other Pedestrian Improvements

- Bridgeport:
  - Short term and long term pedestrian enhancements throughout the City.
- Fairfield
  - Improve pedestrian/bicycle access, safety and visual appearance Grasmere Neighborhood covering Post Rd, Grasmere Avenue, Kings Highway East, and Post Road "jughandle." Recommendations were based on a 2017 RSA.
  - Kings Highway Pedestrian improvements: Continue previous project from Villa Ave. to Bridgeport city line.
  - Various bicycle and pedestrian improvements throughout Fairfield, based on the Town's Bicycle and Pedestrian Plan.
- Monroe & Trumbull:
  - Sidewalk construction and ADA improvements: Fill in the gaps in walks along the Rt 25 and Rt 111 commercial corridors. Includes a Complete Street Concept along Rt 111 to connect major business in Trumbull and Monroe with each other as well as additional access to PRT.
- Stratford
  - Route 110: Pedestrian and Bike Accommodation Improvements (Shared Use Path) in the area intersected by Route 15.
- Seymour:
  - Pedestrian Improvements at Main Street and Deforest Street to normalize grades between sidewalk and roadway.
  - Pedestrian and sidewalk Improvements on 67 and 313, including completing gaps in the section along Route 67 from the Oxford TL to about North Street.
- Shelton:
  - Construct downtown pedestrian & streetscape enhancements along Route 110 & Bridge Street
- Region:
  - Long-term pedestrian enhancements, traffic calming, Complete Streets improvements & ADA accessibility

5.2 Traffic Operations Strategies:

These strategies focus on improving functionality of the existing roadway.

Route 8

- Expand state Incident Management Systems to include Route 8; includes 24-hour monitoring, video surveillance, variable message signs & incident detection.

Route 25

- Access Management Program: Implement an access management program to consolidate, close or relocate commercial driveways along various sections of Route 25.

US 1

- Implement various traffic signal and intersection improvements to improve traffic flow while enhancing pedestrian safety and maintaining the current supply of on-street parking.
- Replace Traffic Control Signals in Various Locations

Route 58

- Implement recommendations for traffic operations from the Black Rock Turnpike Safety Study, as discussed in the Highways section.

Region

- Regional ITS improvements (highway and transit)

5.3 Public Transportation Strategies:

Improving public transportation will ideally increase the Non-SOV travelers and reduce demand on the road network.

Bridgeport – Port Jefferson Ferry

- Rehabilitate Ramp and Apron Area: Despite regular maintenance, the reinforced concrete decking of the ramp and apron is in a chronic state of disrepair. The planned project will rehabilitate and upgrade the ramp and apron structure using materials better suited for a marine environment and for high traffic volumes.
- High speed ferry terminal.

Waterbury Branch Line

- Construct new station building and waiting area with high level platforms and passenger amenities in Ansonia.
- Construct station area renovations, including rehabilitation of building, new commuter parking lot, bus bays & intermodal transfer point, information kiosk, high level platforms, accessible walkways and heated shelter in Derby-Shelton rail station.
- Relocate the Seymour Rail Station to north of Route 67 as part of TOD redevelopment project.
- Purchase three new locomotives and train sets (2 coaches + 1 push-pull) to operate on the WBL to expand service.
- Purchase four new locomotives and train sets (2 coaches + 1 push-pull) to operate on the WBL to replace old equipment.
- Operations: Expand service along the Waterbury branch line to provide 30-minute headways during the AM & PM peak periods.

New Haven Line

- –A second train station in East Bridgeport, Barnum Station.
- Continue state of good repair and improvements to the New Haven Main line, bridges and stations.
- Bridgeport Intermodal Center Improvements.
- Full Capacity New Haven Line Service
- Future Station Improvements for More Efficient Express Service to NYC

Greater Bridgeport Transit

- Continue optimizing services for GBT.
- Continue to replace fixed route buses (hybrid buses) and Paratransit Vehicles.
- Capital and Facility Improvements.

Other Transit

- New BRT-Like Service for Stratford and Bridgeport
- Real-Time Scheduling and Smart Card Fare Boxes
- Multimodal Fare Technology Improvements

5.4 Road Capacity Strategies:

These strategies alter the roadway to increase capacity. Such strategies are often expensive and include changes to road realignment, intersection improvements, and road widening.

Interstate 95

- CTDOT completed a high-level feasibility analysis of an additional travel lane for each direction of I-95 between Greenwich and Bridgeport, detailed in the "I-95 Improvements – Feasibility Evaluation Study (Greenwich to New Haven) Technical Memorandum." Based on this analysis, the study concluded that four travel lanes in each direction on I-95 between Bridgeport and Greenwich were feasible and practical. This could potentially alleviate recurring and non-recurring congestion on I-95.
- Stratford
    - Interchanges 31 and 32: These two interchanges are close together, with all ramps intersecting with local roads. To reduce the number of ramps and provide separation of the interchanges, consider consolidating these interchanges and relocating and constructing a new diamond interchange at Route 130. The new interchange would be located between the existing ramps.
    - Interchange 33: Reconstruct the partial interchange and replace it with a full-directional, diamond interchange. A new southbound off-ramp and northbound on-ramp would be constructed. Several local roads would be reconstructed and realigned to provide better access to I-95 from the adjacent commercial centers. Work would include additional lanes, turning lanes, minor widening and traffic signal improvements.

Route 15

- Fairfield, Interchange 46: The southbound ramps consist of short ramps segments, with the exiting movement along a tight radius loop ramp and the entering movement along a short on-ramp that is stop controlled. Complicating exiting and entering is the proximity of the slip ramps for the rest area located between the ramps. These ramps should be realigned, lengthened and, if possible, relocated to provide a more efficient connection with Congress Street and Route 59, as well as the service area. CTDOT and the Town have implemented low cost improvements on Rt 59 (minor signal improvements & lane reconfigurations) and CTDOT is considering improved signage for curves.
- Stratford, Interchange 53 -Intersection Improvements with Route 110, based on the Route 110 Planning and Engineering Study.

Route 8

- Bridgeport:
    - At the Split between Rt 8 and Rt 25: Three travel lanes carry Rt 25 north while only two handle Rt 8 traffic. Congestion occurs because of the higher traffic volumes on Rt 8. To facilitate diverging traffic, construct a third lane for Rt 8 northbound from the split to the vicinity of off-ramp to Rt 15.
    - Along the Southbound Approach to I-95: Reconstruct and modify the southbound approach I-95 project to eliminate the weave section created by the entrance to Rt 8/25 from Washington Ave followed by the exit to Myrtle Ave. The project would close the

on-ramp from Washington Ave and off-ramp to Myrtle Ave to eliminate the weave section and conflicts between entering, exiting and mainline traffic.

- Shelton:
    - Construct new SB on-ramp at Interchange 11; widen Bridgeport Avenue. Preliminary design completed.
    - Construct new SB on-ramp at Interchange 11; widen Bridgeport Avenue. Preliminary design completed.
    - Reconstruct and realign ramps at interchange 14 (RTE 110 and Kneen St.) and construct new SB on-ramp at interchange 14 from RTE 110; convert interchange to single-point urban interchange. Preliminary design completed.

- Derby:
    - Reconstruct interchanges 16 & 17; extend Pershing Drive & construct local roads. Preliminary design completed.

- Seymour
    - Realign SB lanes between Interchange 19 & 21; modify interchange. Preliminary design completed.
    - Construct new SB on-ramp at Interchange 22. Preliminary design completed.

Route 25

- Implement improvements recommended by the Route 25 and Route 111 Planning and Engineering Study, which are summarized in the Highway section in the Metropolitan Transportation Plan.

US Route 1

- Fairfield, Bridgeport and Stratford:
    - Provide lane continuity over its entire length by widening US Route 1 to a uniform four travel lanes with left turn lanes at signalized intersections.
    - Construct intersection improvements, including minor widening and installing turn lanes, at various locations.
- Fairfield:
    - Interchange 24 with Interstate 95: Reconstruct and reconfigure the southbound on-ramp and the northbound off-ramp and eliminate US Route 1 traffic circle.
    - Eliminate the Rt 1 and Rt 130 traffic circle and widen the westbound section to provide bi-directional travel. Realign to form a “T” intersection with Rt 1. A study to evaluate alternatives will begin in 2019.

Route 34

- Stevenson Dam Bridge**:** Currently, this project is in development to replace the Stevenson Dam Bridge, which was built in 1919. Because of the sharp curves along the approaches and the need to remove the bridge from the dam, the project would construct a new bridge upstream of the dam. This will eliminate the sharp curves in advance of the bridge and provide a straighter alignment.
- Reconstruct and widen Main Street from Bridge St. to Ausonio Dr. to 4 travel lanes

Route 58: Implement improvements recommended by the Black Rock Turnpike Safety Study, which are summarized in the Highway section in the Metropolitan Transportation Plan..

Route 110

- Stratford: Implement improvements recommended by the Route 110 Planning and Engineering Study, which are summarized in the Highway section in the MTP. A key recommendation was to realign the Sikorsky Gate #1 intersection to be directly opposite Oronoque Lane, which will be implemented in 2019. Currently, the three closely spaced intersections (Route 15 southbound ramps and Navajo Lane) cause congestion throughout the weekday peak hours resulting in the most congested portion of the corridor. By realigning the driveway, the traffic light at the driveway can be removed, since traffic at the intersection can be controlled by the Oronoque Lane traffic light.

- Shelton: Realign and improve intersections at Beardsley Road, School Street and Birdseye Road

6.0 Program and Implement CMP Strategies:

The CMP will be incorporated into the Greater Bridgeport and Valley Metropolitan Transportation Plan (MTP) and be used to prioritize projects. In future corridor planning studies, there will be an emphasis on congestion mitigation strategies. Currently, many of the CMP proposals have been derived through planning studies and we hope to continue to program short, medium and long term projects, as well as spot improvements with this process.

7.0 Monitor and Assess CMP Strategies:

In order to assess the effectiveness of the CMP and the resulting strategies, road conditions will need to be monitored. The Greater Bridgeport and Valley Region will continue to obtain NPMRDS data from RITIS and rerun LOTTR, TTTR, and PHED measures using the scripts created for this 2018 CMP. Now that the scripts have been created and the processes run for 2017, the MPO has a baseline that will be able to easily compare the measures to. As projects are completed the measures can be compared in the project area to gauge the effectiveness. In addition, the 2020 census will provide updated information in which to update the Non-SOV travel. In subsequent years, as the 5-year ACS is generated, the Greater Bridgeport and Valley Region will continue to calculate the Non-SOV travel in the Region.