CENTRAL MASSACHUSETTS

METROPOLITAN PLANNING ORGANIZATION

Worcester:
Route 12 (West Boylston Street)
Corridor Profile

May 2025

Document Prepared by:
Staff of the Central Massachusetts Metropolitan Planning Organization
1 Mercantile Street, Suite 520, Worcester MA 01608

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Executive Summary

The Worcester Route 12 Corridor Profile combines the information produced by the transportation Management Systems, analyzes performance-based data, suggests both operational and physical improvements, and identifies candidate projects for further study. Ultimately, a range of suggested improvement options have been compiled for consideration by the city of Worcester and the Massachusetts Department of Transportation (MassDOT), Highway Division. When local consensus is achieved, proposed improvement projects supported by the community eligible for federal-aid funding have the potential to be selected by the CMMPO for programming in the annual Transportation Improvement Program (TIP) document.

There are eleven (11) chapters included in this Corridor Profile. The highlights of each chapter are summarized below.

Chapter 1 (Introduction): Provides a description of the Route 12 study corridor as well as a list of observations and deficiencies at both the focus intersections and the overall corridor.

- The Route 12 study corridor is from the CSX/Genesee & Wyoming Railroad (GWRR) bridge to the West Boylston town line.
- While Route 12 is fairly heavily traveled with over 10,000 vehicles per day, it is not particularly congested with all focus intersections having a LOS of "C" or better.
- Route 12 has a four-lane cross section south of Brooks Street and mostly two lanes for the remainder of the study corridor.

Chapter 2 (Disadvantaged Populations): Gives an overview of the study corridor in relation to the disadvantaged populations that live in the area. Block group data is provided for the Census Tracts adjacent to the study corridor.

- Disadvantaged populations include low income, nonwhite, Limited English Proficiency (LEP), zero vehicle households, disabled, and seniors (65+).
- There are three (3) Census Tracts (7301, 7302, 7303) adjacent to the Route 12 study corridor.
- The three (3) main disadvantaged populations block groups adjacent to Route 12 are nonwhite, low income, and LEP.

Chapter 3 (Environs): Contains major features of the natural environment which are shown on various maps. The data includes open space, wetlands, impaired waters, wellhead protection, areas, vernal pools, rare species habitats, and flood zones.

- There are minimal wetlands, vernal pools, rare species habitats, or flood zones near the study corridor.
- There are no culverts located along the study corridor. However, there are numerous drainage catch basins to allow stormwater to drain off the roadway.

In **Chapter 4** (CMP): Congestion Management is discussed and includes a range of data such as traffic volumes, travel times & delays, existing peak hour intersection volumes, heavy vehicle percentages, and projected future volumes, including a summary and analysis of the Saint Gobain site's planned redevelopment.

- Average travel speeds along the corridor are between 20 mph to 25 mph during AM and PM peak periods.
- Heavy vehicles at the focus intersections average 3.3% in the AM peak period and 2.1% in the PM peak period.
- Additional know growth is summarized, which includes the planned redevelopment of the Saint Gobain site between New Bond Street and Brooks Street.

Chapter 5 (Safety): Includes a crash data analysis for the Route 12 study corridor for the years 2019-2021.

- There was a total of 189 crashes during the three-year study period.
- 32.8% were angle crashes and 31.2% were rear-end crashes.
- The intersection with the highest number of crashes was at East & West Mountain Street, with a total of 26.

Chapter 6 (Pavement): Contains an analysis of the Route 12 pavement assessment that was completed for this study. It summarizes the current condition of the pavement along the study corridor.

- The Route 12 study corridor was observed to be either in "fair" or "poor" condition.
- Observed pavement distresses along the corridor included surface wear potholes, rutting, bleeding, distortions, and alligator cracking of various levels.

Chapter 7 (Bridges): Discusses the three (3) bridges on Route 12 within the study corridor while also providing a brief description.

- The Route 12 northbound bridge over CSX/GWRR is structurally deficient.

Chapter 8 (Public Transit): Provides a summary of the existing WRTA transit services along the corridor as well as a future outlook. A summary of existing rideshare services data is also included.

- WRTA fixed-route bus Routes 14, 30, and 31 serve the Route 12 study corridor.

- There are numerous bus stops along Route 12 with the highest boardings at New Bond Street, Brooks Street, Quisigamond Community College (QCC), and Vendora Street.
- In 2023, there were over 1.7 million rideshare trips originating and ending in Worcester.

For **Chapter 9** (Bicycle, Pedestrian, & Micromobility): The MassDOT Complete Streets Program is summarized and bicycling, pedestrian facilities, regional trails, and micromobility are also discussed.

- There are no dedicated bicycle lanes in the study corridor. In Worcester's Mobility Action Plan, the Route 12 corridor was identified for future bike and micromobility network improvements.
- There are sidewalks of varying widths on both sides of the street for most of the study corridor. Also, the sidewalks were found to be mainly in fair to good condition.
- There are no regional or local trails near the study corridor.

Chapter 10 (Overall Corridor Profile Findings): Contains a summary of all the data findings discussed in the previous chapters related to the focus intersections, roadway segments, and performance management.

Chapter 11 (Suggested Improvements): Provides a comprehensive listing of proposed suggested improvements for the Route 12 study corridor for consideration by both the city and MassDOT.

- As included in Worcester's Mobility Action Plan, expand bicycle and micromobility infrastructure on Route 12.
- Improve pavement throughout the entire study corridor.
- Improve the New Bond Street intersection to mitigate impacts of the planned redevelopment at the Saint Gobain site.

1.0 Introduction

A Corridor Profile combines the information produced by the transportation Management Systems along a particular highway corridor, sometimes in multiple host communities, and analyzes performance-based data, suggests both operational and physical improvements, and often identifies candidate projects for further study.

Utilizing the range of data and analyses produced by the ongoing transportation Management Systems maintained by the staff of the Central Massachusetts Regional Planning Commission (CMRPC) and overseen by the Central Massachusetts Metropolitan Planning Organization (CMMPO), Corridor Profile efforts allow for comprehensive integration through the consideration of a broad range of key transportation planning factors.

Ultimately, a range of suggested improvement options are compiled for the consideration of the host communities and the Massachusetts Department of Transportation (MassDOT), Highway Division. When local consensus is achieved, proposed improvement projects supported by the community eligible for federal-aid funding have the potential to be selected by the CMMPO for programming in the annual Transportation Improvement Program (TIP) document.

As the Corridor Profile study series has evolved, it has become increasingly multi-modal and intermodal. The Management Systems have also served as the foundation for the full consideration of performance-based planning. Performance-based planning seeks to measure the value of investments made in the region's transportation infrastructure. US DOT's required national focus areas include reducing congestion, improving pavement, reducing vehicle crashes and, in the spirit of the state's Complete Streets Program, increasing the use of other modes such as transit, bicycling, and walking.

The Route 12 Corridor Profile includes the analysis and interpretation of Management System data, which includes the following:

Traffic Counting: Daily Automatic Traffic Recorder (ATR) counts and MassDOT Highway Division count data.

Congestion Management Process (CMP): Current Travel Time & Delay studies along Route 12; current peak-hour Turning Movement Counts (TMC) at focus intersections and associated Level-of-Service (LOS) analyses for intersections.

Freight Planning: Peak hour percentages of heavy vehicles utilizing the Route 12 focus intersections.

Transportation Safety Planning Program: In-depth vehicle crash research using crash data provided by MassDOT, utilizing a three-year history of reported crashes and subsequent analysis.

Pavement Management System (PMS): Observation of pavement surface distress and extent in the field along with subsequent analysis and calculated Overall Condition Index (OCI).

Bridge Management System (BMS): Bridge condition data available through MassDOT Highway Division; GIS-based inventory of major roadway drainage structures, such as culverts, as well as staff observations in the field using standardized condition assessment techniques.

1.1 Performance Management

Reaffirmed by the Bipartisan Infrastructure Law (BIL), the CMMPO is continuing the evolution of the development of performance-driven, multimodal TIP projects in the planning region. Performance Based Planning & Programming (PBP&P) is intended to improve public transparency, fiscal accountability, and investment decisions affecting the condition and performance of the nation's transportation system.

The CMMPO's evolving Performance Management program includes both federal transportation performance management requirements as well as the MPO's regionally customized measures. The goals and objectives are then integrated through numerous Federal Transportation Planning Emphasis Areas. The areas are safety, security, state of good repair, congestion, multimodality, sustainability, geographic equity, economic vitality, stormwater management & resiliency, and travel & tourism. Using the goals and objectives from the above Emphasis Areas, a Performance Measures Scoresheet was created to assess both currently programmed and candidate future-year TIP projects to determine to what extent they address the regional goals. Those projects that rank high often provide substantive measurable outcomes for each goal, and thus have an increased regional impact.

The findings from this Corridor Profile Report resulted in the compilation of a list of suggested improvement options. Ideally, these suggested improvements will encourage a TIP project that can positively influence regional performance. A table integrating the suggested improvements and how they can realistically support the goals and objectives for each federal emphasis area is included in the Overall Findings chapter of this report.

1.2 Route 12 Corridor Profile: Worcester

The Route 12 Corridor Profile was completed as part of CMRPC's Unified Planning Work Program (UPWP), as this corridor was previously suggested by City of Worcester officials. The Management Systems data was collected and analyzed to enable Worcester to use the findings

to pursue future roadway improvements along the Route 12 corridor. Route 12 is classified as a minor arterial for the entire study corridor, and it is a federal-aid roadway eligible for US DOT improvement funding. Since the corridor is somewhat heavily traveled, the goals of this Corridor Profile effort include improving roadway safety, reducing congestion, preserving and improving roadway pavement, maintaining drainage structures as well as improving the roadway to accommodate all users. The Route 12 study corridor is shown in **Figure 1** along with other significant aspects of the region's multi-modal transportation network, including long distance trails and railroad lines.

The study limits of this Corridor Profile are between the CSX/Genesee & Wyoming Railroad (GWRR) bridge and the West Boylston town line. Route 12 is known as West Boylston Street for most of the study area and is called State Road from just south of I-190 to the West Boylston town line. Heading south, Route 12 travels through Worcester and continues through Auburn, Oxford and Webster and into Connecticut. Heading north, Route 12 travels through West Boylston and into the Montachusett Regional Planning Commission (MRPC) community of Sterling. Within the study area, Route 12 is a four-lane roadway between the CSX/GWRR bridge and the Brooks Street intersection, here dropping to two lanes essentially for the remainder of the study area except at the channelized intersection at the I-190 ramps which again provides a four-lane cross section. Route 12 hosts a mix of commercial, industrial, and residential land uses. In addition, Quinsigamond Community College (QCC) is located on the east side of Route 12 between Brooks Street and E&W Mountain Streets.

The study segment of Route 12 is 2.9 miles in length. Most of Route 12 is maintained by the City of Worcester except at the I-190 intersection, which is maintained by MassDOT. According to MassDOT's Roadway Inventory File (RIF), Route 12 has a right-of-way width of 65 feet except between the CSX/GWRR bridge and Andover Street, which is 75 feet in width.

WORCESTER ROUTE 12 CORRIDOR PROFILE

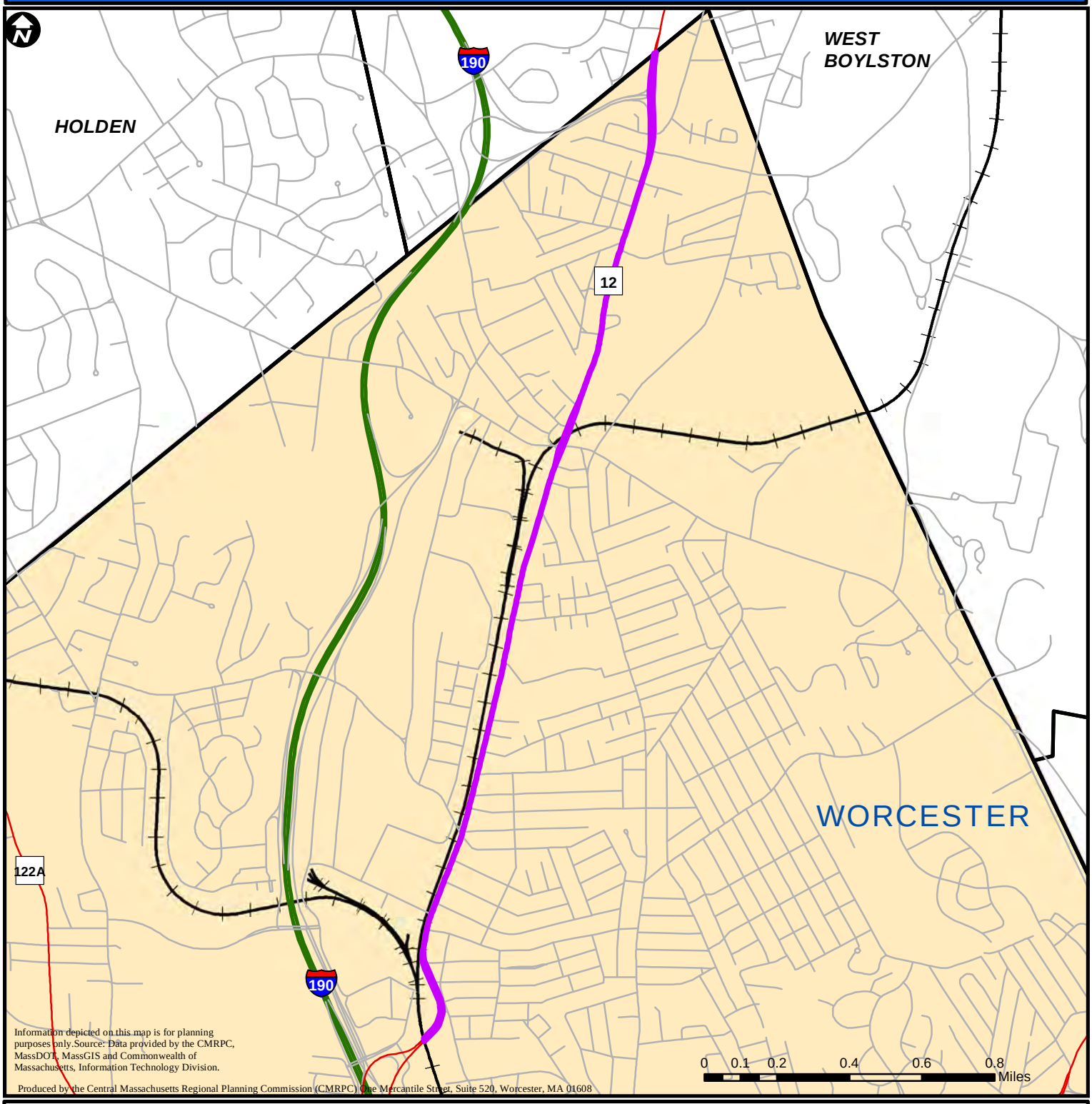

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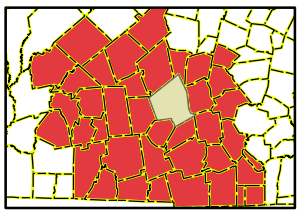
Figure 1: Corridor Profile Study Area

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- New England Rail Roads



1.3 Corridor Profile Work Activities Defined in UPWP

This Corridor Profile effort has been completed as part of the CMMPO's Unified Planning Work Program (UPWP). The following provides an overview of the major tasks that were included within the defined scope of the Route 12 Corridor Profile effort:

- CMRPC coordination on an entire range of Corridor Profile aspects including data collection and analysis.
- Vehicle crash analyses were completed using MassDOT-maintained vehicle crash data.
- Completion of an "Environmental Profile" for the entire Route 12 study corridor in the City of Worcester. This consists of GIS-based maps featuring overlays developed by the Massachusetts Department of Conservation & Recreation (DCR), the Massachusetts Department of Environmental Protection (DEP), the National Heritage & Endangered Species Program (NHESP), and flood zones.
- Range of suggested improvement options compiled for host community consideration.
- Preparation of report document, complete with color graphics and maps, along with accompanying Technical Appendix.
- If needed, attend meetings with host community officials involved in the study effort.

1.4 Route 12 Observations & Existing Deficiencies

The following observations and existing deficiencies, also shown in **Figure 2**, were summarized for the entire length of the Route 12 study corridor:

<u>Route 12/Bourne Street Intersection</u>

- Bourne Street is a one-way street entering the intersection.
- Observed Level of Service (LOS) was a "B" in the AM and "A" in the PM.
- Thirteen (13) total crashes between 2019-2021.

<u>Route 12/New Bond Street Intersection</u>

- Active CSX freight railroad tracks close to Route 12 on New Bond Street.
- Abby Kelley Foster High School & Charter Public School are located on New Bond Street.
- Redevelopment of St. Gobain (formerly Norton Company) site currently underway.
- Observed Level of Service (LOS) was a "B" for both AM and PM.
- Three (3) total crashes.

Route 12/Brooks Street/Greendale Avenue/Airlie Street Intersection

- CSX railroad tracks are located above Brooks Street near the intersection. Limited width of both Brooks Street travel lanes as divided by the CSX railroad bridge support pier.
- Airlie Street is one-way away from the intersection.
- Route 12 northbound cross section drops from two lanes to one lane in each direction.
- Observed Level of Service (LOS) was a "C" for both AM and PM.
- Ten (10) total crashes.

Route 12/QCC Intersection

- Observed Level of Service (LOS) was a "A" for both AM and PM.
- Five (5) total crashes.

Route 12/E & W Mountain Street Intersection

- Mountain Street left turns from both approaches observed to be difficult during heavy traffic.
- Observed Level of Service (LOS) was a "C" for both AM and PM.
- Twenty-six (26) total reported vehicle crashes.

Route 12/Walgreens/Stop & Shop Intersection

- Sidewalk gaps observed in the field on the northbound side of roadway.
- Observed Level of Service (LOS) was a "A" in the AM and "B" in the PM.

Route 12/I-190 Ramps

- Large multi-lane channelized signalized intersection.
- Roadway cross section drops from two lanes to one lane traveling north.
- Observed Level of Service (LOS) was a "B" for both AM and PM.
- Two (2) total crashes.

Corridor-Wide Observations & Deficiencies

- While Route 12 is fairly heavily traveled with over 10,000 vehicles per day, it is not particularly congested with all focus intersections having a LOS of "C" or better.
- The Route 12 study corridor is under regulatory speed limits of 30 mph and 35 mph depending on the segment, rather than the citywide 25 mph statutory speed limit.
- Observed traffic flows include a significant number of large trucks, ranging from 7% to 21% daily on Route 12 within the study area.

- A total of 189 reported vehicle crashes occurred on Route 12 within the study area during the three (3) year period of 2019, 2020 and 2021. Over 60% were either angle crashes or rear end type crashes.
- Bus Routes 14, 30, and 31 are three Worcester Regional Transit Authority (WRTA) fixed-route bus routes that travel on at least a portion of the Route 12 study corridor.
- Route 12 southbound has sidewalks along the entire length of the study corridor. Route 12 northbound provides sidewalks for most of the study corridor, however, a number of gaps in sidewalk connectivity exist north of Mountain Street.
- Limited bicycle infrastructure observed along the Route 12 study corridor.
- Crosswalks and ADA ramps are located at all seven (7) focus intersections.
- Numerous stormwater drainage basins along the study corridor.
- Pavement condition observed to range from “fair” to “poor”.
- Route 12 has a four-lane cross section south of Brooks Street and mostly two lanes for the remainder of the study corridor.
- Numerous overhead municipal streetlights were observed along the Route 12 corridor.
- There are some areas of overgrown vegetation along sidewalks.

WORCESTER ROUTE 12 CORRIDOR PROFILE

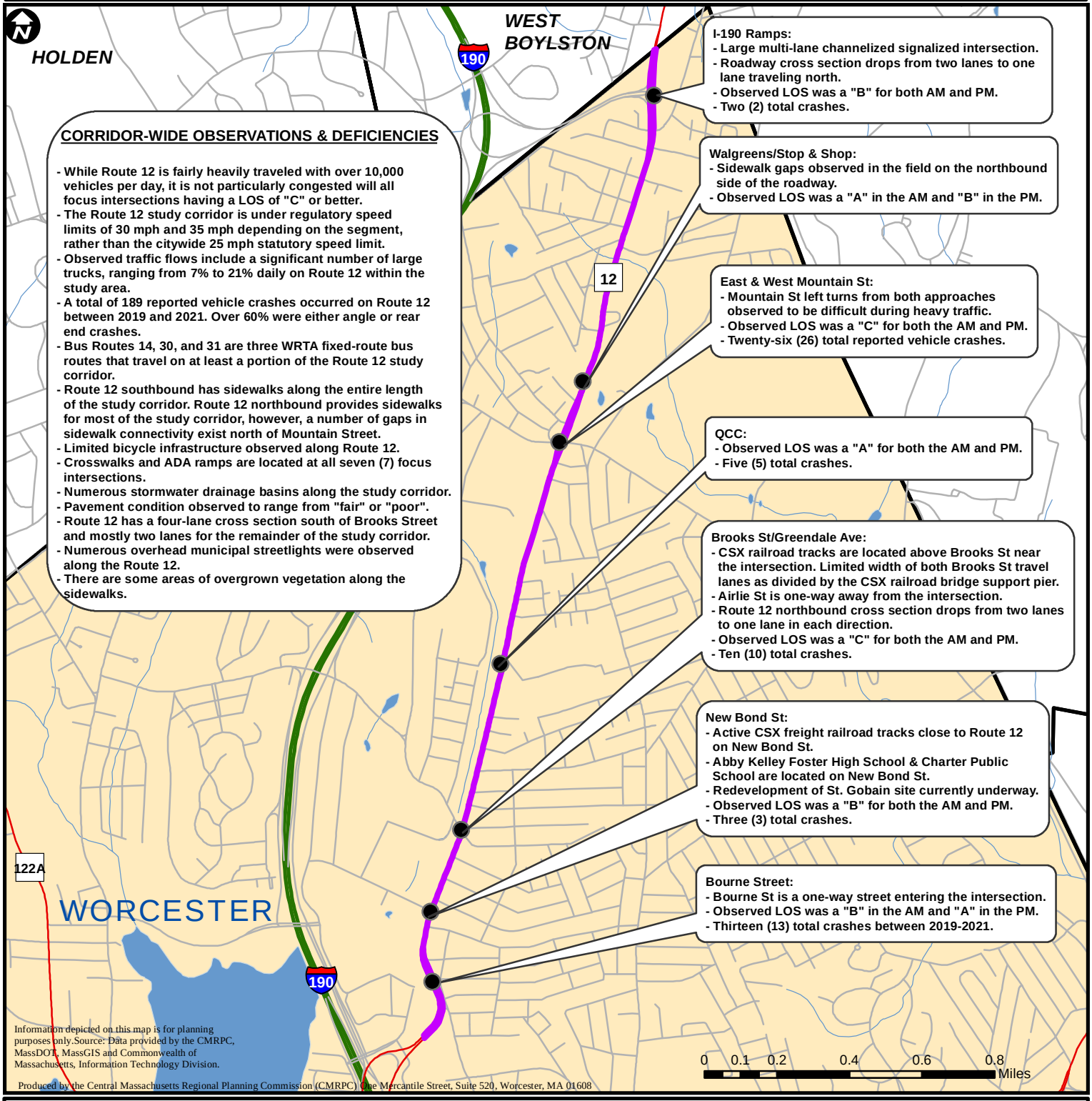


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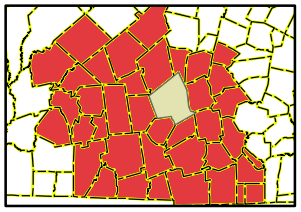
Figure 2: Observations & Deficiencies

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- Streams
- Water Bodies



2.0 Disadvantaged Populations Overview & Analysis

This chapter gives an overview of the Route 12 study corridor in relation to disadvantaged populations and other data from the American Community Survey (ACS). As all populations should have access to the Route 12 study corridor, it is important to know which populations live along the corridor to allow for focused public outreach should any improvements be planned for implementation in the future.

2.1 Route 12 Corridor Analysis

As for the disadvantaged populations, there are six types that are part of this analysis. They are:

- **Low Income (income)**: Annual median household income.
- **Race & Ethnicity (nonwhite)**: Percent of individuals that identify as Hispanic or Latino; Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian or Other Pacific Islander; Some other race; or Two or more races and do not identify as White alone.
- **Limited English Proficiency (LEP)**: Percent of households with LEP speaking members.
- **Car Ownership (zvhh)**: Percent of households without an available vehicle.
- **Disability**: Percent of households with one or more persons with a disability.
- **Age (senior)**: Percent of individuals aged 65 or older.

Using block group data, the most dominant disadvantaged populations within each Census Tract are shown on **Figure 3**. The map shows that there are three main types of disadvantaged populations along and near the Route 12 corridor. They are nonwhite, low income, and LEP populations. Although the block groups are simply showing the most dominant disadvantaged populations, some of the block groups do contain more than one disadvantaged population. In Census Tract 7301, the most dominant population are nonwhite within two block groups. In one of the block groups the threshold is also met for LEP. In Census Tract 7302, there are two block groups with disadvantage populations. One block group shows LEP as the dominant population but also includes low income, nonwhite, and zero vehicle households. Senior populations are dominant in the second block group, which also includes low income, nonwhite, and LEP. Lastly, Census Tract 7303 has two block groups with disadvantaged populations. The first meets only LEP while the second meets both low income and zero vehicle households.

WORCESTER ROUTE 12 CORRIDOR PROFILE

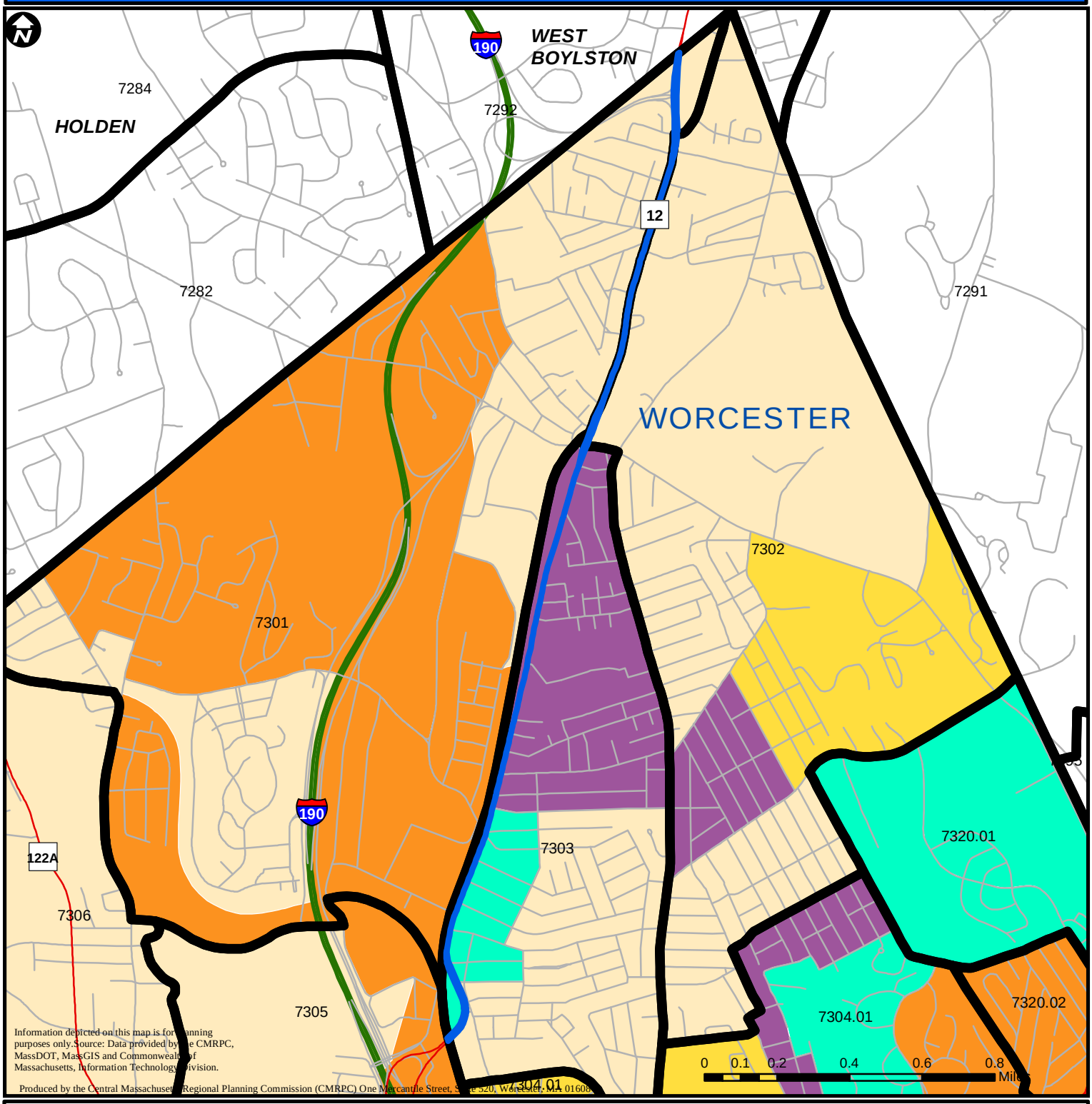


Figure 3: Disadvantaged Population Areas

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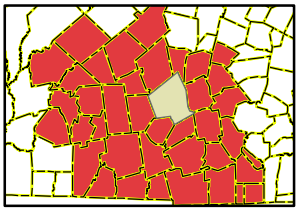
- Route 12 Corridor Profile
- CENSUS2020TRACTS
- Other Roads
- Interstate
- State Route
- US Highway
- MDF: disability
- MDF: income
- MDF: lep
- MDF: nonwhite
- MDF: senior
- MDF: zvhh



In addition to the disadvantaged population areas shown previously in **Figure 3**, the map also includes the 2020 Census Tracts. Using the three Census Tracts (7301, 7302, 7303) that border the Route 12 study corridor, staff used available demographic data to complete an analysis. **Table 1** includes various demographics from the 2022 American Community Survey (ACS) data comparing the three Census Tracts bordering the study corridor.

Table 1 – American Community Survey (ACS) Census Tract Demographics

Category	Census Tract 7301	Census Tract 7302	Census Tract 7303
Total Population	6,973	6,912	5,450
Primary Language			
English	4,788	4,756	4,195
Spanish	674	898	333
Indo/Europe	353	491	368
Asian/Pacific	398	38	292
Other	537	260	111
Commuting			
Drove Alone	71.9%	73.2%	73.0%
Carpooled	13.5%	12.1%	17.6%
Public Trans	2.9%	0.5%	1.9%
Walked	0.0%	0.0%	1.0%
Other	1.3%	0.0%	1.6%
At Home	10.4%	14.2%	4.9%
Travel Time to Work			
<10 Minutes	12.8%	9.6%	24.8%
10-14 Minutes	11.2%	13.4%	22.2%
15-19 Minutes	13.8%	28.1%	14.8%
20-24 Minutes	12.1%	13.5%	10.1%
25-29 Minutes	6.3%	7.2%	6.8%
30-34 Minutes	13.9%	7.7%	6.9%
35-44 Minutes	7.3%	2.4%	6.2%
45-59 Minutes	9.5%	5.2%	0.0%
>=60 Minutes	13.1%	12.9%	8.2%
Disability Percentage	15.2%	14.7%	10.4%
Median Age	38.4	41.8	39.2

As shown in the table, the Census Tract with the highest population is 7301, with a total of 6,973. The primary language for all three Census Tracts is English and the highest commuting types are driving alone and carpooling. Both Census Tracts 7301 and 7302 have at least 10% of people working at home. The travel time to work data shows that the highest percentage in Census Tract 7301 is 30 to 34 minutes, which is 13.9%. In Census Tract 7302, the highest percentage is 28.1%, which is a travel time between 15 and 19 minutes. For Census Tract 7303,

the highest percentage is for a travel time less than 10 minutes, which is 24.8%. Disability percentages range from 10% to 15% and the median age is between 38 and 42 years.

2.2 Performance Management

The Performance Measure emphasis area related to this chapter is Geographic Equity. Geographic Equity is a regionally customized measure within the CMMPO. The goal of the Geographic Equity measure is to ensure that improvements are fairly distributed among all populations, communities, and subregions.

1. **Geographic Equity**: The first measure under Geographic Equity is to have an equitable distribution of TIP projects within the communities and the region. Any improvement projects that result from this Corridor Profile study will contribute to this measure for the Central subregion, which is the City of Worcester. It is also important that any future year roadway improvements benefit all populations within the Route 12 study corridor, especially the nearby disadvantaged populations.

   The second measure is to increase the percentage of disadvantaged populations that can access fixed route transit. As there are three (3) WRTA bus routes that serve the study corridor, the nearby disadvantaged populations lend support to this measure.

3.0 Route 12 Environs

3.1 Natural Environment

Major features of the natural environment were identified as part of the Route 12 Corridor Profile effort and were used to create Environmental Profile maps for the greater study area. Such maps are compiled to view major environmental systems beyond the focus roadway that have impacts on such concerns as drainage, water quality and wildlife migration. Further, most of the study area is located within the Blackstone River Watershed while the northern part of the study area (north of Tyson Road) is within the Nashua River Watershed.

The following Environmental Profile Maps produced for the Route 12 Corridor Profile study include environmental features such as open space, wetlands, impaired waters, wellhead protection areas, vernal pools, and flood zones. Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year. Under the Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waterways. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop a Total Maximum Daily Load (TMDL) for these waters. A TMDL is the calculated limit of the maximum amount of pollutant that a waterbody can receive daily and still safely meet water quality standards. A wellhead protection area is that area of an aquifer which contributes water to a given well under the most severe pumping and recharge conditions that can be realistically anticipated. Vernal pools are small, shallow ponds characterized by lack of fish and by periods of dryness.

These maps of the study area showing major environmental features were compiled from the following key resources:

<u>Department of Conservation and Recreation (DCR)</u>

The DCR manages state parks and oversees more than 450,000 acres of land holdings throughout Massachusetts. The mission of the DCR is to protect, promote and enhance the state's wealth of natural, cultural, and recreational resources. The health and happiness of people across Massachusetts depends on the accessibility and quality of our natural resources, recreational facilities, and great historic landscapes. DCR continues to improve the vital connection between people and the environment. Using the DCR data, **Figure 4** includes the recreation, conservation, and water supply protection areas near the Route 12 study corridor. As shown, there are two small recreational areas near Route 12. One is on the western side of Route 12 at the Brooks Street intersection while the second is on the eastern side, just south of

Mountain Street. It should also be noted that there are athletic fields that are used for recreation activities on the Quinsigamond Community College (QCC) campus.

WORCESTER ROUTE 12 CORRIDOR PROFILE

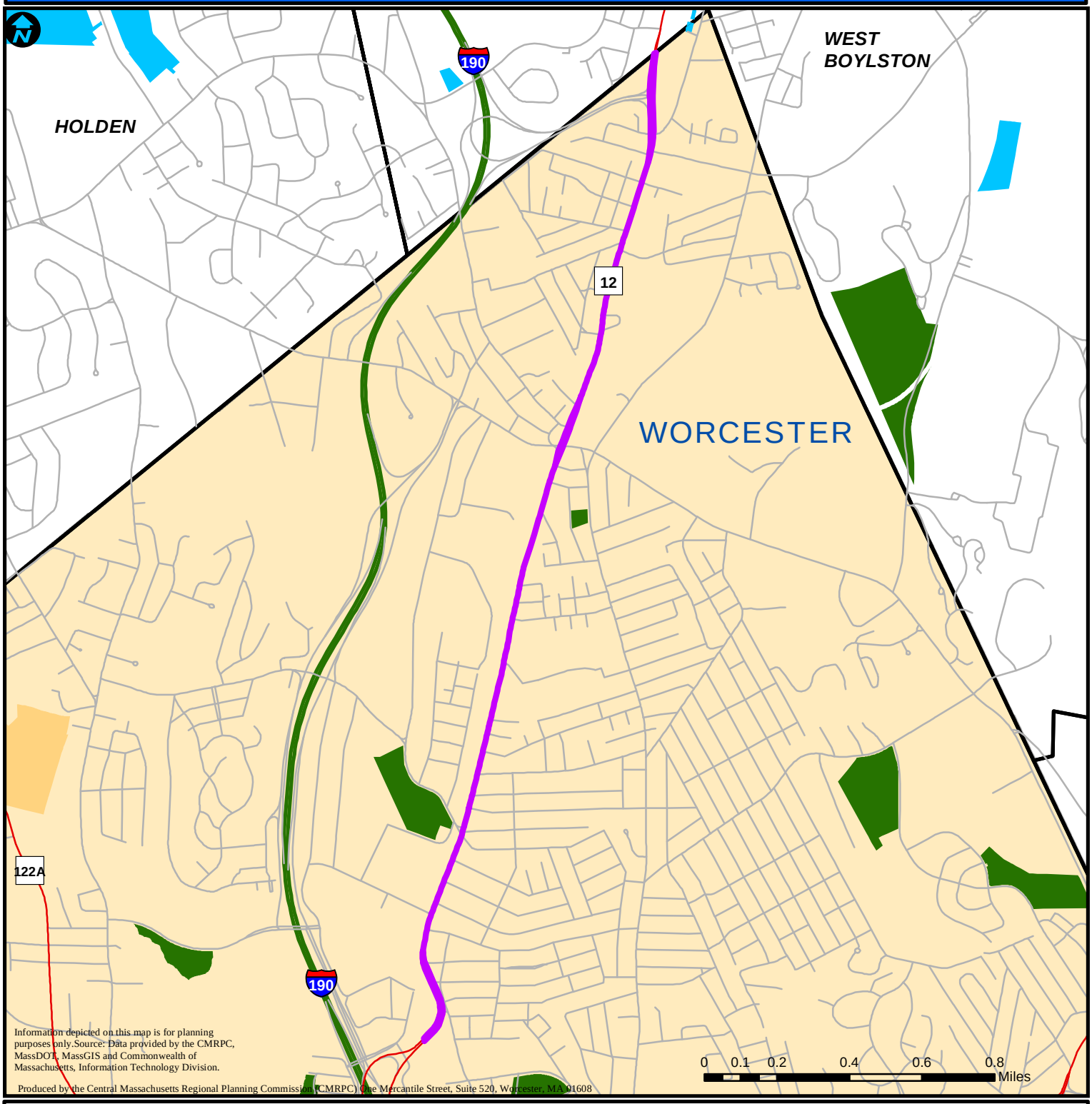
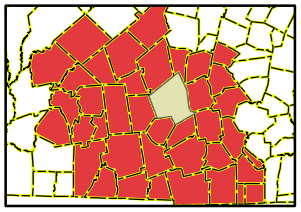


Figure 4: Open Space

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- Recreation/Conservation
- Conservation (Non Facility)
- Recreation (Facility Based)
- Water Supply Protection



Department of Environmental Protection (DEP)

MassDEP's mission is to protect and enhance the Commonwealth's natural resources – air, water, and land – to provide for the health, safety, and welfare of all people, and to ensure a clean and safe environment for future generations. In carrying out this mission, MassDEP commits to address and advance environmental justice and equity for all people of the Commonwealth, provide meaningful, inclusive opportunities for people to participate in agency decisions that affect their lives; and ensure a diverse workforce that reflects the communities they serve.

The types of data from DEP include watersheds, wetlands, impaired waterbodies, and wellhead protection areas. As **Figure 5** shows, there are minimal wetlands along the Route 12 study corridor with most located near the West Boylston town line, near the I-190 intersection. **Figure 6** shows the impaired waters and wellhead protection areas. According to the map, the closest impaired water body is Worcester's Indian Lake, located southwest of the study corridor. There is also a wellhead protection area to the east of the study corridor near the West Boylston/Shrewsbury town lines.

WORCESTER ROUTE 12 CORRIDOR PROFILE

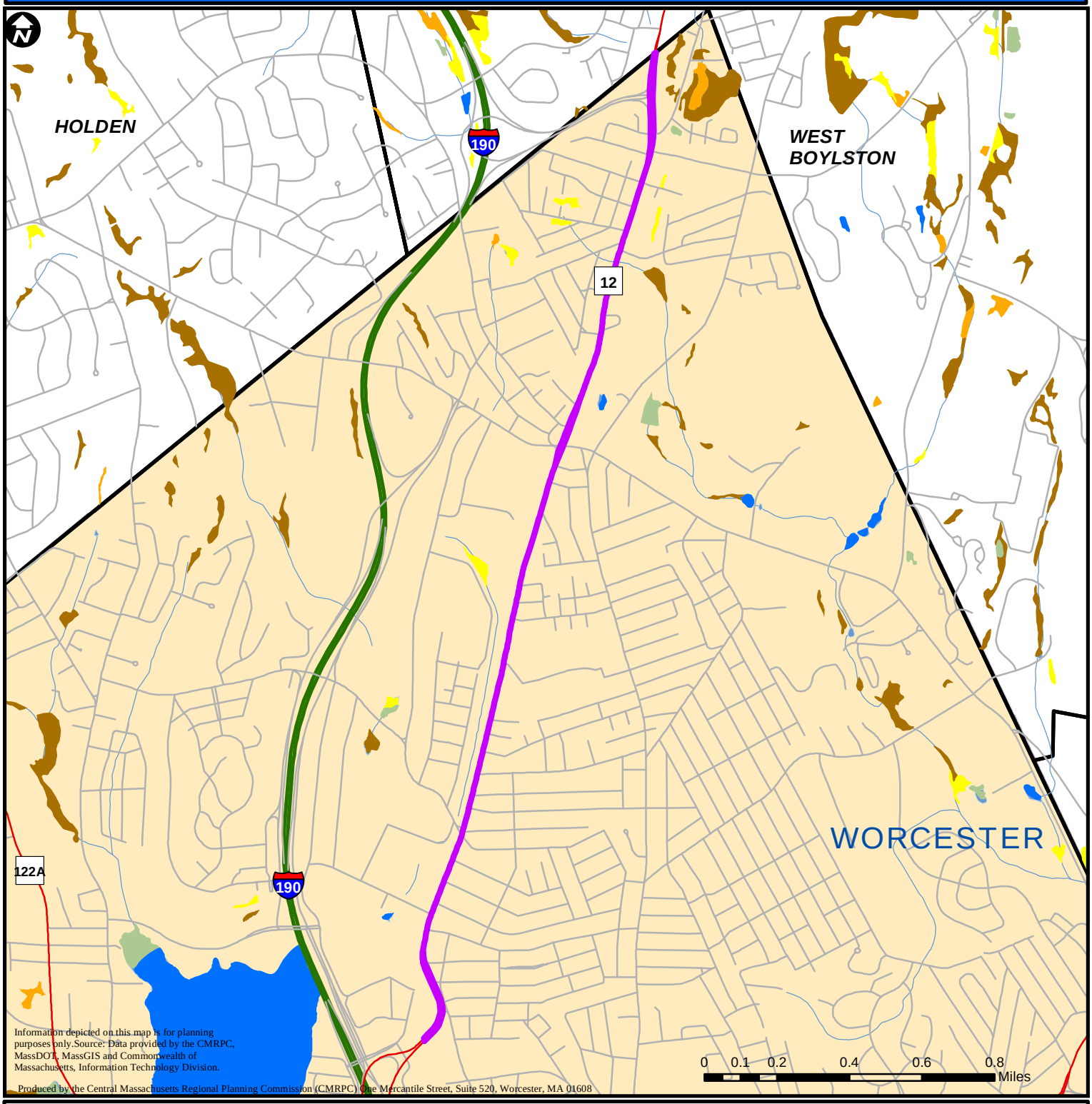
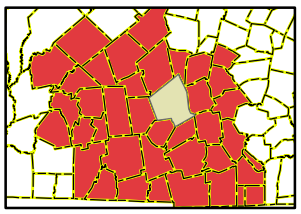


Figure 5: Wetlands

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- Water Bodies
- Streams
- OPEN WATER
- BOG
- DEEP MARSH
- SHALLOW MARSH
- SHRUB SWAMP
- WOODED SWAMP



WORCESTER ROUTE 12 CORRIDOR PROFILE

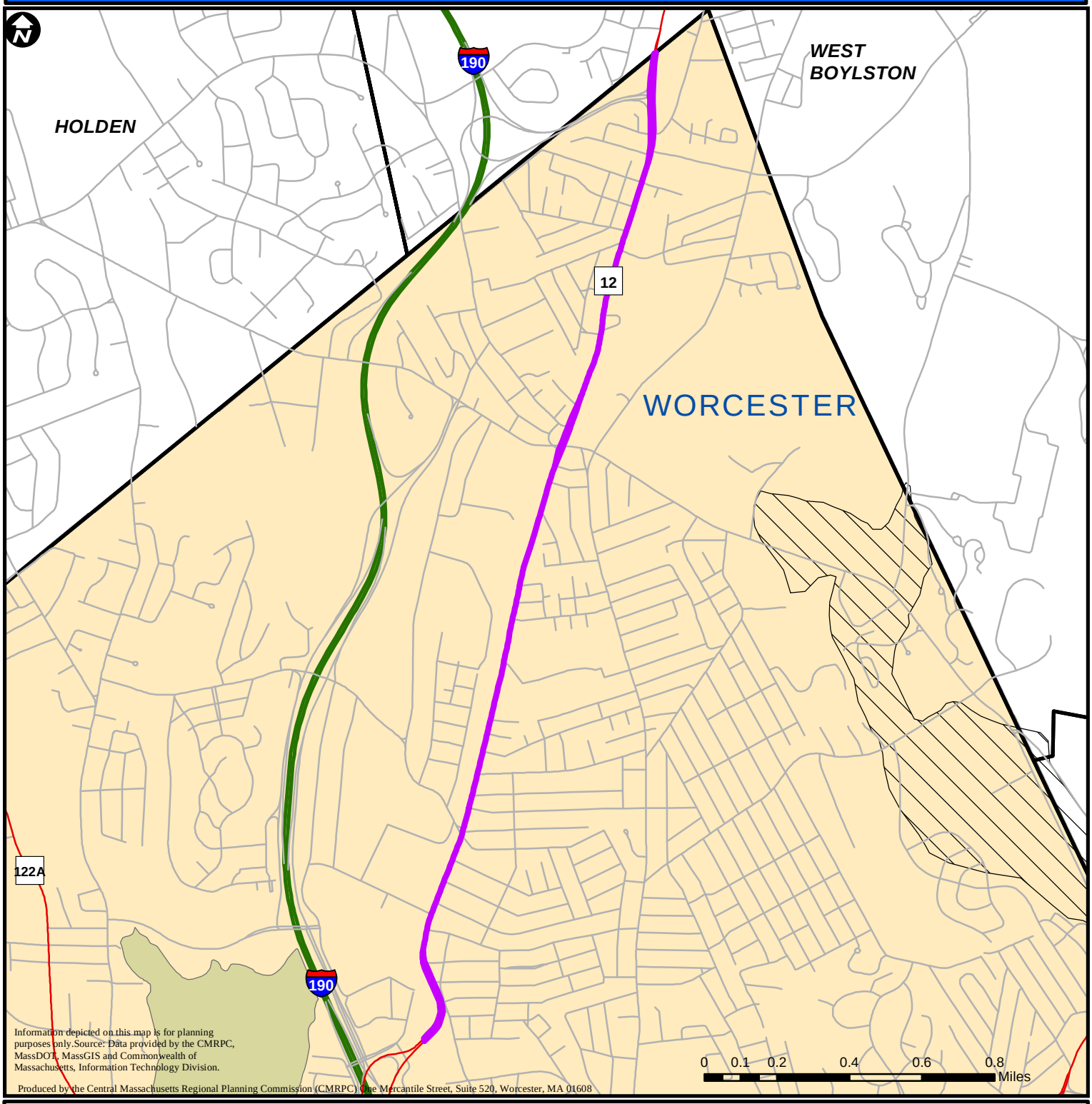
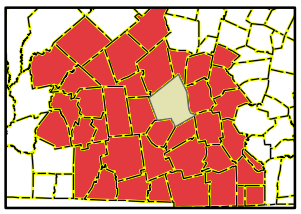


Figure 6: Impaired Waters & Wellhead Protection Areas

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- Wellhead Protection Area
- Attaining Some Uses
- No Uses Assessed
- A TMDL is Completed
- Impairment not Caused by a Pollutant
- Waters Requiring a TMDL



National Heritage & Endangered Species Program (NHESP)

MassWildlife's NHESP is responsible for the conservation and protection of hundreds of species that are not hunted, fished, trapped, or commercially harvested in the state, as well as the protection of the natural communities that make up their habitats. Priority habitats of rare species can either be plants or animals. **Figure 7** includes the vernal pools and rare species habitats near the Route 12 study corridor. As the map shows, there are no vernal pools or rare species habitats near Route 12. However, there are a number of potential vernal pools near Route 12 at the northern segment of the corridor.

WORCESTER ROUTE 12 CORRIDOR PROFILE

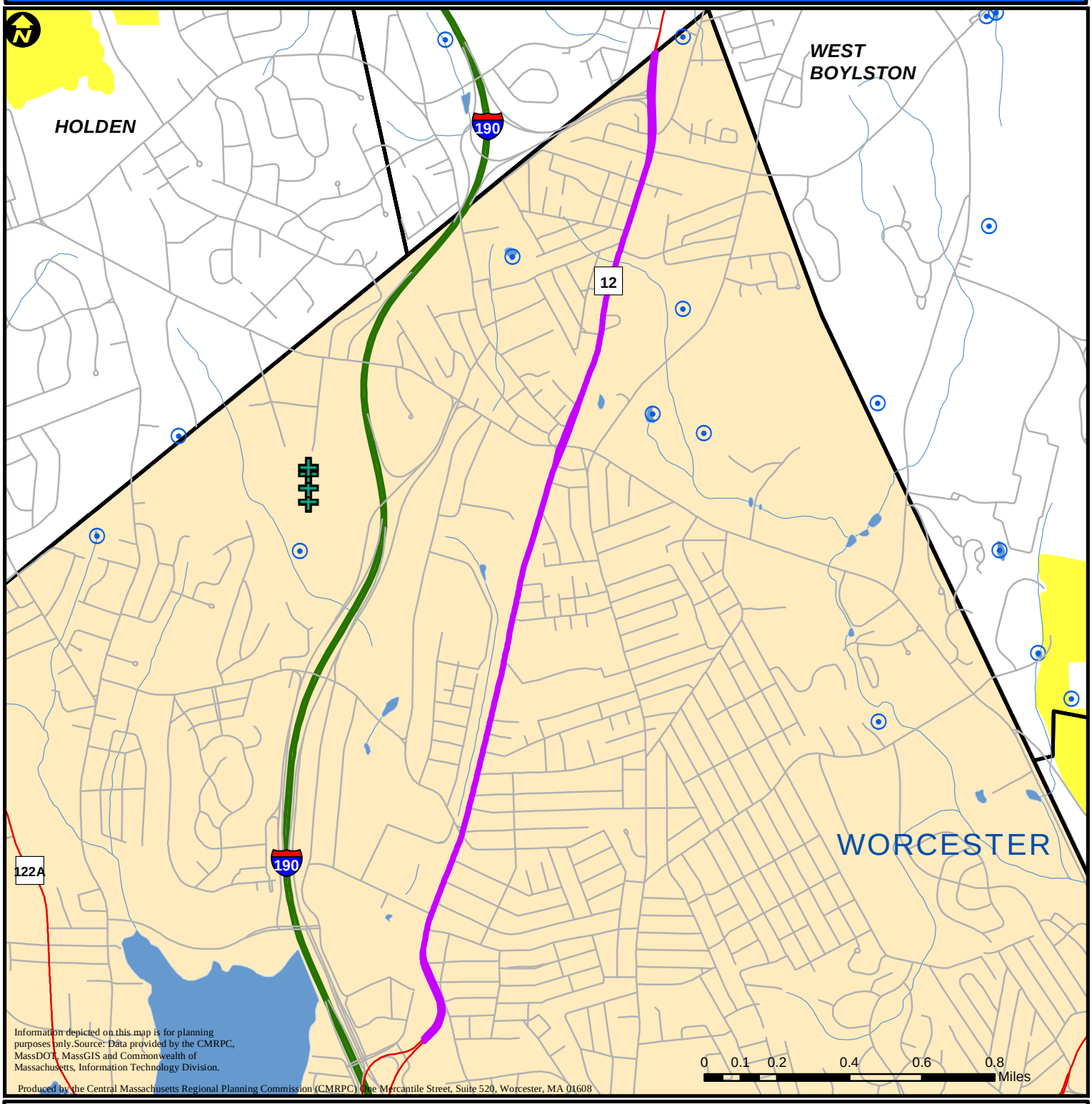
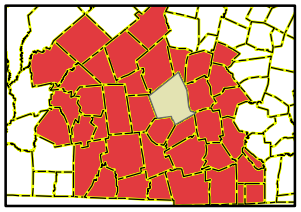


Figure 7: Vernal Pools & Rare Species Habitats

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- NHESP Priority Habitats of Rare Species
- Water Bodies
- Streams



Flood Zones

Created by the Federal Emergency Management Agency (FEMA) regarding National Flood Insurance Rates, **Figure 8** shows the 100 and 500-year flood zones near the study area. The 100-year flood zone means that there is a one percent annual chance of a flood within that defined area. The 500-year flood zone means that there is a 0.2 percent annual chance of a flood. The closer something - roadways, residences - is to the flooding source (e.g., river, stream, pond, etc.), the greater the risk of flooding. As such, defined flood zones are used to calculate flood insurance rates for the homes and businesses within the zones.

As the map shows, there are no 100 or 500-year flood zones along the Route 12 study corridor in Worcester. There is, however, a 100-year flood zone around Indian Lake which is located just southwest of the corridor.

WORCESTER ROUTE 12 CORRIDOR PROFILE

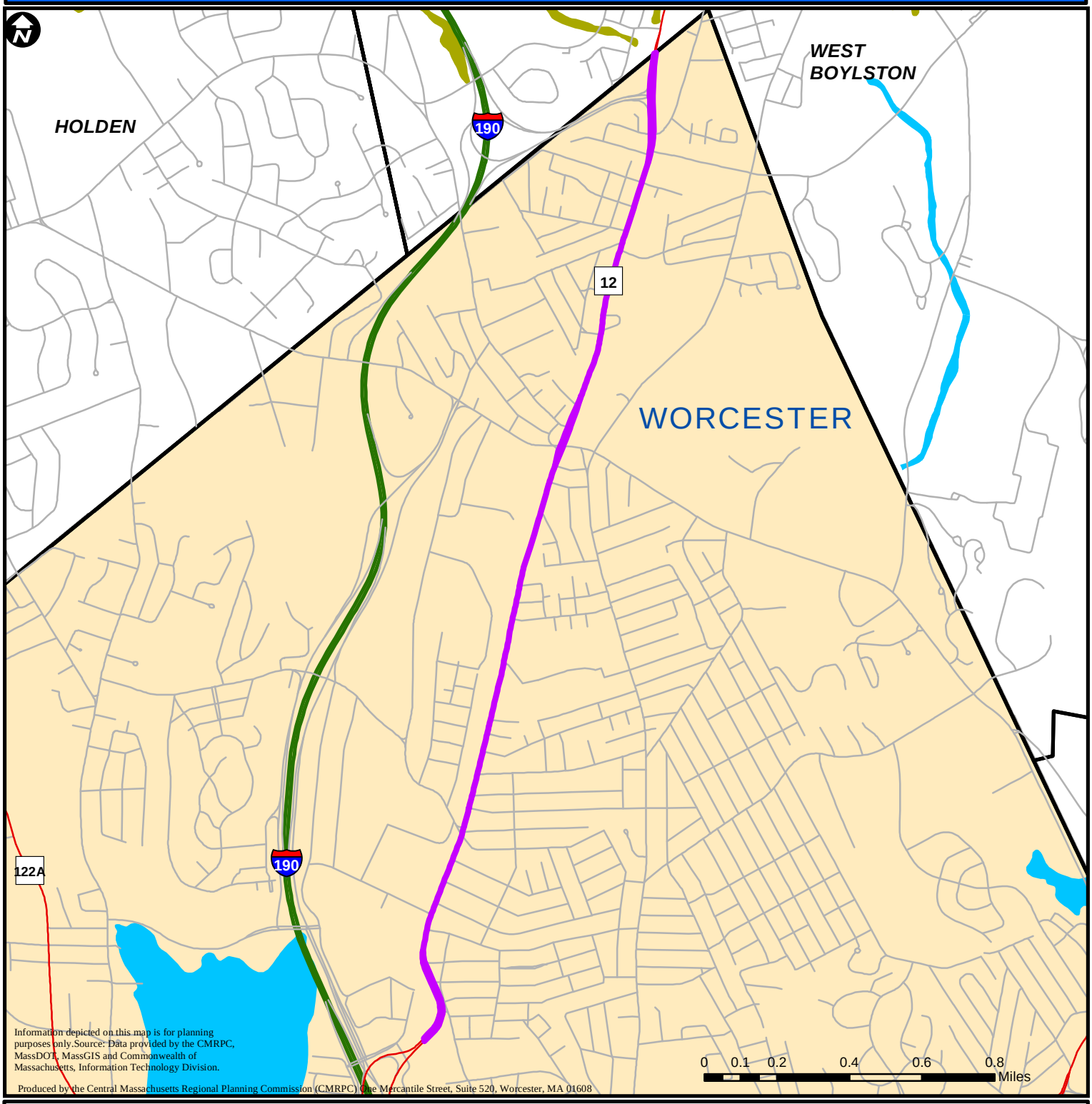
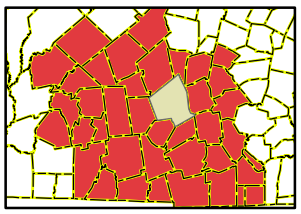


Figure 8: Flood Zones

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- FEMA 100 Year Flood Zone
- FEMA 500 Year Flood Zone

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission



3.2 Route 12 Culverts

Major drainage structures, like culverts and small bridges, play a vital role in the region's transportation network and ecological sustainability, providing the ability to maintain connections within watersheds, as well as protecting property and other infrastructure from floods and storm damage. In coordination with the Massachusetts Department of Environmental Restoration (MassDER) and the North Atlantic Aquatic Connectivity Collaborative (NAACC), a number of CMRPC staff have been trained to assess the condition and non-tidal aquatic passability of culverts based on the established Massachusetts Stream Crossing Standards. To date, over 3,630 culverts and small bridges (both tidal and non-tidal) across the Commonwealth have been assessed using NAACC protocols. These assessments have been used to support many projects that restore both tidal and non-tidal aquatic connectivity while also providing resiliency benefits.

Through a GIS analysis, it was determined that there are no major known culverts along Route 12 within the study area. However, there are numerous drainage catch basins along the entirety of the corridor that allow for stormwater to drain off the roadway.

For culverts located in other areas within the city, MassDEP has a Culvert Replacement Municipal Assistance Grant Program where communities can apply for the available funding. Information about this program can be found on the MassDEP Website. Awarded funds typically range from $25,000 to $400,000, depending on the project phase and the scope of work proposed. Eligible projects must be a culvert or bridge replacement on a public way, owned and maintained by the applying municipality, and must cross a natural freshwater, non-tidal river, or stream channel. The stream channel may be either intermittent or perennial and the project must meet the Massachusetts Stream Crossing Standards.

3.3 Performance Management

The regional Performance Measure of Stormwater Management & Resiliency pertains to this chapter. The goal is to create a transportation network that is resilient to the impacts of stormwater. For any new CMMPO Transportation Improvement Program (TIP) projects, it is important to consider the use of Green Infrastructure or Nature-Based Solutions to help manage stormwater. Also, generally, older culverts should be upgraded to new, modern structures that can adequately handle the heavy water flows from stronger storms with increasing frequency. A higher priority should be given to areas that are within a 100 or 500-year flood zone. By effectively applying these best-practice approaches, the goal of a stormwater resilient transportation network in the planning region is obtainable.

4.0 Congestion Management Process (CMP)

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A Congestion Management Process (CMP) is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet both state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages.

The CMP, as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system. The process includes:

- Development of congestion management objectives.
- Establishment of measures of multimodal transportation system performance.
- Collection of data and system performance monitoring to define the extent and duration of congestion and determine the causes of congestion.
- Identification of congestion management strategies.
- Implementation activities, including identification of an implementation schedule and possible funding sources for each strategy.
- Evaluation of the effectiveness of implemented strategies.

The Congestion Management System (CMS) was first introduced by the **Intermodal Surface Transportation Efficiency Act** (ISTEA) of 1991 and continued under the successor law, the **Transportation Equity Act for the 21st Century** (TEA-21). The CMS was intended to augment and support effective decision making as part of the overall metropolitan planning process. In 2006, the **Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users** (SAFETEA-LU) called for the CMS to evolve into a Congestion Management Process (CMP), with a greater focus on the implementation of operational improvements to the highway system to mitigate congestion. In 2012, the **Moving Ahead for Progress in the 21st Century Act** (MAP-21) called for the continuation of the CMP program while also requiring a transition to performance-based planning. This was reaffirmed by 2015's successor national legislation **Fixing America's Surface Transportation** (FAST) **Act**. Currently, the CMP continues as reflected in the 2021 **Infrastructure Investment and Jobs Act** (IIJA).

4.1 Daily Traffic Volumes

Figure 9 shows locations along Route 12 in the city of Worcester where CMRPC placed Automatic Traffic Recorders (ATRs) to determine the daily volume of traffic. Counts were completed in June, August, and September 2024, while school was in session. The ATRs were

installed along the roadway and left in place for at least 48 hours. There were six (6) count locations completed for this Corridor Profile. **Table 2** shows the traffic volume results from the Route 12 ATR locations. As the data shows, the highest traffic volumes were observed at the southerly end of the study corridor between the CSX/GWRR bridge and Brooks Street. The lowest daily volumes observed on Route 12 were between Mountain Street and the Stop & Shop Plaza.

Table 2
Route 12 Daily Traffic Volumes

ATR Location	Date	Volume*
Route 12 at West Boylston Town Line	8/28/2024	13,550
Route 12 south of I-190 Ramps	6/5/2024	14,275
Route 12 south of Stop & Shop Plaza	6/5/2024	11,425
Route 12 south of Mountain Street	6/5/2024	14,825
Route 12 south of Brooks Street	8/28/2024	21,075
Route 12 south of Bourne Street	8/28/2024	20,775

*Vehicles Per Day (VPD)

WORCESTER ROUTE 12 CORRIDOR PROFILE

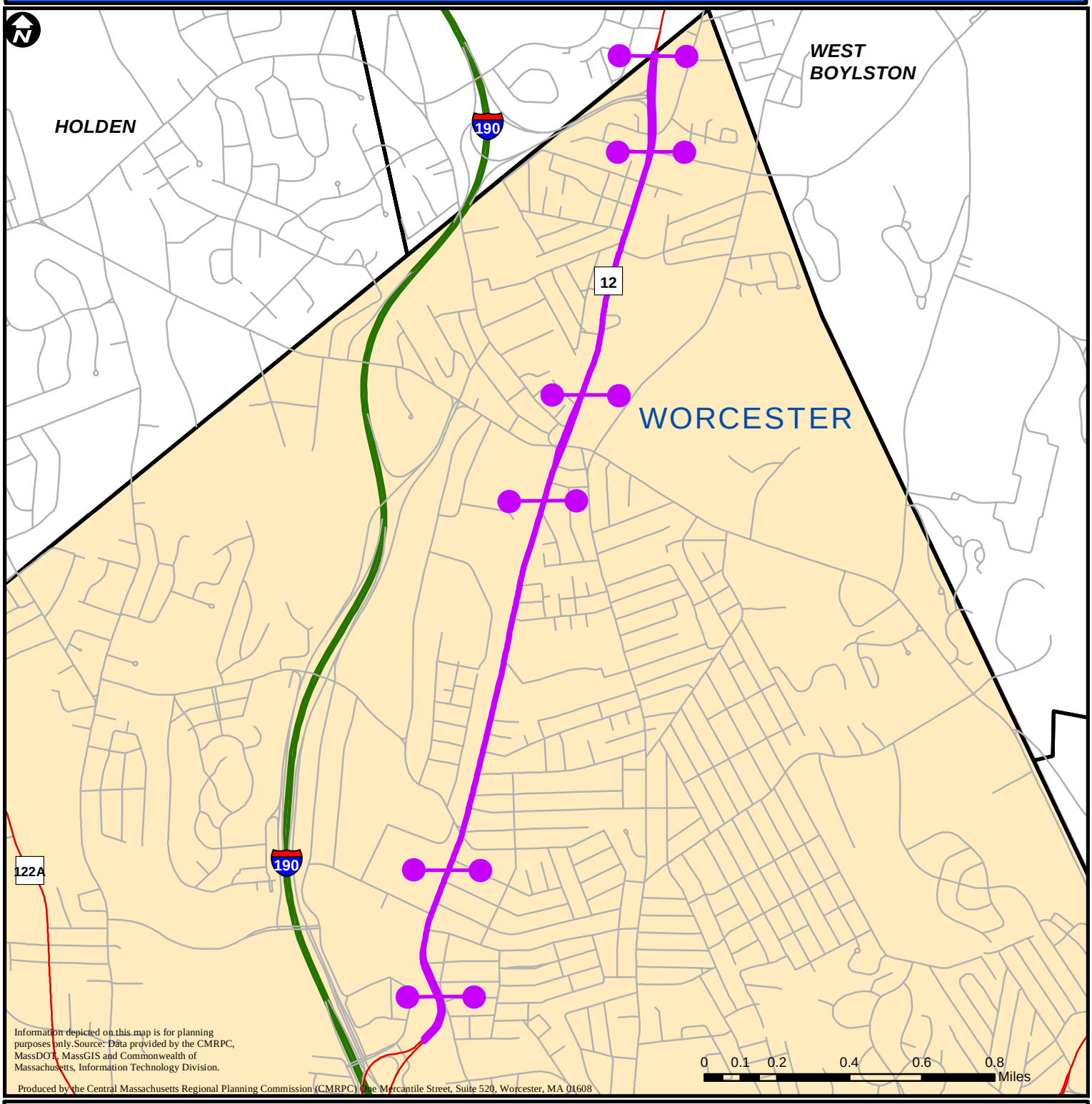
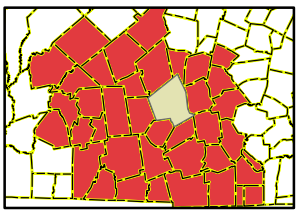


Figure 9: Traffic Count Locations

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



4.2 Route 12 Travel Time and Delay Study

CMRPC staff conducted one (1) travel time and delay study for this Corridor Profile effort. The travel time data was collected by CMRPC using a Global Positioning System (GPS) unit. The study occurred between 7:00 AM – 9:00 AM and 4:00 PM – 6:00 PM. After the field data was collected, it was downloaded into the *TravTime* software (developed by Geo Stats) to analyze the data. As indicated in **Table 3**, it takes between 6.7 and 7.7 minutes to travel the length of the Route 12 study segment during the AM peak period and between 7 and 8 minutes during the PM peak period. The "Congested Time" shown in the table is when observed vehicle speeds are below 20 MPH or 60% of the posted speed limit.

Table 3
Route 12 Travel Time and Delay Study Results

Peak Period	Direction	Study Year	Distance	Travel Time (average minutes)	Average Travel Speed	Congested Time (average minutes)
AM	Northbound	2023	2.9 miles	7.7	22 mph	2.9
AM	Southbound	2023	2.9 miles	6.7	25 mph	1.8
PM	Northbound	2023	2.9 miles	7.5	22 mph	2.5
PM	Southbound	2023	2.9 miles	7.8	21 mph	3.0

Figures 10 and 11 show average Route 12 travel speeds for each section of the study roadway obtained from the travel time and delay study completed in September 2023. According to the above table, the average travel speed for the study corridor is between 21 MPH and 25 MPH. Staff established six (6) checkpoints to divide the Route 12 corridor into seven (7) study segments. The following maps show the average travel speeds for both directions for each defined segment. The slowest travel speeds in the AM peak period are between Bourne Street and New Bond Street and from Quinsigamond Community College to Mountain Street in the northbound direction. For the southbound direction, most of the roadway allows an average travel speed between 20 MPH to 29 MPH except between Mountain Street and Quinsigamond Community College and from Bourne Street to the CSX/GWRR bridge. In the PM peak period, southbound travel speeds were consistently observed between 20 MPH and 29 MPH except at both ends of the study corridor. Traveling northbound, average observed speeds were between 10 MPH and 29 MPH from the CSX/GWRR bridge to Mountain Street, then averaging over 30 MPH north of Mountain Street to the West Boylston town line.

WORCESTER ROUTE 12 CORRIDOR PROFILE

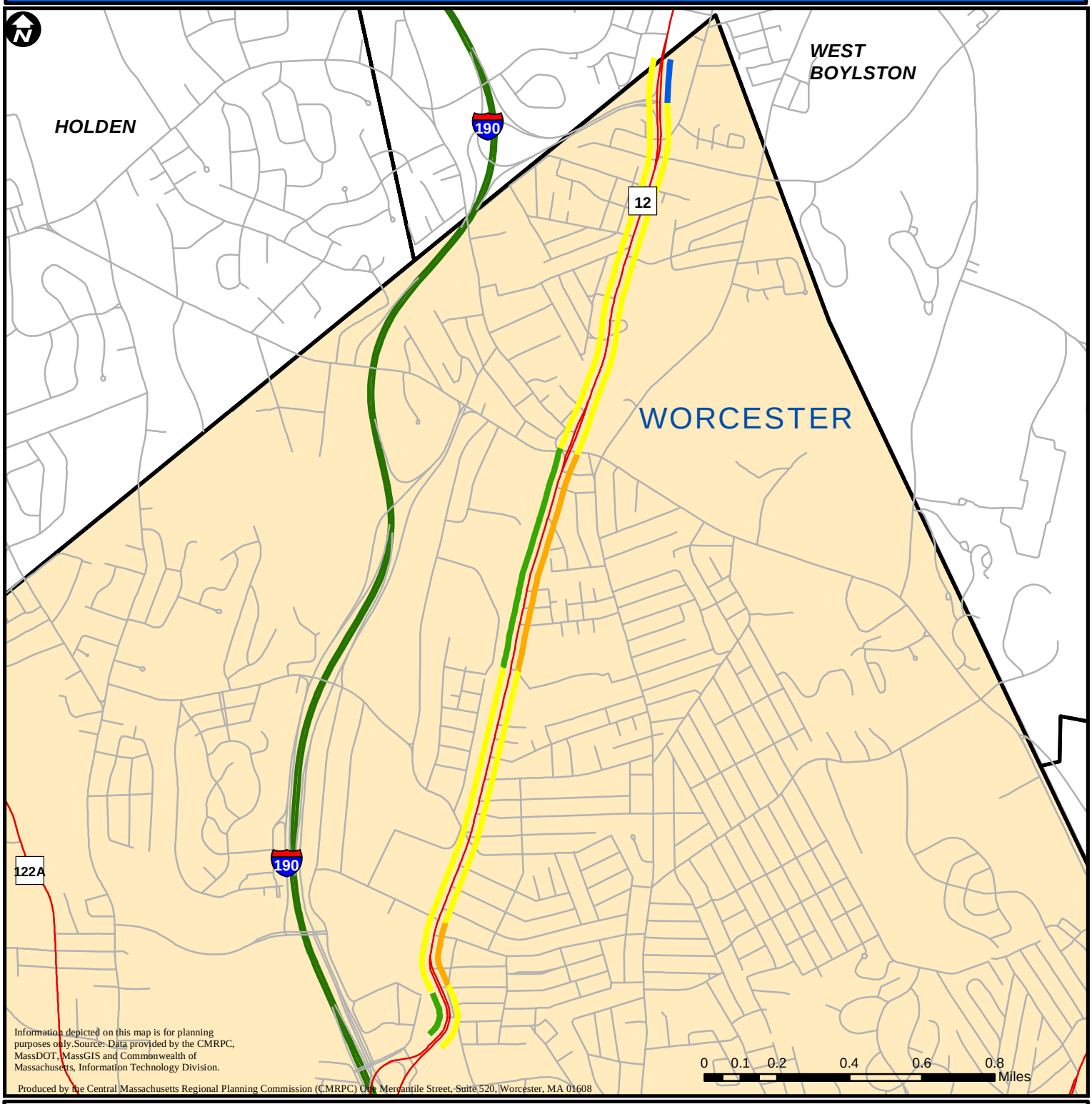


Figure 10: AM Peak Period Average Travel Speeds

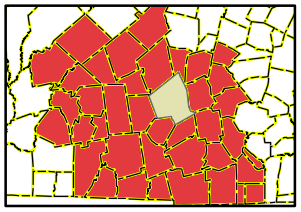
CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Other Roads
Interstate
State Route
US Highway

Average Travel Speed

10-19 mph
20-29 mph
30-39 mph
40-49 mph



WORCESTER ROUTE 12 CORRIDOR PROFILE

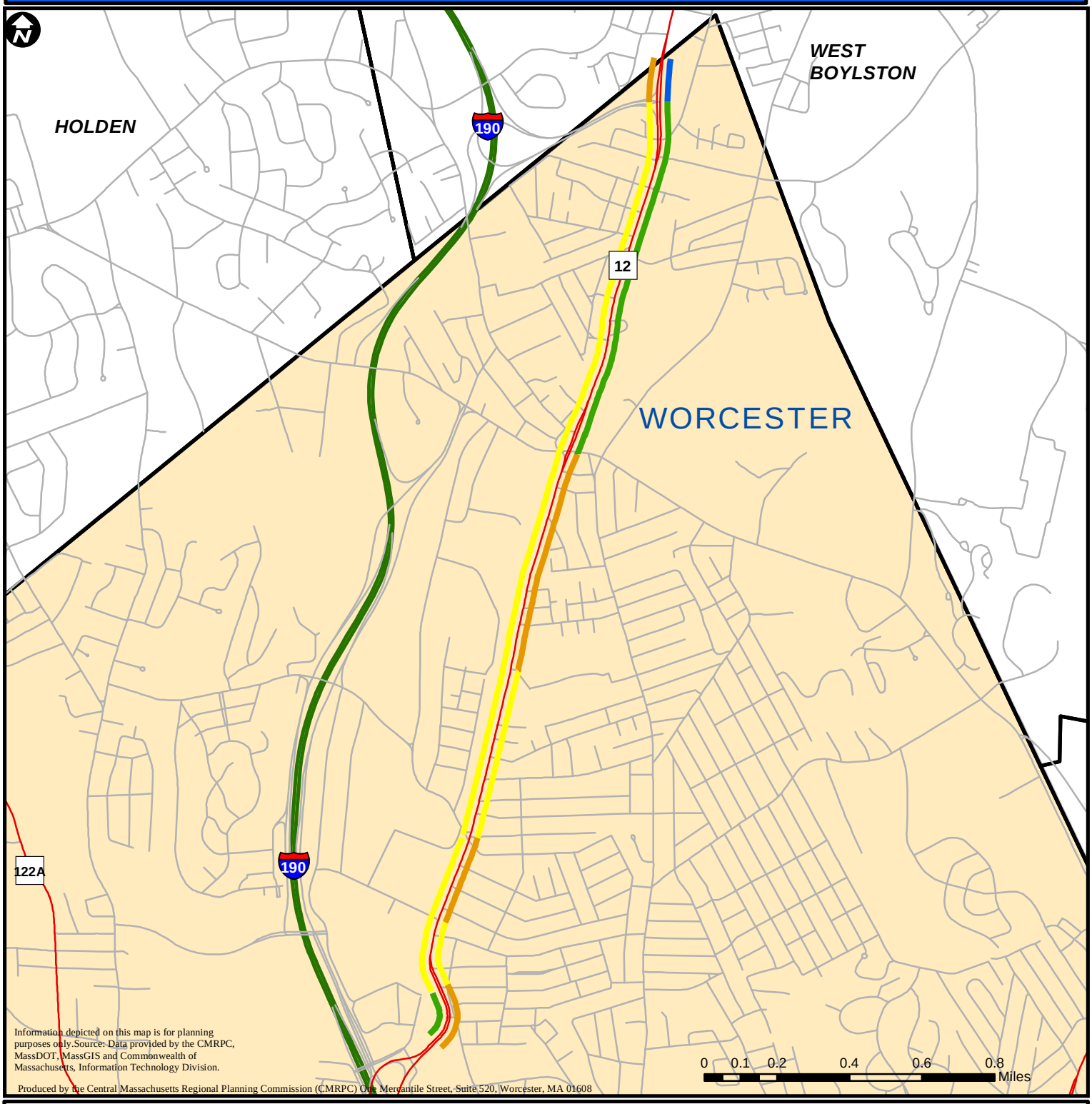


Figure 11: PM Peak Period Average Travel Speeds

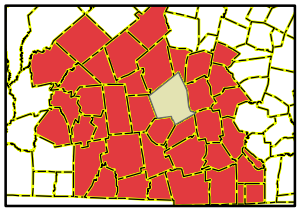
CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

Other Roads
Interstate
State Route
US Highway

Average Travel Speed

10-19 mph
20-29 mph
30-39 mph
40-49 mph



4.3 Route 12 Intersections Existing Peak Hour Traffic Volumes & Level of Service (LOS) Analyses

CMRPC staff conducted Turning Movement Counts (TMCs) at seven (7) focus intersections for this Corridor Profile effort. All counts were completed in 2024 during peak flow months while local schools were in session. In displaying these counts as a network, a "balancing" exercise was conducted to account for the typical addition and loss of traffic between adjacent study intersections (due to local streets, site drives serving major land uses, and other private driveways) as well as natural statistical variations encountered when TMCs are conducted on different weekdays. The observed turning volumes are shown in **Figure 12** and **Figure 13**, respectively, as existing AM and PM peak hour traffic flows. (All TMC datasheets are provided in the document's Technical Appendix).

WORCESTER ROUTE 12 CORRIDOR PROFILE

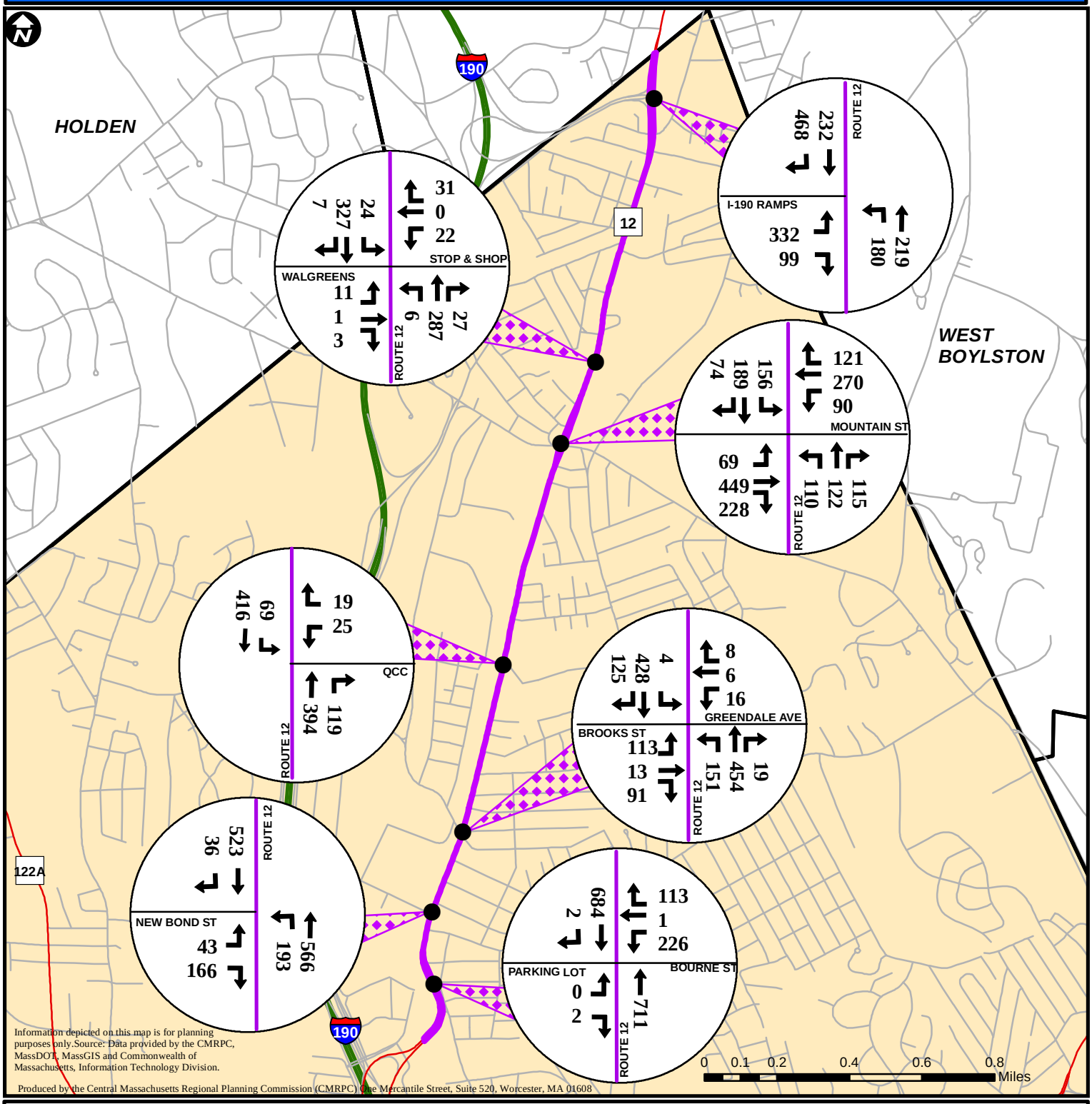
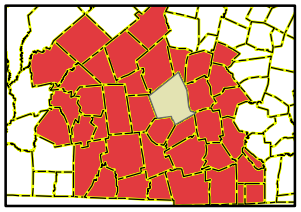


Figure 12: AM Peak Hour Existing Traffic Flows

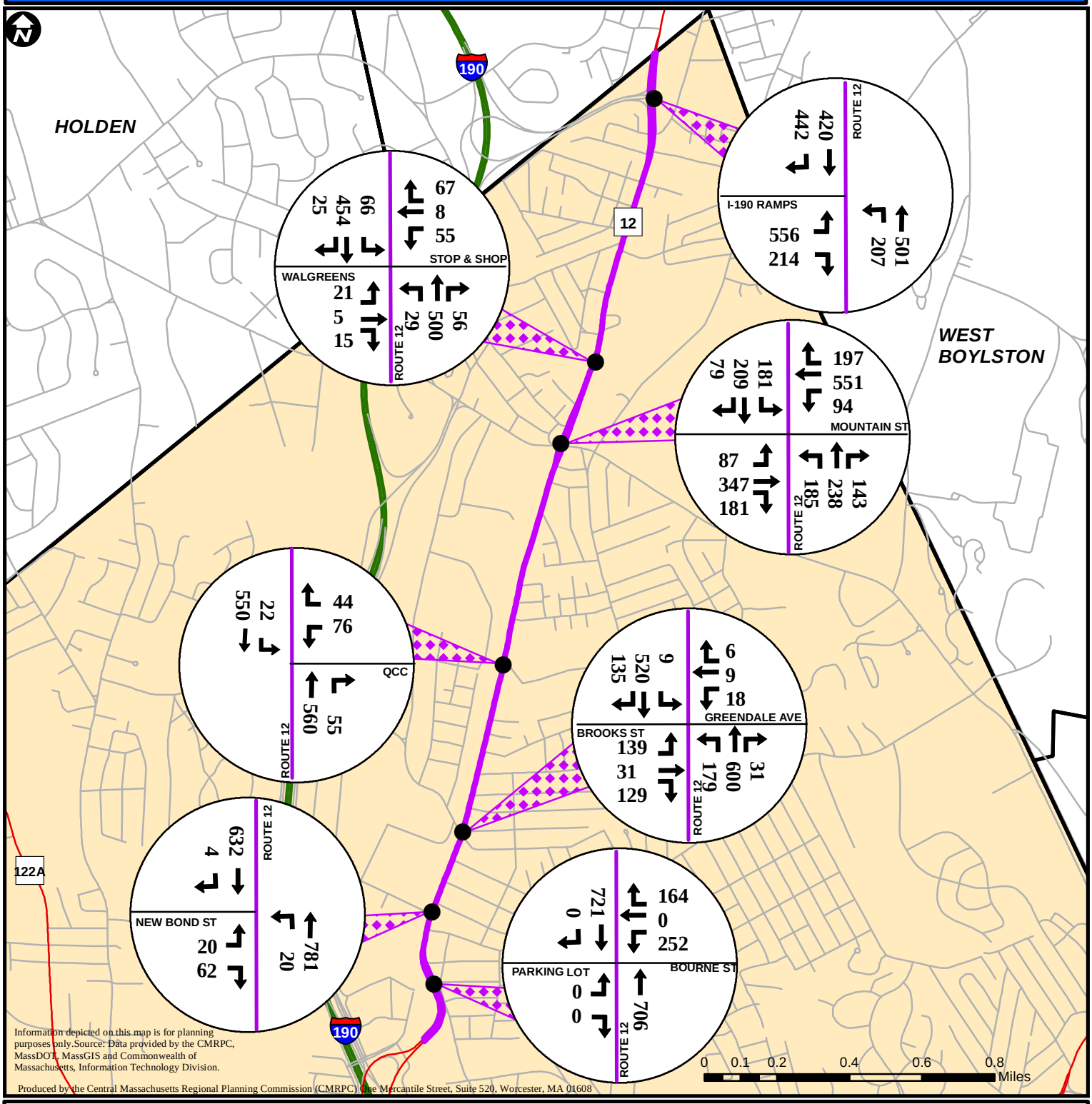
CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



WORCESTER ROUTE 12 CORRIDOR PROFILE



Information depicted on this map is for planning purposes only.Source: Data provided by the CMRPC, MassDOT, MassGIS and Commonwealth of Massachusetts, Information Technology Division.

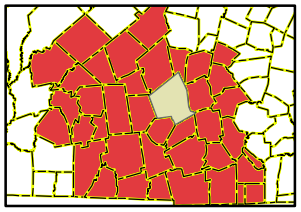
Produced by the Central Massachusetts Regional Planning Commission (CMRPC), One Mercantile Street, Suite 520, Worcester, MA 01608

Figure 13: PM Peak Hour Existing Traffic Flows

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



Existing Peak Hour Level of Service (LOS) Analyses

Using the existing observed traffic volumes on Route 12, a Level of Service (LOS) grade was calculated for each focus intersection. The LOS is calculated by using the *Highway Capacity Software* (HCS). The software calculates the amount of delay (in seconds) for each approach and the entire intersection. Using the estimated length of delay in seconds, a LOS grade between "A" and "F" is assigned. LOS "A" is indicative of free flow conditions while LOS "F" indicates highly congested conditions. **Table 4** lists the existing LOS for the Route 12 focus intersections. (The complete LOS worksheets are provided in the document's Appendices). Based on the calculated results, the following notable trends were observed:

- There are seven (7) study intersections included in the scope of the Route 12 Corridor Profile. All seven (7) intersections are under signalized control.
- All seven (7) intersections exhibit a LOS between "A" and "C" for both the AM and PM peak hour.
- The Route 12/E & W Mountain Street and Route 12/Brooks Street/Greendale Avenue intersections experience the most delay and the worst LOS.
- The intersections with the lowest calculated delay are Route 12/Walgreens/Stop & Shop Plaza and Route 12/Bourne Street.

Table 4
Route 12 Focus Intersections Existing LOS Summary

Community	Route 12 Intersection	Intersection Level of Service Analysis Results					
		AM			PM		
		V/C*	Delay**	LOS	V/C*	Delay**	LOS
Signalized							
Worcester	Route 12 / I-190 Ramps	0.93	19.9	B	0.71	16.1	B
	Route 12 / Stop & Shop / Walgreens	0.35	9.9	A	0.43	13.8	B
	Route 12 / E & W Mountain St	0.74	27.4	C	0.90	32.1	C
	Route 12 / QCC	0.45	4.7	A	0.52	6.1	A
	Route 12 / Brooks St / Greendale Ave	0.94	24.0	C	0.80	25.7	C
	Route 12 / New Bond St	0.88	13.5	B	0.60	10.0	B
	Route 12 / Bourne St	0.42	11.1	B	0.44	8.3	A

*V(volume)/C(capacity) is for worst lane group; C is maximum flow under prevailing conditions
**Delay in seconds

4.4 Percentage of Heavy Vehicles Utilizing Route 12 Focus Intersections

According to the Highway Capacity Manual (HCM), heavy vehicles are vehicles that have more than four tires touching the pavement. Trucks, buses, and recreational vehicles (RVs) are the three primary groups of heavy vehicles. Heavy vehicles often adversely affect traffic flows in two ways: 1) they are larger than passenger cars and occupy more roadway space and 2) they have inferior operating capabilities when compared to passenger cars, particularly with respect to acceleration, deceleration, and the ability to maintain speed on upgrades.

Table 5 lists the percentage of heavy vehicles that were observed at each of the focus study intersections. The Route 12 focus intersections in Worcester average 3.3% in the morning peak hour and 2.1% during the evening peak hour. In the AM, the highest heavy vehicle percentage observed was at the Interstate 190 Ramps with 4.2% and the lowest was at Bourne Street with 2.4%. In the PM, the highest percentage was observed at the New Bond Street intersection with 3.4% and the lowest was at Walgreens/Stop & Shop Plaza with 0.8%. Observers in the field noted that school buses accounted for a portion of the heavy vehicle traffic as well, particularly during the morning peak. This corridor is also part of WRTA Routes 14, 30, and 31.

It should be noted that the heavy vehicle percentages shown in the table were observed on one random weekday. The percentages are, by nature, subject to variation due to sample size and temporary or permanent local conditions as well as other factors, such as prevailing weather. As such, the figures in the table should be used as a general indicator of trends and conditions only, as opposed to absolute statements of prevailing circumstance.

Table 5

Percentage of Heavy Vehicles Utilizing Route 12 Focus Intersections

Study Intersection	Date of Count	Morning Peak Hour %	Evening Peak Hour %
Route 12/I-190 Ramps	June 2024	4.2%	2.1%
Route 12/Walgreens/Stop & Shop Plaza	May 2024	3.4%	0.8%
Route 12/E & W Mountain Street	May 2024	3.5%	2.6%
Route 12/QCC	May 2024	3.1%	2.9%
Route 12/Brooks Street/Greendale Avenue	May 2024	2.6%	1.5%
Route 12/New Bond Street	June 2024	3.6%	3.4%
Route 12/Bourne Street	April 2024	2.4%	1.5%
Peak Hour Averages:		**3.3%**	**2.1%**

4.5 Route 12 Intersections Projected 2034 Peak Hour Traffic Volumes & Level of Service (LOS) Analyses

As this is a planning document, meant to be used to suggest and help design improvements that may not be built or implemented for several years, it is typical to estimate or "project" future traffic conditions in the study area. Transportation changes and solutions are rarely made instantly, and pertinent area circumstances can change. As such, this is an attempt to modify current levels of traffic volume to reflect what might be anticipated in ten (10) years – reasonable lead time for planning purposes.

Regional Travel Demand Forecast Model

The Regional Travel Demand Forecast Model is an advanced computer simulation of the region's network of major highways and other modal networks, such as fixed route transit, that is maintained by the CMRPC transportation staff. It considers the greater region's population, housing stock, and employment. For this Corridor Profile effort, anticipated overall growth in traffic volumes was estimated by the Model and used by staff to analyze potential future conditions.

This study looks ten years into the future by estimating the year 2034 projected traffic increases. This allows for an assessment of potential future year operational conditions and, if necessary, the suggestion of potential improvement options for host community consideration. The Model currently projects approximately 1.0% per year growth over the next decade in the general Route 12 Corridor Profile study area. This results in an overall 10% increase of Route 12 traffic volumes in the 10-year period between 2024 and 2034. This percentage increase, meant to account for both known and unknown growth, was applied to assess potential future year conditions.

CMRPC 2034 Traffic Flow Networks

The resulting 2034 traffic flow networks for the AM and PM peak hours were then analyzed to characterize likely future operating conditions. **Figure 14** and **Figure 15** illustrate the 10-year projection of the existing volumes, again applying the calculated annual growth rate of 1.0% for the next decade over entire length of Route 12 study corridor in northern Worcester.

WORCESTER ROUTE 12 CORRIDOR PROFILE

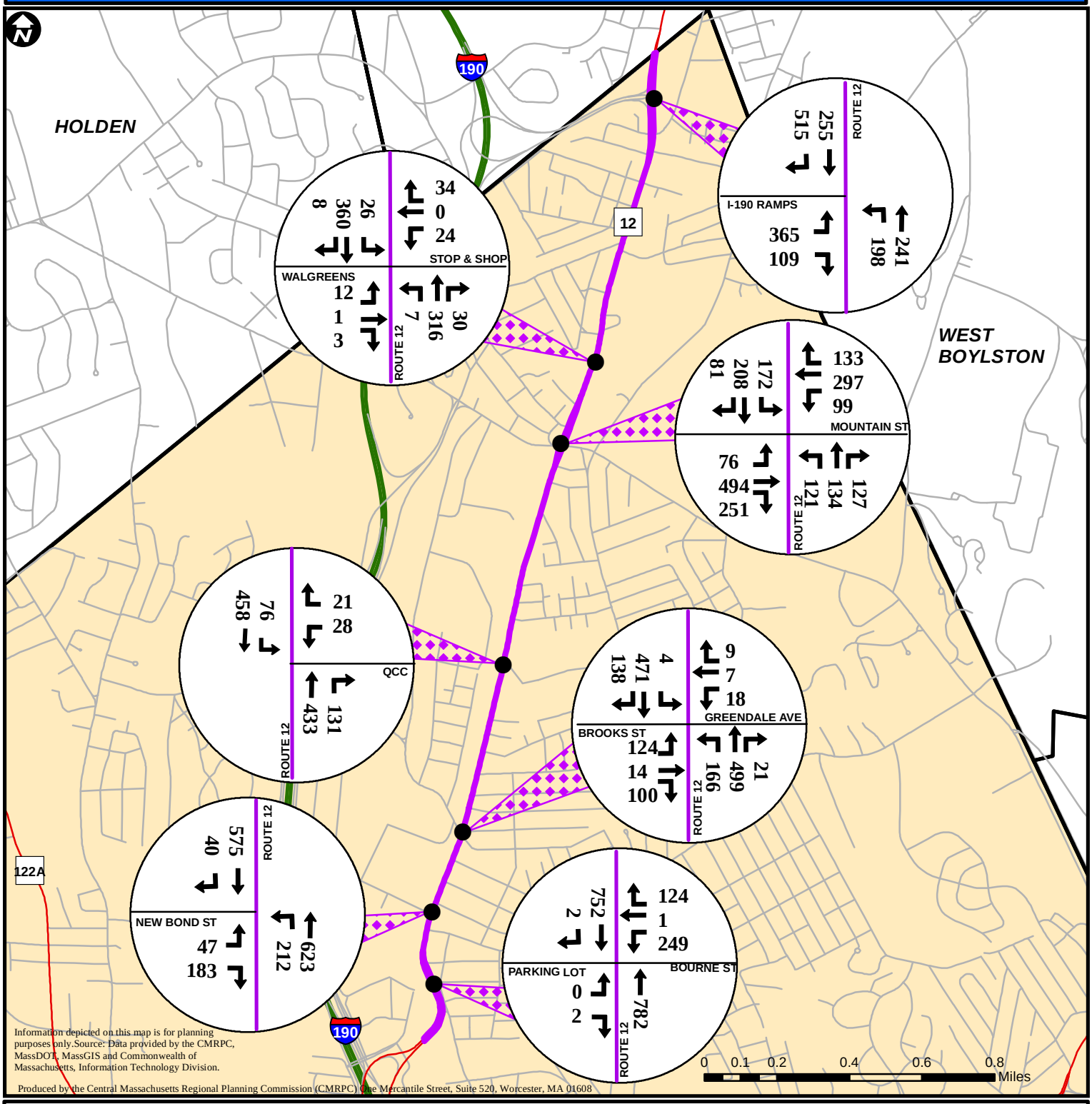


Figure 14: AM Peak Hour Projected 2034 Traffic Flows

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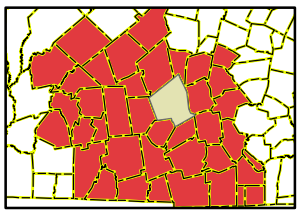
- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



WORCESTER ROUTE 12 CORRIDOR PROFILE

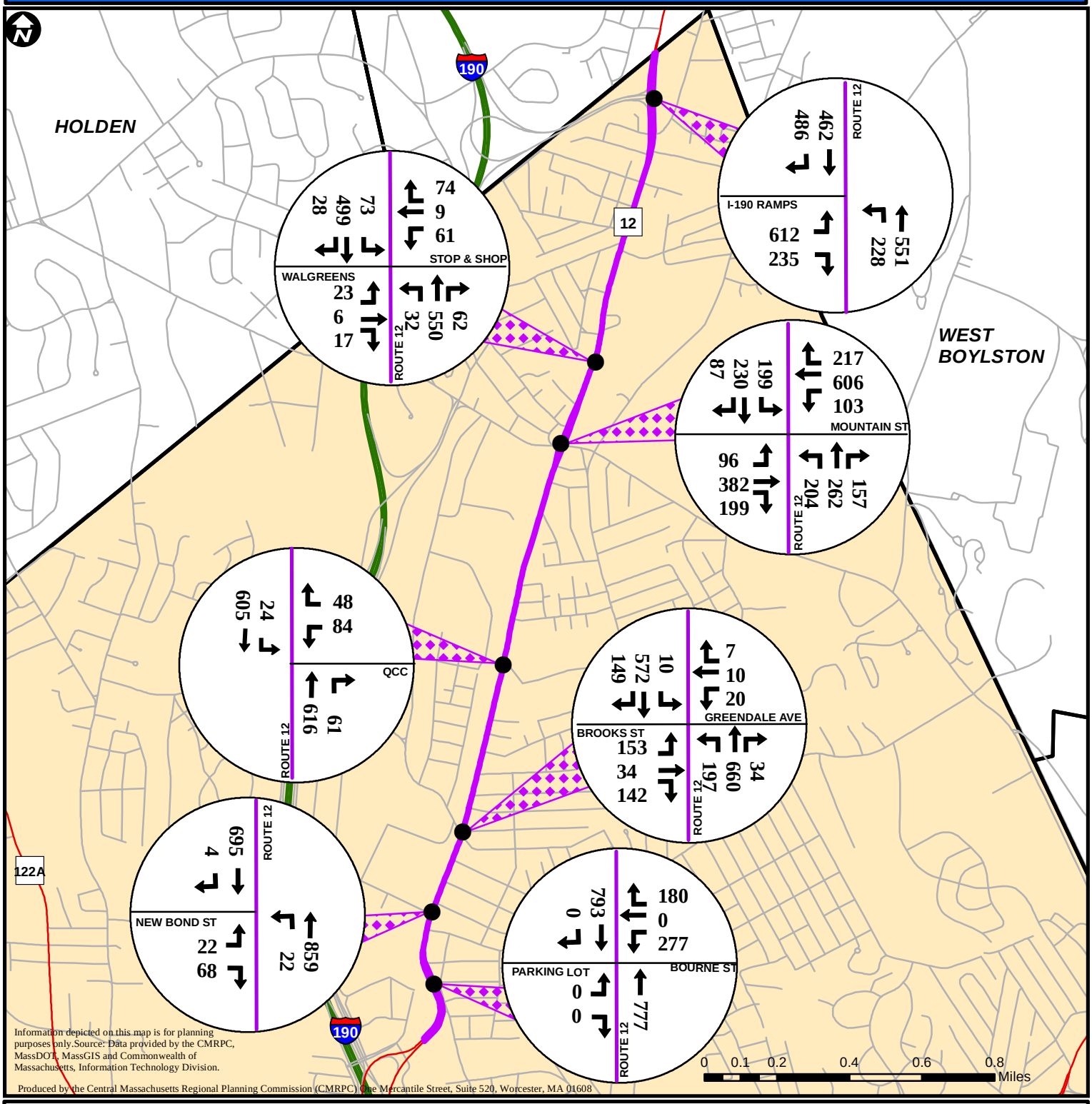


Figure 15: PM Peak Hour Projected 2034 Traffic Flows

CMMPO

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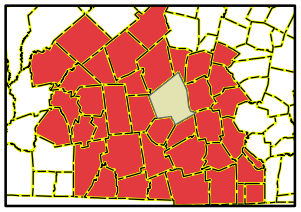
- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



Route 12 Intersections Projected 2034 Peak Hour Level of Service (LOS) Analyses

Using the projected future year 2034 traffic volumes on Route 12, a Level of Service (LOS) grade was calculated for each focus intersection. The *Highway Capacity Software (HCS)* was again used to calculate the LOS, which includes the amount of delay (in seconds) for each approach and the entire intersection while also assigning a LOS grade between "A" and "F". **Table 6** lists the projected 2034 LOS for the Route 12 focus intersections. (The complete LOS worksheets are provided in the Technical Appendix). Based on the calculated results, the following notable trends were observed:

- Delays for most of the focus intersections increased slightly from the existing LOS results. The AM LOS grade dropped to "C" for the I-190 Ramps intersection and a "B" for the Walgreens/Stop & Shop Plaza intersection between existing and projected 2034 conditions.
- For projected 2034 volumes, the AM & PM LOS stayed the same for the QCC, Brooks Street/Greendale Avenue, New Bond Street, and Bourne Street intersections.
- The E & W Mountain Street intersection had the most change in delays between the existing and the projected 2034 volumes, particularly in the PM peak period. With the projected increase in traffic volumes, average vehicle delays increased about 20 seconds, and the LOS grade dropped from a "C" to a "D".

Table 6
Route 12 Focus Intersections Projected 2034 LOS Summary

Community	Route 12 Intersection	Intersection Level of Service Analysis Results					
		AM			PM		
		V/C*	Delay**	LOS	V/C*	Delay**	LOS
Signalized							
Worcester	Route 12 / I-190 Ramps	0.95	20.8	C	0.80	18.5	B
	Route 12 / Stop & Shop / Walgreens	0.45	10.1	B	0.66	14.6	B
	Route 12 / E & W Mountain St	0.91	33.0	C	1.08	51.2	D
	Route 12 / QCC	0.49	4.9	A	0.57	6.5	A
	Route 12 / Brooks St / Greendale Ave	1.03	28.5	C	0.88	28.5	C
	Route 12 / New Bond St	0.97	16.3	B	0.66	10.6	B
	Route 12 / Bourne St	0.46	11.3	B	0.48	8.5	A

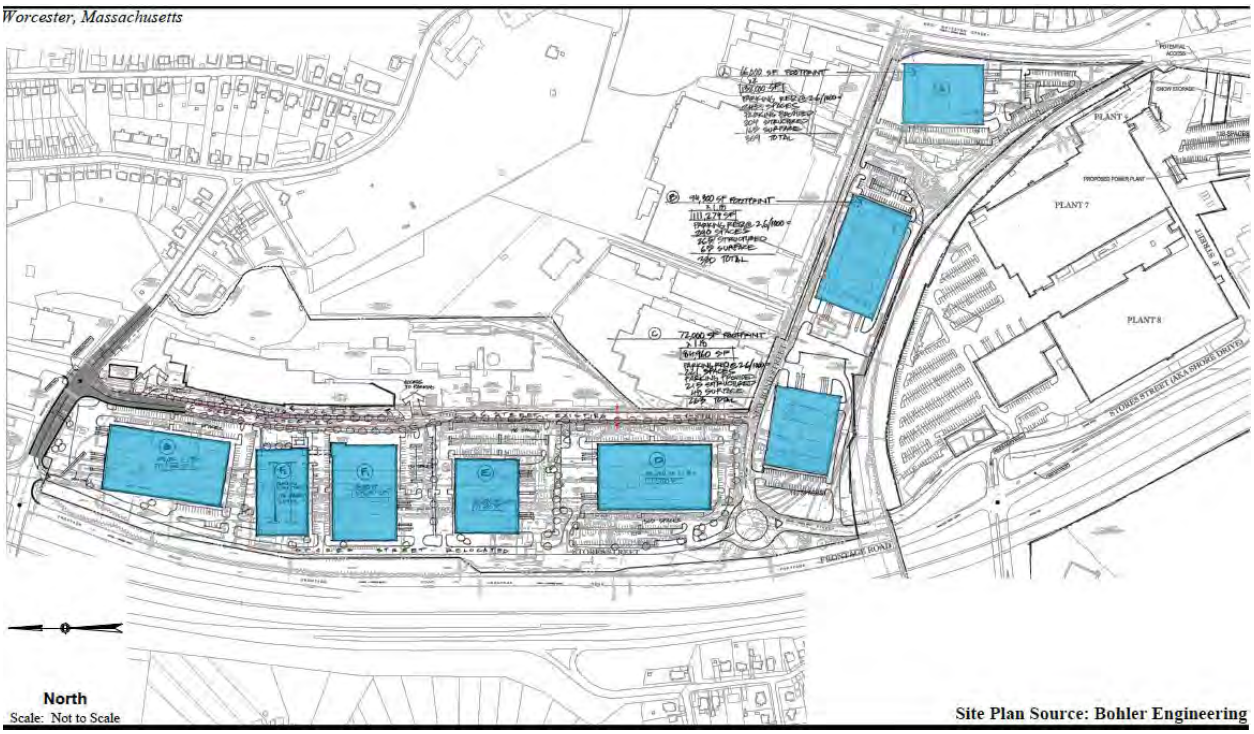
*V(volume)/C(capacity) is for worst lane group; C is maximum flow under prevailing conditions
**Delay in seconds

Additional Known Growth: Major Redevelopment Planned Adjacent to Route 12 Study Corridor

In addition to the future year 2034 traffic volume percentage increase projection calculated by the Model, it should be noted that the consultant-prepared traffic study for the redevelopment of the Saint Gobain Abrasives (SGA) site (formerly Norton Company), situated on the western side of the southern segment of the Route 12 study corridor, has been reviewed by staff to determine the eventual trip generation impacts anticipated at full build. **Figure 16** shows the preliminary site plan.

As such, this chapter of the Corridor Profile also includes an assessment of the peak hour traffic impacts likely affecting Route 12 that will result from the redevelopment scope of nearly 1 million square feet (MSF) of light manufacturing, research & development and an SGA administration facility. Significant site-generated traffic volumes are projected to enter & exit the site at the Route 12/New Bond Street and through the Route 12/Brooks Street/Greendale Avenue study intersections. This additional traffic volume will utilize Route 12 both north and south of the redevelopment site. Traffic impacts from the redevelopment are also likely at the Route 12/East-West Mountain Street intersection. It is anticipated that some level of mitigation will be provided by the redevelopment proponents to assist the city of Worcester manage the projected future year traffic increases.

Figure 16 – Saint Gobain Preliminary Site Plan (MDM)



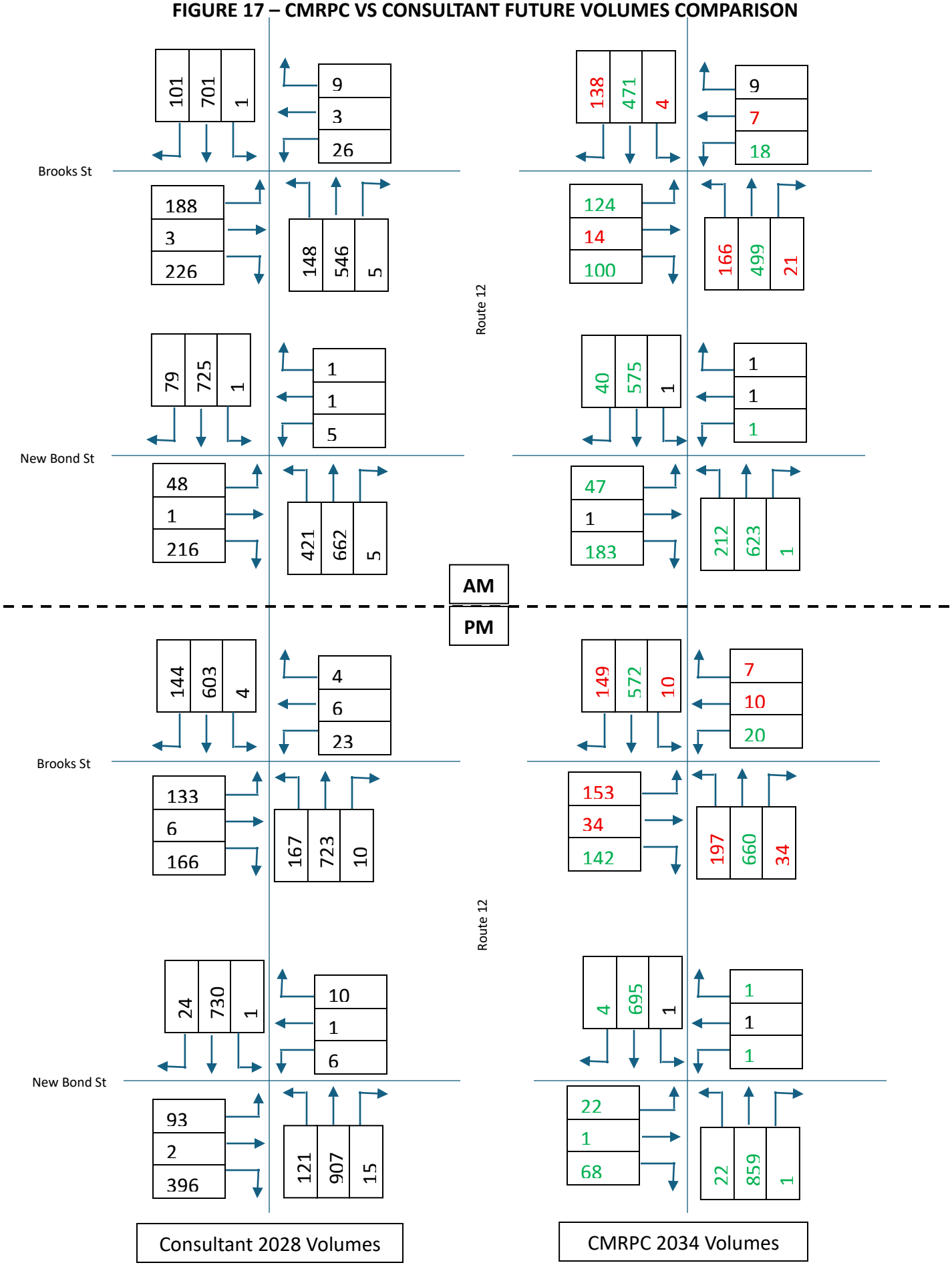
Saint Gobain Abrasives Redevelopment Overview

Staff reviewed the consultant prepared traffic study for the redevelopment of the SGA site dated June 2022. The redevelopment scope consists of nearly 1 MSF, with approximately 940 KSF for light manufacturing and research & development and 40 KSF for an SGA administration facility, the split reflected in the traffic study. Assuming full build conditions, the initial SGA traffic study assesses the future year 2028. This Route 12 Corridor Profile effort considers a future year 2034 network - six (6) additional years further into the future.

As shown in **Figure 17**, the CMRPC-derived 2034 network was compared to the consultant-derived 2028 network. Staff evaluated the projected traffic increases at the two (2) study intersection analysis locations shared by both the Route 12 Corridor Profile and the St. Gobain traffic study, Route 12/New Bond Street & Route 12/Brooks Street/Greendale Avenue. This comparison confirmed a significant additional traffic volume impact beyond the CMRPC projections anticipated from the full build redevelopment scenario of nearly 1 MSF.

In the figure, the CMRPC 2034 volumes are color coded in either black, green or red. The black numbers mean that the CMRPC and consultant volumes are the same. The green CMRPC volumes mean that the volumes are less than the consultant volumes. The red numbers mean that the CMRPC volumes are more than the consultant volumes.

FIGURE 17 – CMRPC VS CONSULTANT FUTURE VOLUMES COMPARISON



Redevelopment Traffic Impacts: Morning Peak Period

Comparing the morning peak travel period networks, notable/significant differences in traffic volumes under the full build scenario of the SGA site - greater than 1 vehicle per minute or 60 vehicles per hour – are evident with the increase in Route 12 southbound through volumes at Brooks Street/Greendale Avenue of over 200 additional vehicles per hour, or 3 to 4 vehicles per minute, on average, being attracted to the site. Further, the eastbound approach of Brooks Street at Route 12 shows a projected increase in exiting traffic volumes of nearly 200 additional vehicles, again 3 to 4 vehicles per minute on average.

Additionally, it should be noted that the Brooks Street approach, with the low clearance CSX railroad bridge, appears to attract a fair amount of projected SGA site generated traffic. There is the need for sufficient advance warning signs for new traffic on Brooks Street as well as feeder Ararat Street - especially for high trucks that are unable to pass due to the substandard low clearance of 11'-2"provided under the bridge. A minimum standard bridge height of 13'-6" is typically required for the passage of modern full-sized tractor trailers.

Under morning peak period conditions at the Route 12/New Bond Street intersection, increases in southbound right turns into the site are anticipated as well as Route 12 through volumes on both the Route 12 northbound and southbound approaches. Morning peak period increases in exiting volumes from the SGA site are also projected under the full build scenario. Most notably, increased Route 12 northbound left turns into the development site of nearly 200 vehicles are also anticipated during the morning peak hour period.

The expected morning peak hour traffic flow increases under the full build scenario for the SGA site highlights the need for a more in-depth examination of the future year geometric design requirements for the Route 12/New Bond Street intersection. This analysis is strongly suggested in order to ensure that this key site access drive can adequately accommodate the significant expected increase in both vehicles entering & exiting the site as well as increased through volumes on Route 12.

Further, it should also be mentioned that, although not a shared study intersection analysis location, traffic generated by the SGA redevelopment site will also likely impact peak period operations at the Route 12/East-West Mountain Street intersection to some extent.

Redevelopment Traffic Impacts: Evening Peak Period

Comparing the evening peak period networks, notable/significant differences - again greater than 1 vehicle per minute or 60 vehicles per hour - under the full build scenario of the SGA site are observed at the Route 12/Brooks Street shared study intersection. Additional volume is realized on Route 12 northbound where the full build redevelopment scenario is anticipated to add just over 1 vehicle per minute, or more than 60 additional vehicles, over the evening peak flow period. At the Route 12/New Bond Street intersection during the evening peak, exiting

site drive traffic is projected to add a significant volume of an additional 400 vehicles. Further, the site will also attract 100 entering vehicles making left turns from Route 12 northbound.

Redevelopment Traffic Impacts: Cursory AM LOS Analysis

A cursory examination of study intersection Level-of-Service (LOS) resulting from the SGA redevelopment site generated traffic was conducted for the two locations shared within the studies prepared by both CMRPC and the transportation consultant assessing the redevelopment's trip making characteristics.

During the morning peak hour, with the addition of SGA redevelopment site traffic volumes, LOS at the Route 12/Brooks Street/Greendale Avenue study intersection is LOS "F". This results due to increased average vehicle delay, determined to be approximately four times greater on the Brooks Street approach. Again, trucking constraints exist at this study location due to the low CSX railroad bridge as well as the grade of the Brooks Street approach.

At the Route 12/New Bond Street intersection, Route 12 northbound left turns entering the SGA site during the AM peak hour need to be accommodated at an average rate of seven (7) vehicles per minute - in addition to processing adjacent Route 12 through volumes. This results in a drop in Route 12 northbound LOS from "A" to "D" under full redevelopment. When comparing the CMRPC and consultant derived networks, average vehicle delay is anticipated to increase by ~50% on the New Bond Street approach under full redevelopment during the morning peak period.

Redevelopment Traffic Impacts: Cursory PM LOS Analysis

During the evening peak hour**,** northbound Route 12 volume increases at the Route 12/Brooks Street/Greendale Avenue intersection projected to be generated by the SGA redevelopment result in no major increases in average vehicle delay when comparing networks.

During the evening peak hour at the Route 12/New Bond Street intersection, there is the need to strongly consider intersection improvements to smoothly process the traffic generated by the redevelopment effort. The substantive volume of future year exiting vehicles needs to be accommodated within the tight confines provided for roadway width and the CSX at-grade railroad crossing. As currently exists, the two approach lanes - exclusive left and right turn lanes - must be maintained on New Bond Street. It is anticipated that approximately 500 exiting vehicles will be generated during the PM peak hour along with another consecutive 100 left turns into the site from the Route 12 northbound approach. This results in the New Bond Street approach dropping to a LOS "F" along with a significant increase in average encountered vehicle delay.

Redevelopment Traffic Impacts: Suggested Mitigation

At the Route 12/New Bond Street study intersection the New Bond Street approach needs to continue to accommodate two exclusive turning lanes. The signalized control timing & phasing needs to be optimized and operate in conjunction with the rail crossing warning signal and safety gates. At times, CSX freight train traffic will likely block the crossing for various intervals during the course of a typical day as well as both the morning & evening peak hour flow periods.

It appears that signal timing adjustments at Route 12/New Bond Street, as well as Brooks Street/Greendale Avenue, will be necessary to accommodate full redevelopment traffic generation. As Route 12 operates well adjacent to the site during both peak flow periods, additional time could be allocated to the signal phases for both Brooks Street and New Bond Street so as to balance likely encountered vehicle delay.

Full consideration of these suggested actions would be viewed as a proactive attempt to fully mitigate the likely traffic impacts associated by the site. Efficient operations are essential at the Route 12/New Bond Street intersection, one of three (3) major access points serving the renewed site. It is strongly suggested to consider the need for approach lanes of adequate length on New Bond Street. The approach geometry needs to be carefully considered prior to opening early phases of the SGA redevelopment.

4.6 Performance Management

The Performance Measures related to the Congestion Management Process (CMP) are both the federal rule of System Performance & Air Quality (PM3) and the regionally customized measure of Economic Vitality which deals with access to jobs. The goal of the System Performance & Air Quality (PM3) measure is to achieve a significant reduction in congestion on the National Highway System (NHS). This rule has five measures that are linked to reliability, congestion, and emissions. The CMMPO continues to support the established five statewide targets regarding Level of Travel Time Reliability (LOTTR), Level of Truck Travel Time Reliability (TTTR), Percentage of Non-Single Occupancy Vehicle (SOV) Travel, Peak Hour Excessive Delay (PHED), and Total Reduction of On-Road Mobile Source Emissions. As for the CMMPO's Economic Vitality measure, it deals with accessibility to jobs in the region.

1. **System Performance & Air Quality (PM3)**: As for the measure of LOTTR, this study segment of Route 12 is not part of the NHS so any improvements to travel time reliability would not affect this performance measure but could improve observed travel times.

   The TTTR target only pertains to the Interstate System so improvements on Route 12 will not affect this measure but could improve truck travel times. Numerous heavy

vehicles have been observed using the Route 12 study corridor. Based on 24-hour traffic volumes, between 7% and 21% are heavy vehicles using the study corridor daily.

For the non-SOV travel measure, creating other travel options (e.g. carpool, public transit, walking, bicycling, or telecommuting) through MassDOT's Complete Streets program or public outreach and awareness could perhaps help contribute towards reaching the target**.**

For the PHED measure, any improvements to Route 12 made regarding the above measures that would help reduce incurred vehicle delays would also contribute positively towards this statewide target.

The Reduction of Emissions measure is related to Congestion Mitigation & Air Quality (CMAQ) projects, a TIP funding category, where such projects are intended to reduce emissions. Examples of these types of projects include intersection improvements, bicycle & pedestrian improvements, and new transit services or buses. A series of standardized calculations indicating measurable emissions reductions are mandatory for all projects seeking CMAQ funding on the TIP. Currently, there are no CMAQ funded projects programmed on the CMMPO TIP within the Route 12 study corridor but there is one project in Worcester at May Street and Chandler Street being funded with CMAQ.

2. **Economic Vitality**: This measure is used to improve accessibility to jobs in the region. The reliability of freight movement is also important. Since Route 12 appears to accommodate a significant volume of daily heavy vehicles, roadway improvements would likely help freight movement as well as improve travel conditions for passenger vehicles and the bicycling & walking modes.

5.0 Safety Management System (SMS)

For this Corridor Profile, CMRPC staff obtained crash data from the Massachusetts Department of Transportation (MassDOT) IMPACT portal. The crash information used for this Corridor Profile is from the three-year period from 2019 to 2021. As the Covid Pandemic occurred during a portion of this timeframe, there was likely some effect on the traffic volumes and crashes for this safety analysis. This chapter will discuss the results of this data analysis for the City of Worcester.

Figure 18 shows the location of the crashes that occurred on the Route 12 corridor in Worcester between 2019 and 2021. The colored dots on the map indicate whether an incident was a fatal injury, non-fatal injury, or property damage-only type crash. Also, Highway Safety Improvement Program (HSIP) eligible "crash clusters", if any, are shown on the map, however there are currently no crash clusters within the Route 12 study corridor. To be HSIP eligible, the clusters need to be within the top 5% worst documented locations statewide. These clusters are defined based on the number of crashes adjacent to one another within a defined radius that has a high incidence of crash severity. MassDOT has developed an automated procedure for processing, standardizing, matching, and aggregating the crash data collected by the Registry of Motor Vehicles (RMV) division by geographical location. Geographic Information System (GIS) tools and procedures are used that result in determining the locations of vehicle crash clusters, bicycle clusters and pedestrian clusters.

WORCESTER ROUTE 12 CORRIDOR PROFILE

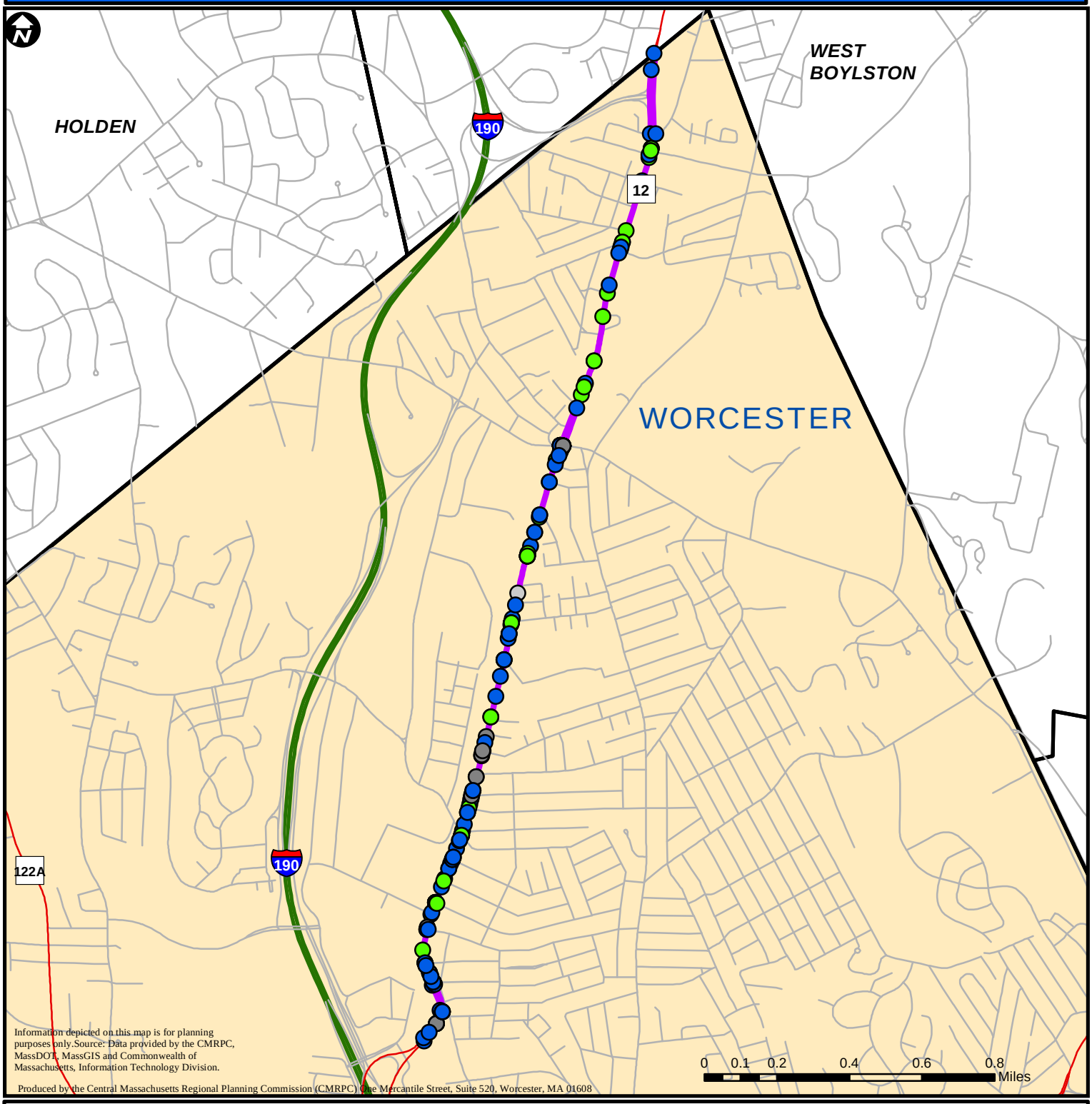


Figure 18: Crash Data (2019-2021)

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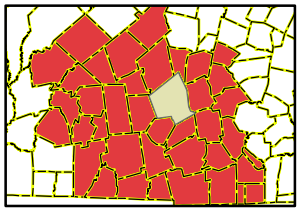
Crash Severity

- Property damage only (none injured)
- Non-fatal injury
- Not Reported
- Unknown

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway



5.1 Route 12 Crash Analysis

MassDOT vehicle crash records for the City of Worcester were analyzed for the three-year period 2019 - 2021. All crashes along Route 12 from the CSX/G&W RR Bridge to the West Boylston town line were tabulated. Also, incidents on minor streets that were close to or at Route 12 were also included. All key information from the crash reports was summarized and included in the various tables that follow.

There was a total of 189 reported study area crashes on Route 12 within the three-year period. **Table 7** shows a summary of the crashes in which the details are shown in a variety of ways. Property damage-only crashes accounted for 59% of the total, while non-fatal injuries accounted for 29%. Angle crashes were the most prevalent with a total of 62, with rear-end crashes the next highest with a total of 59. The intersection with the most reported crashes was E & W Mountain Street, with a total of 26. Often the case, most crashes occurred on dry road conditions, in daylight, and in clear weather. The highest number of crashes occurred between 12 PM and 4 PM and the most crashes occurred during the months of December, January, and February.

Table 7
Summary of Reported Crashes
On Route 12 Corridor in the City of Worcester
January 1, 2019 - December 31, 2021

Crash Severity

	Number	Percent
Property Damage Only	113	59.8%
Non-Fatal Injury	56	29.6%
Not Reported	2	1.1%
Unknown	18	9.5%
Total	**189**	**100.0%**

Manner of Collision

	Number	Percent
Angle	62	32.8%
Rear-end	59	31.2%
Head On	10	5.3%
Sideswipe, opposity direction	5	2.6%
Sideswipe, same direction	26	13.8%
Single vehicle crash	22	11.6%
Not Reported/Unknown	5	2.6%
Total	**189**	**100.0%**

Type of Collision

	Number	Percent
Collision with a motor vehicle in traffic	159	84.1%
Collision with parked car	8	4.2%
Collision with curb	6	3.2%
Collision with fixed object	13	6.9%
Unknown/not reported	2	1.1%
Other	1	0.5%
Total	**189**	**100.0%**

Intersections with the highest number of crashes

	Number
Route 12 / E & W Mountain Street	26
Route 12 / Bourne Street	13
Route 12 / Brooks Street / Greendale Avenue	10
Route 12 / Kendrick Avenue	9
Route 12 / Whitmarsh Avenue	8

Road Surface Condition

	Number	Percent
Dry	145	76.7%
Wet	32	16.9%
Snow/Ice	9	4.8%
Unknown/Not Reported	3	1.6%
Total	**189**	**100.0%**

Time of Day

	Number	Percent
Before 7 AM	5	2.6%
7 AM - 10 AM	23	12.2%
10 AM - 12 PM	28	14.8%
12 PM - 4 PM	64	33.9%
4 PM - 6 PM	33	17.5%
6 PM - 9 PM	25	13.2%
After 9 PM	10	5.3%
Not Reported	1	0.5%
Total	**189**	**100.0%**

Light Conditions

	Number	Percent
Daylight	138	73.0%
Dark	47	24.9%
Dawn	2	1.1%
Dusk	1	0.5%
Not Reported	1	0.5%
Total	**189**	**100.0%**

Weather Conditions

	Number	Percent
Clear	140	74.1%
Rain	19	10.1%
Cloudy	22	11.6%
Snow/Sleet	7	3.7%
Not Reported	1	0.5%
Total	**189**	**100.0%**

Month of the Year

	Number	Percent
January	21	11.1%
February	19	10.1%
March	13	6.9%
April	14	7.4%
May	15	7.9%
June	7	3.7%
July	11	5.8%
August	16	8.5%
September	18	9.5%
October	12	6.3%
November	18	9.5%
December	25	13.2%
Total	**189**	**100.0%**

Table 8 shows collision type by study area location in the City of Worcester. The table lists the total number of crashes at each intersection and at other Route 12 locations (non-intersection crashes) and what type of crash occurred. There were 59 non-intersection crashes and 130 intersection crashes. There were 62 angle crashes along the study corridor with most of these crashes occurring at intersections. One potential reason for the number of angle crashes along Route 12 is the high volume of left turning vehicles, whether turning in/out of a business or turning in/out of a minor street or driveway. Drivers often underestimate the speed and distance of oncoming vehicles (or become impatient when insufficient safe gaps occur) and turn in front of the oncoming vehicles, leaving them very little time to stop. Rear-end crashes were the second highest type of crash with a total of 59. Rear ends often occur during congested roadway conditions and from driver inattention. Roadway surface conditions can also be a factor. Additionally, there were 31 sideswipes, 22 single vehicle crashes, and 10 head-on crashes. The single vehicle crashes occurred from hitting parked cars, light or utility poles, and driving over the curbs. Sideswipes usually occur on multi-lane roadways or the approach to signalized intersections as vehicles are changing lanes. There were also five crashes in which the type of crash was not reported or unknown.

Table 8
Collision Type by Location in Worcester, 2019-2021

Location	Total	Type					
		Angle	Rear-End	Sideswipe	Head-On	Single Vehicle Crash	Not Reported
Route 12 / I-190 Ramps	**2**	-	-	1	-	1	-
Route 12 / Meola Ave	**3**	2	1	-	-	-	-
Route 12 / Tyson Rd	**5**	3	1	1	-	-	-
Route 12 / Wilbur St	**2**	-	2	-	-	-	-
Route 12 / Cumberland St	**1**	1	-	-	-	-	-
Route 12 / Idalla Rd	**3**	2	1	-	-	-	-
Route 12 / Apthorp St	**4**	1	1	1	1	-	-
Route 12 / Cotuit St	**2**	1	1	-	-	-	-
Route 12 / E & W Mountain St	**26**	10	7	8	-	1	-
Route 12 / Vendora Rd	**1**	-	-	1	-	-	-
Route 12 / Hastings Rd	**2**	1	-	1	-	-	-
Route 12 / Volkmar Rd	**2**	-	-	-	1	1	-
Route 12 / Marland Rd	**3**	1	1	-	-	1	-
Route 12 / QCC	**5**	1	2	1	-	-	1
Route 12 / Trottier St	**1**	-	-	1	-	-	-
Route 12 / Randall St	**3**	1	-	2	-	-	-
Route 12 / Francis St	**6**	-	5	-	-	1	-
Route 12 / Fairhaven Rd	**6**	1	3	-	1	1	-

Location	Total	Type					
		Angle	Rear-End	Sideswipe	Head-On	Single Vehicle Crash	Not Reported
Route 12 / Brooks St / Greendale Ave / Airlie St	**10**	3	3	2	1	1	-
Route 12 / Kendrick Ave	**8**	4	1	-	2	1	-
Route 12 / Summerhill Ave	**3**	2	1	-	-	-	-
Route 12 / Whitmarsh Ave	**8**	6	1	1	-	-	-
Route 12 / New Bond St	**3**	2	-	-	-	-	1
Route 12 / King Philip Rd	**3**	1	-	2	-	-	-
Route 12 / Andover St	**5**	1	-	2	-	2	-
Route 12 / Bourne St	**13**	5	3	2	1	1	1
Other Route 12 Locations	**59**	13	25	5	3	11	2
Total	**189**	**62**	**59**	**31**	**10**	**22**	**5**

Table 9 below shows the types of collisions that occurred and the severity. 113 of the 189 crashes caused property damage only while 56 resulted in non-fatal injuries. Angle crashes caused the most property damage with a total of 42 and rear-end crashes were second with a total of 32. Of the 56 crashes that caused a non-fatal injury, most were also angle or rear-end crashes.

Table 9
Worcester Crashes by Severity and Type of Collision, 2019-2021

Type of Collision	Severity			
	Fatal Injury	Non-Fatal Injury	Property Damage Only	Unknown /Not Reported
Angle	-	19	42	1
Rear-end	-	23	32	4
Sideswipe	-	6	20	5
Head-on	-	4	4	2
Single vehicle crash	-	3	12	7
Not Reported	-	1	3	1
Total Number of Crashes	**0**	**56**	**113**	**20**

5.2 Performance Management

The Performance Measures related to this chapter are Safety and Security. The first is Safety, the goal of which is to reduce the number and rate of fatal and serious injury crashes in the region for all types of vehicles. Non-motorized fatalities and serious injuries are also included. The second measure is Security, where the goal is to enhance the transportation security coordination and preparedness regionwide.

1. **Safety**: In February 2024, the CMMPO chose to adopt the statewide Safety Performance Measure targets set by MassDOT for calendar year 2024. The objectives of the safety performance measures are to reduce the total number of fatalities, rate of fatalities per 100 million vehicle miles traveled (VMT), total number of serious injuries, rate of serious injuries per 100 million VMT, and the total number of combined serious injuries and fatalities for non-motorized modes.

   MassDOT has established a long-term target towards "Zero Deaths" and intends to continue establishing safety targets for the CMMPO to consider for future adoption each calendar year. For the Route 12 study corridor, any suggested safety improvements to reduce crashes would potentially help in reaching the safety targets set forth by MassDOT. Further, in the city of Worcester's Vision Zero Safety Action Plan, the section of Route 12 from New Bond Street to Brooks Street is classified as a "High" priority while between Brooks Street and East & West Mountain Street is a "Medium-High" priority.

2. **Security**: The objective of this measure is to enhance transportation security coordination and preparedness regionwide. One measurement is to identify the primary highway evacuation routes in the region. Accordingly, in a previous joint effort between the CMRPC and the Montachusett Regional Planning Commission (MRPC), a Central Region Homeland Security Evacuation Plan was completed in 2013. In this evacuation plan, numerous roadways within the central region were designated as either "primary" or "secondary" evacuation routes. Route 12 was designated as a secondary evacuation route, so it is critical for this route to be both safe and secure.

   Another Security goal is for all communities in the CMRPC planning region to have a Hazard Mitigation Plan and/or Municipal Vulnerability Preparedness (MVP) Plan. These plans identify vulnerable or hazardous locations within the community. In 2019, Worcester's MVP Plan noted flooding issues on Route 12 within the study area.

6.0 Pavement Management System (PMS)

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

For this Corridor Profile effort, pavement distress information was collected along Route 12 for the entire length of the study area in the northern part of Worcester. The pavement data was collected by conducting "windshield surveys." A team of two CMRPC representatives inspected Route 12 taking note of both the severity and extent of the following pavement distresses:

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

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

OPENGOV's Recommended Action category definitions are as follows:

- Do Nothing (Excellent Condition, OCI 100 – 88) – used when a road is in relatively perfect condition and prescribes no maintenance.
- Routine Maintenance (Good Condition, OCI 88 – 68) – used on roads in reasonably good condition to prevent deterioration from the normal effects of traffic and pavement age. This treatment category would include either crack sealing or local repair (pothole, depression, poorly constructed utility patching, etc.), or minor localized leveling.
- Preventative Maintenance (Fair Condition, OCI 68 – 48) – slightly greater response to more pronounced signs of age and wear. This includes crack sealing, full-depth patching, and minor leveling, as well as surface treatments such as chip seals, micro-surfacing, and thin overlays.
- Structural Improvement (Poor Condition, OCI 48 – 24) – when the pavement deteriorates beyond the need for surface maintenance applications, but the road base appears to be sound. These include structural overlays, shim and overlay, cold planing and overlay, and hot in-place recycling.
- Base Rehabilitation (Very Poor Condition, OCI 24 – 0) – represents roads that exhibit weakened pavement foundation base layers. Complete reconstruction and full depth reclamation are indicated.

Each Recommended Action category has an associated cost, which includes the design, materials, and labor to complete such action. OPENGOV's produced OCI Recommended Action categories suggest the type of remedial improvements necessary to bring a road segment to "Excellent" condition. As a roadway's OCI drops, the associated Recommended Action becomes more demanding, and the cost of repair increases. Therefore, the cost of "Routine Maintenance," which categorically falls under "Do Nothing," is only a fraction of the cost of "Base Rehabilitation," the most financially demanding Recommended Action category. For a practical example, the cost of applying crack seal to minor alligator cracking over a half mile segment of road is significantly less than the cost to fully reconstruct a half mile of impassable roadway. Therefore, it is prudent to conduct "Routine Maintenance" on a roadway in order to prevent the deterioration of the pavement.

Figure 19 displays the current pavement condition for Route 12 represented by Overall Condition Index (OCI) Recommended Action. Again, OPENGOV's produced OCI Recommended Action categories suggest the type of action necessary to bring a given roadway segment to "excellent" condition.

WORCESTER ROUTE 12 CORRIDOR PROFILE

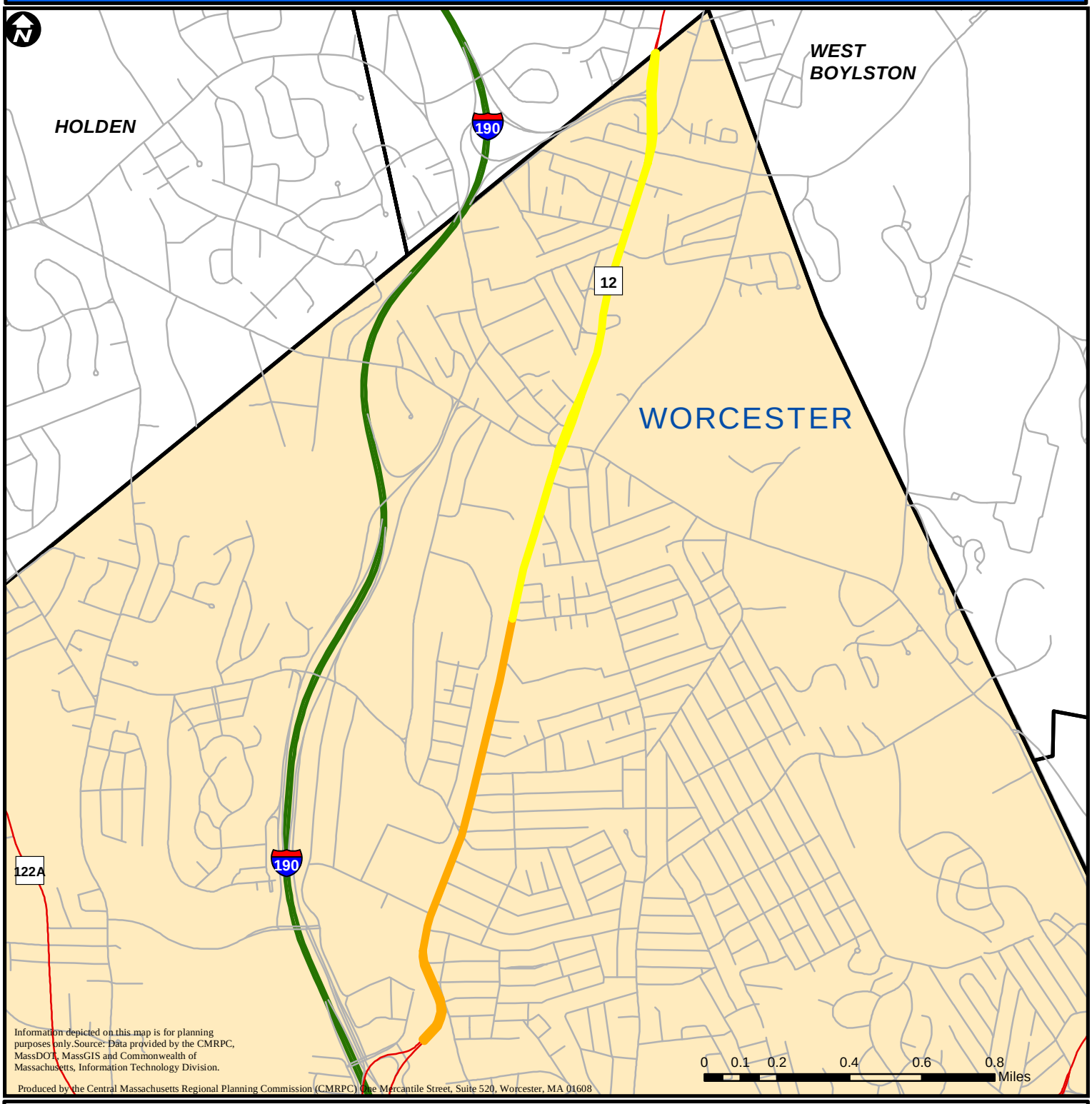


Figure 19: Pavement Condition

- Very Poor
- Poor
- Fair
- Good
- Excellent

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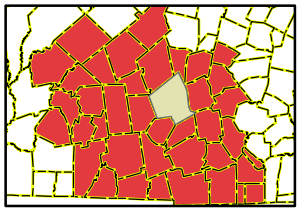

6.1 Route 12 Overall Condition Index (OCI)

The most recent pavement data for Route 12 in Worcester was collected in 2024. **Figure 19** shows that Route 12 exhibits either fair or poor condition ratings for the study corridor. **Table 10** shows each assessed roadway segment, segment length, as well as the suggested plan activity for the segment to reach "excellent" condition. The following are the distresses found in each of the five defined segments.

- **West Boylston TL to Jersey Drive**: This segment is considered in "fair" condition. This segment contains a low severity of surface wear, potholes, rutting, bleeding, corrugations, alligator cracking, and a moderate severity of transverse and longitudinal cracking.
- **Jersey Drive to Mountain Street**: This segment is considered in "fair" condition. This segment contains a low severity of corrugations, distortions, bleeding, rutting, potholes, alligator cracking, and block cracking.
- **Mountain Street to Marland Road**: This segment is also considered in "fair" condition. This segment contains a low severity of transverse and longitudinal cracking, surface wear, potholes, corrugations, bleeding, rutting, and a moderate severity of distortions and alligator cracking.
- **Marland Road to Brooks Street**: This segment is considered in "poor" condition. This segment contains a low severity of surface wear, alligator cracking, bleeding, potholes, and a moderate severity of block cracking, corrugations, and distortions.
- **Brooks Street to CSX/GWRR**: This segment is also considered in "poor" condition. This segment contains a low severity of distortions, potholes, surface wear, alligator cracking, bleeding, rutting, a moderate severity of corrugations, and a high severity of transverse and longitudinal cracking.

Table 10
Route 12 Pavement Analysis Recommendations

Street	From	To	Length	Plan Activity	OCI
Route 12	West Boylston TL	Jersey Dr	0.23 mi	Preventative Maintenance	58.3
Route 12	Jersey Dr	Mountain St	0.95 mi	Preventative Maintenance	63.2
Route 12	Mountain St	Marland Rd	0.49 mi	Preventative Maintenance	48.3
Route 12	Marland Rd	Brooks St	0.61 mi	Structural Improvement	47.9
Route 12	Brooks St	CSX/GWRR	0.62 mi	Structural Improvement	36.5

6.2 Performance Management

Regarding pavement, the associated Performance Measure is from the FHWA State of Good Repair (PM2) rule which is to have at least 30% of non-Interstate NHS pavement in good condition and have 5% or less of non-Interstate NHS pavement in poor condition. Additionally, the targets are 70% or higher for Interstate NHS pavement in good condition and 2% or lower for Interstate NHS pavement in poor condition. The Route 12 study corridor is not an Interstate nor part of the NHS, therefore any improvements to the pavement condition would not be applicable towards the PM2 targets but would still improve the roadway.

7.0 Bridges

7.1 Statewide Bridge Management System

MassDOT has a Bridge Inspection Management System (BIMS) that inventories the location and available inspection data for bridges in accordance with the National Bridge Inventory (NBI). The NBI is a national database maintained by the Federal Highway Administration (FHWA) that contains the type, condition, and inspection data for any bridge over 20 feet in length. As part of this program, these bridges are inspected on a biannual basis. The condition of bridges is evaluated in four major categories (deck, superstructure, substructure, and culvert) and ranked on a scale of 0-9. If any of these categories receive a ranking of 4 or less, they are considered "Structurally Deficient" (SD), meaning there is a need for further monitoring and/or repair. To date, complete inspections are only available for all NBI bridges in Massachusetts. Currently, inspection and inventory efforts are underway for all short span bridges and culverts in Massachusetts. The results of this effort are anticipated to be available when completed.

7.2 MassDOT Municipal Small Bridge Program

The MassDOT Municipal Small Bridge Program provides financial support to cities and towns for small bridge replacement, preservation, and rehabilitation projects. The program was first created through the 2016 Transportation Bond Bill and was reauthorized in the 2021 Transportation Bond Bill. The program is used to assist cities and towns to replace or preserve bridges with spans between 10 feet and 20 feet. Each participating municipality could qualify for up to $500,000 per year. These small bridges are not eligible for federal-aid funding under existing US DOT programs.

Beginning in 2022, the Municipal Small Bridge Program has provided phased grants to municipalities to separately fund the design and construction of bridge projects. A Phase 1 grant is designated for the costs of bridge design and permitting and may provide up to $100,000. A Phase 2 grant provides funding for the costs of construction up to $500,000. The phased grants are intended to ensure that funds are spent in a balanced manner between both design and construction activities.

MassDOT's Municipal Small Bridge Program is 100% state funded. When a community utilizes MassDOT-led consultant support for a Phase 1 grant, it is not necessary to provide any funds directly to the municipality. Phase 2 construction grants are, however, reimbursement-based, meaning that municipalities are reimbursed for approved expenses only after construction costs are incurred. MassDOT and the municipality awarded the grant will enter into an agreement for approved projects.

Interested communities must complete an application with a preliminary cost estimate that includes design costs and an amount for contingencies (suggested 15%). Additional items that are needed include photographs of the structure, a description of the structure which includes date of construction/reconstruction and structure type, repair history, summary of known problems, and a discussion of proposed work. Information about the program can be found at https://madothway.my.site.com/GrantCentral/s/municipal-small-bridge-public-overview.

7.3 Route 12 Corridor Profile Bridges

Within the Corridor Profile study area there are three bridges owned by MassDOT. All three bridges have spans greater than 20 feet and are located on Route 12. Since these bridges are categorized as National Bridge Inventory (NBI) structures, inspections are completed by MassDOT, and one of the bridges was last inspected in 2022 while the other two bridges were inspected in 2025. **Table 11** provides some details about these three bridges.

Table 11
Route 12 Bridges

Host Community	MassDOT Bridge #	Facility Name (Over)	Facility Name (Under)	Year Built/ or Rebuilt	Structurally Deficient
Worcester	W-44-065	Route 12 NB	CSX/G&W RR	1936/1978	Yes
Worcester	W-44-065	Route 12 SB	CSX/G&W RR	1936/1978	No
Worcester	W-44-028	Route 12	CSX	1927/1986	No

7.4 Performance Management

The Performance Measure related to this chapter is from the FHWA State of Good Repair (PM2) rule which is to maintain at least 16% of NHS bridges by deck area in good condition and have less than 12% of NHS bridges by deck area in poor condition. Improving the structurally deficient Route 12 NB bridge over the CSX/G&W RR will help increase the percentage of bridges in good condition for this federal performance measure.

8.0 Public Transit (Public & Private)

8.1 Regional and Profile Study Area Services

Worcester Regional Transit Authority

The Worcester Regional Transit Authority (WRTA) provides transit service for the City of Worcester and 36 additional communities within the Central Massachusetts area. Fixed-route bus service is provided within thirteen (13) communities, and flexible Community Shuttle service is available in six (6) communities. **Figure 20** shows the current fixed-route system map around the study area along with the 3/4-mile ADA buffer.

Paratransit service is available to eligible individuals, including Americans with Disabilities Act (ADA) complementary paratransit service. ADA paratransit services operate within a 3/4-mile "buffer" surrounding the fixed-route service. Also, the paratransit service is available during the corresponding fixed-route schedule. Non-ADA paratransit service is available for elders and people with disabilities, with service hours varying by community or eligibility. These services are generally provided by local Councils on Aging, or other contractors, and are subsidized by the WRTA.

Ridesharing/Transportation Network Companies (TNCs)

In Massachusetts, rideshare companies such as Uber and Lyft are referred to as Transportation Network Companies (TNCs). Generally, ridesharing is commonly provided as a curb-to-curb on-demand ride service. Customers can order a ride through various providers using either a smartphone application or other online service. In turn, the operator provides the trip in a privately-owned vehicle. In Central Massachusetts, TNC services are available through both Uber and Lyft.

Taxicab and Other Providers

Additionally, Yellow Cab and Red Cab taxicab companies also provide public transportation opportunities within the area. Further, other specialized transportation services are available to eligible individuals within the area, as discussed below.

WORCESTER ROUTE 12 CORRIDOR PROFILE

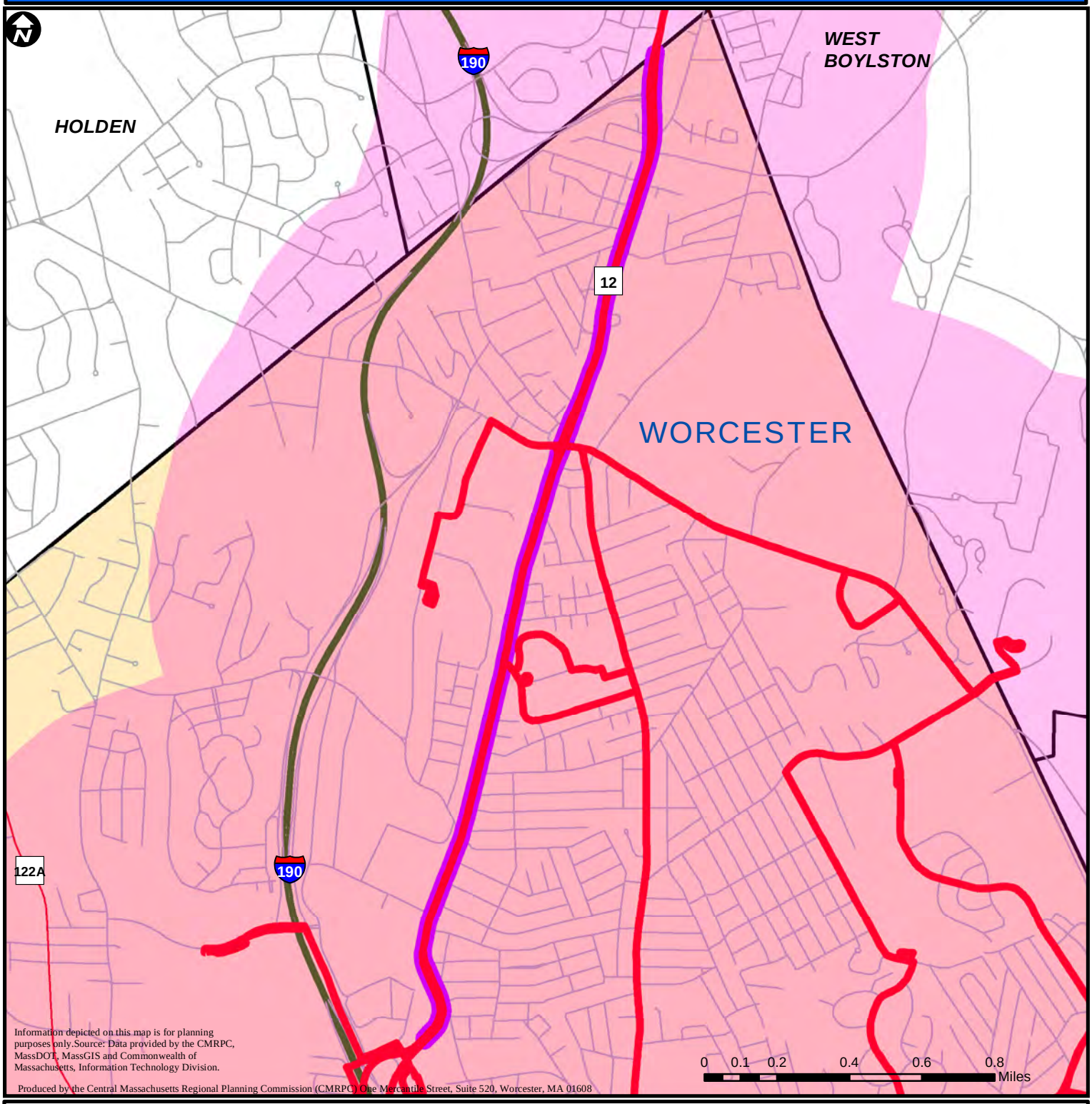

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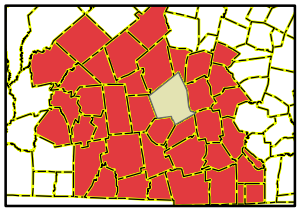
Figure 20: WRTA Fixed-Route System

- Route 12 Corridor Profile
- ADA 3/4 Mile Buffer
- WRTA Routes
- Other Roads
- Interstate
- State Route
- US Highway



8.2 City of Worcester

Existing WRTA Services

WRTA fixed-route buses serves the City of Worcester along with numerous other towns in the CMRPC region. There are three bus routes that serve Route 12 within the study area. Route 30 runs from the WRTA Hub to Wal-Mart Plaza in West Boylston. It covers the entire length of the study roadway. This route runs from 5:15 AM to 11:15 PM with a headway of 20 or 30 minutes on weekdays, 5:50 AM to 9:30 PM with a headway of 30 or 60 minutes on Saturdays, and 11:00 AM to 6:00 PM with a headway of 60 minutes on Sundays. On average, Route 30 runs on time during the weekdays within the study corridor. Route 31 travels from the WRTA Hub to Lincoln Plaza and covers a portion of Route 12 between the CSX/G&W RR Bridge and Mountain Street. This route runs from 6:15 AM to 9:00 PM with a headway of 45 minutes on weekdays, 8:30 AM to 5:00 PM with a headway of 45 minutes on Saturday and does not operate on Sundays. During the weekday, Route 31 runs an average of three minutes late along the study corridor. Lastly, Route 14 runs from the WRTA Hub to Price Chopper supermarket on Pullman Street. This bus route mainly travels on Burncoat Street but also serves Quinsigamond Community College (QCC) and a portion of Route 12 from QCC to Mountain Street. This route only operates during weekdays from 6:30 AM to 9:00 PM with a headway of either 30, 35, or 60 minutes, depending on the time of day. Similar to Route 31, Route 14 runs about three minutes late on average.

There are numerous designated WRTA bus stops located along the Route 12 study corridor. However, there is only one bus shelter, and it is located across from the entrance to QCC. During weekdays for the study corridor, Route 14 averages six (6) boardings, Route 30 averages 108 boardings, and Route 31 averages 38 boardings. The highest boarding locations along the study corridor are at New Bond Street, Brooks Street, QCC, and Vendora Street.

Although the 3/4-mile ADA buffer does not cover all of Worcester, ADA paratransit services are provided for the entire city from the earliest bus time to the latest. The service is available to individuals determined eligible under the ADA guidelines. The WRTA (through their vendors) is the only provider of ADA paratransit services. The City of Worcester does not receive any non-ADA paratransit service.

Future WRTA Outlook

The WRTA recently underwent a Comprehensive Service Analysis (CSA)/Regional Transit Plan of its entire fixed-route system by consultant AECOM in 2021. It was initiated as the result of the WRTA's Memorandum of Understanding with MassDOT and was completed in March 2021. The most recent Plan analyzed the WRTA's current system, identified gaps in service and unmet needs, and helped develop a strategic vision for the next five years. Specific needs identified include fare payment, website redesign, vehicle acquisition and cost efficiencies. Due to the

timing of the COVID-19 pandemic, much attention was focused on restoring ridership and recovery. A limited number of recommendations in the Plan have been brought to full implementation as bus ridership is currently fare free and will continue as such through June 2026.

A new Comprehensive Service Analysis is now underway, led by the WRTA with support from MassDOT. This initiative will assess the current fixed-route transit system, gather input from the member communities, and help shape a long-term vision for improved service. This updated analysis is expected to be completed by Summer 2026. Further, a rebranding effort for the WRTA buses and bus stop signs is a goal for fiscal year 2026. Also, a bus stop sign replacement program is anticipated to begin in Spring 2026 and guidelines are also being developed for a bus stop study.

Existing TNC Services

The transportation landscape in Massachusetts experienced widespread, multimodal changes in 2020 due to pandemic-related factors. Rideshare volume substantially declined across the entire state. In 2021, there were only about 12.5% more rideshare trips in Massachusetts than in 2020, and this modest recovery was not seen in all areas. In 2022, a broader recovery occurred, with a 52% increase in rideshare trips statewide. Per the 2023 Rideshare Data Report, recovery continued in 2023 with a year-over-year increase of 29.9%. Worcester trip volume grew to 1.8 million in 2023, up 47% from 2022. While many cities in 2023 experienced an all-time peak in rides taken, the statewide total remains below 2019 levels.

The Massachusetts Department of Public Utilities (DPU) releases trip count data on a yearly basis provided by Uber, Lyft, and other TNC providers. The TNCs provided approximately 60.6 million rides that started in Massachusetts in 2022 and in 2023 there were 78.7 million rides, an increase of 29.9%. In 2022, there were 1,235,568 trips that originated in Worcester and 1,812,827 trips in 2023. For trips going to Worcester there were 1,181,749 in 2022 and 1,750,246 in 2023. There were 960,146 trips in 2022 that started and ended in Worcester while there were 1,429,808 in 2023. In 2023, the average ride time in Massachusetts lasted 16.5 minutes and covered 5.93 miles at 21.6 miles per hour (MPH). For comparison, the average ride time in the City of Worcester lasted 12.6 minutes and covered 5.6 miles at 26.5 MPH.

8.3 Performance Management

There are two Performance Measures related to this chapter, Multimodality and Geographic Equity. The Multimodality objective is to improve access to transit services and to increase ridership totals for the entire system and the Geographic Equity objective is to increase disadvantaged populations that intersect WRTA fixed-route bus service.

1. **Multimodality**: Currently, there is fixed-route bus service within the City of Worcester and three specific bus routes provide service along Route 12 within the study area. By

improving the study roadway, it will provide better access to fixed-route transit services and potentially increase ridership totals. This would help meet the CMMPO's regionally customized multimodality performance goal for transit.

2. **Geographic Equity**: This measure seeks to ensure that all populations benefit from roadway improvements, WRTA service, and any other public transportation services. Currently, there are various disadvantage populations identified within the Route 12 study area. With transit serving these disadvantaged populations it will help to meet the CMMPO's regionally customized transit geographic equity goal.

9.0 Bicycle, Pedestrian, & Micromobility

Traffic congestion, or traffic "jams", occur when demand for the highway infrastructure exceeds capacity. Because of this recurring congestion, various state initiatives, design criteria revisions, funding opportunities and compacts have evolved the design of the planning region's transportation and physical infrastructure so that alternatives to driving alone are both available and highly encouraged. These other modes include bicycling, public transit (detailed in a previous chapter), walking, and micromobility.

9.1 MassDOT Healthy Transportation Compact

The Transportation Reform Law (2009) established the Healthy Transportation Compact (HTC) which promotes improved public health through active transportation. Active transportation refers to bicycling, transit, and walking. The HTC is an interagency initiative co-chaired by the Commonwealth's Secretary of Transportation and Secretary of Health & Human Services, including the Secretary of Energy & Environmental Affairs, MassDOT Highway Administrator, MassDOT Transit Administrator, the Commissioner of Public Health, and the Secretary of Housing & Economic Development. The HTC goals are to facilitate transportation decisions that balance the needs of all users, expand mobility, improve public health, support a cleaner environment and, in turn, create stronger communities. Overall, the intent is to adopt best practices to increase efficiency in achieving positive health outcomes through the coordination of land use, transportation, and public health policy.

Some of the programs and/or initiatives promoted by MassDOT and its partners that are currently in place, making the connection between health and transportation, are:

- Mass in Motion
- Safe Routes to School
- Healthy Transportation Policy Directive
- Healthy Transportation Engineering Directive
- Complete Streets

9.2 Healthy Transportation Policy Directive

MassDOT's Healthy Transportation Policy Directive requires all state transportation projects to increase bicycling, transit, and walking options. This Directive is intended to promote multimodal access for all transportation customers. MassDOT has indicated that everyone in Massachusetts must be provided the opportunity to bike, take transit, or walk instead of driving alone in a motor vehicle.

All MassDOT facilities will consider adjacent land uses and, as applicable, be designed to include sidewalks of sufficient width, landscaping, street crossing opportunities and other features to enhance healthy transportation options. Safety audits will be conducted at vehicle crash cluster sites where incidents have occurred with healthy-mode transportation users. MassDOT has also developed a Shared Use Path Planning and Design Guide to assist communities proposing shared use paths on or along former railroad right-of-way to accelerate the path design process. To view the guide, click on the following link Shared Use Path Planning and Design Guide. The resources compiled in this guide help communities understand the process of planning, designing, funding, and constructing shared use paths.

9.3 Complete Streets

What is widely known as the "Complete Streets" approach was first included in MassDOT's 2006 *Project Development and Design Guide*. Multimodal design guidelines are part of MassDOT's current policy for Context Sensitive Design. In a Complete Streets approach, roadway projects accommodate all users, not only vehicular traffic. All highway projects shall, from the earliest design stages, provide safe access and connectivity for pedestrians and bicyclists. The Healthy Transportation Policy Directive expands on how, when and where these accommodations should be provided, including ADA design compliance. The *Complete Streets Initiative*, which requires roadway designs that accommodate all users, calls for bicycle & pedestrian accommodation as part of most highway projects, a major exception being limited access highways.

The state's 2014 Transportation Bond Bill authorized funding for the creation of the Complete Streets Funding Program. It offers Massachusetts municipalities incentives to adopt complete streets policies and practices. To aid in the program MassDOT launched an interactive web portal to assist municipalities through the policy development, prioritization planning, and project approval steps of the application process. To view the website, click on the following link Complete Streets Program

For a community to be eligible for funding from this program it must meet three primary requirements as follows:

1. Attendance of a municipal employee at a Complete Streets training and the development of a locally customized Complete Streets Policy that scores 80 or above out of a possible 100 points.
2. Development of a Complete Streets Prioritization Plan.
3. Submittal of an application for available funding to construct projects in those communities with an approved Prioritization Plan.

Once these primary requirements are met, the host communities are eligible for up to $38,000 in technical assistance and up to $500,000 in construction funding. The Transportation Bond Bill at that time stated that 33% of the funds will go to municipalities that are at or below the median household income. Municipalities are now only eligible to receive up to $500,000 in any rolling four-fiscal-year period. Accordingly, a municipality may only receive one full $500,000 grant, or several smaller grants, during any four-fiscal-year timeframe. Between FY 2017 and FY 2024, over 250 Tier 3 construction project grants have been awarded across the Commonwealth totaling $90.6 million.

The City of Worcester's Prioritization Plan was approved by MassDOT on 4/7/2023. The Prioritization Plan does not include any projects on Route 12 (West Boylston Street). However, the City of Worcester did receive a Tier 3 Grant in the FY 2024 Round 1 for a total of $498,981.42 for multimodal improvements on Country Club Boulevard, from Lincoln Street to St. Nicholas Avenue/Erie Avenue.

9.4 Bicycling in the Corridor

Paved shoulders reduce passing conflicts between motor vehicles, bicyclists and pedestrians while also making the crossing pedestrian more visible. They also provide for stormwater discharge from outside the travel lanes, reducing hydroplaning, along with splash and spray to following vehicles, bicyclists, and pedestrians. In rural areas, roadway shoulders often provide space for bicyclists to ride at their own pace.

There are no dedicated bicycle lanes along Route 12 in Worcester within the study area. In addition, there are minimal shoulders along the entire length of the study corridor except at the I-190 Ramps intersection near the West Boylston town line. In some places where there are shoulders, parking is allowed. With shoulders lacking, it is not considered safe to ride a bicycle along the roadway. For safety purposes, shoulder widths should be at least five feet wide for bicyclists. In Worcester's 2024 Mobility Action Plan, the Route 12 study corridor was identified for future bike and micromobility network improvements. Additionally, the Federal Highway Administration (FHWA) has indicated that bike lanes are for roadways with low speeds and low to moderate volumes. Separated bike lanes or shared-use paths are used for roadways with moderate to high speeds and high volumes.

In 2018, CMRPC staff completed a Regional Bicycle Plan. The main purpose of the Plan was to identify opportunities for both encouraging and enhancing bicycle travel within the CMRPC region. The recommendations contained in the Plan are intended to be used as a guide for local jurisdictions in taking advantage of these opportunities. The implementation of the recommendations will eventually provide for a comprehensive bicycle transportation network in the region that is focused on accessibility, mobility, and safety. For more information, follow this link to the Regional Bicycle Plan on the CMRPC website 2018 Regional Bicycle Plan.

Through the public input process, related meetings and stakeholder outreach, several intersections, bridges, interchanges, and other barriers to bicycle travel were identified in the Bicycle Plan. As reflected in the Plan, the Route 12 study corridor is considered a regional priority.

As a supplement to the Regional Bicycle Plan, a Bicycle Compatibility Index (BCI) was created to serve as a guide to evaluate the capability of urban and rural roadways to accommodate bicyclists. The BCI spotlights individual road segments as they pertain to the larger bicycle network. This includes identifying what infrastructure currently exists as well as an understanding of the viability of implementing bicycle facilities on a given roadway segment. The BCI provides insight to guide decision making with stakeholders and local officials regarding projects along federal-aid eligible highways within the community. For the BCI, a rating or grading system is used to help stakeholders make the most informed decisions. Various criteria are used to determine the scoring of the roadway segments. The resulting scores allow for project prioritization, thus allocating funding towards those projects that can best meet the goals of the community and/or region.

According to the BCI rating, the Route 12 study corridor is considered a “Class C” for most of its length with some sections of “Class F”. A “Class F” roadway is likely to have high traffic volumes and speeds along with multiple travel/turning lanes that result in limited capacity for bicycle accommodation. Roadway sections ranked “Class F” also likely require extensive intervention in order to support safe and comfortable bicycling. Only highly confident bicycle riders would be comfortable utilizing the roadway segments considered “Class F”.

9.5 Pedestrian Facilities and Activity in the Corridor

As observed in the field, there are sidewalks on the southbound side of Route 12 for the entirety of the study corridor. The southbound sidewalk is 8’ wide between Bourne Street and New Bond Street while there is a 4’ – 5’ observed sidewalk width for the remainder of the corridor. Route 12 northbound provides sidewalks for most of the study corridor, however there is an observed gap north of Mountain Street. Heading northbound, the sidewalk is 8’ – 9’ wide between Bourne Street and Brooks Street, 6’ – 7’ wide between Brooks Street and QCC, and 4’ – 6’ wide for the remainder of the corridor. In 2024, staff assessed the condition of all sidewalks and ADA ramps along the Route 12 study corridor. The assessments revealed that the sidewalks between the CSX/GWRR bridge and Mountain Street are mostly in good condition. Sidewalks north of Mountain Street were observed to be a mix of fair and good conditions. The ADA ramps were also observed to be in good condition. There were, however, locations along the study corridor where there were no ramps provided and further, there were also some ramps observed to be in poor condition.

Route 12 has several crosswalks within the study corridor delineating the best locations for pedestrians to cross. The crosswalks are mainly located at the focus intersections. There is also overhead lighting along the entire study corridor. There are street lights on aluminum posts between the CSX/GWRR bridge and the Stop & Shop plaza while there are street lights on utility poles for the remainder of corridor.

In 2018, the CMRPC staff also completed a Regional Pedestrian Plan. This Plan was intended to facilitate the expansion and upgrade of the pedestrian network in the region to encourage more walking trips and safely link important destinations to where people live. Additionally, the Plan also documented the extensive pedestrian-related planning and project development work being conducted in the CMRPC communities. The recommendations within the Pedestrian Plan are intended to be used as a guide for local jurisdictions in order to take advantage of available opportunities. For more information, the Plan can be found on the CMRPC website at 2018 Regional Pedestrian Plan.

Through the public input process, related meetings and stakeholder outreach, some overall recommendations of the Pedestrian Plan included connecting emerging residential development with traditional village centers while also improving crosstown connectivity, such as joining segments of already existing pathways and trails. Some priority recommendations for the host community of Worcester included participation in the Complete Streets funding program as well as partnering eligible K-8 grade schools with the MassDOT Safe Routes to School (SRTS) Program to increase safe bicycling and walking among students.

9.6 Regional Trails in the Corridor

In addition to on-road facilities like sidewalks and marked bicycle lanes, regional trails are also used by hikers and bicyclists. During the winter, for example, trails can also be used by cross-country skiers. These trails are often built on former railroad right-of-way as well as through forests, recreational areas, and parks. Looking at available data, there are no long-distance or regional trails near the Route 12 study corridor.

9.7 Micromobility

Micromobility refers to transportation using lightweight vehicles or devices such as bicycles or scooters, especially electric or electric-assisted devices. As new mobility devices become available and more widespread, new challenges are presented with respect to the infrastructure to use such devices. Oftentimes, micromobility devices are provided through shared systems, such as a bikeshare, that cover the “first and last mile” of a trip. Benefits of micromobility devices include reduced traffic congestion, lower emissions, improved public health, and greater accessibility to transit and the greater transportation network. As previously mentioned, Worcester’s Mobility Action Plan identified the Route 12 study corridor for future micromobility network improvements.

9.8 Performance Management

The Performance Measure emphasis areas related to this chapter are 1) Multimodal, 2) Economic Vitality, and 3) Travel & Tourism. All three are regionally customized measures established by the CMMPO. The goal of the Multimodal measure is to improve and/or expand transportation accessibility for all modes (bicycle, pedestrian, transit) in the region. The goal of the Economic Vitality measure is to make employment opportunities accessible and available, thus allowing for job expansion by improving bicycle, pedestrian, and transit networks near major employment centers. Next, the Travel & Tourism goal is to enhance the access, safety and effectiveness of the region's transportation network that serves places of touristic value.

1. **Multimodal**: The first measure under Multimodal is to increase the miles of sidewalks in good condition. Sidewalk conditions are rated on a scale of poor, fair, good and excellent. Any sidewalks within the good or excellent categories are included in this measure. The sidewalks along the Route 12 study corridor were observed to mostly be in good condition, but there were some seen to be in fair condition. If new sidewalks were to be constructed where the gaps exist and/or the sidewalks in fair condition were to be improved, they would add to this measure being in good or excellent condition.

   The second measure is to increase the number of ADA ramps in good condition. ADA ramp conditions are rated on a scale of good, poor, and no ramp. Any ramp that is not in good condition will help towards the goal of this measure if they were to be improved. Newly constructed ramps will also help with this measure.

   The third measure is to increase bicycle facility miles in the region. Bicycle facilities include shared use paths, bike lanes, separated bike lanes, and MassDOT identified bicycle/pedestrian priority roadways. According to the MassDOT Bicycle Facility Inventory, Route 12 within the study corridor does not have any bicycle facilities. Accordingly, improving the bicycle infrastructure would help improve this measure.

2. **Economic Vitality**: This measure is to improve the accessibility to jobs in the region using all modes of travel. By improving accessibility on the roadway for all modes, people can drive, walk, and ride a bicycle for a greater distance with reduced congestion. As more travel options become increasingly available, there exists the potential for fewer vehicles on the roadway network.

3. **Travel & Tourism**: The goal of this emphasis area is to enhance the access and safety of the transportation network that serves tourist areas. Enhancing and improving the Route 12/Brooks Streets/Greendale Avenue intersection will improve access to the athletic fields located on Brooks Street.

10.0 Overall Corridor Profile Findings

This Corridor Profile effort considers the results of all Management System and environmental analyses and, in conjunction with local public processes, selects those improvement options viewed as feasible to the host community. Based on all the analysis completed and discussed previously, this section of the study summarizes the Corridor Profile findings for both intersections and roadway segments as well applicable Performance Measures related to the Route 12 corridor.

10.1 Route 12 Intersections

Table 12 summarizes the findings for intersections. It includes study intersection locations, disadvantaged populations, environmental considerations adjacent to Route 12, calculated intersection Level of Service (LOS), the percentage of heavy vehicles during the morning and evening peak hour travel periods, number of documented vehicle crashes, the availability of public transit and other considerations.

The following observations for Route 12 are based on the table:

- Disadvantage populations were included in the geographic equity analysis conducted for the Route 12 Corridor Profile. The data shows that there are three Block Groups that include disadvantaged populations near five of the focus intersections. The types of disadvantaged populations near these intersections include low income, nonwhite, LEP, and zero vehicle households.
- All focus intersections in Worcester are in the Blackstone River Watershed except the I-190 ramps intersection at the West Boylston town line, which is within the Nashua River Watershed. There are minimal environmentally sensitive areas along the study corridor. Only the Brooks Street/Greendale Avenue intersection has a nearby recreation area and at the mentioned I-190 intersection there are nearby wetlands.
- The intersections of Brooks Street/Greendale Avenue and East & West Mountain Street have the highest encountered delays, with both intersections having a LOS of “C” in the AM and PM peak periods. The remaining focus intersections have a LOS of “A” or “B”.
- Normally, heavy vehicles travel at slower speeds than passenger cars. As such, the heavier the vehicles using the roadway, the more likely observed travel times are slower. The percentage of heavy vehicles using the Route 12 intersections, as is typically the case in the region, was higher during the morning peak hour than during the evening peak hour. Often trucking activities follow a 7:00 AM to 3:00 PM shift, leading to a decrease in activity during the evening peak. Observed morning

percentages were as high as 4.2% (Interstate 190 Ramps) and evening percentages were as high as 3.4% (New Bond Street).

- MassDOT crash data from 2019-2021 was used for this Corridor Profile. There was a total of 61 reported crashes at the seven focus intersections in the city of Worcester over the three-year analysis period. The intersection that had the highest number of reported crashes was East & West Mountain Street, with a total of 26. The next highest crash location was Bourne Street with 13. There are currently no Highway Safety Improvement Program (HSIP) identified crash clusters along the Route 12 study corridor.
- The WRTA provides fixed route and ADA paratransit services along the Route 12 study corridor. Bus routes 30 and 31 service the entire study corridor while bus route 14 only services the corridor partly but includes the intersections of both QCC and Mountain Street.
- Bourne Street is one-way entering the Route 12 intersection. CSX railroad tracks are located on the New Bond Street approach which serves as a major access point to the St. Gobain redevelopment site. CSX railroad tracks are located above Brooks Street on a low bridge which provides only 11'-2" of clearance which restricts large trucks. There is a WRTA bus shelter located across from QCC site drive. Left turns from E & W Mountain Street are difficult during the peak travel periods. Limited accommodations exist for both bicycles and pedestrians at the Route 12/Walgreens/Stop & Shop intersection. Route 12 at the I-190 ramps is a major channelized intersection.

Table 12

Worcester
Route 12 Focus Intersections:
Overall Corridor Profile Findings

Study Intersection Location	Disadvantage Populations	Environmental Consultation Analysis	Level-of-Service (LOS)	Freight Movement Heavy Vehicle %	Safety Analysis*	Public Transit	Other Considerations
Route 12 / Bourne Street	Low Income and Zero Vehicle Households	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	AM = B PM = A	AM = 2.4% PM = 1.5%	13	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Bourne Street is one-way entering intersection. Empty parking lot across from Bourne Street is included in signal cycle.
Route 12 / New Bond Street	Low Income, Nonwhite, and Zero Vehicle Households	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	AM = B PM = B	AM = 3.6% PM = 3.4%	3	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Railroad tracks located on New Bond Street. Major Redevelopment ongoing on New Bond Street.
Route 12 / Brooks Street / Greendale Avenue	Low Income, Nonwhite, and Zero Vehicle Households	Nearby recreation area.	AM = C PM = C	AM = 2.6% PM = 1.5%	10	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Railroad tracks located above Brooks Street approach. Low bridge at 11'-2" restricts large trucks.
Route 12 / QCC	LEP and Nonwhite	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	AM = A PM = A	AM = 3.1% PM = 2.9%	5	WRTA fixed-route buses #14, #30, & #31 available as well as ADA paratransit services provided by WRTA.	WRTA bus shelter located across from QCC site drive.
Route 12 / E & W Mountain Street	LEP	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	AM = C PM = C	AM = 3.5% PM = 2.6%	26	WRTA fixed-route buses #14, #30, & #31 available as well as ADA paratransit services provided by WRTA.	Left turns from E & W Mountain Street are difficult during peak travel periods.
Route 12 / Walgreens / Stop & Shop	None	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	AM = A PM = B	AM = 3.4% PM = 0.8%	2	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Limited accommodations for bicyles and pedetrians.
Route 12 / I-190 Ramps	None	Nearby wetlands.	AM = B PM = B	AM = 4.2% PM = 2.1%	2	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Major channelized intersection.

*Total number of crashes (2019-2021)

10.2 Route 12 Roadway Segments

The Corridor Profile findings for Route 12 roadway segments are summarized in **Table 13**. Similar to the previous intersection table, the roadway segment table lists each Route 12 study segment, disadvantaged populations, environmental considerations adjacent to Route 12 and beyond, the daily percentage of heavy vehicles, number of documented vehicle crashes, the field-observed condition of the paved roadway surface, any bridges or culverts, the availability of public transit and other considerations.

Based on the information summarized in the table, the following observations are provided:

- Disadvantaged populations were included in the geographic equity analysis conducted for the Route 12 Corridor Profile. For the roadway segments, the data shows that there are three Block Groups that include disadvantaged populations between the CSX/GWRR bridge and the Walgreens intersection. The types of disadvantaged populations along these roadway segments include low income, nonwhite, LEP, and zero vehicle households.
- The entire study corridor is within the Blackstone River Watershed except between Tyson Road and the West Boylston town line, which is within the Nashua River Watershed. The New Bond Street to Mountain Street segments include a nearby recreation area. Further, the roadway segments from QCC to Mountain Street, Walgreens to I-190, and I-190 to the West Boylston town line all have nearby wetlands.
- Using data obtained through the ongoing traffic count program maintained by CMRPC, staff were able to determine the heavy vehicle percentages along Route 12 for a 24-hour period. The data listed in the table is the daily percentage of heavy vehicles traveling along the focus roadway segments. The entire study corridor averages between 7.8% and 20.9% heavy vehicles daily.
- From 2019 to 2021 there were 128 reported roadway segment crashes on Route 12 within the study area. Most of the crashes (30) occurred between QCC and Mountain Street. The next highest number of crashes (25) happened between Brooks Street and QCC. Two other roadway segments also had over 20 reported crashes. The two segments were between Walgreens and I-190 and between New Bond Street and Brooks Street.
- Roadway pavement condition along Route 12 is based on a calculated “Overall Condition Index” (OCI) which is derived from the pavement distresses (cracking, distortions, etc.) observed in the field. The OCI scale ranges from 100, indicative of a new roadway, down to zero, where total failure of the paved surface is evident. As can be seen in the table, some of the study segments have two pavement condition scores

as the previously established pavement management segments are *not* the same as the defined CP study segments. The table shows the Route 12 study corridor is largely in "fair" or "poor" condition.

- Route 12 has three bridges within the study area. The first two bridges (W-44-065) are Route 12, carrying both the southbound and northbound directions of travel, and are located above the parallel CSX and Genessee & Wyoming Railroad (G&W RR) lines, south of New Bond Street. Last inspected by MassDOT in 2018, the northbound bridge is considered "Structurally Deficient". The third bridge (W-44-028) is located between Mountain Street and Walgreens and is above the CSX railroad. As for culverts, accommodating streams or other water bodies, none were identified along the study corridor.
- As previously reflected in the intersection findings table, the WRTA provides fixed route and ADA paratransit services along the Route 12 study corridor. Bus routes 30 and 31 service the entirety of the study corridor while bus route 14 services the corridor partly, between QCC and Mountain Street.
- Route 12 is a four-lane roadway between the CSX/GWRR bridge and Brooks Street that includes a raised median that terminates at Andover Street. There is also on-street parking allowed on the northbound side of Route 12 between Bourne Street and New Bond Street. Between Brooks Street and E & W Mountain Street and Walgreens to I-190, Route 12 provides a single lane in each direction. There are sidewalks along the southbound side for the entire length of the study corridor. Sidewalks also exist on the northbound side with one notable exception where sidewalks do *not* exist between Walgreens and Wilbur Street.

Table 13

Worcester
Route 12 Roadway Segments:
Overall Corridor Profile Findings

Route 12 Roadway Segments	Disadvantaged Populations	Environmental Consultation Analysis	Freight Movement Daily % of Heavy Vehicles	Safety Analysis*	Pavement Condition**	Bridges / Culverts	Public Transit	Other Considerations
GWRR to Bourne Street	Low Income and Zero Vehicle Households	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	17.9%	16	OCI = 36.5 (Poor) Structural Improvement	W-44-065	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Four-lane roadway with raised median and minimal shoulder widths. Sidewalks on both sides of roadway.
Bourne Street to New Bond Street	Low Income, Nonwhite, and Zero Vehicle Households	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	17.9%	9	OCI = 36.5 (Poor) Structural Improvement	None	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Four-lane roadway with raised median. Sidewalks on both sides of roadway. On-street parking allowed on northbound side.
New Bond Street to Brooks Street	Low Income, LEP, Nonwhite, and Zero Vehicle Households	Nearby recreation area.	17.9%	23	OCI = 36.5 (Poor) Structural Improvement	None	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Four-lane undivided roadway with sidewalks on both sides of roadway. City's Greendale Fire Station located on this segment.
Brooks Street to QCC	Low Income, LEP, Nonwhite, and Zero Vehicle Households	Nearby recreation area.	7.8%	25	OCI = 47.9 (Poor) Structural Improvement	None	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Single travel lane in each direction with sidewalks on both sides of the roadway.
QCC to E & W Mountain Street	LEP and Nonwhite	Nearby recreation area and wetlands.	7.8%	30	OCI = 47.9 (Poor) Structural Improvement OCI = 48.3 (Fair) Preventative Maintenance	None	WRTA fixed-route buses #14, #30, & #31 available as well as ADA paratransit services provided by WRTA.	Single travel lane in each direction with sidewalks on both sides of the roadway.
E & W Mountain Street to Walgreens	LEP	No nearby open space, wetlands, vernal pools, rare species habitats, or flood zones.	15.7%	4	OCI = 63.2 (Fair) Preventative Maintenance	W-44-028	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Two and four-lane roadway. Sidewalk on southbound side but minimal sidewalk on northbound side.
Walgreens to I-190 Ramps	None	Nearby wetlands.	13.2%	21	OCI = 63.2 (Fair) Preventative Maintenance OCI = 58.3 (Fair) Preventative Maintenance	None	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Two-lane roadway. No sidewalk on northbound side between Walgreens and Wilbur Street.
I-190 Ramps to West Boylston TL	None	Nearby wetlands and a potential vernal pool.	20.9%	0	OCI = 58.3 (Fair) Preventative Maintenance	None	WRTA fixed-route buses #30 & #31 available as well as ADA paratransit services provided by WRTA.	Four-lane divided roadway drops to two undivided lanes at the West Boylston town line heading northbound.

*Total number of crashes (2019-2021)

**OCI = Overal Condition Index, Ranging From 0 - 100

10.3 Performance Management

The below text summarizes the integration of the Route 12 Corridor Profile findings as they relate to performance management. The summary lists numerous federal transportation planning emphasis areas and the associated report chapter in which they are discussed. Information contained in the summary includes the performance objectives for each of the emphasis areas, the corridor context, observed deficiencies, and suggested improvements. Also as shown, there is more than one performance area that is included in multiple chapters. The "corridor context" text describes how the Route 12 corridor relates to each of the performance areas and associated objectives.

Integration of Corridor Profile Findings with Performance Management

Safety (Chapter 5)

- **Performance Objective**: Reduce the number and rate of fatal & serious injury crashes in the region for all types of vehicles. Also includes non-motorized fatalities and serious injuries (PM1).
- **Corridor Context**: Route 12 is a major north/south route through the city of Worcester and the region. Safety improvements could reduce vehicle crashes that involve injuries and fatalities along the roadway.
- **Observed Deficiencies**: A total of 189 crashes occurred in the host community of Worcester along the Route 12 study corridor between 2019-2021. If those crashes, 56 caused injuries and there were zero fatalities.
- **Suggested Improvements**: Improve intersections with a high number of crashes such as Route 12/East & West Mountain Street. Improve roadway geometry, pavement markings, and signage. Also, cut back overgrown vegetation where needed.

Security (Chapter 5)

- **Performance Objective**: Enhance the transportation security coordination and preparedness regionwide.
- **Corridor Context**: Route 12 is considered a secondary evacuation route and it is important for the roadway to be safe and secure. Hazard Mitigation Plans and/or Municipal Vulnerability Preparedness (MVP) Plans are developed to identify vulnerable or hazardous locations within a community.
- **Observed Deficiencies**: The Worcester MVP Plan identified Route 12 as an area prone to flooding within the study corridor.
- **Suggested Improvements**: Maintain the Route 12 corridor in good condition as it is an evacuation route in the city. Make improvements to fix the flooding issues in the study corridor.

State of Good Repair (Chapters 6 & 7)

- **Performance Objective**: Maintain the highway infrastructure asset system in a state of good repair (PM2). 6) Increase % of pavement in good condition and reduce % of pavement in poor condition. 7) Increase % of bridges by deck area in good condition and reduce % of bridges by deck area in poor condition.
- **Corridor Context**: 6) Pavement conditions found along the study corridor are in fair or poor condition. 7) There are two MassDOT-owned bridges along the study corridor located over the CSX/G&W RR for both the northbound and southbound directions and over the CSX at East & West Mountain Street.
- **Observed Deficiencies**: 6) There are two segments in poor condition and three segments in fair condition. 7) The bridge over the CSX and the southbridge bridge over the CSX/G&W RR are not structurally deficient, but the northbound bridge over the CSX/G&W RR is structurally deficient.
- **Suggested Improvements**: 6) Improve all pavement, especially the segments in poor condition. Consider structural improvements for the poor segments, but at the very least, preventative maintenance such as crack sealing, patching and surface treatments should be scheduled along the entire study corridor so other sections of the roadway will not degrade to poor condition. 7) Continue to inspect the two bridges along the study corridor on a regular basis. Also, consider structural improvements for the northbound bridge over the CSX/G&W RR.

Congestion (Chapter 4)

- **Performance Objective**: To achieve a significant reduction in congestion on the National Highway System (NHS). Travel time reliability, non-SOV travel, peak hour excessive delay, and emissions reduction are the focus of this Performance Measure (PM3).
- **Corridor Context**: Route 12 is a major north/south route in the city of Worcester. Route 12 is used by both passenger vehicles and heavy trucks.
- **Observed Deficiencies**: Most focus intersections have a LOS of “A” or “B”, but two intersections have a LOS of “C”. Average travel speeds are between 20 mph and 25 mph. Moderate congestion along the corridor; fairly high volumes with an average of over 10,000 vehicles per day.
- **Suggested Improvements**: Periodically check/adjust signal timing and phasing of all study intersections to ensure they are operating efficiently. See to encourage other travel options though the Complete Streets program and the use of the WRTA fixed-route bus service.

Multimodality (Chapters 8 & 9)

- **Performance Objective**: Improve and/or expand transportation accessibility for all modes (bicycle, pedestrian, transit) in the region.
- **Corridor Context**: 8) Currently, there are three fixed-route buses (14,30,31) that serves Route 12. 9) Pedestrian accommodation exists but bicycle accommodation is limited along the corridor.
- **Observed Deficiencies**: 8) Bus Route 31 has no Sunday service and Route 14 has no weekend service. 9) There is a gap in the sidewalk on the northbound side, north of Walgreens intersection. Throughout the entire corridor, there are no bicycle lanes and minimal shoulder widths to safely ride a bike.
- **Suggested Improvements**: 8) Potentially increase transit service frequency and add or improve bus shelters at high boarding/alighting bus stops. 9) Where needed, construct new sidewalks and ADA ramps where none currently exist. Further, consider widening segments of the Route 12 study corridor where possible to increase shoulder widths or, if feasible, consider separate parallel bicycle/multiuse facilities along the length of the corridor. Potentially utilize the Complete Streets program to fund these types of improvements.

Geographic Equity (Chapters 2 & 8)

- **Performance Objective**: Achieve geographic and population equity across the region. Also, increase disadvantaged populations that intersect with WRTA fixed-route bus service and also ensure all subregions benefit from TIP projects.
- **Corridor Context**: 2) Multiple disadvantaged populations near the Route 12 study corridor. 8) WRTA fixed-route service along Route 12 includes bus routes 14, 30, and 31.
- **Observed Deficiencies**: See observed deficiencies identified within the other performance areas.
- **Suggested Improvements**: 2) Route 12 improvement projects should consider the benefits and burdens of all populations in the project area. 8) Consider pedestrian and transit improvements along the Route 12 corridor.

Economic Vitality (Chapters 4 & 9)

- **Performance Objective**: To improve the accessibility to jobs in the CMMPO region for all modes while also including reliable freight movement.
- **Corridor Context**: 4) Route 12 has a high percentage of heavy trucks. 9) Numerous businesses along the study corridor and nearby streets being accessed by all modes.

- **Observed Deficiencies**: 4) There are between 7% & 21% daily trucks using the study corridor. 9) Minimal bicycle accommodations along the corridor and some gaps in the sidewalk network.
- **Suggested Improvements**: 4) Periodically check/adjust timing and phasing of all signalized intersections on Route 12 to ensure they are working efficiently. 9) Consider using the Complete Streets program to improve the roadway for all users.

Stormwater Management (Chapter 3)

- **Performance Objective**: Create a transportation network that is resilient to the impacts of stormwater.
- **Corridor Context**: There are no major culverts within the study corridor, but there are numerous drainage basins.
- **Observed Deficiencies**: Some areas of Route 12 within the study corridor are known for flooding according to Worcester's MVP plan.
- **Suggested Improvements**: Improve and/or maintain the drainage basins along the study corridor. Options include Green Infrastructure or Nature-Based Solutions if improvements are needed.

Travel & Tourism (Chapter 9)

- **Performance Objective**: To enhance the access, safety and effectiveness of region's transportation network that serves places of touristic value.
- **Corridor Context**: Minimal tourist areas near the Route 12 study corridor. Recreational ball fields located on Brooks Street, just west of Route 12.
- **Observed Deficiencies**: There are no regional or local trails near the study corridor.
- **Suggested Improvements**: install or improve standardized wayfinding signs to recreation areas and popular tourist attractions, if any. Improve roadways near and around local tourist attractions.

11.0 Suggested Improvement Options

CMRPC summarizes a broad range of suggested improvement options within each completed Corridor Profile effort. Depending on host community needs, some suggestions can be specific to a certain corridor location or can be applied to the entire length of the study area. Staff will typically meet with each community included in the Corridor Profile scope to discuss and incorporate their ideas for suggested improvements into the study report. Some improvements can be implemented on a short-term basis while others are aimed at the future, perhaps 5 to 10 years from the present.

As a reference, below are some of the short-term improvement options that were suggested in previous Corridor Profiles which can be used at specific intersections or along an entire corridor. These suggestions include:

- Check and potentially adjust the timing & phasing of signalized intersections.
- Maintain all traffic signals, signs, and pavement markings.
- Trim any overgrown vegetation that is obstructing the sight lines of vehicles, signs, or traffic signals.
- Maintain good pavement surfaces.
- Maintain bridges, culverts, and other roadside drainage facilities and features.
- Install new or improve existing guide signs for sites of touristic value.
- Consider access management techniques, such as curb cut consolidation.
- Incorporate additional traffic control signage for safety purposes, such as yellow diamond warning signs.
- Consider enhancing pedestrian and bicyclist safety corridor-wide, with a focus at high-use locations.
- Reconfigure travel lane delineation at an intersection where appropriate and feasible.
- Use streetscaping for beautification & livability purposes.

In addition, the following suggested improvement options incorporated into prior Corridor Profile efforts were considered more for the mid-term/long-term time frames. These types of improvements will likely be of higher cost and will take longer to implement or construct. These have been largely suggested on a community-by-community basis but can certainly be used for more than one location. They include:

- Realignment of intersection approaches.
- The consideration of the installation of a modern roundabout rather than signalized control where appropriate and feasible.
- Widen roadways where additional shoulder width, travel or turning lanes are deemed necessary.

- Incorporate Intelligent Transportation Systems (ITS) components into the roadway network, such as dynamic messaging signs.
- Install overhead highway lighting where necessary.
- Utilize a "Complete Streets" approach, designing for all roadway users.
- Coordinate adjacent traffic signals where appropriate and feasible.
- Install new traffic signals or modernize/update existing signal equipment.
- Utilize traffic calming measures along densely settled sections of a roadway, as appropriate and feasible.

Reaffirmed by the Bipartisan Infrastructure Law (BIL), the CMMPO is continuing the development of performance-driven, multimodal TIP projects. Performance Based Planning & Programming (PBP&P) is intended to improve public transparency, fiscal accountability, and investment decisions affecting the condition and performance of the transportation system.

The CMMPO's Performance Management program includes numerous goals and objectives across many federal transportation planning emphasis areas. Each goal and objective have corresponding performance metrics that are monitored and progress towards the established goals is reported annually. A Performance Measures Scoresheet was created to assess both current and future year TIP projects as to what extent they address regional goals. TIP projects that rank high are often projects that can provide substantive measurable outcomes for each goal, thus having increased regional impact.

This Corridor Profile report includes a range of suggested improvement options for both MassDOT and host community consideration. Entirely maintained by the City of Worcester, Route 12 is federal-aid eligible, therefore many of the suggested improvement options could be included in future candidate TIP projects that have the potential to produce higher Performance Management scores. Higher scores increase the likelihood of CMMPO programming. In addition to the TIP, the MassWorks Infrastructure Program could also be a potential funding option for some of the suggested improvements on Route 12. For more information on the MassWorks program, click here MassWorks Program.

11.1 Route 12 Suggested Improvement Options

The following suggested improvement options, meant to address general overall deficiencies observed along the Route 12 study corridor, have been compiled for MassDOT and host community City of Worcester consideration. These improvement options are also shown in **Figure 21**.

- As the East & West Mountain Street intersection has the highest number of crashes within the study corridor, consider improvements to improve safety for all roadway

users. Additionally, consider signal timing modifications as this study intersection exhibits the longest calculated delays during both peak travel periods.

- As included in Worcester's recent Mobility Action Plan, expand bicycle and micro-mobility infrastructure on Route 12 (West Boylston Street). A network or system of connected safe bikeways is envisioned, providing people access to everyday, popular destinations within the city without requiring the use of a car.
- Construct new sidewalks to fill in the gaps observed on the northbound side of Route 12, north of East & West Mountain Street. This would complete the sidewalk network on both sides of Route 12 for the entire length of the study corridor.
- Selectively trim trees and other vegetation that block the view of any traffic control signs, signals, and pedestrian crosswalks.
- Periodically conduct needed sign maintenance. Replace worn and faded traffic control signs to ensure nighttime reflectivity.
- Repaint/upgrade worn pavement markings to enhance travel lane and crosswalk delineation through increased reflectivity.
- Install pedestrian crosswalks in strategically identified locations along the study corridor as needed. Install appropriate, accompanying warning signs. Consider use of Rectangular Rapid-Flashing Beacons (RRFB).
- Consider ITS applications along the study corridor, such as active speed monitoring, currently in use in the greater region. Also, consider Transit Signal Priority for the Route 12 corridor as it is frequently used by three (3) WRTA fixed route buses.
- Improve pavement throughout the study corridor as it is currently rated in either "fair" or "poor" condition.
- Upgrade all signalized focus intersections to be compliant with the Americans with Disabilities Act (ADA) and the Public Right-of-Way Accessibility Guidelines (PROWAG).
- Evaluate the existing 4-lane sections of Route 12 to consider modifying the roadway to improve safety. The use of road dieting to eliminate double-threat type crashes could also be studied further. Road diet methods could include potentially reducing lane widths, increasing shoulder widths, and improving conditions for on-street bicycling.
- At the Route 12/New Bond Street study intersection the New Bond Street approach needs to continue to accommodate two exclusive turning lanes. The signalized control timing & phasing needs to be optimized and operate in conjunction with the rail crossing warning signal & safety gates. At times, CSX freight train traffic will likely block the crossing for various intervals during the course of a typical day, including both the morning & evening peak hour flow periods.

  It appears that signal timing adjustments at Route 12/New Bond Street, as well as Route 12/Brooks Street, will be necessary to accommodate full redevelopment traffic

generation. As Route 12 operates well adjacent to the site during both peak flow periods, additional time could be allocated to the signal phases for both Brooks Street and New Bond Street to balance encountered vehicle delay.

Full consideration of these suggested actions would be viewed as a proactive attempt to fully mitigate the likely traffic impacts associated with the site. Efficient operations are essential at the Route 12/New Bond Street intersection, one of three (3) major access points serving the renewed site. It is strongly suggested to consider the need to establish approach lanes of adequate length on New Bond Street. The approach geometry should be carefully considered and addressed prior to opening early phases of the SGA redevelopment.

WORCESTER ROUTE 12 CORRIDOR PROFILE

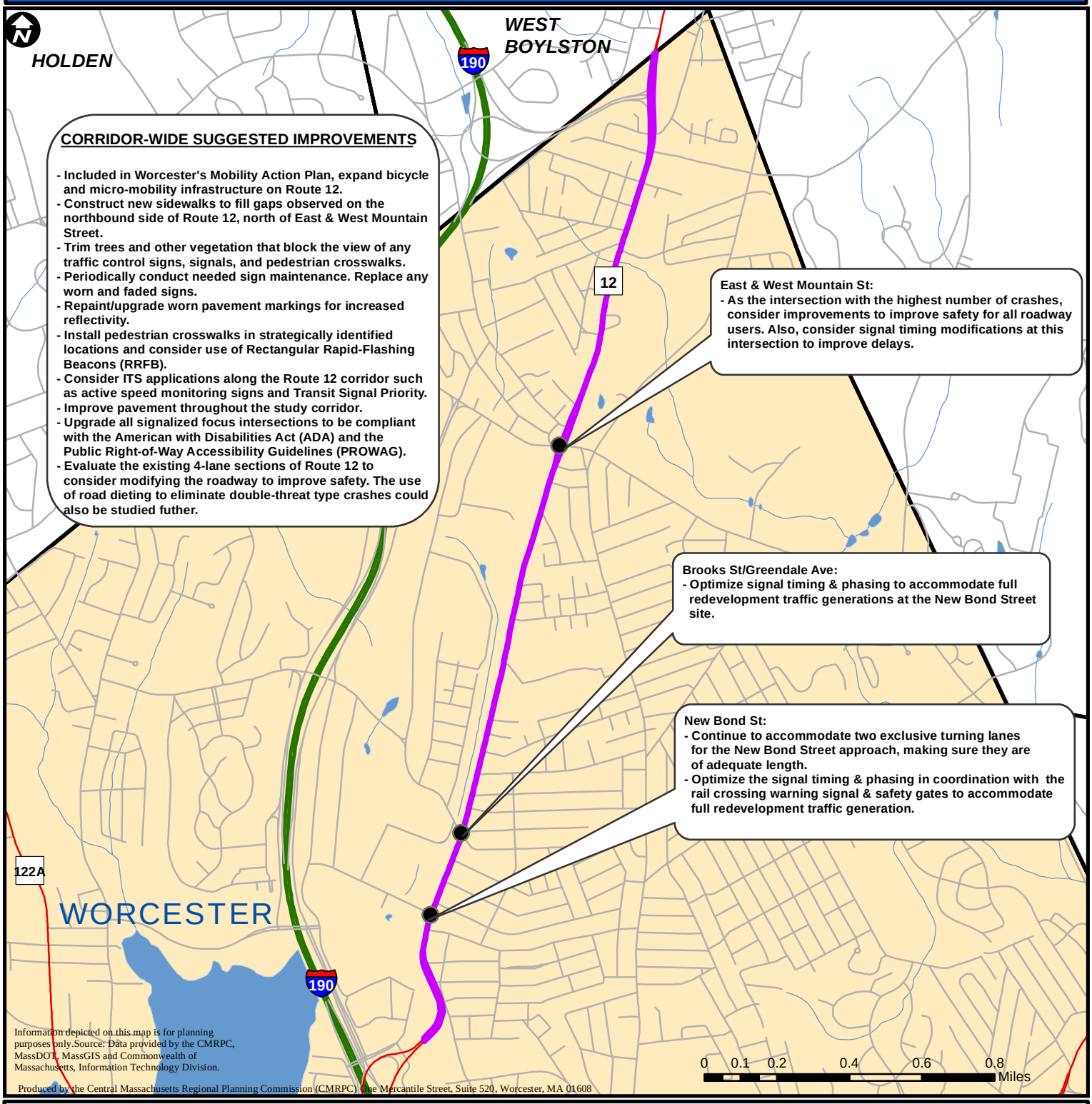
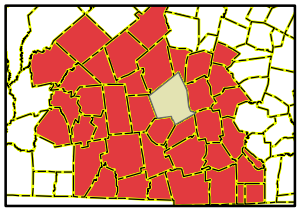


Figure 21: Suggested Improvement Options

CMMPO

CENTRAL MASSACHUSETTS Regional Planning Commission

- Route 12 Corridor Profile
- Other Roads
- Interstate
- State Route
- US Highway
- Streams
- Water Bodies



Appendix A: Route 12 Traffic Volume Counts

Appendix A includes the results from the six (6) traffic counts completed on Route 12 in the City of Worcester. The data shows the 60-minute volumes for each direction at each traffic count location.

Town : Worcester
Street : West Boylston Street
Location : North of I-190

Site: 2024300

Weekly Volume

Interval Start	Mon 8/26/2024		Tue 8/27/2024		Wed 8/28/2024		Thu 8/29/2024		Fri 8/30/2024		Sat 8/31/2024		Sun 9/1/2024		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	12	16	14	19	21	20	-	-	-	-	-	-	15.7	18.3	15.7	18.3
1:00 AM	-	-	8	10	6	9	5	10	-	-	-	-	-	-	6.3	9.7	6.3	9.7
2:00 AM	-	-	9	7	5	5	6	5	-	-	-	-	-	-	6.7	5.7	6.7	5.7
3:00 AM	-	-	10	5	12	9	14	11	-	-	-	-	-	-	12.0	8.3	12.0	8.3
4:00 AM	-	-	31	43	29	46	27	31	-	-	-	-	-	-	29.0	40.0	29.0	40.0
5:00 AM	-	-	104	126	107	136	103	130	-	-	-	-	-	-	104.7	130.7	104.7	130.7
6:00 AM	-	-	290	246	271	261	262	268	-	-	-	-	-	-	274.3	258.3	274.3	258.3
7:00 AM	-	-	403	327	423	353	424	339	-	-	-	-	-	-	416.7	339.7	416.7	339.7
8:00 AM	-	-	387	368	477	330	-	-	-	-	-	-	-	-	432.0	349.0	432.0	349.0
9:00 AM	-	-	354	417	350	394	-	-	-	-	-	-	-	-	352.0	405.5	352.0	405.5
10:00 AM	-	-	437	368	410	403	-	-	-	-	-	-	-	-	423.5	385.5	423.5	385.5
11:00 AM	-	-	405	469	433	450	-	-	-	-	-	-	-	-	419.0	459.5	419.0	459.5
12:00 PM	462	518	502	427	461	516	-	-	-	-	-	-	-	-	475.0	487.0	475.0	487.0
1:00 PM	437	432	402	468	411	513	-	-	-	-	-	-	-	-	416.7	471.0	416.7	471.0
2:00 PM	449	419	463	484	468	485	-	-	-	-	-	-	-	-	460.0	462.7	460.0	462.7
3:00 PM	436	463	478	480	561	451	-	-	-	-	-	-	-	-	491.7	464.7	491.7	464.7
4:00 PM	419	529	458	562	453	531	-	-	-	-	-	-	-	-	443.3	540.7	443.3	540.7
5:00 PM	397	523	504	466	458	500	-	-	-	-	-	-	-	-	453.0	496.3	453.0	496.3
6:00 PM	361	392	396	463	413	462	-	-	-	-	-	-	-	-	390.0	439.0	390.0	439.0
7:00 PM	328	373	393	380	355	402	-	-	-	-	-	-	-	-	358.7	385.0	358.7	385.0
8:00 PM	256	256	284	289	303	264	-	-	-	-	-	-	-	-	281.0	269.7	281.0	269.7
9:00 PM	155	137	185	175	185	157	-	-	-	-	-	-	-	-	175.0	156.3	175.0	156.3
10:00 PM	93	71	73	79	88	84	-	-	-	-	-	-	-	-	84.7	78.0	84.7	78.0
11:00 PM	34	39	40	49	40	45	-	-	-	-	-	-	-	-	38.0	44.3	38.0	44.3
Totals	3827	4152	6628	6724	6733	6825	862	814	0	0	0	0	0	0	6558.8	6704.8	6558.8	6704.8
Combined	7979		13352		13558		1676		0		0		0		13263.7		13263.7	
Split (%)	48.0	52.0	49.6	50.4	49.7	50.3	51.4	48.6	-	-	-	-	-	-	49.4	50.6	49.4	50.6

Peak Hours

12:00 AM - 12:00 PM	-	-	10:00 AM	11:00 AM	8:00 AM	11:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	8:00 AM	11:00 AM	8:00 AM	11:00 AM
Volume	-	-	437	469	477	450	424	339	-	-	-	-	-	-	432.0	459.5	432.0	459.5
12:00 PM - 12:00 AM	12:00 PM	4:00 PM	5:00 PM	4:00 PM	3:00 PM	4:00 PM	-	-	-	-	-	-	-	-	3:00 PM	4:00 PM	3:00 PM	4:00 PM
Volume	462	529	504	562	561	531	-	-	-	-	-	-	-	-	491.7	540.7	491.7	540.7

Town : Worcester
Street : West Boylston Street
Location : South of I-190

Site: 2024299

Weekly Volume

Interval Start	Mon 6/3/2024		Tue 6/4/2024		Wed 6/5/2024		Thu 6/6/2024		Fri 6/7/2024		Sat 6/8/2024		Sun 6/9/2024		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	-	-	23	20	29	27	0	0	-	-	-	-	17.3	15.7	17.3	15.7
1:00 AM	-	-	-	-	18	12	11	13	0	0	-	-	-	-	9.7	8.3	9.7	8.3
2:00 AM	-	-	-	-	6	7	17	6	0	0	-	-	-	-	7.7	4.3	7.7	4.3
3:00 AM	-	-	-	-	15	5	12	8	0	0	-	-	-	-	9.0	4.3	9.0	4.3
4:00 AM	-	-	-	-	47	27	40	21	0	0	-	-	-	-	29.0	16.0	29.0	16.0
5:00 AM	-	-	-	-	136	58	123	72	0	0	-	-	-	-	86.3	43.3	86.3	43.3
6:00 AM	-	-	-	-	317	125	307	138	0	0	-	-	-	-	208.0	87.7	208.0	87.7
7:00 AM	-	-	-	-	575	214	471	196	0	0	-	-	-	-	348.7	136.7	348.7	136.7
8:00 AM	-	-	-	-	553	209	497	273	0	0	-	-	-	-	350.0	160.7	350.0	160.7
9:00 AM	-	-	-	-	508	264	575	279	0	0	-	-	-	-	361.0	181.0	361.0	181.0
10:00 AM	-	-	604	302	591	301	569	286	-	-	-	-	-	-	588.0	296.3	588.0	296.3
11:00 AM	-	-	654	366	653	309	600	309	-	-	-	-	-	-	635.7	328.0	635.7	328.0
12:00 PM	-	-	707	338	711	320	688	343	-	-	-	-	-	-	702.0	333.7	702.0	333.7
1:00 PM	-	-	691	323	684	329	643	292	-	-	-	-	-	-	672.7	314.7	672.7	314.7
2:00 PM	-	-	700	354	649	326	643	400	-	-	-	-	-	-	664.0	360.0	664.0	360.0
3:00 PM	-	-	712	347	675	371	642	363	-	-	-	-	-	-	676.3	360.3	676.3	360.3
4:00 PM	-	-	815	366	738	338	691	388	-	-	-	-	-	-	748.0	364.0	748.0	364.0
5:00 PM	-	-	662	351	616	357	663	355	-	-	-	-	-	-	647.0	354.3	647.0	354.3
6:00 PM	-	-	625	326	646	302	539	343	-	-	-	-	-	-	603.3	323.7	603.3	323.7
7:00 PM	-	-	549	262	584	274	485	274	-	-	-	-	-	-	539.3	270.0	539.3	270.0
8:00 PM	-	-	463	201	458	214	410	181	-	-	-	-	-	-	443.7	198.7	443.7	198.7
9:00 PM	-	-	268	148	269	138	226	115	-	-	-	-	-	-	254.3	133.7	254.3	133.7
10:00 PM	-	-	150	66	116	73	115	71	-	-	-	-	-	-	127.0	70.0	127.0	70.0
11:00 PM	-	-	81	33	65	38	83	74	-	-	-	-	-	-	76.3	48.3	76.3	48.3
Totals	0	0	7681	3783	9653	4631	9079	4827	0	0	0	0	0	0	8804.3	4413.7	8804.3	4413.7
Combined	0		11464		14284		13906		0		0		0		13218.0		13218.0	
Split (%)	-	-	67.0	33.0	67.6	32.4	65.3	34.7	-	-	-	-	-	-	66.6	33.4	66.6	33.4

Peak Hours

12:00 AM - 12:00 PM	-	-	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	-	-	-	-	-	-	11:00 AM	11:00 AM	11:00 AM	11:00 AM
Volume	-	-	654	366	653	309	600	309	-	-	-	-	-	-	635.7	328.0	635.7	328.0
12:00 PM - 12:00 AM	-	-	4:00 PM	4:00 PM	4:00 PM	3:00 PM	4:00 PM	2:00 PM	-	-	-	-	-	-	4:00 PM	4:00 PM	4:00 PM	4:00 PM
Volume	-	-	815	366	738	371	691	400	-	-	-	-	-	-	748.0	364.0	748.0	364.0

Town : Worcester
Street : West Boylston Street
Location : South of Stop & Shop Plaza

Site: 2024298

Weekly Volume

Interval Start	Mon 6/3/2024		Tue 6/4/2024		Wed 6/5/2024		Thu 6/6/2024		Fri 6/7/2024		Sat 6/8/2024		Sun 6/9/2024		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	-	-	22	16	32	20	30	18	-	-	-	-	28.0	18.0	28.0	18.0
1:00 AM	-	-	-	-	17	15	12	11	10	10	-	-	-	-	13.0	12.0	13.0	12.0
2:00 AM	-	-	-	-	8	6	9	11	6	10	-	-	-	-	7.7	9.0	7.7	9.0
3:00 AM	-	-	-	-	8	12	9	7	6	7	-	-	-	-	7.7	8.7	7.7	8.7
4:00 AM	-	-	-	-	31	31	23	32	28	26	-	-	-	-	27.3	29.7	27.3	29.7
5:00 AM	-	-	-	-	64	79	78	75	69	69	-	-	-	-	70.3	74.3	70.3	74.3
6:00 AM	-	-	-	-	142	191	152	184	160	188	-	-	-	-	151.3	187.7	151.3	187.7
7:00 AM	-	-	-	-	252	324	235	302	263	315	-	-	-	-	250.0	313.7	250.0	313.7
8:00 AM	-	-	-	-	275	332	322	303	305	338	-	-	-	-	300.7	324.3	300.7	324.3
9:00 AM	-	-	-	-	348	308	325	374	347	353	-	-	-	-	340.0	345.0	340.0	345.0
10:00 AM	-	-	-	-	337	352	374	359	-	-	-	-	-	-	355.5	355.5	355.5	355.5
11:00 AM	-	-	550	352	397	403	399	403	-	-	-	-	-	-	448.7	386.0	448.7	386.0
12:00 PM	-	-	532	396	414	418	391	437	-	-	-	-	-	-	445.7	417.0	445.7	417.0
1:00 PM	-	-	499	394	424	396	377	412	-	-	-	-	-	-	433.3	400.7	433.3	400.7
2:00 PM	-	-	441	488	375	449	400	498	-	-	-	-	-	-	405.3	478.3	405.3	478.3
3:00 PM	-	-	468	422	423	439	422	434	-	-	-	-	-	-	437.7	431.7	437.7	431.7
4:00 PM	-	-	421	470	384	441	422	419	-	-	-	-	-	-	409.0	443.3	409.0	443.3
5:00 PM	-	-	406	420	398	408	380	454	-	-	-	-	-	-	394.7	427.3	394.7	427.3
6:00 PM	-	-	369	415	330	399	370	373	-	-	-	-	-	-	356.3	395.7	356.3	395.7
7:00 PM	-	-	298	330	297	351	301	312	-	-	-	-	-	-	298.7	331.0	298.7	331.0
8:00 PM	-	-	251	276	240	274	229	247	-	-	-	-	-	-	240.0	265.7	240.0	265.7
9:00 PM	-	-	169	174	155	184	133	178	-	-	-	-	-	-	152.3	178.7	152.3	178.7
10:00 PM	-	-	76	102	86	78	77	76	-	-	-	-	-	-	79.7	85.3	79.7	85.3
11:00 PM	-	-	41	55	48	49	80	55	-	-	-	-	-	-	56.3	53.0	56.3	53.0
Totals	0	0	4521	4294	5475	5955	5552	5976	1224	1334	0	0	0	0	5709.2	5971.5	5709.2	5971.5
Combined	0		8815		11430		11528		2558		0		0		11680.7		11680.7	
Split (%)	-	-	51.3	48.7	47.9	52.1	48.2	51.8	47.8	52.2	-	-	-	-	48.9	51.1	48.9	51.1

Peak Hours

12:00 AM - 12:00 PM	-	-	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	9:00 AM	9:00 AM	-	-	-	-	11:00 AM	11:00 AM	11:00 AM	11:00 AM
Volume	-	-	550	352	397	403	399	403	347	353	-	-	-	-	448.7	386.0	448.7	386.0
12:00 PM - 12:00 AM	-	-	12:00 PM	2:00 PM	1:00 PM	2:00 PM	3:00 PM	2:00 PM	-	-	-	-	-	-	12:00 PM	2:00 PM	12:00 PM	2:00 PM
Volume	-	-	532	488	424	449	422	498	-	-	-	-	-	-	445.7	478.3	445.7	478.3

Town : Worcester
Street : West Boylston Street
Location : South of Mountain Street

Site: 2024297

Weekly Volume

Interval Start	Mon 6/3/2024		Tue 6/4/2024		Wed 6/5/2024		Thu 6/6/2024		Fri 6/7/2024		Sat 6/8/2024		Sun 6/9/2024		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	-	-	48	26	84	36	70	24	-	-	-	-	67.3	28.7	67.3	28.7
1:00 AM	-	-	-	-	28	18	33	15	0	0	-	-	-	-	20.3	11.0	20.3	11.0
2:00 AM	-	-	-	-	25	6	23	10	0	0	-	-	-	-	16.0	5.3	16.0	5.3
3:00 AM	-	-	-	-	28	13	23	11	0	0	-	-	-	-	17.0	8.0	17.0	8.0
4:00 AM	-	-	-	-	58	39	53	34	0	0	-	-	-	-	37.0	24.3	37.0	24.3
5:00 AM	-	-	-	-	126	88	152	74	0	0	-	-	-	-	92.7	54.0	92.7	54.0
6:00 AM	-	-	-	-	294	224	293	208	0	0	-	-	-	-	195.7	144.0	195.7	144.0
7:00 AM	-	-	-	-	444	357	439	371	0	0	-	-	-	-	294.3	242.7	294.3	242.7
8:00 AM	-	-	-	-	409	388	470	371	0	0	-	-	-	-	293.0	253.0	293.0	253.0
9:00 AM	-	-	-	-	464	345	536	325	0	0	-	-	-	-	333.3	223.3	333.3	223.3
10:00 AM	-	-	-	-	516	325	569	335	-	-	-	-	-	-	542.5	330.0	542.5	330.0
11:00 AM	-	-	-	-	644	341	551	360	-	-	-	-	-	-	597.5	350.5	597.5	350.5
12:00 PM	-	-	622	388	830	340	701	345	-	-	-	-	-	-	717.7	357.7	717.7	357.7
1:00 PM	-	-	650	387	686	394	685	337	-	-	-	-	-	-	673.7	372.7	673.7	372.7
2:00 PM	-	-	675	388	675	369	768	365	-	-	-	-	-	-	706.0	374.0	706.0	374.0
3:00 PM	-	-	663	389	707	367	731	397	-	-	-	-	-	-	700.3	384.3	700.3	384.3
4:00 PM	-	-	728	342	708	362	659	410	-	-	-	-	-	-	698.3	371.3	698.3	371.3
5:00 PM	-	-	644	355	659	365	656	348	-	-	-	-	-	-	653.0	356.0	653.0	356.0
6:00 PM	-	-	604	296	553	293	527	342	-	-	-	-	-	-	561.3	310.3	561.3	310.3
7:00 PM	-	-	476	310	451	301	454	292	-	-	-	-	-	-	460.3	301.0	460.3	301.0
8:00 PM	-	-	404	245	361	254	325	247	-	-	-	-	-	-	363.3	248.7	363.3	248.7
9:00 PM	-	-	297	165	264	186	221	180	-	-	-	-	-	-	260.7	177.0	260.7	177.0
10:00 PM	-	-	164	92	206	90	150	97	-	-	-	-	-	-	173.3	93.0	173.3	93.0
11:00 PM	-	-	81	64	90	63	111	78	-	-	-	-	-	-	94.0	68.3	94.0	68.3
Totals	0	0	6008	3421	9274	5554	9214	5588	70	24	0	0	0	0	8568.7	5089.2	8568.7	5089.2
Combined	0		9429		14828		14802		94		0		0		13657.8		13657.8	
Split (%)	-	-	63.7	36.3	62.5	37.5	62.2	37.8	74.5	25.5	-	-	-	-	62.7	37.3	62.7	37.3

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	11:00 AM	8:00 AM	10:00 AM	7:00 AM	12:00 AM	12:00 AM	-	-	-	-	11:00 AM	11:00 AM	11:00 AM	11:00 AM
Volume	-	-	-	-	644	388	569	371	70	24	-	-	-	-	597.5	350.5	597.5	350.5
12:00 PM - 12:00 AM	-	-	4:00 PM	3:00 PM	12:00 PM	1:00 PM	2:00 PM	4:00 PM	-	-	-	-	-	-	12:00 PM	3:00 PM	12:00 PM	3:00 PM
Volume	-	-	728	389	830	394	768	410	-	-	-	-	-	-	717.7	384.3	717.7	384.3

Central Massachusetts Regional Planning Commission

One Mercantile Street STE 520
Worcester, MA 01608

Site Code: 2024296
Worcester: West Boylston
South of Brooks Street (NB Only)

Start Time	09-Sep-24 NB	NB	Tue NB	NB	Wed NB	NB	Thu NB	NB	Fri		Sat		Sun		Week Average	
12:00 AM	*	*	0	31	0	44	0	48	*	*	*	*	*	*	0	41
01:00	*	*	0	19	0	32	0	30	*	*	*	*	*	*	0	27
02:00	*	*	0	19	0	21	0	25	*	*	*	*	*	*	0	22
03:00	*	*	0	51	0	22	0	23	*	*	*	*	*	*	0	32
04:00	*	*	0	39	0	37	0	45	*	*	*	*	*	*	0	40
05:00	*	*	0	118	0	122	0	126	*	*	*	*	*	*	0	122
06:00	*	*	0	299	0	315	0	314	*	*	*	*	*	*	0	309
07:00	*	*	0	**828**	0	**764**	0	**817**	*	*	*	*	*	*	0	**803**
08:00	*	*	0	747	0	746	0	743	*	*	*	*	*	*	0	745
09:00	*	*	0	737	0	746	0	806	*	*	*	*	*	*	0	763
10:00	*	*	0	713	0	742	*	*	*	*	*	*	*	*	0	728
11:00	*	*	0	736	0	680	*	*	*	*	*	*	*	*	0	708
12:00 PM	0	769	0	757	0	810	*	*	*	*	*	*	*	*	0	779
01:00	0	771	0	748	0	801	*	*	*	*	*	*	*	*	0	773
02:00	0	844	0	864	0	804	*	*	*	*	*	*	*	*	0	837
03:00	0	**947**	0	**933**	0	**941**	*	*	*	*	*	*	*	*	0	**940**
04:00	0	865	0	860	0	852	*	*	*	*	*	*	*	*	0	859
05:00	0	812	0	841	0	811	*	*	*	*	*	*	*	*	0	821
06:00	0	664	0	735	0	750	*	*	*	*	*	*	*	*	0	716
07:00	0	493	0	501	0	523	*	*	*	*	*	*	*	*	0	506
08:00	0	312	0	393	0	378	*	*	*	*	*	*	*	*	0	361
09:00	0	223	0	240	0	280	*	*	*	*	*	*	*	*	0	248
10:00	0	139	0	147	0	167	*	*	*	*	*	*	*	*	0	151
11:00	0	102	0	87	0	97	*	*	*	*	*	*	*	*	0	95
Lane	0	6941	0	11443	0	11485	0	2977	0	0	0	0	0	0	0	11426
Day	6941		11443		11485		2977		0		0		0		11426	
AM Peak	-	-	-	07:00	-	07:00	-	07:00	-	-	-	-	-	-	-	07:00
Vol.	-	-	-	828	-	764	-	817	-	-	-	-	-	-	-	803
PM Peak	-	15:00	-	15:00	-	15:00	-	-	-	-	-	-	-	-	-	15:00
Vol.	-	947	-	933	-	941	-	-	-	-	-	-	-	-	-	940

Comb. Total	6941	11443	11485	2977	0	0	0	11426
ADT	ADT 11,427	AADT 11,427						

Central Massachusetts Regional Planning Commission

One Mercantile Street STE 520
Worcester, MA 01608

Site Code: 2024296
Worcester: West Boylston Street
South of Brooks Street (SB only)

Start Time	Mon 26-Aug-24	Tue 27-Aug-24	Wed 28-Aug-24	Thu 29-Aug-24	Fri 30-Aug-24	Average Day	Sat 31-Aug-24	Sun 01-Sep-24	Week Average
12:00 AM	*	47	47	48	*	47	*	*	47
01:00	*	23	23	31	*	26	*	*	26
02:00	*	23	21	22	*	22	*	*	22
03:00	*	13	25	19	*	19	*	*	19
04:00	*	54	56	54	*	55	*	*	55
05:00	*	147	122	138	*	136	*	*	136
06:00	*	395	375	369	*	380	*	*	380
07:00	*	**618**	581	**619**	*	**606**	*	*	**606**
08:00	*	606	**606**	586	*	599	*	*	599
09:00	*	565	554	*	*	560	*	*	560
10:00	*	528	528	*	*	528	*	*	528
11:00	*	548	565	*	*	556	*	*	556
12:00 PM	638	626	597	*	*	620	*	*	620
01:00	659	678	707	*	*	681	*	*	681
02:00	**766**	745	**790**	*	*	**767**	*	*	**767**
03:00	738	**766**	751	*	*	752	*	*	752
04:00	716	748	712	*	*	725	*	*	725
05:00	547	621	694	*	*	621	*	*	621
06:00	462	515	552	*	*	510	*	*	510
07:00	393	476	455	*	*	441	*	*	441
08:00	341	302	314	*	*	319	*	*	319
09:00	213	225	242	*	*	227	*	*	227
10:00	137	151	168	*	*	152	*	*	152
11:00	84	106	99	*	*	96	*	*	96
Day Total	5694	9526	9584	1886	0	9445	0	0	9445
% Avg. WkDay	60.3%	100.9%	101.5%	20.0%	0.0%				
% Avg. Week	60.3%	100.9%	101.5%	20.0%	0.0%	100.0%	0.0%	0.0%	
AM Peak	-	07:00	08:00	07:00	-	07:00	-	-	07:00
Vol.	-	618	606	619	-	606	-	-	606
PM Peak	14:00	15:00	14:00	-	-	14:00	-	-	14:00
Vol.	766	766	790	-	-	767	-	-	767

Grand Total	5694	9526	9584	1886	0	9445	0	0	9445

ADT ADT 9,445 AADT 9,445

Town : Worcester
Street : West Boylston Street
Location : South of Bourne Street

Site: 2024295

Weekly Volume, per Channel

NB

Interval Start	Mon 8/26/2024	Tue 8/27/2024	Wed 8/28/2024	Thu 8/29/2024	Fri 8/30/2024	Sat 8/31/2024	Sun 9/1/2024	Mon - Fri Average	Weekly Average
12:00 AM	-	61	67	56	-	-	-	61.3	61.3
1:00 AM	-	33	36	44	-	-	-	37.7	37.7
2:00 AM	-	21	21	29	-	-	-	23.7	23.7
3:00 AM	-	28	27	31	-	-	-	28.7	28.7
4:00 AM	-	51	58	50	-	-	-	53.0	53.0
5:00 AM	-	163	162	155	-	-	-	160.0	160.0
6:00 AM	-	494	518	487	-	-	-	499.7	499.7
7:00 AM	-	785	754	708	-	-	-	749.0	749.0
8:00 AM	-	754	708	717	-	-	-	726.3	726.3
9:00 AM	-	612	627	-	-	-	-	619.5	619.5
10:00 AM	-	581	601	-	-	-	-	591.0	591.0
11:00 AM	-	610	665	-	-	-	-	637.5	637.5
12:00 PM	-	693	671	-	-	-	-	682.0	682.0
1:00 PM	713	663	680	-	-	-	-	685.3	685.3
2:00 PM	798	747	825	-	-	-	-	790.0	790.0
3:00 PM	761	698	929	-	-	-	-	796.0	796.0
4:00 PM	738	762	791	-	-	-	-	763.7	763.7
5:00 PM	726	757	738	-	-	-	-	740.3	740.3
6:00 PM	579	564	584	-	-	-	-	575.7	575.7
7:00 PM	404	416	461	-	-	-	-	427.0	427.0
8:00 PM	293	378	401	-	-	-	-	357.3	357.3
9:00 PM	208	265	272	-	-	-	-	248.3	248.3
10:00 PM	160	163	183	-	-	-	-	168.7	168.7
11:00 PM	97	110	136	-	-	-	-	114.3	114.3
Totals	5477	10409	10915	2277	0	0	0	10536.0	10536.0

Peak Hours

12:00 AM - 12:00 PM	-	7:00 AM	7:00 AM	8:00 AM	-	-	-	7:00 AM	7:00 AM
Volume	-	785	754	717	-	-	-	749.0	749.0
12:00 PM - 12:00 AM	2:00 PM	4:00 PM	3:00 PM	-	-	-	-	3:00 PM	3:00 PM
Volume	798	762	929	-	-	-	-	796.0	796.0

Town : Worcester
Street : West Boylston Street
Location : South of Bourne Street

Site: 2024295

Weekly Volume, per Channel

SB

Interval Start	Mon 8/26/2024	Tue 8/27/2024	Wed 8/28/2024	Thu 8/29/2024	Fri 8/30/2024	Sat 8/31/2024	Sun 9/1/2024	Mon - Fri Average	Weekly Average
12:00 AM	-	34	47	55	-	-	-	45.3	45.3
1:00 AM	-	23	27	38	-	-	-	29.3	29.3
2:00 AM	-	19	26	28	-	-	-	24.3	24.3
3:00 AM	-	28	29	26	-	-	-	27.7	27.7
4:00 AM	-	54	58	51	-	-	-	54.3	54.3
5:00 AM	-	178	151	176	-	-	-	168.3	168.3
6:00 AM	-	382	395	384	-	-	-	387.0	387.0
7:00 AM	-	729	720	669	-	-	-	706.0	706.0
8:00 AM	-	669	682	628	-	-	-	659.7	659.7
9:00 AM	-	539	522	-	-	-	-	530.5	530.5
10:00 AM	-	490	506	-	-	-	-	498.0	498.0
11:00 AM	-	550	519	-	-	-	-	534.5	534.5
12:00 PM	-	615	592	-	-	-	-	603.5	603.5
1:00 PM	671	661	657	-	-	-	-	663.0	663.0
2:00 PM	824	807	825	-	-	-	-	818.7	818.7
3:00 PM	837	870	682	-	-	-	-	796.3	796.3
4:00 PM	774	838	863	-	-	-	-	825.0	825.0
5:00 PM	659	705	711	-	-	-	-	691.7	691.7
6:00 PM	475	489	532	-	-	-	-	498.7	498.7
7:00 PM	385	453	447	-	-	-	-	428.3	428.3
8:00 PM	326	289	360	-	-	-	-	325.0	325.0
9:00 PM	209	226	224	-	-	-	-	219.7	219.7
10:00 PM	146	146	168	-	-	-	-	153.3	153.3
11:00 PM	94	112	122	-	-	-	-	109.3	109.3
Totals	5400	9906	9865	2055	0	0	0	9797.5	9797.5
Peak Hours									
12:00 AM - 12:00 PM	-	7:00 AM	7:00 AM	7:00 AM	-	-	-	7:00 AM	7:00 AM
Volume	-	729	720	669	-	-	-	706.0	706.0
12:00 PM - 12:00 AM	3:00 PM	3:00 PM	4:00 PM	-	-	-	-	4:00 PM	4:00 PM
Volume	837	870	863	-	-	-	-	825.0	825.0

Appendix B: Route 12 Turning Movement Counts (TMCs) and Level of Service (LOS) Analyses

Appendix B includes the results from the seven (7) TMCs completed on Route 12 in the City of Worcester. The results contain the full 4-hour count, the AM and PM peak hour data diagram, and the current and projected LOS results calculated by the Highway Capacity Software (HCS). The New Bond Street and Brooks Street/Greendale Avenue intersection also contain the projected 2028 volumes LOS results for the St. Gobain redevelopment study that is discussed in Chapter 4.

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 4/9/2024

LOCATION: Route 12 / Bourne Street / Parking Lot

DAY OF WEEK: Tuesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

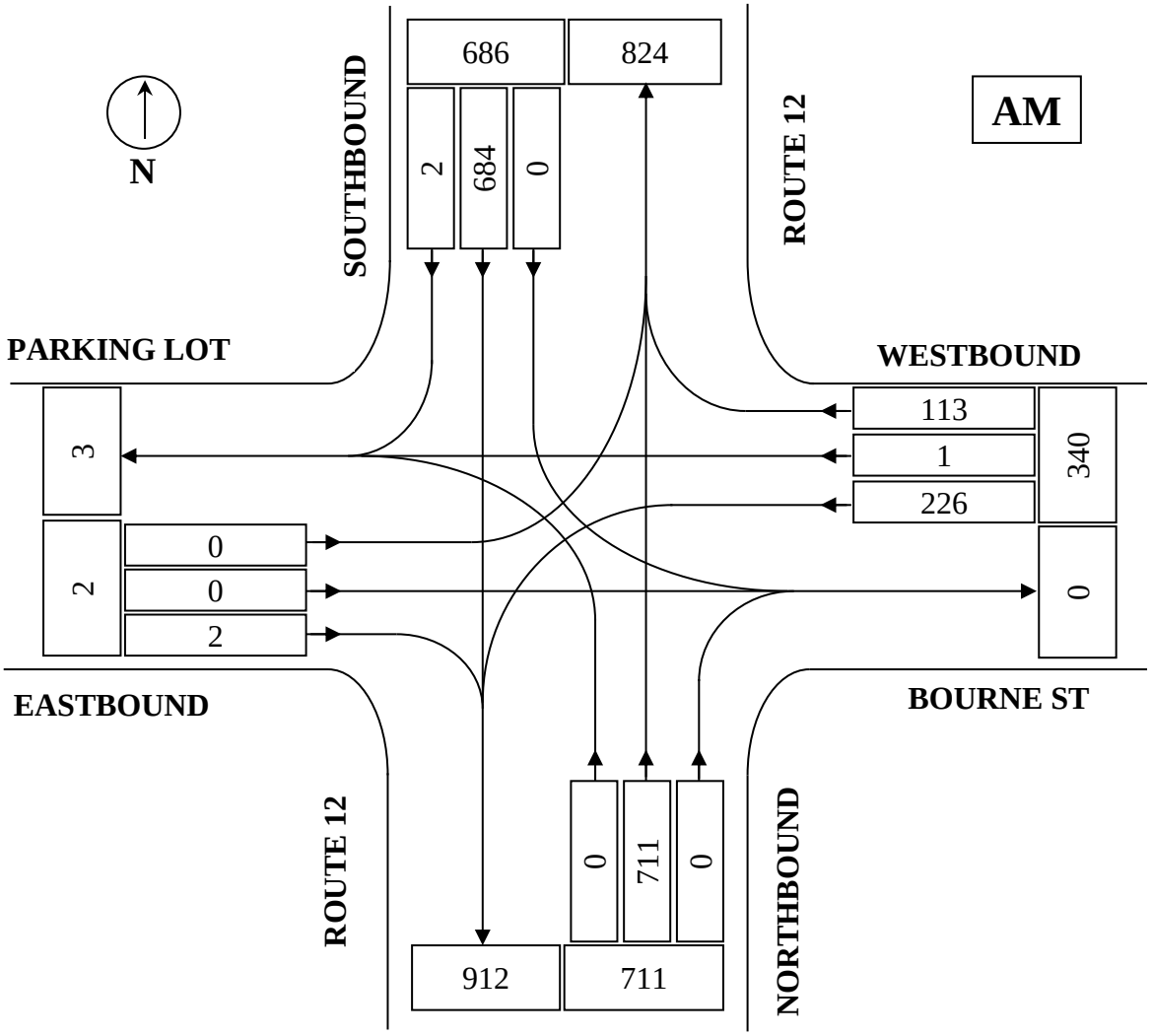
Time Period	Parking Lot EB				Bourne St WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0		1	0	52	0	41	4		191		5		176	1	8	462	
7:15 - 7:30	0		0	0	54	0	26	1		157		4		216	1	2	454	
7:30 - 7:45	0		1	0	50	1	25	4		178		3		134	0	3	389	
7:45 - 8:00	0		0	0	70	0	21	2		185		4		158	0	1	434	1739
8:00 - 8:15	0		1	0	64	0	14	0		150		3		163	0	3	392	1669
8:15 - 8:30	0		0	0	55	0	21	4		198		9		154	0	7	428	1643
8:30 - 8:45	0		0	0	65	0	19	4		162		10		192	1	13	439	1693
8:45 - 9:00	0		0	0	57	0	32	2		179		8		149	0	3	417	1676
TOTAL	0	0	3	0	467	1	199	21	0	1400	0	46	0	1342	3	40	3415	
		EBPct	0.1			**WBPct**	19.6			**NBPct**	40.9			**SBPct**	39.4			
Peak Sums:	**0**	**0**	**2**	**0**	**226**	**1**	**113**	**11**	**0**	**711**	**0**	**16**	**0**	**684**	**2**	**14**	**1739**	
Total Trucks	41					**TrkPct**	2.36			**PHF**	0.94							

Time Period	Parking Lot EB				Bourne St WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0		0	0	59	0	41	0		166		8		220	0	9	486	
4:15 - 4:30	0		0	0	61	0	39	2		165		8		200	1	5	466	
4:30 - 4:45	0		0	0	61	0	37	0		183		12		165	0	2	446	
4:45 - 5:00	0		0	0	59	0	43	0		167		4		159	0	2	428	1826
5:00 - 5:15	0		0	0	72	0	48	1		157		2		214	0	1	491	1831
5:15 - 5:30	0		0	0	60	0	36	1		199		2		183	0	0	478	1843
5:30 - 5:45	0		0	0	42	0	28	0		127		1		160	0	0	357	1754
5:45 - 6:00	0		0	0	45	0	27	1		129		1		132	0	1	333	1659
TOTAL	0	0	0	0	459	0	299	5	0	1293	0	38	0	1433	1	20	3485	
		EBPct	0.0			**WBPct**	22.6			**NBPct**	38.3			**SBPct**	39.1			
Peak Sums:	**0**	**0**	**0**	**0**	**252**	**0**	**164**	**2**	**0**	**706**	**0**	**20**	**0**	**721**	**0**	**5**	**1843**	
Total Trucks	27					**TrkPct**	1.47			**PHF**	0.94							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 4/9/24 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 12 / Bourne Street / Parking Lot

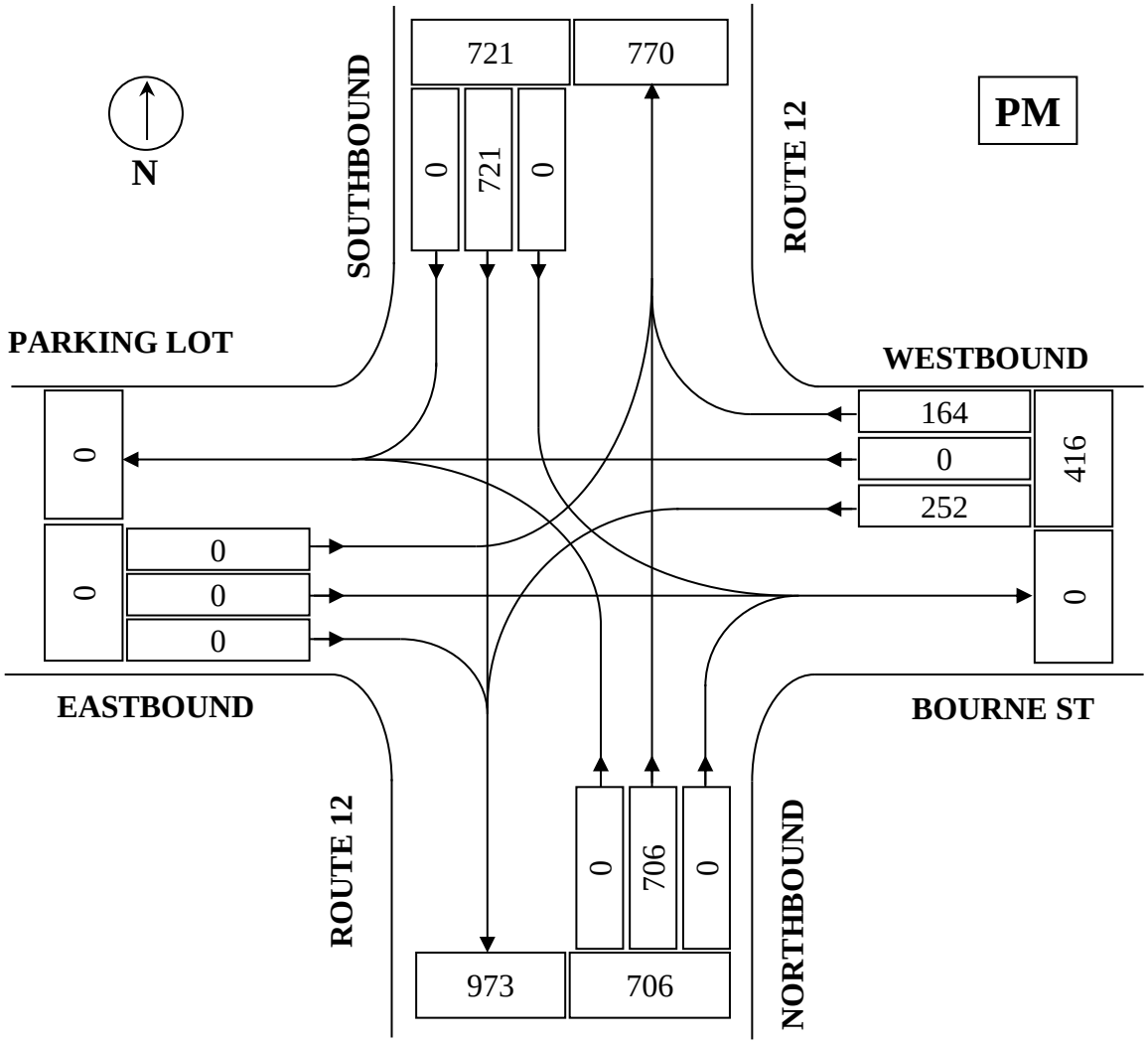


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Parking Lot EB	2	0.1%	7:00 - 8:00 AM
Bourne St WB	340	19.6%	PHF = .94
Route 12 NB	711	40.9%	**VEHICLES COUNTED**
Route 12 SB	686	39.4%	**ALL VEHICLES:** 1739
TOTAL	1739	100.0%	**TRUCKS:** 41
			PERCENT TRUCKS: 2.36%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

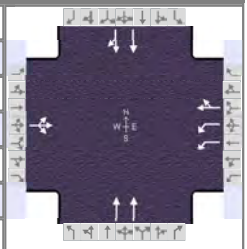
CITY: Worcester **DATE:** 4/9/24 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 12 / Bourne Street / Parking Lot



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Parking Lot EB	0	0.0%	4:30 - 5:30 PM
Bourne St WB	416	22.6%	PHF = .94
Route 12 NB	706	38.3%	VEHICLES COUNTED
Route 12 SB	721	39.1%	ALL VEHICLES: 1843
TOTAL	1843	100.0%	TRUCKS: 27
			PERCENT TRUCKS: 1.47%

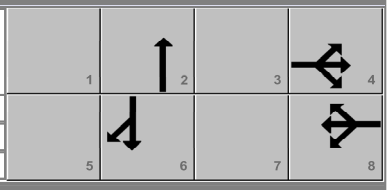
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	5/14/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:00 - 8:00 AM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Route 12/Bourne St	File Name	24_Route 12 & Bourne St_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	0	2	226	1	113		711			684	2

Signal Information													
Cycle, s	65.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	Yes	Simult. Gap E/W	On	Green	33.0	22.0	0.0	0.0	0.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0			
				Red	2.0	2.0	0.0	0.0	0.0	0.0			



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		6.0		8.0		8.0
Phase Duration, s		27.0		27.0		38.0		38.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.0		3.0
Queue Clearance Time (g_s), s		2.1		24.0		10.7		9.8
Green Extension Time (g_e), s		0.8		0.0		3.4		3.4
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		1.00		0.01		0.01

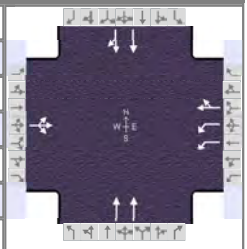
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18		2			6	16
Adjusted Flow Rate (*v*), veh/h		0		240	116			756			367	363
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1730		1413	1587			1773			1870	1853
Queue Service Time (g_s), s		0.0		4.0	3.4			8.7			7.8	7.8
Cycle Queue Clearance Time (g_c), s		0.0		4.1	3.4			8.7			7.8	7.8
Green Ratio (*g/C*)		0.24		0.34	0.34			0.51			0.51	0.51
Capacity (*c*), veh/h				1175	537			1801			950	941
Volume-to-Capacity Ratio (*X*)		0.000		0.205	0.216			0.420			0.386	0.386
Back of Queue (*Q*), ft/ln (95 th percentile)		0		53	51			128			121	118
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0		2.1	2.0			5.0			4.8	4.7
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (d_1), s/veh				15.6	15.3			10.0			9.8	9.8
Incremental Delay (d_2), s/veh		0.0		0.0	0.1			0.1			0.1	0.1
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh				15.6	15.4			10.1			9.9	9.9
Level of Service (LOS)				B	B			B			A	A
Approach Delay, s/veh / LOS	14.2	B		15.6	B		10.1	B		9.9	A	
Intersection Delay, s/veh / LOS	11.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.09	B	2.09	B	2.08	B	1.65	B
Bicycle LOS Score / LOS	0.49	A	1.08	A	1.11	A	1.09	A

 HCS™ Streets Version 2024 Generated: 5/14/2024 10:37:26 AM

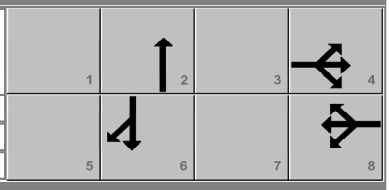
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	5/14/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:30
Intersection	Route 12/Bourne St	File Name	24_Route 12 & Bourne St_PM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	0	0	252	0	164		706			721	0

Signal Information												
Cycle, s	42.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
				Green	20.0	12.0	0.0	0.0	0.0	0.0		
				Yellow	3.0	3.0	0.0	0.0	0.0	0.0		
				Red	2.0	2.0	0.0	0.0	0.0	0.0		



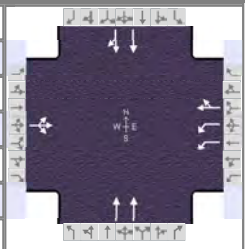
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		6.0		8.0		8.0
Phase Duration, s		17.0		17.0		25.0		25.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		0.0		3.2		3.0		3.0
Queue Clearance Time (g_s), s				14.0		7.9		7.6
Green Extension Time (g_e), s		0.0		0.0		3.4		3.4
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				1.00		0.10		0.10

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18		2			6	16
Adjusted Flow Rate (*v*), veh/h		0		268	164			751			767	0
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1730		1737	1584			1788			1878	1854
Queue Service Time (g_s), s		0.0		2.4	3.5			5.9			5.6	0.0
Cycle Queue Clearance Time (g_c), s		0.0		2.4	3.5			5.9			5.6	0.0
Green Ratio (*g/C*)		0.24		0.29	0.29			0.48			0.48	0.51
Capacity (*c*), veh/h				1336	453			1702			1788	
Volume-to-Capacity Ratio (*X*)		0.000		0.201	0.362			0.441			0.429	0.000
Back of Queue (*Q*), ft/ln (95 th percentile)		0		35	44			65			66	0
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0		1.4	1.8			2.6			2.6	0.0
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (d_1), s/veh				11.6	12.0			7.3			7.2	
Incremental Delay (d_2), s/veh		0.0		0.0	0.2			0.1			0.1	0.0
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh				11.6	12.1			7.4			7.3	
Level of Service (LOS)				B	B			A			A	
Approach Delay, s/veh / LOS	0.0			11.8		B	7.4		A	7.3		A
Intersection Delay, s/veh / LOS	8.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	2.07	B	1.64	B
Bicycle LOS Score / LOS	0.49	A	1.20	A	1.11	A	1.12	A

HCS Signalized Intersection Results Summary

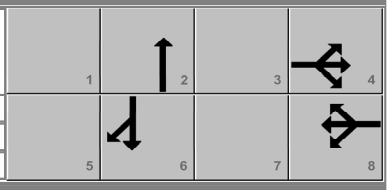
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	5/14/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:00 - 8:00 AM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Route 12/Bourne St	File Name	24_Route 12 & Bourne St_AM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	0	2	249	1	124		782			752	2

Signal Information			
Cycle, s	65.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	33.0	22.0	0.0	0.0	0.0	0.0	
Yellow	3.0	3.0	0.0	0.0	0.0	0.0	
Red	2.0	2.0	0.0	0.0	0.0	0.0	



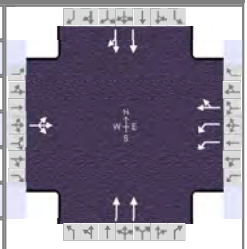
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		6.0		8.0		8.0
Phase Duration, s		27.0		27.0		38.0		38.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.0		3.0
Queue Clearance Time (g_s), s		2.1		6.5		11.8		10.8
Green Extension Time (g_e), s		0.8		0.8		3.8		3.8
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.02		0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18		2			6	16
Adjusted Flow Rate (*v*), veh/h		0		265	128			832			403	399
Adjusted Saturation Flow Rate (*s*), veh/h/ln		0		1413	1587			1773			1870	1853
Queue Service Time (g_s), s		0.0		4.5	3.8			9.8			8.8	8.8
Cycle Queue Clearance Time (g_c), s		0.0		4.5	3.8			9.8			8.8	8.8
Green Ratio (*g/C*)				0.34	0.34			0.51			0.51	0.51
Capacity (*c*), veh/h				1175	537			1801			950	941
Volume-to-Capacity Ratio (*X*)		0.000		0.225	0.238			0.462			0.424	0.424
Back of Queue (*Q*), ft/ln (95 th percentile)		0		60	56			144			137	134
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0		2.3	2.2			5.7			5.4	5.3
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (d_1), s/veh				15.7	15.5			10.3			10.0	10.0
Incremental Delay (d_2), s/veh		0.0		0.0	0.1			0.1			0.1	0.1
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh				15.8	15.6			10.4			10.2	10.2
Level of Service (LOS)				B	B			B			B	B
Approach Delay, s/veh / LOS	14.2	B		15.7	B		10.4	B		10.2	B	
Intersection Delay, s/veh / LOS	11.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.09	B	2.09	B	2.08	B	1.65	B
Bicycle LOS Score / LOS	0.49	A	1.14	A	1.17	A	1.15	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	5/14/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:30
Intersection	Route 12/Bourne St	File Name	24_Route 12 & Bourne St_PM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	0	0	0	277	0	180		777			793	0

Signal Information													
Cycle, s	42.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	20.0	12.0	0.0	0.0	0.0	0.0	1	2	3	4
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0	5	6	7	8
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		6.0		8.0		8.0
Phase Duration, s		17.0		17.0		25.0		25.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0		5.0
Max Allow Headway (*MAH*), s		0.0		3.2		3.0		3.0
Queue Clearance Time (g_s), s				5.9		8.6		8.4
Green Extension Time (g_e), s		0.0		0.7		3.7		3.7
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.14		0.16		0.16

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18		2			6	16
Adjusted Flow Rate (*v*), veh/h		0		295	181			827			844	0
Adjusted Saturation Flow Rate (*s*), veh/h/ln		0		1737	1584			1788			1878	0
Queue Service Time (g_s), s		0.0		2.7	3.9			6.6			6.4	0.0
Cycle Queue Clearance Time (g_c), s		0.0		2.7	3.9			6.6			6.4	0.0
Green Ratio (*g/C*)				0.29	0.29			0.48			0.48	
Capacity (*c*), veh/h				1336	453			1702			1788	
Volume-to-Capacity Ratio (*X*)		0.000		0.221	0.400			0.486			0.472	0.000
Back of Queue (*Q*), ft/ln (95 th percentile)		0		38	50			74			75	0
Back of Queue (*Q*), veh/ln (95 th percentile)		0.0		1.5	2.0			2.9			3.0	0.0
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00		0.00	0.00			0.00			0.00	0.00
Uniform Delay (d_1), s/veh				11.7	12.1			7.5			7.4	
Incremental Delay (d_2), s/veh		0.0		0.0	0.2			0.1			0.1	0.0
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0			0.0			0.0	0.0
Control Delay (*d*), s/veh				11.7	12.3			7.6			7.5	
Level of Service (LOS)				B	B			A			A	
Approach Delay, s/veh / LOS	0.0			11.9		B	7.6		A	7.5		A
Intersection Delay, s/veh / LOS	8.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.08	B	2.08	B	2.07	B	1.64	B
Bicycle LOS Score / LOS	0.49	A	1.27	A	1.17	A	1.18	A

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 6/6/2024

LOCATION: Route 12 / New Bond Street

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

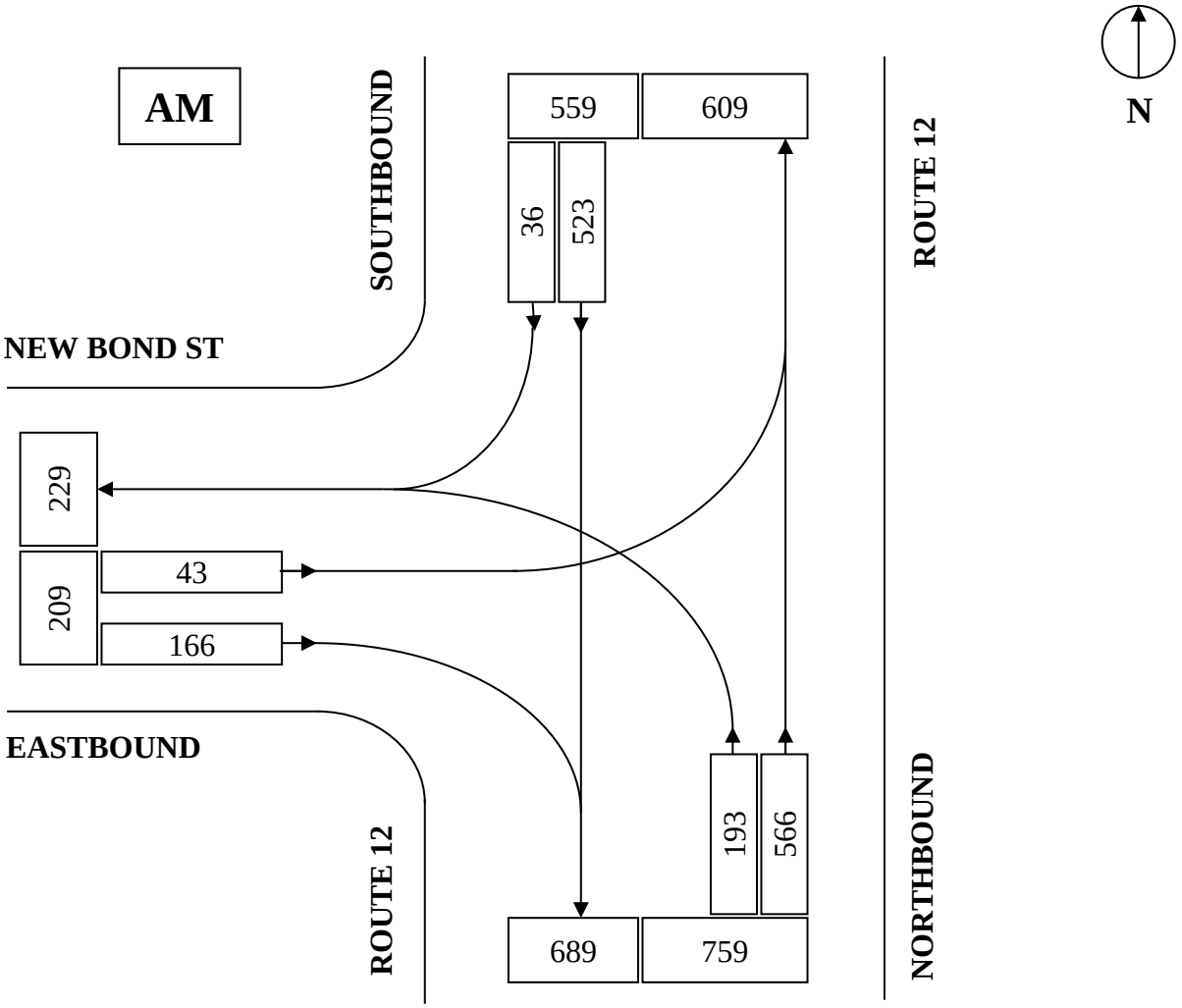
Time Period	New Bond St EB								Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	20		56	4					56	162		12		121	12	11	427	
7:15 - 7:30	12		83	2					65	142		3		132	8	4	442	
7:30 - 7:45	5		20	2					38	112		5		124	9	6	308	
7:45 - 8:00	6		7	1					34	150		3		146	7	2	350	1527
8:00 - 8:15	1		9	0					31	148		4		149	6	9	344	1444
8:15 - 8:30	6		20	2					36	167		14		142	7	6	378	1380
8:30 - 8:45	18		76	5					38	152		14		112	4	11	400	1472
8:45 - 9:00	4		20	0					28	174		9		125	2	4	353	1475
TOTAL	72	0	291	16	0	0	0	0	326	1207	0	64	0	1051	55	53	3002	
		EBPct	13.7			**WBPct**	0.0			**NBPct**	49.7			**SBPct**	36.6			
Peak Sums:	**43**	**0**	**166**	**9**	**0**	**0**	**0**	**0**	**193**	**566**	**0**	**23**	**0**	**523**	**36**	**23**	**1527**	
Total Trucks	55					**TrkPct**	3.60			**PHF**	0.86							

Time Period	New Bond St EB								Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	8		33	0					3	197		13		177	1	8	419	
4:15 - 4:30	6		11	2					5	183		8		143	1	2	349	
4:30 - 4:45	3		12	2					11	205		9		140	0	2	371	
4:45 - 5:00	3		6	0					1	196		5		172	2	1	380	1519
5:00 - 5:15	9		23	0					1	195		2		145	1	0	374	1474
5:15 - 5:30	1		12	0					6	183		2		109	2	1	313	1438
5:30 - 5:45	3		4	0					1	175		3		153	2	2	338	1405
5:45 - 6:00	0		3	0					1	157		2		118	0	0	279	1304
TOTAL	33	0	104	4	0	0	0	0	29	1491	0	44	0	1157	9	16	2823	
		EBPct	5.4			**WBPct**	0.0			**NBPct**	52.7			**SBPct**	41.9			
Peak Sums:	**20**	**0**	**62**	**4**	**0**	**0**	**0**	**0**	**20**	**781**	**0**	**35**	**0**	**632**	**4**	**13**	**1519**	
Total Trucks	52					**TrkPct**	3.42			**PHF**	0.91							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 6/6/24 **DAY OF WEEK:** Thursday
INTERSECTION: Route 12 / New Bond Street

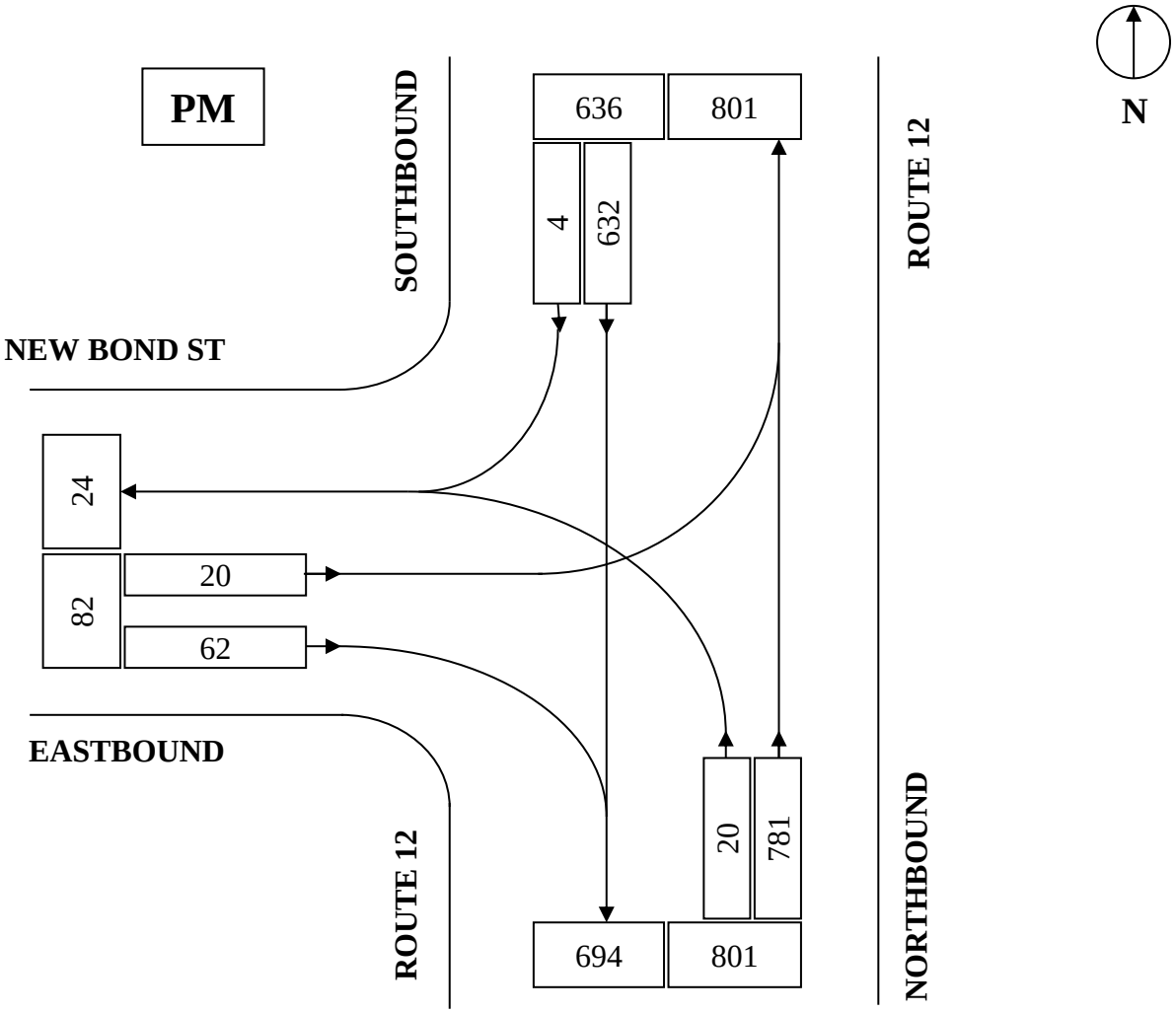


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
New Bond St EB	209	13.7%	
			PHF = .86
Route 12 NB	759	49.7%	
			VEHICLES COUNTED
Route 12 SB	559	36.6%	
			ALL VEHICLES: 1527
TOTAL	1527	100.0%	**TRUCKS:** 55
			PERCENT TRUCKS: 3.60%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

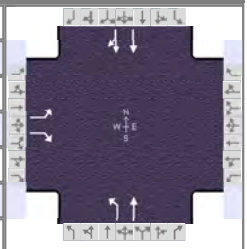
CITY: Worcester **DATE:** 6/6/24 **DAY OF WEEK:** Thursday
INTERSECTION: Route 12 / New Bond Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:00 - 5:00 PM
New Bond St EB	82	5.4%	
			PHF = .91
Route 12 NB	801	52.7%	
			VEHICLES COUNTED
Route 12 SB	636	41.9%	
			ALL VEHICLES: 1519
TOTAL	1519	100.0%	**TRUCKS:** 52
			PERCENT TRUCKS: 3.42%

HCS Signalized Intersection Results Summary

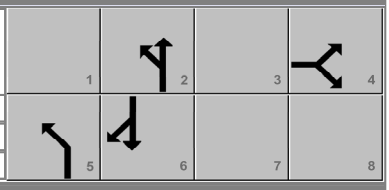
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:00 - 8:00 AM	PHF	0.86
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	43		166				193	566			523	36

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	53.0	12.0	0.0	0.0	0.0	
Yellow	3.0	3.0	3.0	0.0	0.0	0.0	
Red	2.0	2.0	2.0	0.0	0.0	0.0	



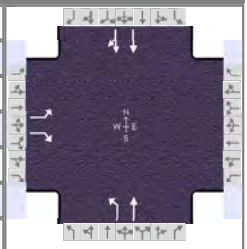
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		17.0			12.0	70.0		58.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		12.4			5.5	14.4		9.4
Green Extension Time (g_e), s		0.0			0.1	2.7		2.7
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	50		193				224	658			330	320
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781		1585				1810	1826			1841	1784
Queue Service Time (g_s), s	2.2		10.4				3.5	12.4			7.4	7.4
Cycle Queue Clearance Time (g_c), s	2.2		10.4				3.5	12.4			7.4	7.4
Green Ratio (*g/C*)	0.14		0.14				0.71	0.75			0.61	0.61
Capacity (*c*), veh/h	246		219				644	1364			1121	1087
Volume-to-Capacity Ratio (*X*)	0.204		0.883				0.348	0.482			0.294	0.295
Back of Queue (*Q*), ft/ln (95 th percentile)	42		246				45	146			119	112
Back of Queue (*Q*), veh/ln (95 th percentile)	1.7		9.7				1.8	5.7			4.6	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	33.3		36.8				4.8	4.3			8.1	8.1
Incremental Delay (d_2), s/veh	0.2		30.8				0.1	0.1			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	33.4		67.6				4.9	4.4			8.1	8.2
Level of Service (LOS)	C		E				A	A			A	A
Approach Delay, s/veh / LOS	60.5		E	0.0			4.6		A	8.1		A
Intersection Delay, s/veh / LOS	13.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.95	B	0.64	A	1.87	B
Bicycle LOS Score / LOS		F			1.94	B	1.02	A

HCS Signalized Intersection Results Summary

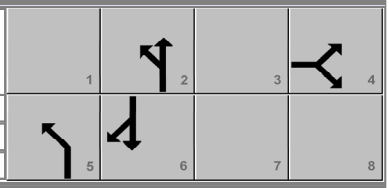
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_PM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	20		62				20	781			632	4

Signal Information			
Cycle, s	104.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	60.0	14.0	0.0	0.0	0.0	
Yellow	3.0	3.0	3.0	0.0	0.0	0.0	
Red	2.0	2.0	2.0	0.0	0.0	0.0	



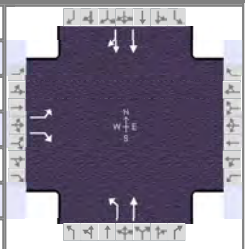
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			20.0	85.0		65.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		6.0			2.3	23.0		12.3
Green Extension Time (g_e), s		0.1			0.0	3.5		3.5
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.00			0.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	22		68				22	858			351	348
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1795		1598				1767	1841			1856	1837
Queue Service Time (g_s), s	1.1		4.0				0.3	21.0			10.3	10.3
Cycle Queue Clearance Time (g_c), s	1.1		4.0				0.3	21.0			10.3	10.3
Green Ratio (*g/C*)	0.13		0.13				0.74	0.77			0.58	0.58
Capacity (*c*), veh/h	242		215				678	1416			1071	1060
Volume-to-Capacity Ratio (*X*)	0.091		0.317				0.032	0.606			0.328	0.328
Back of Queue (*Q*), ft/ln (95 th percentile)	22		72				4	255			182	176
Back of Queue (*Q*), veh/ln (95 th percentile)	0.9		2.8				0.2	10.0			7.1	7.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	39.4		40.7				4.3	5.2			11.5	11.5
Incremental Delay (d_2), s/veh	0.1		0.3				0.0	0.5			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	39.5		41.0				4.3	5.7			11.5	11.5
Level of Service (LOS)	D		D				A	A			B	B
Approach Delay, s/veh / LOS	40.6		D	0.0			5.7		A	11.5		B
Intersection Delay, s/veh / LOS	10.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	1.96	B	0.64	A	1.89	B
Bicycle LOS Score / LOS		F			1.94	B	1.06	A

HCS Signalized Intersection Results Summary

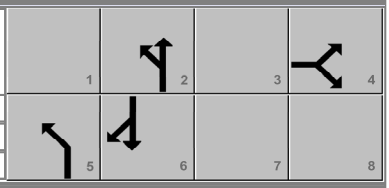
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:00 - 8:00 AM	PHF	0.86
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_AM-Proj.xus		
Project Description	Projected 2024				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	47		183				212	623			575	40

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	7.0	53.0	12.0	0.0	0.0	0.0
Yellow	3.0	3.0	3.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



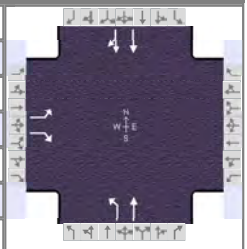
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		17.0			12.0	70.0		58.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		13.6			5.9	16.5		10.4
Green Extension Time (g_e), s		0.0			0.1	3.1		3.1
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	55		213				247	724			363	352
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781		1585				1810	1826			1841	1782
Queue Service Time (g_s), s	2.4		11.6				3.9	14.5			8.3	8.4
Cycle Queue Clearance Time (g_c), s	2.4		11.6				3.9	14.5			8.3	8.4
Green Ratio (*g/C*)	0.14		0.14				0.71	0.75			0.61	0.61
Capacity (*c*), veh/h	246		219				612	1364			1121	1086
Volume-to-Capacity Ratio (*X*)	0.222		0.973				0.403	0.531			0.324	0.324
Back of Queue (*Q*), ft/ln (95 th percentile)	46		307				50	172			134	126
Back of Queue (*Q*), veh/ln (95 th percentile)	1.8		12.1				2.0	6.7			5.2	5.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	33.4		37.3				5.1	4.6			8.3	8.3
Incremental Delay (d_2), s/veh	0.2		52.9				0.2	0.2			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	33.5		90.2				5.2	4.8			8.3	8.3
Level of Service (LOS)	C		F				A	A			A	A
Approach Delay, s/veh / LOS	78.6		E	0.0			4.9		A	8.3		A
Intersection Delay, s/veh / LOS	16.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.95	B	0.64	A	1.87	B
Bicycle LOS Score / LOS		F			2.09	B	1.08	A

HCS Signalized Intersection Results Summary

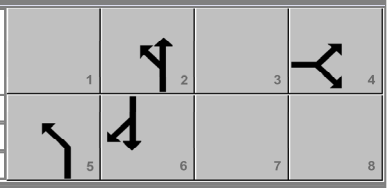
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_PM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	22		68				22	859			695	4

Signal Information			
Cycle, s	104.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	60.0	14.0	0.0	0.0	0.0
Yellow	3.0	3.0	3.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



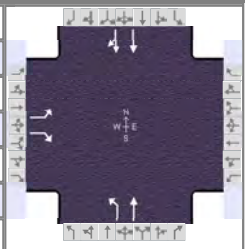
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			20.0	85.0		65.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		6.4			2.4	27.3		13.6
Green Extension Time (g_e), s		0.1			0.0	4.1		4.1
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.00			0.00	0.01		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	24		75				24	944			386	382
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1795		1598				1767	1841			1856	1837
Queue Service Time (g_s), s	1.2		4.4				0.4	25.3			11.6	11.6
Cycle Queue Clearance Time (g_c), s	1.2		4.4				0.4	25.3			11.6	11.6
Green Ratio (*g/C*)	0.13		0.13				0.74	0.77			0.58	0.58
Capacity (*c*), veh/h	242		215				648	1416			1071	1060
Volume-to-Capacity Ratio (*X*)	0.100		0.347				0.037	0.667			0.361	0.361
Back of Queue (*Q*), ft/ln (95 th percentile)	24		79				5	300			203	197
Back of Queue (*Q*), veh/ln (95 th percentile)	1.0		3.1				0.2	11.7			7.9	7.9
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	39.5		40.9				4.5	5.7			11.8	11.8
Incremental Delay (d_2), s/veh	0.1		0.4				0.0	1.0			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	39.5		41.2				4.5	6.7			11.8	11.8
Level of Service (LOS)	D		D				A	A			B	B
Approach Delay, s/veh / LOS	40.8	D		0.0			6.6	A		11.8	B	
Intersection Delay, s/veh / LOS	10.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	1.96	B	0.64	A	1.89	B
Bicycle LOS Score / LOS		F			2.09	B	1.12	A

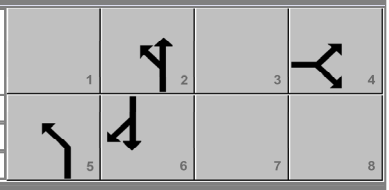
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:00 - 8:00 AM	PHF	0.86
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_AM-Consultant Proj…		
Project Description	Consultant 2028 Volumes				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	48		216				421	662			725	79

Signal Information					EB			WB			NB			SB		
Cycle, s	87.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	7.0	53.0		12.0	0.0	0.0	0.0					
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	3.0		3.0	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0		2.0	0.0	0.0	0.0					



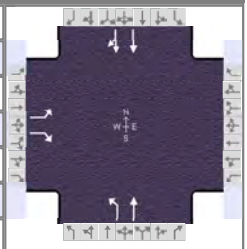
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		17.0			12.0	70.0		58.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		14.0			9.0	18.0		13.9
Green Extension Time (g_e), s		0.0			0.0	3.9		3.9
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			1.00	0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	56		251				490	770			478	457
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1781		1585				1810	1826			1841	1760
Queue Service Time (g_s), s	2.4		12.0				7.0	16.0			11.9	11.9
Cycle Queue Clearance Time (g_c), s	2.4		12.0				7.0	16.0			11.9	11.9
Green Ratio (*g/C*)	0.14		0.14				0.71	0.75			0.61	0.61
Capacity (*c*), veh/h	246		219				516	1364			1121	1072
Volume-to-Capacity Ratio (*X*)	0.227		1.149				0.949	0.564			0.426	0.426
Back of Queue (*Q*), ft/ln (95 th percentile)	47		442				382	193			191	177
Back of Queue (*Q*), veh/ln (95 th percentile)	1.9		17.4				15.3	7.5			7.4	7.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	33.4		37.5				14.1	4.8			9.0	9.0
Incremental Delay (d_2), s/veh	0.2		106.8				27.1	0.3			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	33.5		144.3				41.2	5.1			9.1	9.1
Level of Service (LOS)	C		F				D	A			A	A
Approach Delay, s/veh / LOS	124.2		F	0.0			19.2		B	9.1		A
Intersection Delay, s/veh / LOS	28.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.95	B	0.64	A	1.87	B
Bicycle LOS Score / LOS		F			2.57	C	1.26	A

HCS Signalized Intersection Results Summary

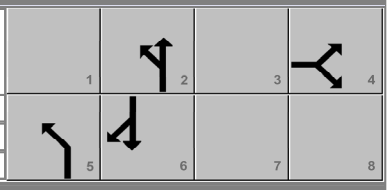
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 26, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/New Bond St	File Name	24_Route 12 & New Bond St_PM-Consultant Proj…		
Project Description	Consultant 2028 Volumes				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	93		396				121	907			730	24

Signal Information			
Cycle, s	104.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	60.0	14.0	0.0	0.0	0.0
Yellow	3.0	3.0	3.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			20.0	85.0		65.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3			3.1	3.0		3.0
Queue Clearance Time (g_s), s		16.0			4.2	30.3		14.8
Green Extension Time (g_e), s		0.0			0.1	4.5		4.6
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			0.00	0.02		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	102		435				133	997			418	410
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1795		1598				1767	1841			1856	1820
Queue Service Time (g_s), s	5.4		14.0				2.2	28.3			12.8	12.8
Cycle Queue Clearance Time (g_c), s	5.4		14.0				2.2	28.3			12.8	12.8
Green Ratio (*g/C*)	0.13		0.13				0.74	0.77			0.58	0.58
Capacity (*c*), veh/h	242		215				622	1416			1071	1050
Volume-to-Capacity Ratio (*X*)	0.423		2.023				0.214	0.704			0.391	0.391
Back of Queue (*Q*), ft/ln (95 th percentile)	109		1354				29	334			220	211
Back of Queue (*Q*), veh/ln (95 th percentile)	4.3		53.7				1.1	13.0			8.6	8.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	41.3		45.0				5.1	6.0			12.0	12.0
Incremental Delay (d_2), s/veh	0.4		476.5				0.1	1.4			0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	41.7		521.5				5.2	7.4			12.1	12.1
Level of Service (LOS)	D		F				A	A			B	B
Approach Delay, s/veh / LOS	430.3		F	0.0			7.1		A	12.1		B
Intersection Delay, s/veh / LOS	99.9						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.15	B	1.96	B	0.64	A	1.89	B
Bicycle LOS Score / LOS		F			2.35	B	1.17	A

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 5/30/2024

LOCATION: Route 12 / Brooks Street / Greendale Avenue

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

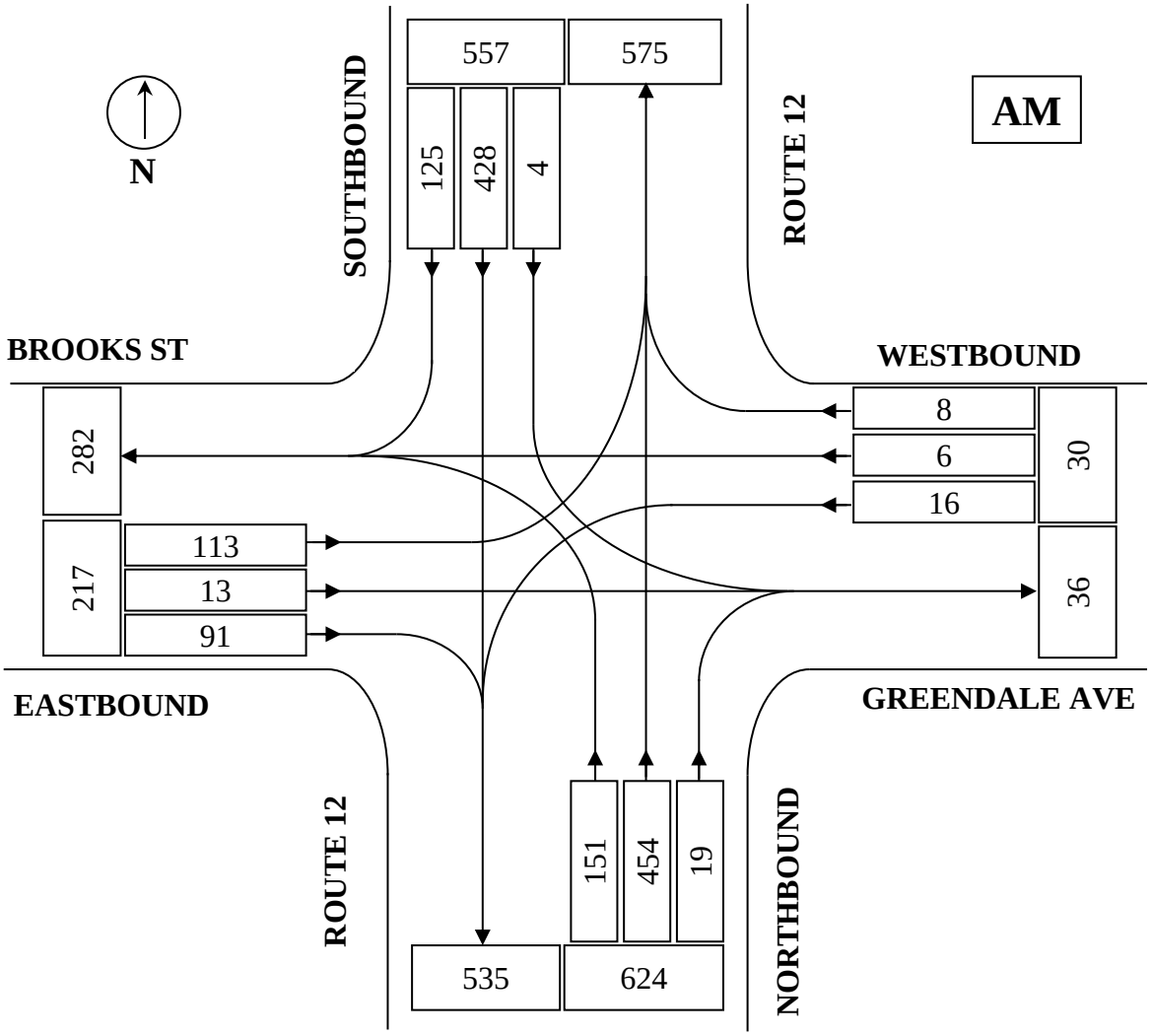
Time Period	Brooks St EB				Greendale Ave WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	23	0	26	3	4	1	1	0	57	98	0	6	0	92	42	4	344	
7:15 - 7:30	27	8	23	1	5	2	1	0	29	117	2	4	0	84	20	3	318	
7:30 - 7:45	21	4	18	0	3	1	1	0	15	105	3	3	2	94	21	6	288	
7:45 - 8:00	27	3	20	1	3	0	0	0	25	140	4	5	2	115	20	2	359	1309
8:00 - 8:15	29	2	19	0	3	2	3	0	24	103	2	2	1	98	27	3	313	1278
8:15 - 8:30	20	4	25	2	6	3	1	1	40	95	4	3	0	118	46	6	362	1322
8:30 - 8:45	37	4	27	2	4	1	4	0	62	116	9	7	1	97	32	3	394	1428
8:45 - 9:00	30	2	15	1	7	0	1	0	23	130	3	8	4	93	22	5	330	1399
TOTAL	214	27	173	10	35	10	12	1	275	904	27	38	10	791	230	32	2708	
		EBPct	15.2			**WBPct**	2.1			**NBPct**	43.7			**SBPct**	39.0			
Peak Sums:	**113**	**13**	**91**	**5**	**16**	**6**	**8**	**1**	**151**	**454**	**19**	**17**	**4**	**428**	**125**	**14**	**1428**	
Total Trucks	37					**TrkPct**	2.59			**PHF**	0.91							

Time Period	Brooks St EB				Greendale Ave WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	45	5	47	6	2	3	3	0	33	157	5	8	2	122	38	2	462	
4:15 - 4:30	31	5	20	0	2	1	2	0	33	150	4	5	3	143	33	4	427	
4:30 - 4:45	27	10	30	2	5	4	2	0	34	151	7	7	1	126	18	3	415	
4:45 - 5:00	40	9	38	0	4	2	2	0	59	147	8	3	3	127	46	1	485	1789
5:00 - 5:15	41	7	41	0	7	2	0	0	53	152	12	1	2	134	38	2	489	1816
5:15 - 5:30	25	5	33	0	4	2	2	0	38	133	7	1	1	123	48	2	421	1810
5:30 - 5:45	33	3	38	1	4	1	1	0	46	136	14	1	1	101	29	0	407	1802
5:45 - 6:00	27	5	15	0	6	1	0	0	26	112	3	4	4	96	34	1	329	1646
TOTAL	269	49	262	9	34	16	12	0	322	1138	60	30	17	972	284	15	3435	
		EBPct	16.5			**WBPct**	1.8			**NBPct**	44.6			**SBPct**	37.1			
Peak Sums:	**139**	**31**	**129**	**2**	**18**	**9**	**6**	**0**	**179**	**600**	**31**	**16**	**9**	**530**	**135**	**10**	**1816**	
Total Trucks	28					**TrkPct**	1.54			**PHF**	0.93							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 5/30/24 **DAY OF WEEK:** Thursday
INTERSECTION: Route 12 / Brooks Street / Greendale Avenue

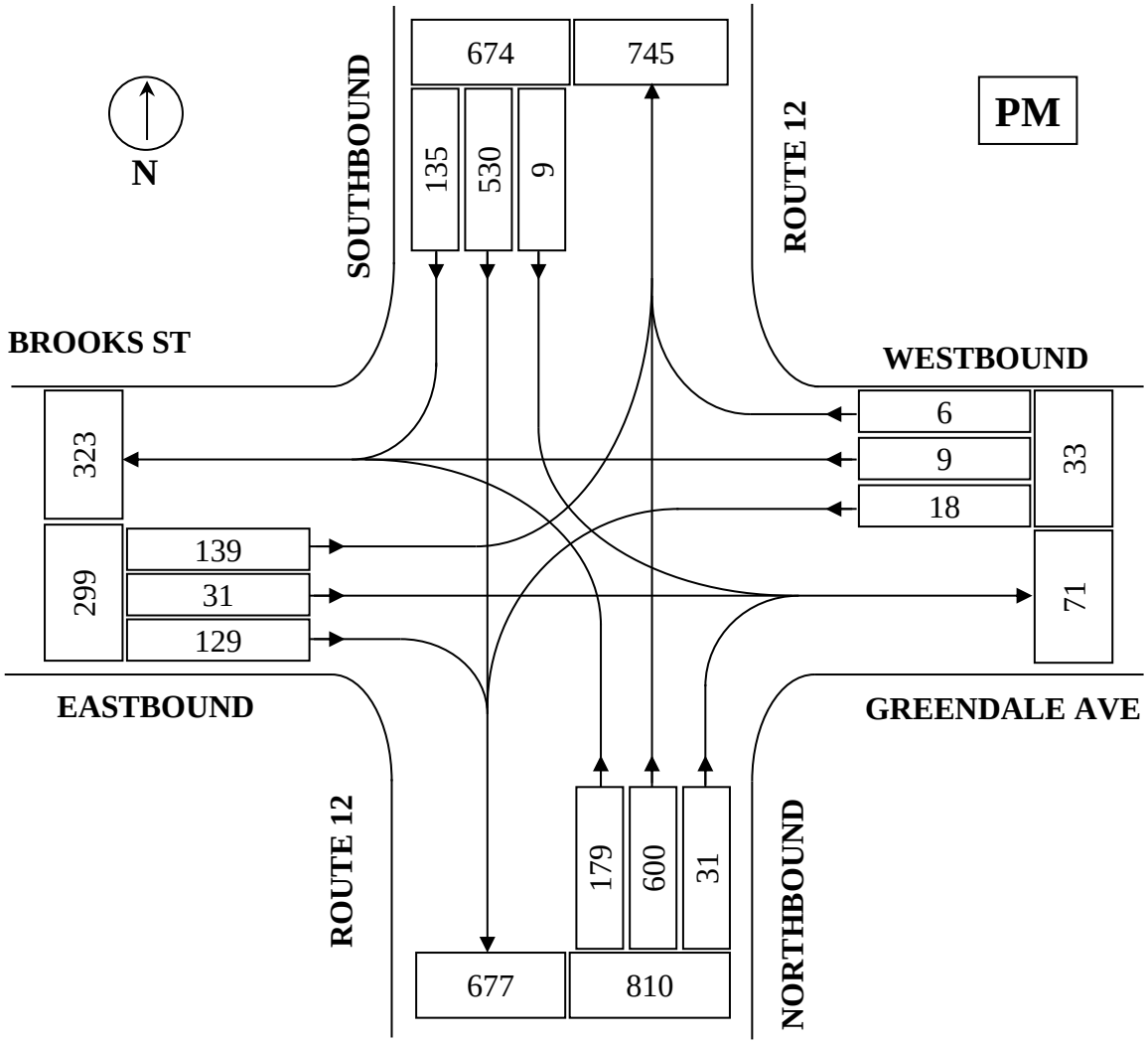


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Brooks St EB	217	15.2%	7:45 - 8:45 AM
Greendale Ave WB	30	2.1%	PHF = .91
Route 12 NB	624	43.7%	**VEHICLES COUNTED**
Route 12 SB	557	39.0%	**ALL VEHICLES:** 1428
TOTAL	1428	100.0%	**TRUCKS:** 37
			PERCENT TRUCKS: 2.59%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

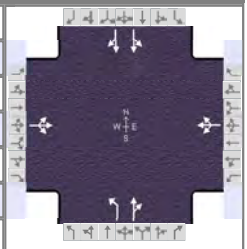
CITY: Worcester **DATE:** 5/30/24 **DAY OF WEEK:** Thursday
INTERSECTION: Route 12 / Brooks Street / Greendale Avenue



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Brooks St EB	299	16.5%	4:15 - 5:15 PM
Greendale Ave WB	33	1.8%	PHF = .93
Route 12 NB	810	44.6%	**VEHICLES COUNTED**
Route 12 SB	674	37.1%	**ALL VEHICLES:** 1816
TOTAL	1816	100.0%	**TRUCKS:** 28
			PERCENT TRUCKS: 1.54%

HCS Signalized Intersection Results Summary

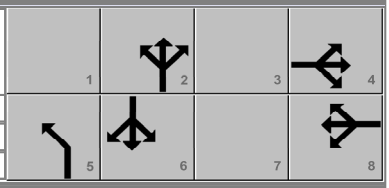
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	113	13	91	16	6	8	151	454	19	4	428	125

Signal Information			
Cycle, s	82.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	29.0	12.0	3.0	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



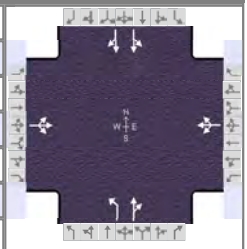
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		17.0		8.0	23.0	57.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		13.2		3.5	5.4	13.9		13.6
Green Extension Time (g_e), s		0.0		0.0	0.2	2.1		2.1
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		1.00	0.00	0.03		0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		233			33		166	520		328		279
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1687			1747		1767	1827		1849		1556
Queue Service Time (g_s), s		11.2			1.5		3.4	11.9		0.0		11.6
Cycle Queue Clearance Time (g_c), s		11.2			1.5		3.4	11.9		11.4		11.6
Green Ratio (*g/C*)		0.15			0.04		0.60	0.63		0.35		0.35
Capacity (*c*), veh/h		247			64		648	1159		699		550
Volume-to-Capacity Ratio (*X*)		0.943			0.516		0.256	0.449		0.469		0.506
Back of Queue (*Q*), ft/ln (95 th percentile)		299			31		51	177		205		179
Back of Queue (*Q*), veh/ln (95 th percentile)		11.7			1.2		2.0	6.9		8.2		7.2
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		34.7			38.8		8.7	7.7		20.8		20.9
Incremental Delay (d_2), s/veh		41.4			3.2		0.1	0.1		0.2		0.3
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		76.1			42.0		8.8	7.8		21.0		21.2
Level of Service (LOS)		E			D		A	A		C		C
Approach Delay, s/veh / LOS	76.1	E		42.0	D		8.0	A		21.1	C	
Intersection Delay, s/veh / LOS	24.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.13	B	1.95	B	1.64	B	1.69	B
Bicycle LOS Score / LOS	0.87	A	0.54	A	1.62	B	0.99	A

HCS Signalized Intersection Results Summary

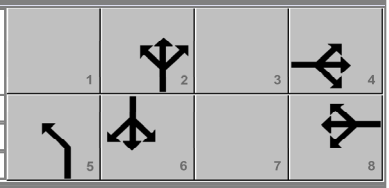
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:15 - 5:15 PM	PHF	0.93
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:15
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_PM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	139	31	129	18	9	6	179	600	31	9	530	135

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	36.0	23.0	6.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



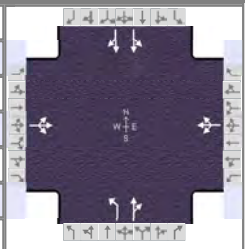
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		28.0		11.0	20.0	61.0		41.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		19.4		3.9	7.7	27.8		19.1
Green Extension Time (g_e), s		0.3		0.0	0.2	2.3		2.9
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		0.75		1.00	0.01	0.31		0.04

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		316			35		192	678		389		330
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1714			1756		1781	1837		1848		1564
Queue Service Time (g_s), s		17.4			1.9		5.7	25.8		0.0		17.1
Cycle Queue Clearance Time (g_c), s		17.4			1.9		5.7	25.8		16.8		17.1
Green Ratio (*g/C*)		0.23			0.06		0.53	0.56		0.36		0.36
Capacity (*c*), veh/h		394			105		479	1029		702		563
Volume-to-Capacity Ratio (*X*)		0.802			0.337		0.402	0.660		0.554		0.587
Back of Queue (*Q*), ft/ln (95 th percentile)		326			39		99	391		294		261
Back of Queue (*Q*), veh/ln (95 th percentile)		12.9			1.5		3.9	15.4		11.8		10.4
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		36.3			45.1		14.9	15.4		25.9		26.0
Incremental Delay (d_2), s/veh		10.5			0.7		0.2	1.3		0.6		1.1
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		46.8			45.8		15.1	16.6		26.4		27.0
Level of Service (LOS)		D			D		B	B		C		C
Approach Delay, s/veh / LOS	46.8	D		45.8	D		16.3	B		26.7	C	
Intersection Delay, s/veh / LOS	25.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.96	B	1.66	B	1.70	B
Bicycle LOS Score / LOS	1.01	A	0.55	A	1.92	B	1.08	A

HCS Signalized Intersection Results Summary

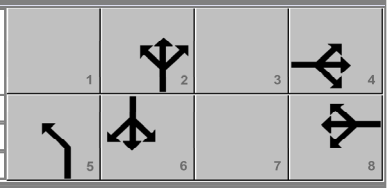
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_AM-P…		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	124	14	100	18	7	9	166	499	21	4	471	138

Signal Information			
Cycle, s	82.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	29.0	12.0	3.0	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



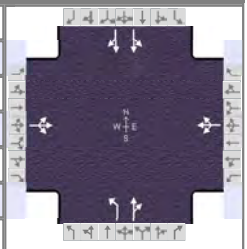
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		17.0		8.0	23.0	57.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		14.0		3.7	5.8	15.6		15.0
Green Extension Time (g_e), s		0.0		0.0	0.2	2.3		2.4
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		1.00	0.00	0.06		0.05

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		256			37		182	571		362		306
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1687			1748		1767	1827		1849		1555
Queue Service Time (g_s), s		12.0			1.7		3.8	13.6		0.0		13.0
Cycle Queue Clearance Time (g_c), s		12.0			1.7		3.8	13.6		12.8		13.0
Green Ratio (*g/C*)		0.15			0.04		0.60	0.63		0.35		0.35
Capacity (*c*), veh/h		247			64		625	1159		698		550
Volume-to-Capacity Ratio (*X*)		1.037			0.584		0.292	0.493		0.518		0.557
Back of Queue (*Q*), ft/ln (95 th percentile)		373			40		57	200		226		201
Back of Queue (*Q*), veh/ln (95 th percentile)		14.6			1.6		2.2	7.8		9.1		8.0
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		35.0			38.9		9.2	8.0		21.3		21.3
Incremental Delay (d_2), s/veh		67.3			8.9		0.1	0.1		0.3		0.8
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		102.3			47.8		9.3	8.1		21.6		22.1
Level of Service (LOS)		F			D		A	A		C		C
Approach Delay, s/veh / LOS	102.3	F		47.8	D		8.4	A		21.8	C	
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.13	B	1.95	B	1.64	B	1.69	B
Bicycle LOS Score / LOS	0.91	A	0.55	A	1.73	B	1.04	A

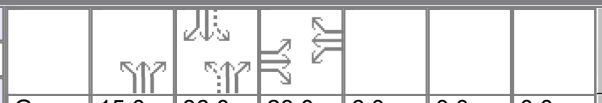
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:15 - 5:15 PM	PHF	0.93
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:15
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_PM-P…		
Project Description	Projected 2034				

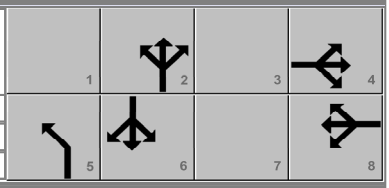


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	153	34	142	20	10	7	197	660	34	10	572	149

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	15.0	36.0	23.0	6.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



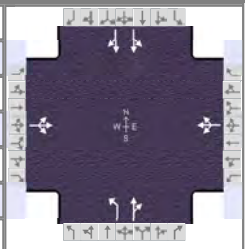
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		28.0		11.0	20.0	61.0		41.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		21.6		4.2	8.3	32.1		21.1
Green Extension Time (g_e), s		0.1		0.0	0.2	1.6		3.2
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		1.00	0.03	0.85		0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		348			40		212	746		422		358
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1714			1754		1781	1837		1843		1562
Queue Service Time (g_s), s		19.6			2.2		6.3	30.1		0.0		19.1
Cycle Queue Clearance Time (g_c), s		19.6			2.2		6.3	30.1		18.7		19.1
Green Ratio (*g/C*)		0.23			0.06		0.53	0.56		0.36		0.36
Capacity (*c*), veh/h		394			105		458	1029		700		562
Volume-to-Capacity Ratio (*X*)		0.884			0.378		0.463	0.725		0.603		0.637
Back of Queue (*Q*), ft/ln (95 th percentile)		387			44		110	453		323		287
Back of Queue (*Q*), veh/ln (95 th percentile)		15.4			1.7		4.4	17.8		12.9		11.5
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		37.2			45.2		15.7	16.3		26.5		26.6
Incremental Delay (d_2), s/veh		19.8			0.8		0.3	2.2		1.0		1.9
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		57.0			46.0		16.0	18.6		27.5		28.4
Level of Service (LOS)		E			D		B	B		C		C
Approach Delay, s/veh / LOS	57.0	E		46.0	D		18.0	B		27.9	C	
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.96	B	1.66	B	1.70	B
Bicycle LOS Score / LOS	1.06	A	0.55	A	2.07	B	1.13	A

HCS Signalized Intersection Results Summary

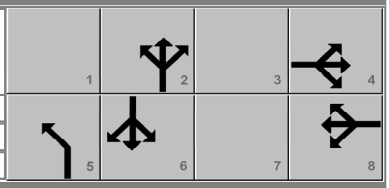
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.91
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_AM-…		
Project Description	Consultant 2028 Build Volumes				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	188	3	226	26	3	9	148	546	5	1	701	101

Signal Information			
Cycle, s	82.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	29.0	12.0	3.0	0.0	0.0	
Yellow	3.0	3.0	3.0	3.0	0.0	0.0	
Red	2.0	2.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		17.0		8.0	23.0	57.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		14.0		3.9	5.3	16.7		19.9
Green Extension Time (g_e), s		0.0		0.0	0.2	2.8		2.5
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		1.00	0.00	0.13		0.27

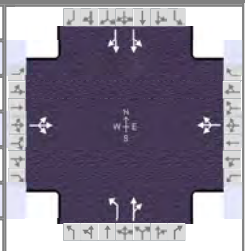
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		453			42		163	605		469		408
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1658			1744		1767	1838		1855		1613
Queue Service Time (g_s), s		12.0			1.9		3.3	14.7		0.0		17.9
Cycle Queue Clearance Time (g_c), s		12.0			1.9		3.3	14.7		17.9		17.9
Green Ratio (*g/C*)		0.15			0.04		0.60	0.63		0.35		0.35
Capacity (*c*), veh/h		243			64		560	1165		700		571
Volume-to-Capacity Ratio (*X*)		1.866			0.654		0.290	0.520		0.670		0.715
Back of Queue (*Q*), ft/ln (95 th percentile)		1296			51		50	214		306		281
Back of Queue (*Q*), veh/ln (95 th percentile)		50.6			2.0		2.0	8.4		12.2		11.2
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		35.0			39.0		10.6	8.2		22.9		22.9
Incremental Delay (d_2), s/veh		405.2			17.5		0.1	0.2		2.0		3.7
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		440.2			56.5		10.7	8.4		24.9		26.6
Level of Service (LOS)		F			E		B	A		C		C
Approach Delay, s/veh / LOS	440.2	F		56.5	E		8.9	A		25.7	C	
Intersection Delay, s/veh / LOS	108.0						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.13	B	1.95	B	1.64	B	1.69	B
Bicycle LOS Score / LOS	1.23	A	0.56	A	1.76	B	1.21	A

 HCS™ Streets Version 2024 Generated: 5/16/2025 8:31:54 AM

HCS Signalized Intersection Results Summary

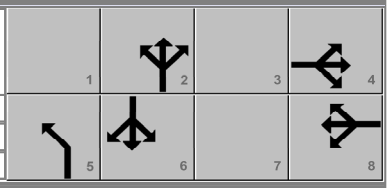
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/24/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:15 - 5:15 PM	PHF	0.93
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:15
Intersection	Route 12/Brooks St/Gre…	File Name	24_Route 12 & Brooks St & Greendale Ave_PM-…		
Project Description	Consultant 2028 Future Volumes				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	133	6	166	23	6	4	167	723	10	4	603	144

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	15.0	36.0	23.0	6.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2		6
Case Number		12.0		12.0	1.0	4.0		8.3
Phase Duration, s		28.0		11.0	20.0	61.0		41.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.3		3.2	3.1	3.1		3.1
Queue Clearance Time (g_s), s		20.2		3.9	7.3	34.7		21.5
Green Extension Time (g_e), s		0.2		0.0	0.2	0.7		3.3
Phase Call Probability		1.00		1.00	1.00	1.00		1.00
Max Out Probability		1.00		1.00	0.01	1.00		0.11

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		323			35		180	788		435		367
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1685			1769		1781	1850		1863		1569
Queue Service Time (g_s), s		18.2			1.9		5.3	32.7		0.0		19.5
Cycle Queue Clearance Time (g_c), s		18.2			1.9		5.3	32.7		19.4		19.5
Green Ratio (*g/C*)		0.23			0.06		0.53	0.56		0.36		0.36
Capacity (*c*), veh/h		388			106		451	1036		707		565
Volume-to-Capacity Ratio (*X*)		0.832			0.334		0.398	0.761		0.615		0.650
Back of Queue (*Q*), ft/ln (95 th percentile)		342			39		92	493		334		295
Back of Queue (*Q*), veh/ln (95 th percentile)		13.6			1.5		3.6	19.4		13.4		11.8
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00			0.00		0.00	0.00		0.00		0.00
Uniform Delay (d_1), s/veh		36.7			45.1		15.4	16.9		26.7		26.7
Incremental Delay (d_2), s/veh		13.5			0.7		0.2	3.0		1.2		2.1
Initial Queue Delay (d_3), s/veh		0.0			0.0		0.0	0.0		0.0		0.0
Control Delay (*d*), s/veh		50.2			45.8		15.6	19.9		27.9		28.8
Level of Service (LOS)		D			D		B	B		C		C
Approach Delay, s/veh / LOS	50.2	D		45.8	D		19.1	B		28.3	C	
Intersection Delay, s/veh / LOS	27.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	1.96	B	1.66	B	1.70	B
Bicycle LOS Score / LOS	1.02	A	0.55	A	2.08	B	1.15	A

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 5/9/2024

LOCATION: Route 12 / QCC

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

Time Period					QCC WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15					1		0	0		87	5	2	5	88		5	186	
7:15 - 7:30					3		0	0		72	10	4	6	74		1	165	
7:30 - 7:45					4		4	0		97	18	5	11	73		0	207	
7:45 - 8:00					5		5	2		83	25	4	20	122		7	260	818
8:00 - 8:15					4		3	0		79	20	0	13	108		4	227	859
8:15 - 8:30					9		6	1		78	16	1	8	99		2	216	910
8:30 - 8:45					6		3	0		94	26	6	16	80		4	225	928
8:45 - 9:00					6		7	1		103	37	6	17	94		4	264	932
TOTAL	0	0	0	0	38	0	28	4	0	693	157	28	96	738	0	27	1750	
		EBPct	0.0			**WBPct**	4.7			**NBPct**	48.6			**SBPct**	46.7			
Peak Sums:	**0**	**0**	**0**	**0**	**25**	**0**	**19**	**2**	**0**	**354**	**99**	**13**	**54**	**381**	**0**	**14**	**932**	
Total Trucks	29					**TrkPct**	3.11			**PHF**	0.88							

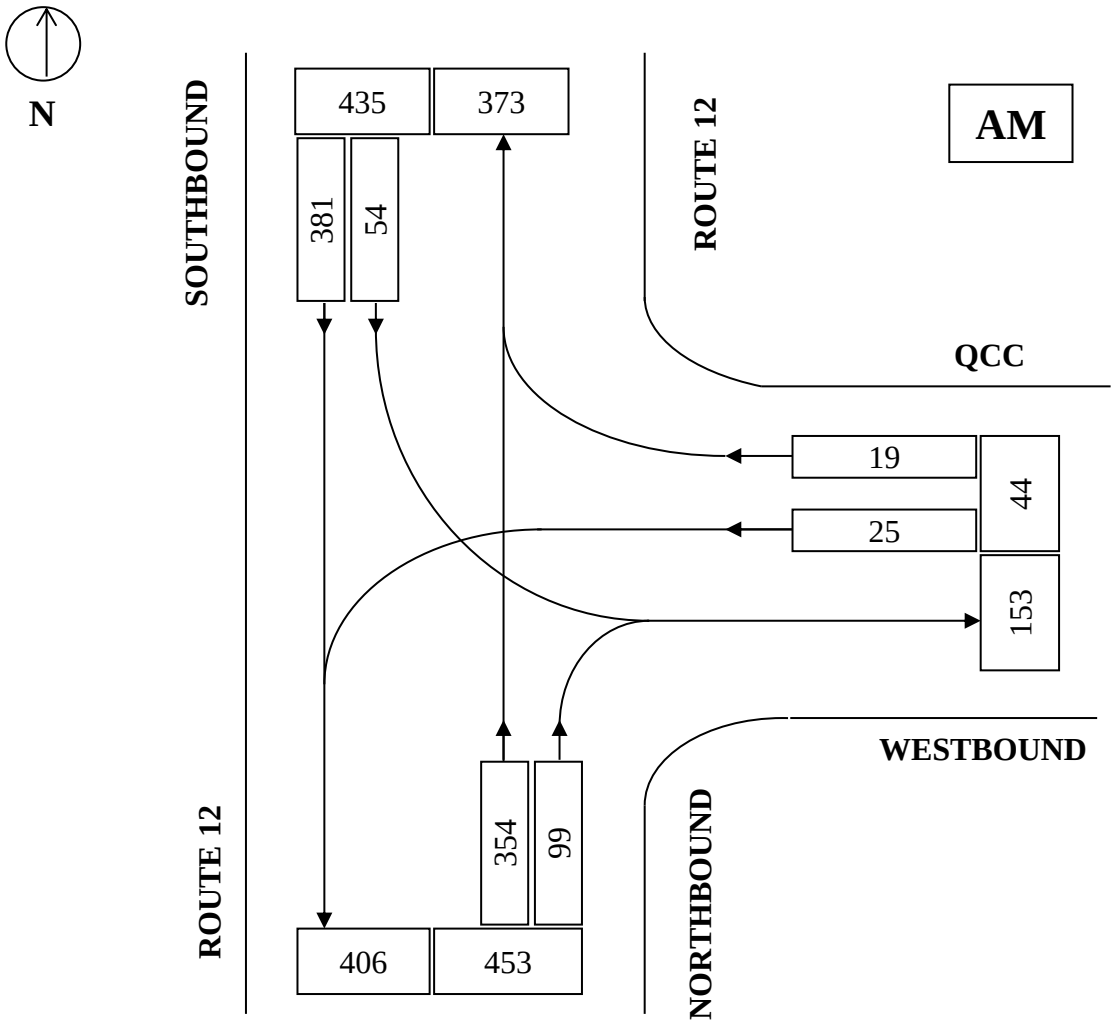
Time Period					QCC WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15					22		16	0		146	6	10	6	128		2	324	
4:15 - 4:30					17		10	2		135	13	3	4	128		3	307	
4:30 - 4:45					14		11	1		110	13	5	5	133		1	286	
4:45 - 5:00					13		7	0		119	13	4	7	121		4	280	1197
5:00 - 5:15					14		6	0		134	13	0	8	134		0	309	1182
5:15 - 5:30					14		4	0		130	22	1	4	131		0	305	1180
5:30 - 5:45					10		13	1		123	16	2	8	103		2	273	1167
5:45 - 6:00					14		4	0		122	9	1	6	100		3	255	1142
TOTAL	0	0	0	0	118	0	71	4	0	1019	105	26	48	978	0	15	2339	
		EBPct	0.0			**WBPct**	9.2			**NBPct**	46.4			**SBPct**	44.4			
Peak Sums:	**0**	**0**	**0**	**0**	**66**	**0**	**44**	**3**	**0**	**510**	**45**	**22**	**22**	**510**	**0**	**10**	**1197**	
Total Trucks	35					**TrkPct**	2.92			**PHF**	0.92							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 5/9/2024 **DAY OF WEEK:** Thursday

INTERSECTION: Route 12 / QCC



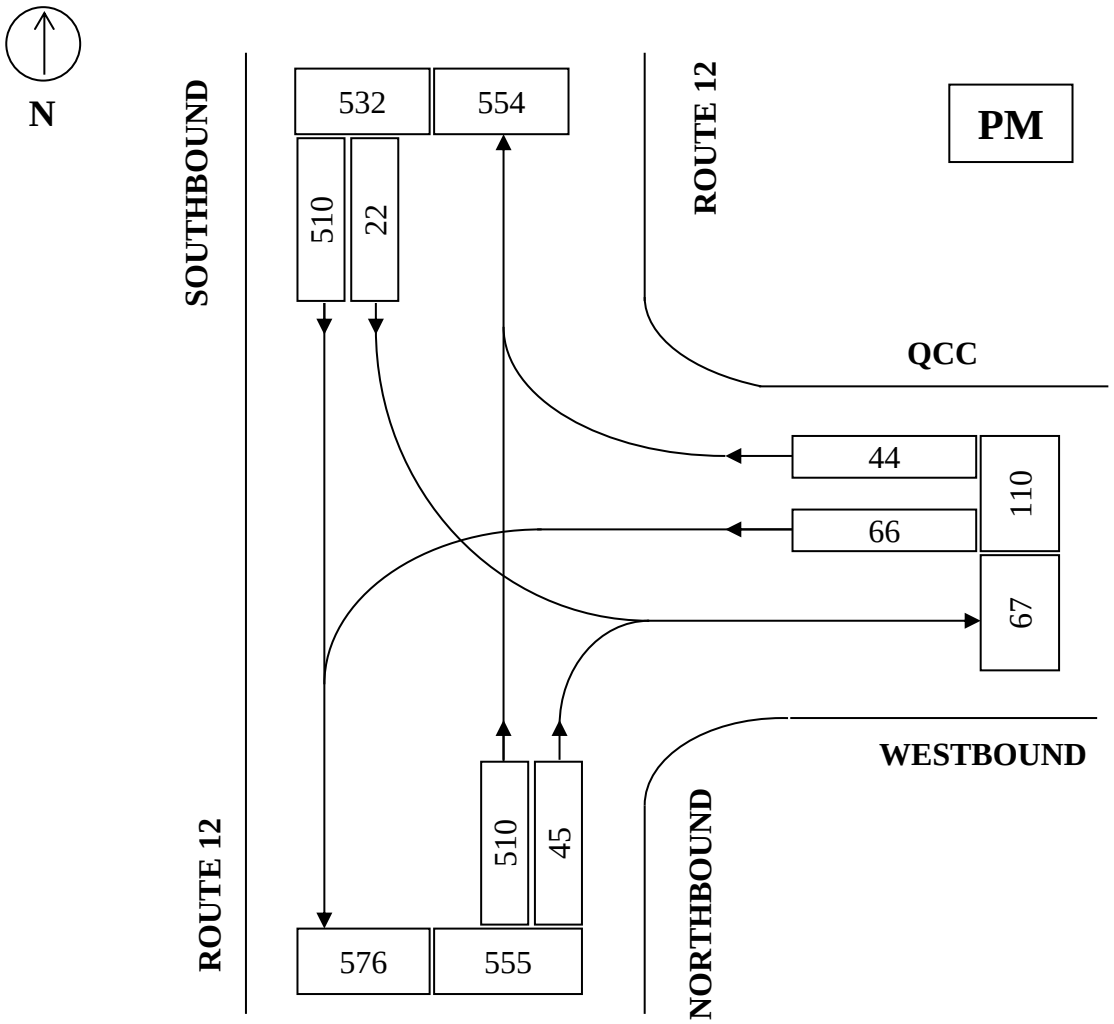
STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			8:00 - 9:00 AM
QCC WB	44	4.7%	
			PHF = .88
Route 12 NB	453	48.6%	
			VEHICLES COUNTED
Route 12 SB	435	46.7%	
			ALL VEHICLES: 932
TOTAL	932	100.00%	**TRUCKS:** 29
			PERCENT TRUCKS: 3.11%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 5/9/2024 **DAY OF WEEK:** Thursday

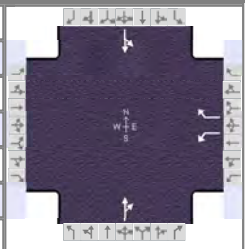
INTERSECTION: Route 12 / **QCC**



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:00 - 5:00 PM
QCC WB	110	9.2%	
			PHF = .92
Route 12 NB	555	46.4%	
			VEHICLES COUNTED
Route 12 SB	532	44.4%	
			ALL VEHICLES: 1197
TOTAL	1197	100.00%	**TRUCKS:** 35
			PERCENT TRUCKS: 2.92%

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	8:00 - 9:00 AM	PHF	0.88
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 8:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				25		19		354	99	54	381	

Signal Information					EB		WB				NB				SB			
Cycle, s	63.0	Reference Phase	2															
Offset, s	0	Reference Point	End	Green	45.0	8.0	0.0	0.0	0.0	0.0	1	2	3	4				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0	5	6	7	8				
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0								

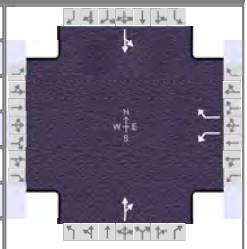
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		50.0		50.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.2		3.2		3.2
Queue Clearance Time (g_s), s				2.9		9.2		8.5
Green Extension Time (g_e), s				0.0		2.2		2.2
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.05		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				28		22		509			494	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1788			1699	
Queue Service Time (g_s), s				0.9		0.7		7.2			0.0	
Cycle Queue Clearance Time (g_c), s				0.9		0.7		7.2			6.5	
Green Ratio (*g/C*)				0.13		0.13		0.71			0.71	
Capacity (*c*), veh/h				230		204		1277			1278	
Volume-to-Capacity Ratio (*X*)				0.124		0.106		0.399			0.387	
Back of Queue (*Q*), ft/ln (95 th percentile)				16		12		63			59	
Back of Queue (*Q*), veh/ln (95 th percentile)				0.6		0.5		2.5			2.3	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				24.4		24.3		3.6			3.5	
Incremental Delay (d_2), s/veh				0.1		0.1		0.1			0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				24.5		24.4		3.7			3.6	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			24.5		C	3.7		A	3.6		A
Intersection Delay, s/veh / LOS	4.6						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.33	A	1.30	A

HCS Signalized Intersection Results Summary

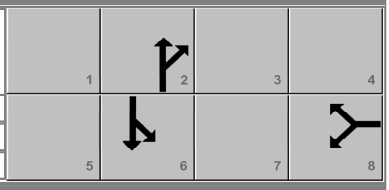
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.92
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_PM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				66		44		510	45	22	510	

Signal Information			
Cycle, s	58.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	40.0	8.0	0.0	0.0	0.0	0.0	
Yellow	3.0	3.0	0.0	0.0	0.0	0.0	
Red	2.0	2.0	0.0	0.0	0.0	0.0	



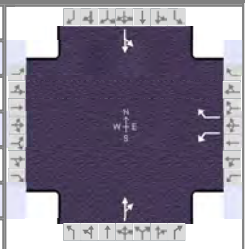
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		45.0		45.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.3		3.1		3.1
Queue Clearance Time (g_s), s				4.1		10.7		10.1
Green Extension Time (g_e), s				0.1		2.5		2.5
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.45		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				72		48		598			578	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1546		1832			1816	
Queue Service Time (g_s), s				2.1		1.6		8.7			0.0	
Cycle Queue Clearance Time (g_c), s				2.1		1.6		8.7			8.1	
Green Ratio (*g/C*)				0.14		0.14		0.69			0.69	
Capacity (*c*), veh/h				250		213		1263			1317	
Volume-to-Capacity Ratio (*X*)				0.287		0.224		0.473			0.439	
Back of Queue (*Q*), ft/ln (95 th percentile)				37		24		78			74	
Back of Queue (*Q*), veh/ln (95 th percentile)				1.5		1.0		3.1			2.9	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				22.4		22.2		4.1			4.1	
Incremental Delay (d_2), s/veh				0.2		0.2		0.1			0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				22.7		22.4		4.2			4.1	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			22.6		C	4.2		A	4.1		A
Intersection Delay, s/veh / LOS	5.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.47	A	1.44	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	8:00 - 9:00 AM	PHF	0.88
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 8:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_AM-Bal.xus		
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				25		19		394	119	69	416	

Signal Information					EB		WB				NB				SB			
Cycle, s	63.0	Reference Phase	2															
Offset, s	0	Reference Point	End	Green	45.0	8.0	0.0	0.0	0.0	0.0	1	2	3	4				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0	5	6	7	8				
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0								

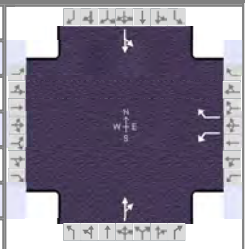
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		50.0		50.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.2		3.2		3.2
Queue Clearance Time (g_s), s				2.9		10.6		9.6
Green Extension Time (g_e), s				0.0		2.6		2.6
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.05		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				28		22		577			551	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1783			1650	
Queue Service Time (g_s), s				0.9		0.7		8.6			0.0	
Cycle Queue Clearance Time (g_c), s				0.9		0.7		8.6			7.6	
Green Ratio (*g/C*)				0.13		0.13		0.71			0.71	
Capacity (*c*), veh/h				230		204		1274			1244	
Volume-to-Capacity Ratio (*X*)				0.124		0.106		0.453			0.443	
Back of Queue (*Q*), ft/ln (95 th percentile)				16		12		75			69	
Back of Queue (*Q*), veh/ln (95 th percentile)				0.6		0.5		2.9			2.7	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				24.4		24.3		3.8			3.7	
Incremental Delay (d_2), s/veh				0.1		0.1		0.1			0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				24.5		24.4		3.9			3.8	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			24.5		C	3.9		A	3.8		A
Intersection Delay, s/veh / LOS	4.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.44	A	1.40	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.92
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_PM-Bal.xus		
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				76		44		560	55	22	550	

Signal Information					EB		WB				NB				SB			
Cycle, s	58.0	Reference Phase	2															
Offset, s	0	Reference Point	End	Green	40.0	8.0	0.0	0.0	0.0	0.0	1	2	3	4				
Uncoordinated	Yes	Simult. Gap E/W	On	Yellow	3.0	3.0	0.0	0.0	0.0	0.0	5	6	7	8				
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.0	2.0	0.0	0.0	0.0	0.0								

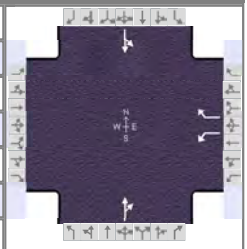
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		45.0		45.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.2		3.1		3.1
Queue Clearance Time (g_s), s				4.4		12.2		11.1
Green Extension Time (g_e), s				0.1		2.9		2.9
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.66		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				83		48		663			622	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1546		1829			1815	
Queue Service Time (g_s), s				2.4		1.6		10.2			0.0	
Cycle Queue Clearance Time (g_c), s				2.4		1.6		10.2			9.1	
Green Ratio (*g/C*)				0.14		0.14		0.69			0.69	
Capacity (*c*), veh/h				250		213		1261			1316	
Volume-to-Capacity Ratio (*X*)				0.331		0.224		0.526			0.472	
Back of Queue (*Q*), ft/ln (95 th percentile)				43		24		93			83	
Back of Queue (*Q*), veh/ln (95 th percentile)				1.7		1.0		3.6			3.2	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				22.6		22.2		4.4			4.2	
Incremental Delay (d_2), s/veh				0.3		0.2		0.2			0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				22.9		22.4		4.6			4.3	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			22.7		C	4.6		A	4.3		A
Intersection Delay, s/veh / LOS	6.1						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.58	B	1.51	B

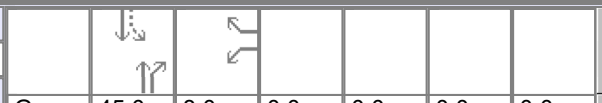
HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	8:00 - 9:00 AM	PHF	0.88
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 8:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_AM-Proj.xus		
Project Description	Projected 2034				

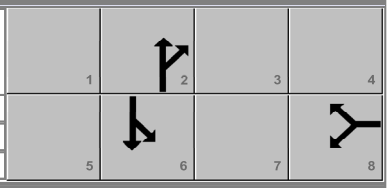


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				28		21		433	131	76	458	

Signal Information			
Cycle, s	63.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	45.0	8.0	0.0	0.0	0.0	0.0	
Yellow	3.0	3.0	0.0	0.0	0.0	0.0	
Red	2.0	2.0	0.0	0.0	0.0	0.0	



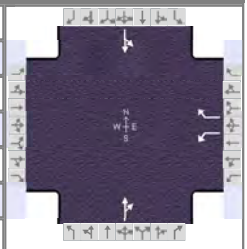
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		50.0		50.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.2		3.2		3.2
Queue Clearance Time (g_s), s				3.0		12.0		10.7
Green Extension Time (g_e), s				0.0		3.1		3.1
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.06		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				32		24		635			607	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1610		1783			1633	
Queue Service Time (g_s), s				1.0		0.8		10.0			0.0	
Cycle Queue Clearance Time (g_c), s				1.0		0.8		10.0			8.7	
Green Ratio (*g/C*)				0.13		0.13		0.71			0.71	
Capacity (*c*), veh/h				230		204		1274			1231	
Volume-to-Capacity Ratio (*X*)				0.138		0.117		0.499			0.493	
Back of Queue (*Q*), ft/ln (95 th percentile)				18		14		87			80	
Back of Queue (*Q*), veh/ln (95 th percentile)				0.7		0.5		3.4			3.1	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				24.4		24.4		4.0			3.8	
Incremental Delay (d_2), s/veh				0.1		0.1		0.1			0.1	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				24.5		24.5		4.1			3.9	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			24.5		C	4.1		A	3.9		A
Intersection Delay, s/veh / LOS	4.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.72	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.54	B	1.49	A

HCS Signalized Intersection Results Summary

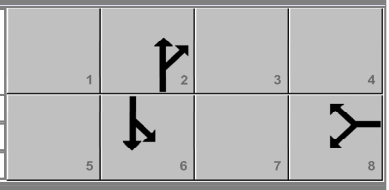
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.92
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/QCC	File Name	24_Route 12 & QCC_PM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				84		48		616	61	24	605	

Signal Information			
Cycle, s	58.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	40.0	8.0	0.0	0.0	0.0	0.0	
Yellow	3.0	3.0	0.0	0.0	0.0	0.0	
Red	2.0	2.0	0.0	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2		6
Case Number				9.0		8.0		8.0
Phase Duration, s				13.0		45.0		45.0
Change Period, ($Y+R_c$), s				5.0		5.0		5.0
Max Allow Headway (*MAH*), s				3.2		3.1		3.1
Queue Clearance Time (g_s), s				4.7		14.0		12.5
Green Extension Time (g_e), s				0.1		3.3		3.3
Phase Call Probability				1.00		1.00		1.00
Max Out Probability				0.90		0.01		0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				91		52		730			684	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1810		1546		1828			1809	
Queue Service Time (g_s), s				2.7		1.7		12.0			0.0	
Cycle Queue Clearance Time (g_c), s				2.7		1.7		12.0			10.5	
Green Ratio (*g/C*)				0.14		0.14		0.69			0.69	
Capacity (*c*), veh/h				250		213		1261			1312	
Volume-to-Capacity Ratio (*X*)				0.366		0.245		0.579			0.521	
Back of Queue (*Q*), ft/ln (95 th percentile)				48		27		113			97	
Back of Queue (*Q*), veh/ln (95 th percentile)				1.9		1.1		4.4			3.8	
Queue Storage Ratio (*RQ*) (95 th percentile)				0.00		0.00		0.00			0.00	
Uniform Delay (d_1), s/veh				22.7		22.3		4.7			4.4	
Incremental Delay (d_2), s/veh				0.3		0.2		0.4			0.2	
Initial Queue Delay (d_3), s/veh				0.0		0.0		0.0			0.0	
Control Delay (*d*), s/veh				23.0		22.5		5.1			4.6	
Level of Service (LOS)				C		C		A			A	
Approach Delay, s/veh / LOS	0.0			22.8		C	5.1		A	4.6		A
Intersection Delay, s/veh / LOS	6.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	1.71	B	1.61	B	0.64	A
Bicycle LOS Score / LOS				F	1.69	B	1.62	B

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 5/8/2024

LOCATION: Route 12 / E & W Mountain Street

DAY OF WEEK: Wednesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

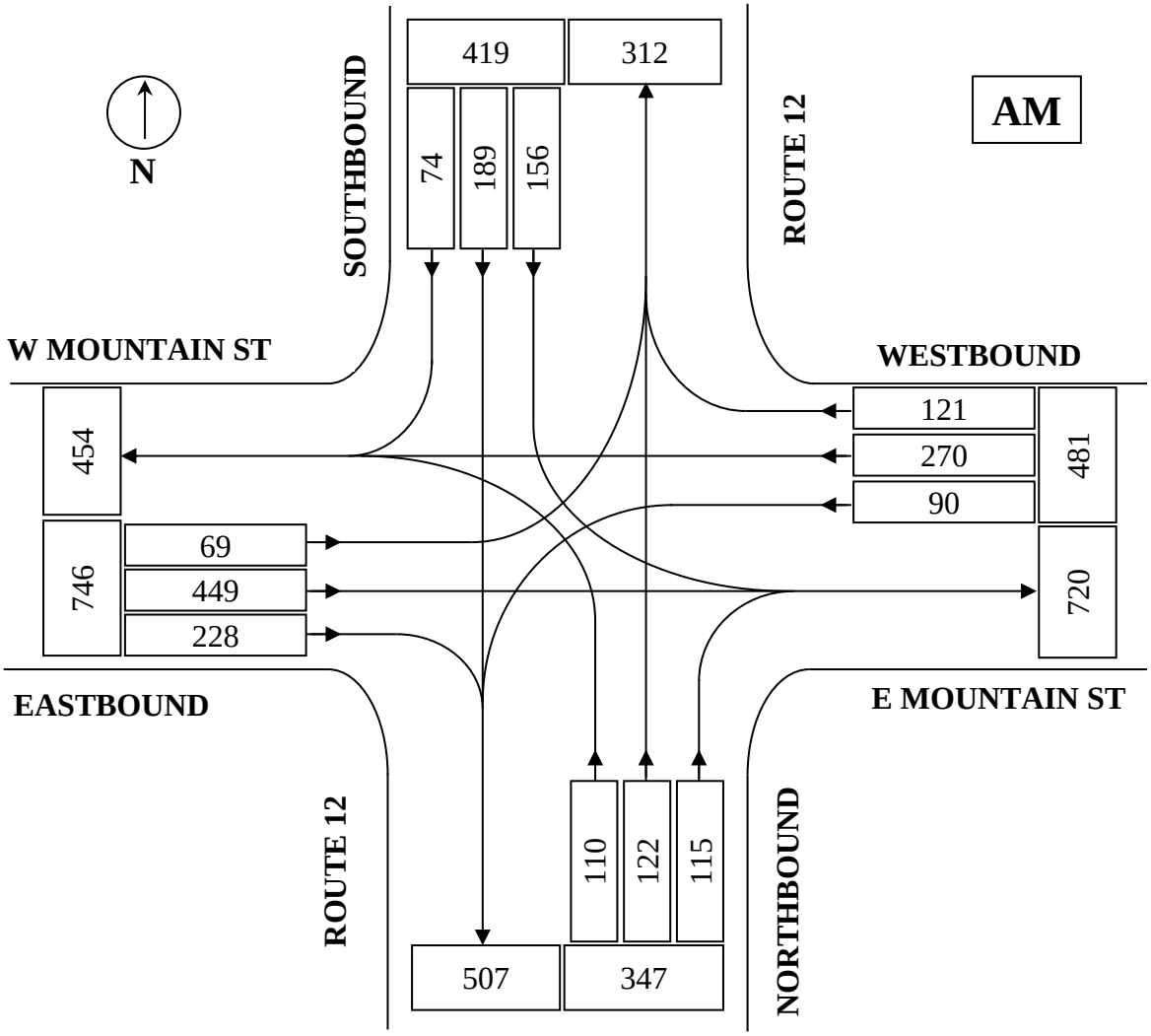
Time Period	W Mountain St EB				E Mountain St WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	11	76	31	5	23	49	25	4	22	20	18	3	23	31	9	6	338	
7:15 - 7:30	13	112	49	7	16	66	20	4	22	35	32	6	32	30	9	2	436	
7:30 - 7:45	18	110	52	1	19	75	39	8	28	40	38	2	34	45	16	3	514	
7:45 - 8:00	27	141	59	10	24	76	35	7	37	35	24	5	52	54	27	7	591	1879
8:00 - 8:15	11	99	59	9	17	60	20	3	22	27	32	2	32	48	15	1	442	1983
8:15 - 8:30	13	99	58	4	30	59	27	5	23	20	21	2	38	42	16	1	446	1993
8:30 - 8:45	11	81	65	6	21	51	22	6	27	40	17	7	38	27	16	0	416	1895
8:45 - 9:00	10	98	53	4	34	54	29	6	29	44	40	10	29	49	13	1	482	1786
TOTAL	114	816	426	46	184	490	217	43	210	261	222	37	278	326	121	21	3665	
		EBPct	37.4			**WBPct**	24.1			**NBPct**	17.4			**SBPct**	21.0			
Peak Sums:	**69**	**449**	**228**	**24**	**90**	**270**	**121**	**23**	**110**	**122**	**115**	**11**	**156**	**189**	**74**	**12**	**1993**	
Total Trucks	70					**TrkPct**	3.51			**PHF**	0.84							

Time Period	W Mountain St EB				E Mountain St WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	23	85	49	9	27	130	45	3	62	62	40	5	53	52	20	2	648	
4:15 - 4:30	22	75	42	3	22	144	62	1	44	70	39	4	45	44	22	3	631	
4:30 - 4:45	19	93	49	6	17	122	52	4	37	57	19	3	37	53	21	2	576	
4:45 - 5:00	23	94	41	7	28	155	38	5	32	39	35	4	38	52	12	2	587	2442
5:00 - 5:15	25	95	27	7	26	164	47	6	46	55	41	1	43	46	13	1	628	2422
5:15 - 5:30	9	67	31	6	24	153	52	5	33	50	19	2	48	40	22	0	548	2339
5:30 - 5:45	13	85	47	7	25	147	43	8	38	34	31	1	43	46	24	1	576	2339
5:45 - 6:00	17	53	16	3	11	93	46	6	34	35	16	1	33	43	10	1	407	2159
TOTAL	151	647	302	48	180	1108	385	38	326	402	240	21	340	376	144	12	4601	
		EBPct	25.2			**WBPct**	34.5			**NBPct**	21.9			**SBPct**	18.4			
Peak Sums:	**87**	**347**	**181**	**25**	**94**	**551**	**197**	**13**	**175**	**228**	**133**	**16**	**173**	**201**	**75**	**9**	**2442**	
Total Trucks	63					**TrkPct**	2.58			**PHF**	0.94							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 5/8/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / E & W Mountain Street

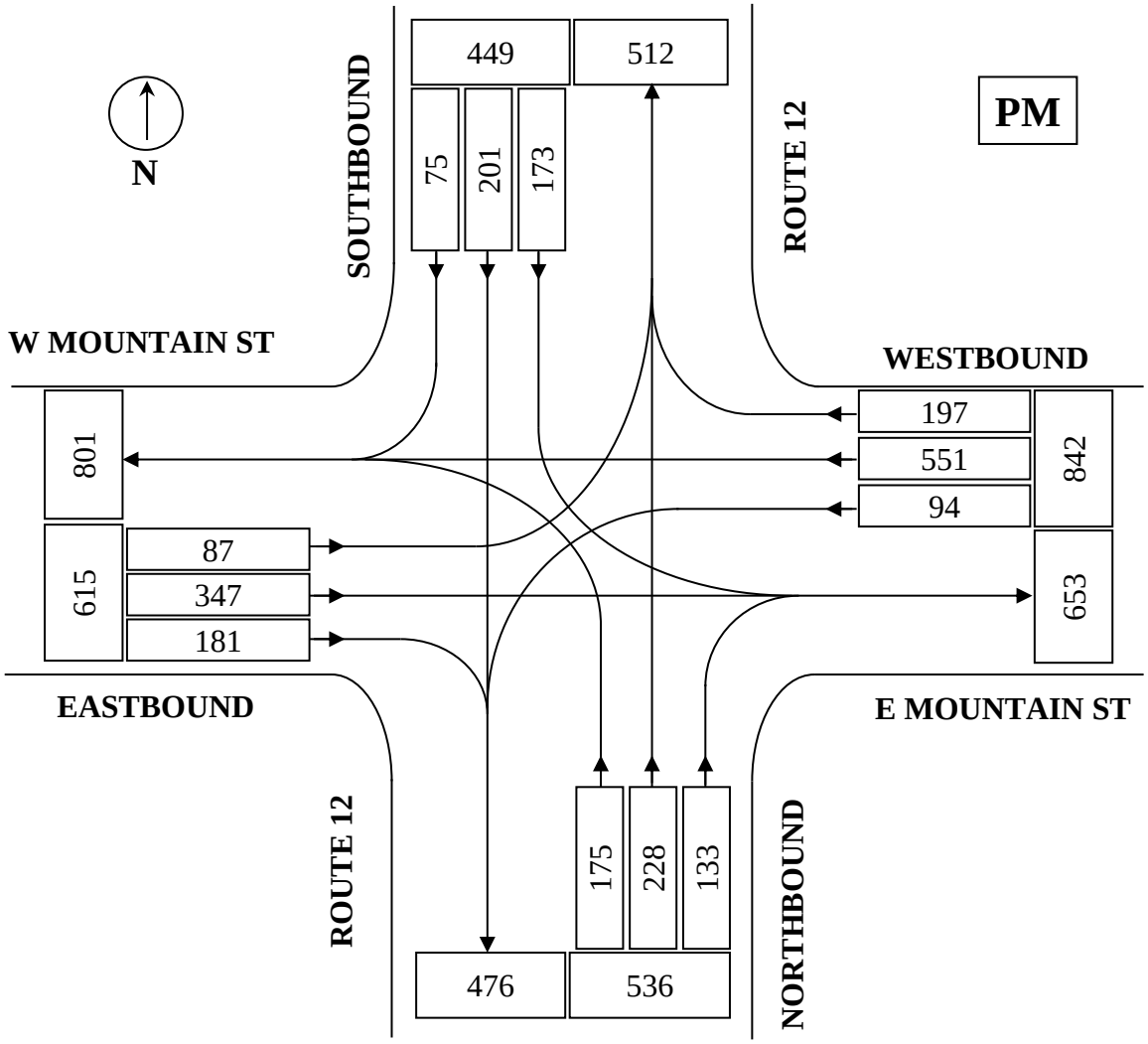


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
W Mountain St EB	746	37.5%	7:30 - 8:30 AM
E Mountain St WB	481	24.1%	PHF = .84
Route 12 NB	347	17.4%	**VEHICLES COUNTED**
Route 12 SB	419	21.0%	**ALL VEHICLES:** 1993
TOTAL	1993	100.0%	**TRUCKS:** 70
			PERCENT TRUCKS: 3.51%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

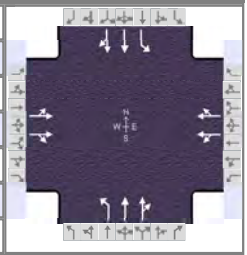
CITY: Worcester **DATE:** 5/8/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / E & W Mountain Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
W Mountain St EB	615	25.2%	4:00 - 5:00 PM
E Mountain St WB	842	34.5%	PHF = .94
Route 12 NB	536	21.9%	**VEHICLES COUNTED**
Route 12 SB	449	18.4%	**ALL VEHICLES:** 2442
TOTAL	2442	100.0%	**TRUCKS:** 63
			PERCENT TRUCKS: 2.58%

HCS Signalized Intersection Results Summary

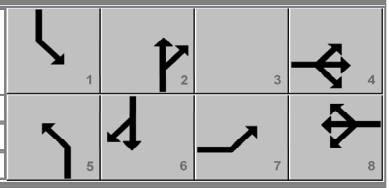
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:30 - 8:30 AM	PHF	0.84
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:30
Intersection	Route 12/Mountain St	File Name	24_Route 12 & Mountain St_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	69	449	228	90	270	121	110	122	115	156	189	74

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.0	19.0	8.0	28.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



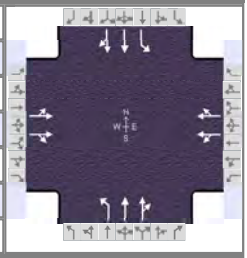
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8	5	2	1	6
Case Number	0.0	14.2		8.3	2.0	4.0	2.0	4.0
Phase Duration, s	13.0	46.0		33.0	17.0	24.0	17.0	24.0
Change Period, (*Y+R c*), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	0.0	3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s		35.1		31.2	7.9	8.0	10.6	8.4
Green Extension Time (*g e*), s	0.0	0.0		0.0	0.1	0.9	0.0	0.9
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.29	0.01	1.00	0.02

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	446		413	238		322	131	141	129	186	156	147
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1170		1588	770		1604	1810	1900	1603	1810	1900	1707
Queue Service Time (*g s*), s	8.0		16.1	13.1		14.8	5.9	5.5	6.0	8.6	6.1	6.4
Cycle Queue Clearance Time (*g c*), s	33.1		16.1	29.2		14.8	5.9	5.5	6.0	8.6	6.1	6.4
Green Ratio (*g/C*)	0.47		0.47	0.32		0.32	0.14	0.22	0.22	0.14	0.22	0.22
Capacity (*c*), veh/h	601		748	423		516	250	415	350	250	415	373
Volume-to-Capacity Ratio (*X*)	0.742		0.551	0.564		0.624	0.525	0.340	0.369	0.744	0.377	0.395
Back of Queue (*Q*), ft/ln (95 th percentile)	262		233	169		237	116	109	101	195	122	115
Back of Queue (*Q*), veh/ln (95 th percentile)	10.5		9.3	6.8		9.5	4.6	4.4	4.0	7.8	4.9	4.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00	1.28	0.00	0.00	0.91	0.00	0.00
Uniform Delay (*d 1*), s/veh	17.4		16.4	32.4		25.0	34.8	28.7	28.9	36.0	29.0	29.1
Incremental Delay (*d 2*), s/veh	4.4		0.5	1.1		1.8	1.0	0.2	0.2	10.2	0.2	0.3
Initial Queue Delay (*d 3*), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	21.8		16.9	33.5		26.8	35.8	28.9	29.1	46.2	29.2	29.3
Level of Service (LOS)	C		B	C		C	D	C	C	D	C	C
Approach Delay, s/veh / LOS	19.5		B	29.6		C	31.2		C	35.7		D
Intersection Delay, s/veh / LOS	27.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.27	B	2.29	B	2.13	B	2.16	B
Bicycle LOS Score / LOS	1.20	A	0.95	A	0.82	A	0.89	A

HCS Signalized Intersection Results Summary

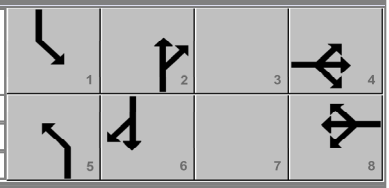
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/Mountain St	File Name	24_Route 12 & Mountain St_PM-Bal.xus		
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	87	347	181	94	551	197	185	238	143	181	209	79

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	18.0	18.0	34.0	0.0	0.0	0.0						
Yellow	3.0	3.0	3.0	0.0	0.0	0.0						
Red	2.0	2.0	2.0	0.0	0.0	0.0						



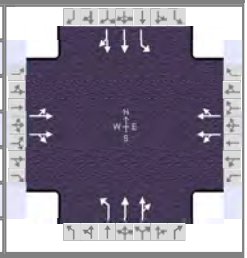
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		39.0		39.0	23.0	23.0	23.0	23.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		36.0		36.0	10.4	10.8	10.2	8.3
Green Extension Time (g_e), s		0.0		0.0	0.2	1.0	0.2	1.1
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.01	0.14	0.01	0.04

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	284		344	442		443	197	206	188	193	153	145
Adjusted Saturation Flow Rate (*s*), veh/h/ln	709		1547	1098		1555	1767	1856	1621	1767	1856	1683
Queue Service Time (g_s), s	13.8		14.5	19.5		20.2	8.4	8.4	8.8	8.2	6.0	6.3
Cycle Queue Clearance Time (g_c), s	34.0		14.5	34.0		20.2	8.4	8.4	8.8	8.2	6.0	6.3
Green Ratio (*g/C*)	0.40		0.40	0.40		0.40	0.21	0.21	0.21	0.21	0.21	0.21
Capacity (*c*), veh/h	340		619	491		622	374	393	343	374	393	356
Volume-to-Capacity Ratio (*X*)	0.837		0.555	0.900		0.712	0.526	0.525	0.548	0.515	0.390	0.406
Back of Queue (*Q*), ft/ln (95 th percentile)	284		216	413		296	161	169	153	157	120	112
Back of Queue (*Q*), veh/ln (95 th percentile)	11.4		8.7	16.5		11.9	6.3	6.6	6.1	6.1	4.7	4.5
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00	1.79	0.00	0.00	0.73	0.00	0.00
Uniform Delay (d_1), s/veh	27.7		19.6	27.8		21.4	29.7	29.7	29.9	29.6	28.8	28.9
Incremental Delay (d_2), s/veh	15.7		0.7	18.9		3.3	0.7	0.6	1.1	0.5	0.2	0.3
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	43.3		20.3	46.7		24.7	30.4	30.4	30.9	30.2	29.0	29.2
Level of Service (LOS)	D		C	D		C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	30.7		C	35.7		D	30.6		C	29.5		C
Intersection Delay, s/veh / LOS	32.1						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.13	B	2.16	B
Bicycle LOS Score / LOS	1.01	A	1.22	A	0.98	A	0.89	A

HCS Signalized Intersection Results Summary

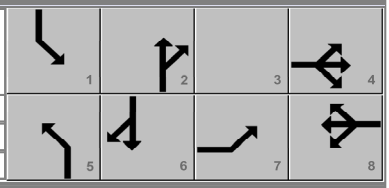
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:30 - 8:30 AM	PHF	0.84
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:30
Intersection	Route 12/Mountain St	File Name	24_Route 12 & Mountain St_AM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	76	494	251	99	297	133	121	134	127	172	208	81

Signal Information			
Cycle, s	87.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	12.0	19.0	8.0	28.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



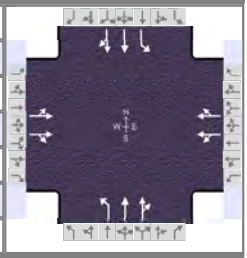
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4		8	5	2	1	6
Case Number	0.0	14.2		8.3	2.0	4.0	2.0	4.0
Phase Duration, s	13.0	46.0		33.0	17.0	24.0	17.0	24.0
Change Period, (*Y+R c*), s	5.0	5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	0.0	3.4		3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (*g s*), s		43.0		37.0	8.5	8.6	11.6	9.1
Green Extension Time (*g e*), s	0.0	0.0		0.0	0.1	1.0	0.0	1.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.64	0.03	1.00	0.03

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	491		457	253		365	144	157	142	205	173	162
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1039		1587	659		1606	1810	1900	1600	1810	1900	1706
Queue Service Time (*g s*), s	8.0		18.5	16.5		17.3	6.5	6.1	6.6	9.6	6.8	7.1
Cycle Queue Clearance Time (*g c*), s	41.0		18.5	35.0		17.3	6.5	6.1	6.6	9.6	6.8	7.1
Green Ratio (*g/C*)	0.47		0.47	0.32		0.32	0.14	0.22	0.22	0.14	0.22	0.22
Capacity (*c*), veh/h	539		748	371		517	250	415	349	250	415	372
Volume-to-Capacity Ratio (*X*)	0.910		0.611	0.682		0.706	0.577	0.377	0.407	0.820	0.416	0.434
Back of Queue (*Q*), ft/ln (95 th percentile)	356		265	200		276	132	122	112	228	136	128
Back of Queue (*Q*), veh/ln (95 th percentile)	14.3		10.6	8.0		11.1	5.3	4.9	4.5	9.1	5.4	5.1
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00	1.46	0.00	0.00	1.06	0.00	0.00
Uniform Delay (*d 1*), s/veh	20.8		17.1	35.6		25.9	35.1	29.0	29.2	36.5	29.2	29.4
Incremental Delay (*d 2*), s/veh	19.2		1.1	4.2		3.7	2.2	0.2	0.3	18.0	0.2	0.3
Initial Queue Delay (*d 3*), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	40.1		18.1	39.8		29.6	37.3	29.2	29.5	54.5	29.5	29.7
Level of Service (LOS)	D		B	D		C	D	C	C	D	C	C
Approach Delay, s/veh / LOS	29.5		C	33.8		C	31.9		C	39.0		D
Intersection Delay, s/veh / LOS	33.0						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.27	B	2.29	B	2.13	B	2.16	B
Bicycle LOS Score / LOS	1.27	A	1.00	A	0.85	A	0.93	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	May 24, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.94
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/Mountain St	File Name	24_Route 12 & Mountain St_PM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	96	382	199	103	606	217	204	262	157	199	230	87

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	18.0	18.0	34.0	0.0	0.0	0.0	5	6	7	8
Yellow	3.0	3.0	3.0	0.0	0.0	0.0				
Red	2.0	2.0	2.0	0.0	0.0	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		8.0		8.0	2.0	4.0	2.0	4.0
Phase Duration, s		39.0		39.0	23.0	23.0	23.0	23.0
Change Period, ($Y+R_c$), s		5.0		5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4		3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		36.0		36.0	11.4	11.8	11.1	9.0
Green Extension Time (g_e), s		0.0		0.0	0.2	1.0	0.2	1.2
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.03	0.26	0.03	0.08

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	308		386	481		493	217	228	207	212	169	159
Adjusted Saturation Flow Rate (*s*), veh/h/ln	568		1548	942		1556	1767	1856	1620	1767	1856	1681
Queue Service Time (g_s), s	10.5		16.9	17.1		23.5	9.4	9.4	9.8	9.1	6.7	7.0
Cycle Queue Clearance Time (g_c), s	34.0		16.9	34.0		23.5	9.4	9.4	9.8	9.1	6.7	7.0
Green Ratio (*g/C*)	0.40		0.40	0.40		0.40	0.21	0.21	0.21	0.21	0.21	0.21
Capacity (*c*), veh/h	284		619	429		622	374	393	343	374	393	356
Volume-to-Capacity Ratio (*X*)	1.085		0.623	1.123		0.793	0.580	0.581	0.603	0.566	0.431	0.448
Back of Queue (*Q*), ft/ln (95 th percentile)	464		248	685		350	184	193	174	178	134	124
Back of Queue (*Q*), veh/ln (95 th percentile)	18.6		9.9	27.4		14.0	7.2	7.5	7.0	6.9	5.3	5.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00	0.00		0.00	2.04	0.00	0.00	0.83	0.00	0.00
Uniform Delay (d_1), s/veh	30.0		20.4	30.3		22.4	30.1	30.1	30.3	30.0	29.1	29.2
Incremental Delay (d_2), s/veh	78.1		1.5	81.3		6.4	1.5	1.4	2.1	1.3	0.3	0.3
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	108.1		21.8	111.5		28.8	31.6	31.6	32.4	31.3	29.3	29.5
Level of Service (LOS)	F		C	F		C	C	C	C	C	C	C
Approach Delay, s/veh / LOS	60.1		E	69.6		E	31.8		C	30.1		C
Intersection Delay, s/veh / LOS	51.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.28	B	2.13	B	2.16	B
Bicycle LOS Score / LOS	1.06	A	1.29	A	1.03	A	0.93	A

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 5/22/2024

LOCATION: Route 12 / Walgreens / Stop and Shop

DAY OF WEEK: Wednesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

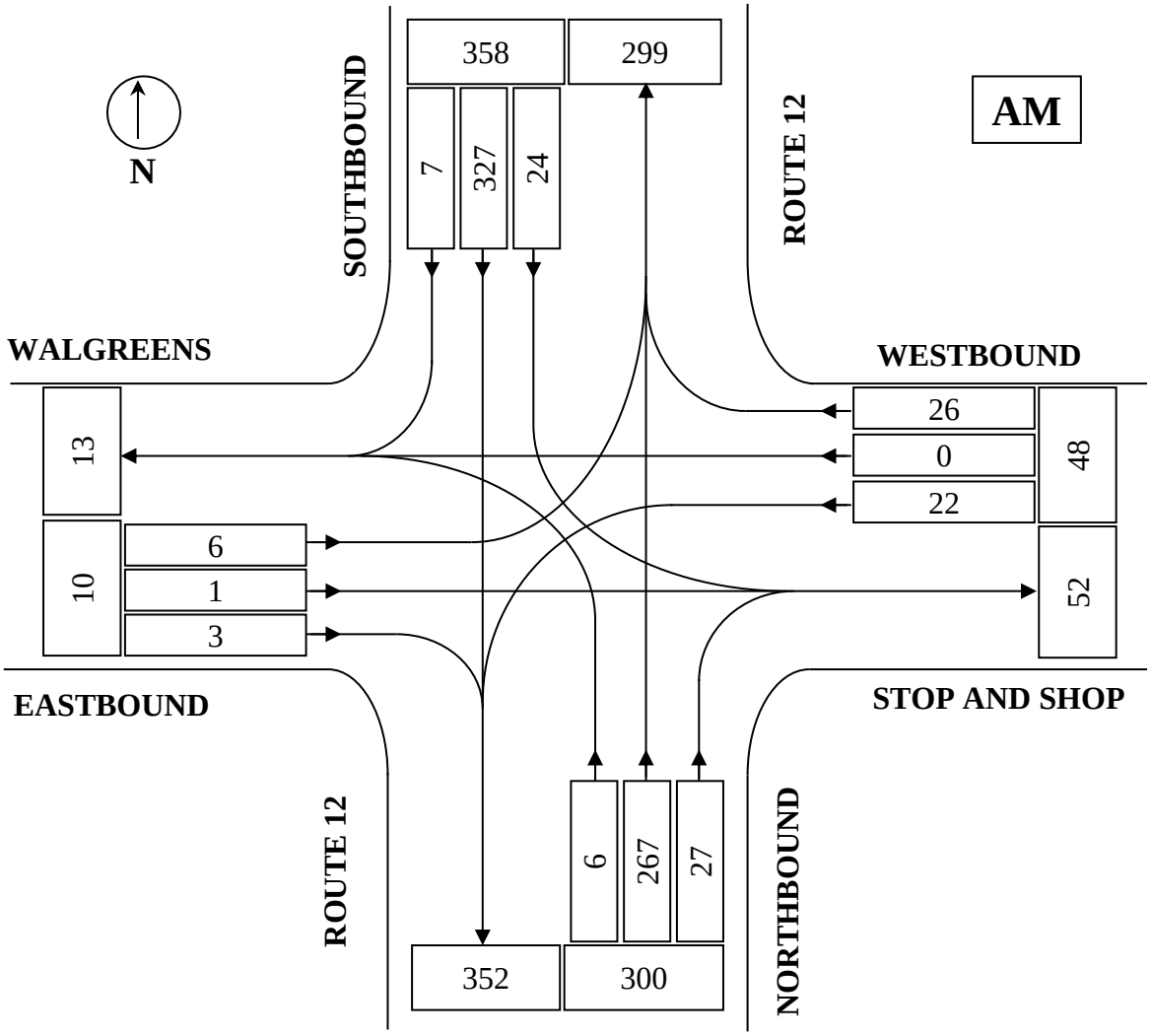
Time Period	Walgreens EB				Stop and Shop WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	0	0	0	1	0	0	0	0	52	9	2	2	58	0	6	122	
7:15 - 7:30	1	0	0	0	3	0	4	0	1	60	3	1	3	73	1	1	149	
7:30 - 7:45	0	0	0	0	8	1	3	0	1	57	6	5	3	75	3	3	157	
7:45 - 8:00	4	0	2	0	4	0	7	1	4	68	4	6	8	128	4	2	233	661
8:00 - 8:15	0	0	0	0	7	0	8	1	1	67	9	2	5	65	0	2	162	701
8:15 - 8:30	2	0	1	0	6	0	8	2	0	60	6	3	7	69	1	1	160	712
8:30 - 8:45	0	1	0	0	5	0	3	0	1	72	8	3	4	65	2	1	161	716
8:45 - 9:00	0	0	0	0	7	1	4	1	2	69	6	4	6	86	0	4	181	664
TOTAL	7	1	3	0	41	2	37	5	10	505	51	26	38	619	11	20	1325	
		EBPct	1.4			**WBPct**	6.7			**NBPct**	41.9			**SBPct**	50.0			
Peak Sums:	**6**	**1**	**3**	**0**	**22**	**0**	**26**	**4**	**6**	**267**	**27**	**14**	**24**	**327**	**7**	**6**	**716**	
Total Trucks	24					**TrkPct**	3.35			**PHF**	0.77							

Time Period	Walgreens EB				Stop and Shop WB				Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	2	0	5	0	15	2	22	0	7	123	14	3	16	99	7	1	312	
4:15 - 4:30	6	1	2	0	16	2	14	1	10	110	12	0	11	108	5	4	297	
4:30 - 4:45	0	2	4	0	22	0	11	0	12	109	12	2	11	121	4	2	308	
4:45 - 5:00	9	0	3	0	13	1	8	0	5	116	17	0	20	99	8	2	299	1216
5:00 - 5:15	3	1	1	0	8	4	16	0	9	112	10	2	21	132	4	0	321	1225
5:15 - 5:30	4	2	7	0	12	3	22	0	3	123	17	1	14	102	9	1	318	1246
5:30 - 5:45	5	1	3	0	12	0	16	0	6	100	11	2	14	126	2	0	296	1234
5:45 - 6:00	3	0	3	0	23	0	17	0	5	102	11	0	13	123	3	1	303	1238
TOTAL	32	7	28	0	121	12	126	1	57	895	104	10	120	910	42	11	2454	
		EBPct	2.9			**WBPct**	9.6			**NBPct**	43.7			**SBPct**	43.7			
Peak Sums:	**16**	**5**	**15**	**0**	**55**	**8**	**57**	**0**	**29**	**460**	**56**	**5**	**66**	**454**	**25**	**5**	**1246**	
Total Trucks	10					**TrkPct**	0.80			**PHF**	0.97							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 5/22/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / Walgreens / Stop and Shop

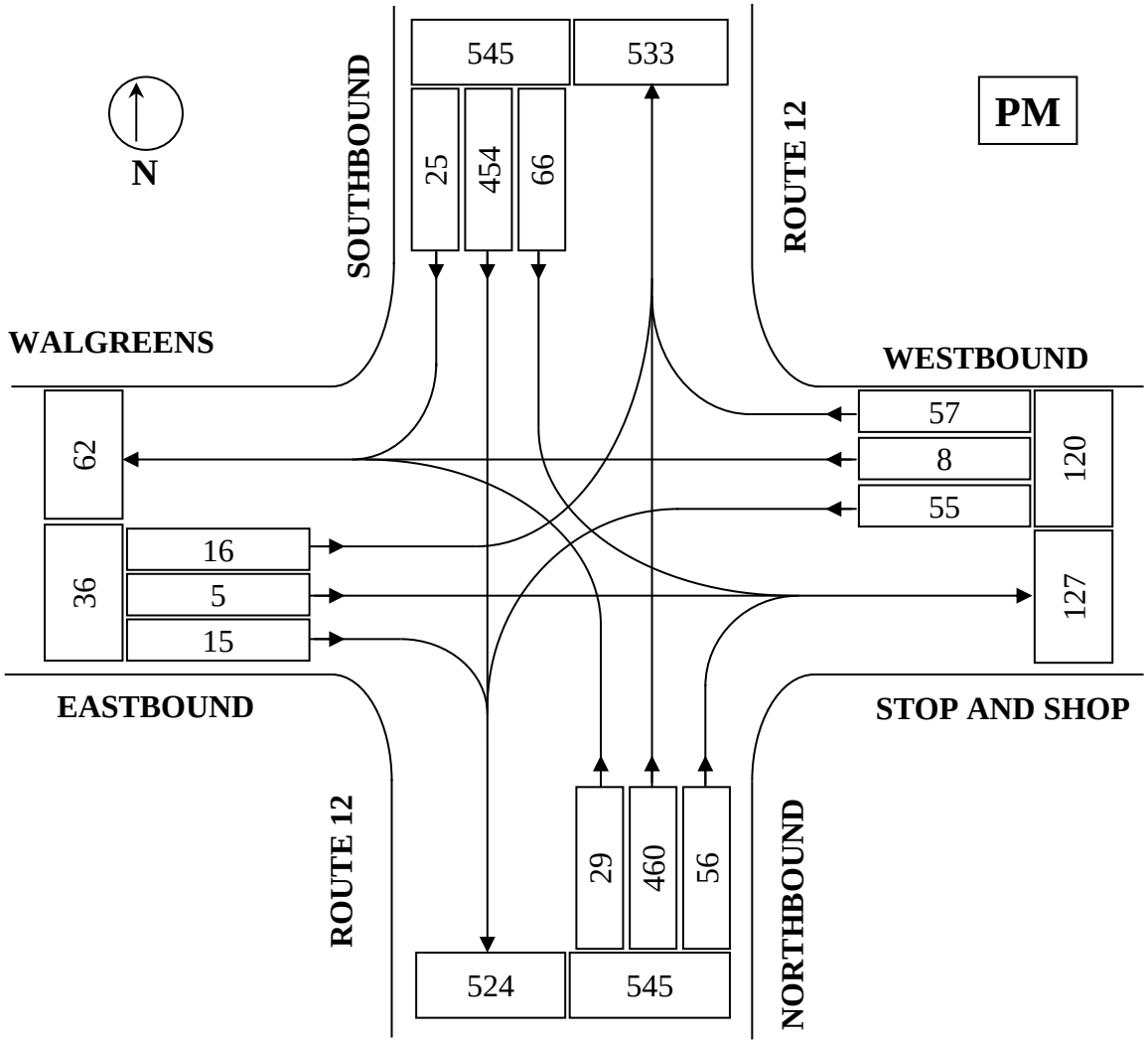


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Walgreens EB	10	1.4%	7:45 - 8:45 AM
Stop and Shop WB	48	6.7%	PHF = .77
Route 12 NB	300	41.9%	**VEHICLES COUNTED**
Route 12 SB	358	50.0%	**ALL VEHICLES:** 716
TOTAL	716	100.0%	**TRUCKS:** 24
			PERCENT TRUCKS: 3.35%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

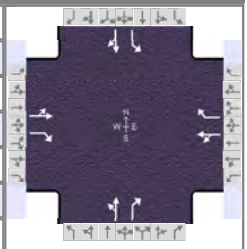
CITY: Worcester **DATE:** 5/22/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / Walgreens / Stop and Shop



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Walgreens EB	36	3.0%	4:30 - 5:30 PM
Stop and Shop WB	120	9.6%	PHF = .97
Route 12 NB	545	43.7%	**VEHICLES COUNTED**
Route 12 SB	545	43.7%	**ALL VEHICLES:** 1246
TOTAL	1246	100.0%	**TRUCKS:** 10
			PERCENT TRUCKS: 0.80%

HCS Signalized Intersection Results Summary

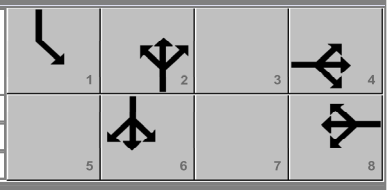
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.77
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_AM.…		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	6	1	3	22	0	26	6	267	27	24	327	7

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	45.0	5.0	5.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



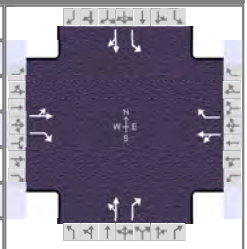
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		10.0		50.0	10.0	60.0
Change Period, (*Y+R c*), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.3		3.1	3.1	3.1
Queue Clearance Time (*g s*), s		2.4		3.7		10.3	2.5	9.7
Green Extension Time (*g e*), s		0.0		0.0		1.6	0.0	1.6
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		9	4		29	34		355	35	31	434	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1822	1584		1767	1560		1845	1566	1767	1841	
Queue Service Time (*g s*), s		0.4	0.2		1.2	1.7		0.0	0.8	0.5	7.7	
Cycle Queue Clearance Time (*g c*), s		0.4	0.2		1.2	1.7		8.3	0.8	0.5	7.7	
Green Ratio (*g/C*)		0.06	0.06		0.06	0.06		0.56	0.56	0.65	0.69	
Capacity (*c*), veh/h		114	99		110	97		1084	881	671	1266	
Volume-to-Capacity Ratio (*X*)		0.080	0.039		0.259	0.346		0.327	0.040	0.046	0.343	
Back of Queue (*Q*), ft/ln (95 th percentile)		7	3		24	29		135	11	7	102	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.3	0.1		1.0	1.1		5.3	0.4	0.3	4.0	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (*d 1*), s/veh		35.3	35.2		35.7	35.9		9.5	7.8	5.7	5.1	
Incremental Delay (*d 2*), s/veh		0.1	0.1		0.5	0.8		0.1	0.0	0.0	0.1	
Initial Queue Delay (*d 3*), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		35.4	35.3		36.2	36.7		9.5	7.8	5.7	5.2	
Level of Service (LOS)		D	D		D	D		A	A	A	A	
Approach Delay, s/veh / LOS	35.4	D		36.5	D		9.4	A		5.2	A	
Intersection Delay, s/veh / LOS	9.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.95	B	1.88	B	1.85	B
Bicycle LOS Score / LOS	0.51	A	0.59	A	1.13	A	1.25	A

HCS Signalized Intersection Results Summary

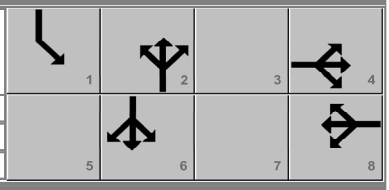
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:30 - 5:30 PM	PHF	0.97
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:30
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_PM.…		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	5	15	55	8	57	29	460	56	66	454	25

Signal Information			
Cycle, s	71.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	33.0	5.0	8.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



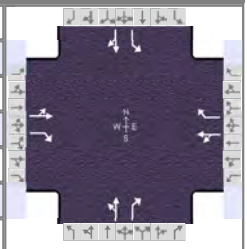
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		13.0		38.0	10.0	48.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.1	3.1	3.1
Queue Clearance Time (g_s), s		2.8		4.4		15.9	3.2	12.1
Green Extension Time (g_e), s		0.0		0.1		2.1	0.0	2.1
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		0.65		0.01	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		22	15		65	59		504	58	68	494	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1830	1610		1806	1598		1827	1553	1795	1860	
Queue Service Time (g_s), s		0.8	0.6		2.3	2.4		0.0	1.5	1.2	10.1	
Cycle Queue Clearance Time (g_c), s		0.8	0.6		2.3	2.4		13.9	1.5	1.2	10.1	
Green Ratio (*g/C*)		0.07	0.07		0.11	0.11		0.46	0.46	0.56	0.61	
Capacity (*c*), veh/h		129	113		204	180		903	722	478	1127	
Volume-to-Capacity Ratio (*X*)		0.168	0.136		0.319	0.326		0.558	0.080	0.142	0.438	
Back of Queue (*Q*), ft/ln (95 th percentile)		15	11		45	41		227	20	18	144	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.6	0.4		1.8	1.6		9.0	0.8	0.7	5.7	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh		31.0	31.0		29.0	29.0		13.9	10.6	9.0	7.5	
Incremental Delay (d_2), s/veh		0.2	0.2		0.3	0.4		0.5	0.0	0.1	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		31.3	31.2		29.3	29.4		14.4	10.6	9.0	7.6	
Level of Service (LOS)		C	C		C	C		B	B	A	A	
Approach Delay, s/veh / LOS	31.2	C		29.4	C		14.0	B		7.8	A	
Intersection Delay, s/veh / LOS	13.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	1.94	B	1.89	B	1.87	B
Bicycle LOS Score / LOS	0.55	A	0.69	A	1.41	A	1.41	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.77
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_AM-…		
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	11	1	3	22	0	31	6	287	27	24	327	7

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	5.0	45.0	5.0	5.0	0.0	0.0	5	6	7	8
Yellow	3.0	3.0	3.0	3.0	0.0	0.0				
Red	2.0	2.0	2.0	2.0	0.0	0.0				

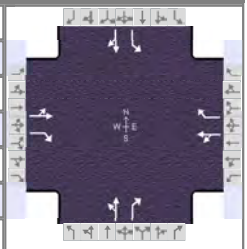
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		10.0		50.0	10.0	60.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.3		3.1	3.1	3.1
Queue Clearance Time (g_s), s		2.6		4.0		11.0	2.5	9.7
Green Extension Time (g_e), s		0.0		0.0		1.6	0.0	1.6
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		16	4		29	40		381	35	31	434	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1817	1584		1767	1560		1846	1566	1767	1841	
Queue Service Time (g_s), s		0.6	0.2		1.2	2.0		0.0	0.8	0.5	7.7	
Cycle Queue Clearance Time (g_c), s		0.6	0.2		1.2	2.0		9.0	0.8	0.5	7.7	
Green Ratio (*g/C*)		0.06	0.06		0.06	0.06		0.56	0.56	0.65	0.69	
Capacity (*c*), veh/h		114	99		110	97		1084	881	651	1266	
Volume-to-Capacity Ratio (*X*)		0.137	0.039		0.259	0.413		0.351	0.040	0.048	0.343	
Back of Queue (*Q*), ft/ln (95 th percentile)		13	3		24	35		147	11	7	102	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.5	0.1		1.0	1.4		5.7	0.4	0.3	4.0	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh		35.5	35.2		35.7	36.1		9.6	7.8	5.8	5.1	
Incremental Delay (d_2), s/veh		0.2	0.1		0.5	1.0		0.1	0.0	0.0	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		35.7	35.3		36.2	37.1		9.7	7.8	5.8	5.2	
Level of Service (LOS)		D	D		D	D		A	A	A	A	
Approach Delay, s/veh / LOS	35.6	D		36.7	D		9.5	A		5.2	A	
Intersection Delay, s/veh / LOS	9.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.95	B	1.88	B	1.85	B
Bicycle LOS Score / LOS	0.52	A	0.60	A	1.17	A	1.25	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:30 - 5:30 PM	PHF	0.97
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:30
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_PM-…		
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	21	5	15	55	8	67	29	500	56	66	454	25

Signal Information			
Cycle, s	71.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	5.0	33.0	5.0	8.0	0.0	0.0	5	6	7	8
Yellow	3.0	3.0	3.0	3.0	0.0	0.0				
Red	2.0	2.0	2.0	2.0	0.0	0.0				

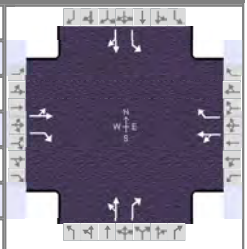
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		13.0		38.0	10.0	48.0
Change Period, ($Y+R_c$), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.1	3.1	3.1
Queue Clearance Time (g_s), s		3.0		4.8		17.5	3.2	12.1
Green Extension Time (g_e), s		0.0		0.1		2.2	0.0	2.3
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.02	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		27	15		65	69		545	58	68	494	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1826	1610		1806	1598		1831	1553	1795	1860	
Queue Service Time (g_s), s		1.0	0.6		2.3	2.8		0.0	1.5	1.2	10.1	
Cycle Queue Clearance Time (g_c), s		1.0	0.6		2.3	2.8		15.5	1.5	1.2	10.1	
Green Ratio (*g/C*)		0.07	0.07		0.11	0.11		0.46	0.46	0.56	0.61	
Capacity (*c*), veh/h		129	113		204	180		905	722	448	1127	
Volume-to-Capacity Ratio (*X*)		0.208	0.136		0.319	0.384		0.603	0.080	0.152	0.438	
Back of Queue (*Q*), ft/ln (95 th percentile)		19	11		45	48		250	20	18	144	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.8	0.4		1.8	1.9		9.9	0.8	0.7	5.7	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh		31.1	31.0		29.0	29.2		14.3	10.6	9.4	7.5	
Incremental Delay (d_2), s/veh		0.3	0.2		0.3	0.5		0.8	0.0	0.1	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		31.4	31.2		29.3	29.7		15.1	10.6	9.4	7.6	
Level of Service (LOS)		C	C		C	C		B	B	A	A	
Approach Delay, s/veh / LOS	31.3	C		29.5	C		14.7	B		7.8	A	
Intersection Delay, s/veh / LOS	13.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	1.94	B	1.89	B	1.87	B
Bicycle LOS Score / LOS	0.56	A	0.71	A	1.48	A	1.41	A

HCS Signalized Intersection Results Summary

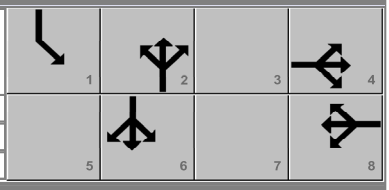
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:45 - 8:45 AM	PHF	0.77
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:45
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_AM-…		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	12	1	3	24	0	34	7	316	30	26	360	8

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	5.0	45.0	5.0	5.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



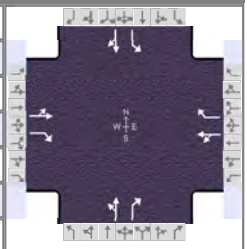
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		10.0		50.0	10.0	60.0
Change Period, (*Y+R c*), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.3		3.1	3.1	3.1
Queue Clearance Time (*g s*), s		2.7		4.2		12.2	2.5	10.8
Green Extension Time (*g e*), s		0.0		0.0		1.8	0.0	1.8
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.00	1.00	0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		17	4		31	44		419	39	34	478	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1816	1584		1767	1560		1844	1566	1767	1841	
Queue Service Time (*g s*), s		0.7	0.2		1.3	2.2		0.0	0.9	0.5	8.8	
Cycle Queue Clearance Time (*g c*), s		0.7	0.2		1.3	2.2		10.2	0.9	0.5	8.8	
Green Ratio (*g/C*)		0.06	0.06		0.06	0.06		0.56	0.56	0.65	0.69	
Capacity (*c*), veh/h		114	99		110	97		1083	881	621	1266	
Volume-to-Capacity Ratio (*X*)		0.149	0.039		0.282	0.453		0.387	0.044	0.054	0.378	
Back of Queue (*Q*), ft/ln (95 th percentile)		14	3		27	39		166	12	8	116	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.6	0.1		1.0	1.5		6.5	0.5	0.3	4.5	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (*d 1*), s/veh		35.5	35.2		35.8	36.2		9.9	7.9	6.0	5.3	
Incremental Delay (*d 2*), s/veh		0.2	0.1		0.5	1.2		0.1	0.0	0.0	0.1	
Initial Queue Delay (*d 3*), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		35.7	35.3		36.3	37.4		10.0	7.9	6.0	5.3	
Level of Service (LOS)		D	D		D	D		A	A	A	A	
Approach Delay, s/veh / LOS	35.6	D		36.9	D		9.8	A		5.4	A	
Intersection Delay, s/veh / LOS	10.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.95	B	1.88	B	1.85	B
Bicycle LOS Score / LOS	0.52	A	0.61	A	1.24	A	1.33	A

HCS Signalized Intersection Results Summary

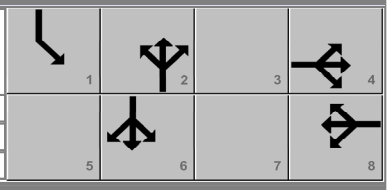
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	6/10/2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:30 - 5:30 PM	PHF	0.97
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:30
Intersection	Route 12/Walgreens/Sto…	File Name	12_Route 12 & Walgreens & Stop and Shop_PM-…		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	23	6	17	61	9	74	32	550	62	73	499	28

Signal Information										
Cycle, s	71.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	Yes	Simult. Gap E/W	On							
Force Mode	Fixed	Simult. Gap N/S	On							

Green	5.0	33.0	5.0	8.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	0.0	0.0
Red	2.0	2.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2	1	6
Case Number		11.0		11.0		7.3	1.0	4.0
Phase Duration, s		10.0		13.0		38.0	10.0	48.0
Change Period, (*Y+R c*), s		5.0		5.0		5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.1	3.1	3.1
Queue Clearance Time (*g s*), s		3.1		5.2		20.0	3.4	13.6
Green Extension Time (*g e*), s		0.0		0.1		2.4	0.0	2.5
Phase Call Probability		1.00		1.00		1.00	1.00	1.00
Max Out Probability		1.00		1.00		0.07	1.00	0.01

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		30	18		72	76		600	64	75	543	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1828	1610		1806	1598		1824	1553	1795	1860	
Queue Service Time (*g s*), s		1.1	0.7		2.6	3.2		2.7	1.6	1.4	11.6	
Cycle Queue Clearance Time (*g c*), s		1.1	0.7		2.6	3.2		18.0	1.6	1.4	11.6	
Green Ratio (*g/C*)		0.07	0.07		0.11	0.11		0.46	0.46	0.56	0.61	
Capacity (*c*), veh/h		129	113		204	180		901	722	408	1126	
Volume-to-Capacity Ratio (*X*)		0.232	0.155		0.355	0.424		0.666	0.089	0.185	0.482	
Back of Queue (*Q*), ft/ln (95 th percentile)		21	12		50	54		284	23	20	165	
Back of Queue (*Q*), veh/ln (95 th percentile)		0.9	0.5		2.0	2.1		11.3	0.9	0.8	6.5	
Queue Storage Ratio (*RQ*) (95 th percentile)		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	
Uniform Delay (*d 1*), s/veh		31.2	31.0		29.1	29.4		14.9	10.6	10.2	7.8	
Incremental Delay (*d 2*), s/veh		0.3	0.2		0.4	0.6		1.5	0.0	0.1	0.1	
Initial Queue Delay (*d 3*), s/veh		0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh		31.5	31.2		29.5	29.9		16.4	10.6	10.2	7.9	
Level of Service (LOS)		C	C		C	C		B	B	B	A	
Approach Delay, s/veh / LOS	31.4	C		29.7	C		15.9	B		8.2	A	
Intersection Delay, s/veh / LOS	14.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.93	B	1.94	B	1.89	B	1.87	B
Bicycle LOS Score / LOS	0.57	A	0.73	A	1.58	B	1.51	B

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: City of Worcester

DATE: 6/5/2024

LOCATION: Route 12 / I-190 Ramps

DAY OF WEEK: Wednesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: Camera

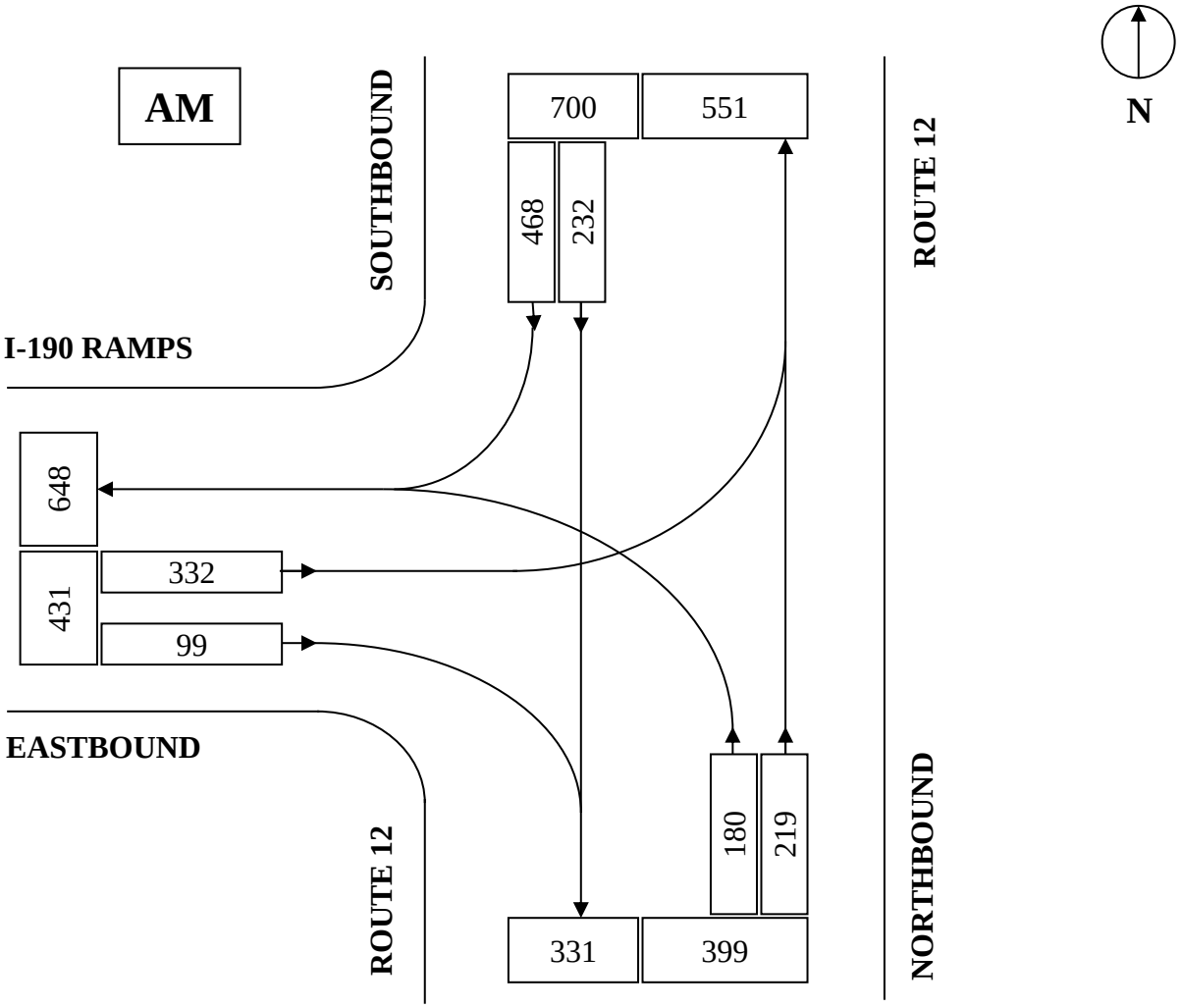
Time Period	I-190 Ramps EB								Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	64		26	6					28	48		3		42	96	11	304	
7:15 - 7:30	95		19	5					43	54		3		57	119	3	387	
7:30 - 7:45	82		32	5					54	52		6		64	114	8	398	
7:45 - 8:00	78		29	6					46	57		3		52	123	8	385	1474
8:00 - 8:15	77		19	5					37	56		4		59	112	8	360	1530
8:15 - 8:30	69		16	5					50	58		3		59	113	5	365	1508
8:30 - 8:45	76		29	3					34	64		6		64	108	3	375	1485
8:45 - 9:00	93		22	6					29	60		3		61	86	9	351	1451
TOTAL	634	0	192	41	0	0	0	0	321	449	0	31	0	458	871	55	2925	
		EBPct	28.2			**WBPct**	0.0			**NBPct**	26.1			**SBPct**	45.8			
Peak Sums:	**332**	**0**	**99**	**21**	**0**	**0**	**0**	**0**	**180**	**219**	**0**	**16**	**0**	**232**	**468**	**27**	**1530**	
Total Trucks	64					**TrkPct**	4.18			**PHF**	0.96							

Time Period	I-190 Ramps EB								Route 12 NB				Route 12 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	127		51	8					52	121		4		110	111	1	572	
4:15 - 4:30	147		53	6					40	115		5		104	109	4	568	
4:30 - 4:45	141		46	4					63	137		1		107	112	5	606	
4:45 - 5:00	141		64	4					52	128		2		99	110	6	594	2340
5:00 - 5:15	123		33	2					57	109		1		98	114	3	534	2302
5:15 - 5:30	136		52	1					33	126		0		89	91	0	527	2261
5:30 - 5:45	94		39	4					33	88		3		93	90	0	437	2092
5:45 - 6:00	108		47	1					36	108		1		81	112	3	492	1990
TOTAL	1017	0	385	30	0	0	0	0	366	932	0	17	0	781	849	22	4330	
		EBPct	32.9			**WBPct**	0.0			**NBPct**	30.3			**SBPct**	36.8			
Peak Sums:	**556**	**0**	**214**	**22**	**0**	**0**	**0**	**0**	**207**	**501**	**0**	**12**	**0**	**420**	**442**	**16**	**2340**	
Total Trucks	50					**TrkPct**	2.14			**PHF**	0.97							

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Worcester **DATE:** 6/5/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / I-190 Ramps

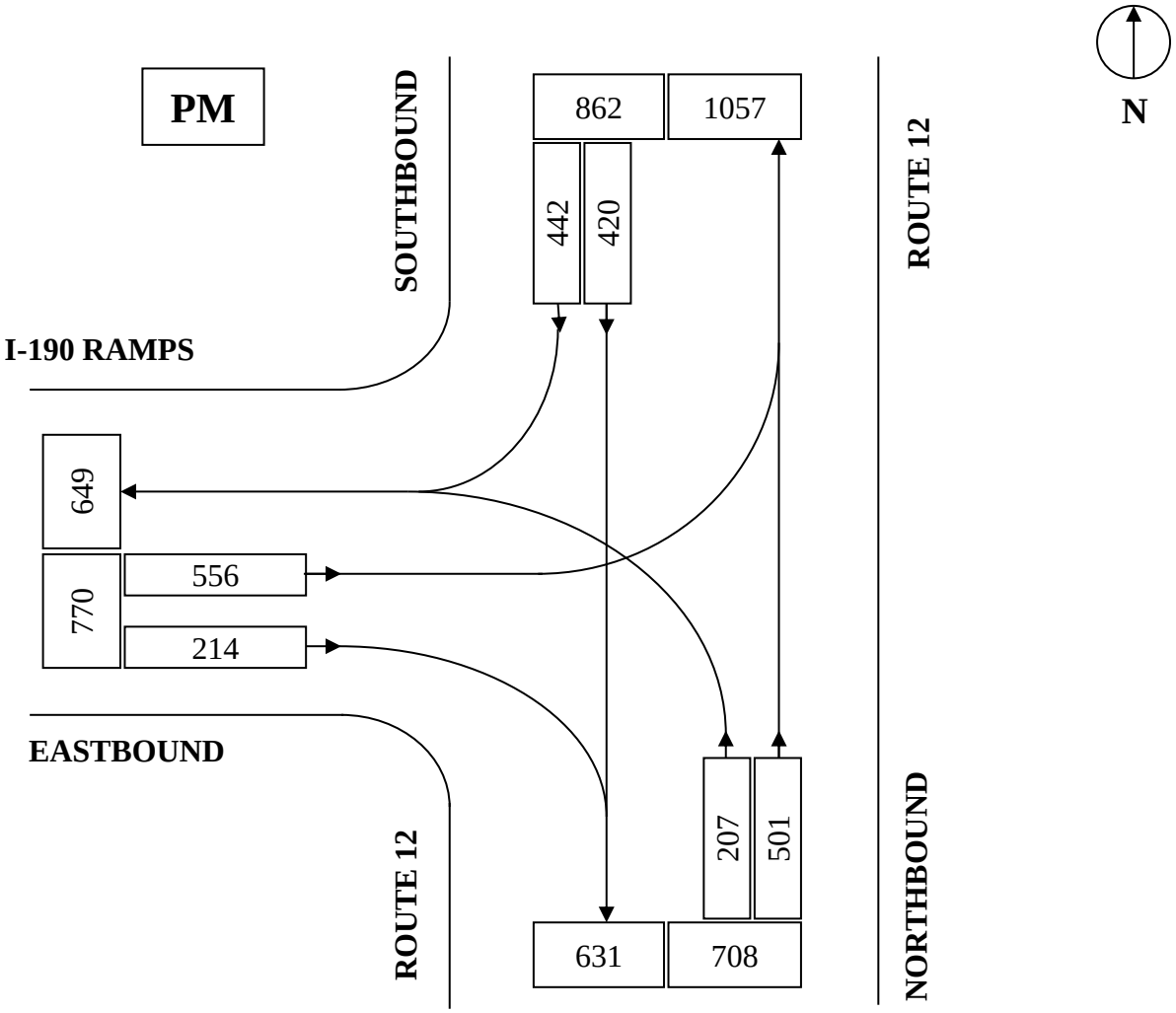


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:15 - 8:15 AM
I-190 Ramps EB	431	28.2%	
			PHF = .96
Route 12 NB	399	26.0%	
			VEHICLES COUNTED
Route 12 SB	700	45.8%	
			ALL VEHICLES: 1530
TOTAL	1530	100.0%	**TRUCKS:** 64
			PERCENT TRUCKS: 4.18%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

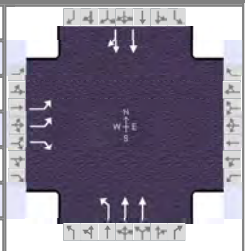
CITY: Worcester **DATE:** 6/5/24 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 12 / I-190 Ramps



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:00 - 5:00 PM
I-190 Ramps EB	770	32.9%	
			PHF = .97
Route 12 NB	708	30.3%	
			VEHICLES COUNTED
Route 12 SB	862	36.8%	
			ALL VEHICLES: 2340
TOTAL	2340	100.0%	**TRUCKS:** 50
			PERCENT TRUCKS: 2.14%

HCS Signalized Intersection Results Summary

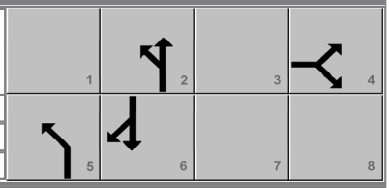
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 27, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:15 - 8:15 AM	PHF	0.92
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:15
Intersection	Route 12/I-190 Ramps	File Name	24_Route 12 & I-190_AM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	332		99				180	219			232	468

Signal Information			
Cycle, s	46.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	11.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



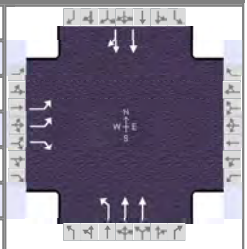
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			11.0	27.0		16.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2			3.1	3.2		3.2
Queue Clearance Time (g_s), s		5.8			5.4	3.8		12.0
Green Extension Time (g_e), s		0.8			0.0	1.3		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.03			1.00	0.19		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	361		108				196	238			252	346
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1702		1560				1753	1749			1841	1554
Queue Service Time (g_s), s	3.8		2.4				3.4	1.8			5.6	10.0
Cycle Queue Clearance Time (g_c), s	3.8		2.4				3.4	1.8			5.6	10.0
Green Ratio (*g/C*)	0.30		0.30				0.41	0.48			0.24	0.24
Capacity (*c*), veh/h	1036		475				402	1673			440	372
Volume-to-Capacity Ratio (*X*)	0.348		0.227				0.486	0.142			0.573	0.930
Back of Queue (*Q*), ft/ln (95 th percentile)	54		32				46	21			96	249
Back of Queue (*Q*), veh/ln (95 th percentile)	2.1		1.2				1.8	0.8			3.7	10.0
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.21	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	12.5		12.0				10.7	6.7			15.4	17.1
Incremental Delay (d_2), s/veh	0.1		0.1				0.3	0.0			1.2	29.2
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	12.5		12.0				11.1	6.7			16.6	46.3
Level of Service (LOS)	B		B				B	A			B	D
Approach Delay, s/veh / LOS	12.4	B		0.0			8.7	A		33.8	C	
Intersection Delay, s/veh / LOS	19.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.33	B	0.67	A	2.09	B
Bicycle LOS Score / LOS		F			0.85	A	0.98	A

HCS Signalized Intersection Results Summary

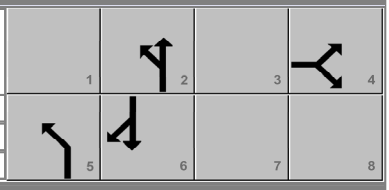
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 27, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	4:00 - 5:00 PM	PHF	0.97
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 4:00
Intersection	Route 12/I-190 Ramps	File Name	24_Route 12 & I-190_PM.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	556		214				207	501			420	442

Signal Information			
Cycle, s	54.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	10.0	16.0	13.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



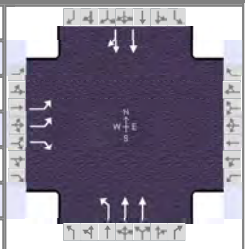
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		18.0			15.0	36.0		21.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2			3.1	3.1		3.1
Queue Clearance Time (g_s), s		10.1			5.5	5.9		12.2
Green Extension Time (g_e), s		0.7			0.2	2.3		1.3
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		1.00			0.27	0.14		0.83

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	573		221				213	516			393	341
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1730		1585				1781	1777			1870	1607
Queue Service Time (g_s), s	8.1		6.6				3.5	3.9			9.5	10.2
Cycle Queue Clearance Time (g_c), s	8.1		6.6				3.5	3.9			9.5	10.2
Green Ratio (*g/C*)	0.24		0.24				0.52	0.57			0.30	0.30
Capacity (*c*), veh/h	833		382				540	2040			554	476
Volume-to-Capacity Ratio (*X*)	0.688		0.578				0.395	0.253			0.710	0.716
Back of Queue (*Q*), ft/ln (95 th percentile)	141		104				46	46			194	171
Back of Queue (*Q*), veh/ln (95 th percentile)	5.5		4.1				1.8	1.8			7.6	6.8
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.21	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	18.7		18.1				9.1	5.7			16.9	17.0
Incremental Delay (d_2), s/veh	2.0		1.4				0.2	0.0			3.6	4.4
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	20.7		19.5				9.3	5.8			20.5	21.3
Level of Service (LOS)	C		B				A	A			C	C
Approach Delay, s/veh / LOS	20.3		C	0.0			6.8		A	20.9		C
Intersection Delay, s/veh / LOS	16.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.29	B	2.33	B	0.66	A	2.09	B
Bicycle LOS Score / LOS		F			1.09	A	1.09	A

HCS Signalized Intersection Results Summary

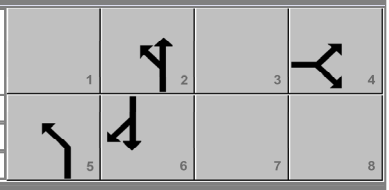
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 27, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:15 - 8:15 AM	PHF	0.92
Urban Street	Route 12	Analysis Year	2024	Analysis Period	1> 7:15
Intersection	Route 12/I-190 Ramps	File Name	24_Route 12 & I-190_AM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	365		109				198	241			255	515

Signal Information			
Cycle, s	46.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	11.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			11.0	27.0		16.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2			3.1	3.2		3.2
Queue Clearance Time (g_s), s		6.2			5.8	3.9		12.3
Green Extension Time (g_e), s		0.9			0.0	1.4		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.05			1.00	0.22		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	397		118				215	262			277	353
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1702		1560				1753	1749			1841	1554
Queue Service Time (g_s), s	4.2		2.6				3.8	1.9			6.2	10.3
Cycle Queue Clearance Time (g_c), s	4.2		2.6				3.8	1.9			6.2	10.3
Green Ratio (*g/C*)	0.30		0.30				0.41	0.48			0.24	0.24
Capacity (*c*), veh/h	1036		475				397	1673			440	372
Volume-to-Capacity Ratio (*X*)	0.383		0.250				0.542	0.157			0.630	0.951
Back of Queue (*Q*), ft/ln (95 th percentile)	61		35				54	24			112	267
Back of Queue (*Q*), veh/ln (95 th percentile)	2.4		1.4				2.1	0.9			4.4	10.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.24	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	12.6		12.0				10.9	6.8			15.7	17.2
Incremental Delay (d_2), s/veh	0.1		0.1				0.8	0.0			2.2	33.7
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	12.7		12.1				11.7	6.8			17.9	51.0
Level of Service (LOS)	B		B				B	A			B	D
Approach Delay, s/veh / LOS	12.6	B		0.0			9.0	A		36.4	D	
Intersection Delay, s/veh / LOS	20.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.38	B	0.67	A	2.09	B
Bicycle LOS Score / LOS		F			0.88	A	1.01	A

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.250
Analyst	KK	Analysis Date	Jun 27, 2024	Area Type	Other
Jurisdiction	Worcester	Time Period	7:15 - 8:15 AM	PHF	0.92
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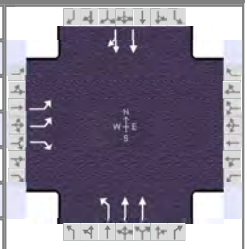
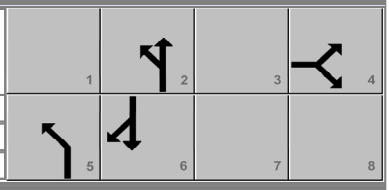
Intersection	Route 12/I-190 Ramps	File Name	24_Route 12 & I-190_AM-Proj.xus		
Project Description	Projected 2034				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	365		109				198	241			255	515

Signal Information			
Cycle, s	46.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	6.0	11.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	1.0	1.0	1.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4			5	2		6
Case Number		9.0			1.0	4.0		8.3
Phase Duration, s		19.0			11.0	27.0		16.0
Change Period, ($Y+R_c$), s		5.0			5.0	5.0		5.0
Max Allow Headway (*MAH*), s		3.2			3.1	3.2		3.2
Queue Clearance Time (g_s), s		6.2			5.8	3.9		12.3
Green Extension Time (g_e), s		0.9			0.0	1.4		0.0
Phase Call Probability		1.00			1.00	1.00		1.00
Max Out Probability		0.05			1.00	0.22		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7		14				5	2			6	16
Adjusted Flow Rate (*v*), veh/h	397		118				215	262			277	353
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Back of Queue (*Q*), veh/ln (95 th percentile)	2.4		1.4				2.1	0.9			4.4	10.7
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00		0.00				0.24	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	12.6		12.0				10.9	6.8			15.7	17.2
Incremental Delay (d_2), s/veh	0.1		0.1				0.8	0.0			2.2	33.7
Initial Queue Delay (d_3), s/veh	0.0		0.0				0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	12.7		12.1				11.7	6.8			17.9	51.0
Level of Service (LOS)	B		B				B	A			B	D
Approach Delay, s/veh / LOS	12.6	B		0.0			9.0	A		36.4	D	
Intersection Delay, s/veh / LOS	20.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.28	B	2.38	B	0.67	A	2.09	B
Bicycle LOS Score / LOS		F			0.88	A	1.01	A

Central Massachusetts Regional Planning Commission

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Millville	West Brookfield
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North Brookfield	Worcester

Central Mass Regional Planning Commission

1 Mercantile Street, Suite 520
Worcester, MA 01608