



**Routes 7/15 Interchange
Norwalk, Connecticut
State Project No. 102-358**

**Environmental Assessment,
Draft Section 4(F) Evaluation and
Environmental Impact Evaluation**

**Appendix B
Analysis, Needs, and Deficiencies
Report**

August 2022

Prepared for:
Connecticut Department of
Transportation Federal Highway
Administration



Routes 7/15 Interchange
Norwalk, Connecticut
State Project 102-358

Analysis, Needs, and Deficiencies
Report

Prepared for:
CTDOT

Prepared by:
Stantec Consulting Services, Inc.
VN Engineers, Inc.
Fitzgerald and Halliday, Inc.

December 6, 2017
(Revised May 8, 2020)

Table of Contents

SUMMARY OF REVISIONS TO THE ANALYSIS, NEEDS, AND DEFICIENCIES REPORT	VII
1.0 INTRODUCTION	1.1
2.0 TRANSPORTATION NETWORK.....	2.1
2.1 ROADWAY NETWORK	2.1
2.1.1 Mainlines and Interchanges.....	2.4
2.1.2 Local Roads and Key Intersections.....	2.8
2.2 TRANSIT NETWORK.....	2.11
2.2.1 Bus Transportation.....	2.11
2.2.2 Rail Transportation	2.13
2.3 BICYCLIST AND PEDESTRIAN ACCESSIBILITY	2.13
2.3.1 Assessment of Key Roadways	2.13
2.3.2 Field Review of Bicycle and Pedestrian Environment.....	2.15
2.3.3 Review of ADA Issues.....	2.17
2.3.4 Bicycle and Pedestrian Counts.....	2.17
2.3.5 Bicycle and Pedestrian Crash Analysis	2.18
2.3.6 Bicycling and Walking Demand Analysis.....	2.19
3.0 EXISTING TRAVEL PATTERNS.....	3.1
3.1 TRAFFIC VOLUMES	3.1
3.1.1 Turning Movement Counts (TMC)	3.3
3.1.2 Automatic Traffic Recorders (ATR)	3.9
3.1.3 Heavy Vehicles	3.20
3.1.4 Validation of 2016 Traffic Data	3.20
3.2 TRAVEL SPEEDS	3.23
3.2.1 Travel Time and Speed Studies	3.23
3.3 ORIGIN-DESTINATION PATTERNS	3.35
4.0 CRASH ANALYSES	4.1
4.1 STUDY AREA CRASH ANALYSES	4.1
4.2 MERRITT PARKWAY CORRIDOR CRASH ANALYSES	4.4
5.0 EXISTING TRAFFIC OPERATIONS.....	5.1
5.1 VISSIM CORRIDOR ANALYSIS	5.1
5.1.1 Methodology/Criteria	5.1
5.1.2 Results	5.5
5.2 CAPACITY ANALYSIS	5.9
5.2.1 Synchro Analysis	5.9
5.2.2 HCS Segment Analysis.....	5.11
5.2.3 Existing Traffic Operations Summary.....	5.15



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

6.0	EXISTING ROADWAY GEOMETRY AND STRUCTURES REVIEW	6.1
6.1	ROADWAY GEOMETRY REVIEW	6.1
6.1.1	Methodology.....	6.1
6.1.2	Review of Mainline Geometrics.....	6.6
6.1.3	Review of Interchange Ramp Geometrics	6.8
6.1.4	Review of Local Roadway Geometrics	6.12
6.2	ROADWAY STRUCTURES REVIEW	6.13
6.2.1	Methodology.....	6.13
6.2.2	Existing Structural Conditions.....	6.15
7.0	SUMMARY OF DEFICIENCIES.....	7.1
7.1	CORRIDOR DEFICIENCIES	7.1
7.1.1	Route 15 Corridor	7.1
7.1.2	Route 7 Corridor	7.1
7.1.3	Main Avenue Corridor	7.1
7.1.4	Glover Avenue Corridor	7.2
7.1.5	Creeping Hemlock Drive Corridor	7.2
7.2	ROUTES 7/15 INTERCHANGE DEFICIENCIES.....	7.2
7.3	MAIN AVENUE/ROUTE 15 INTERCHANGE DEFICIENCIES.....	7.2
8.0	FUTURE (2045) TRANSPORTATION CONDITIONS	8.1
8.1	FUTURE (2045) TRAFFIC VOLUMES.....	8.1
8.1.1	Methodology.....	8.1
8.1.2	Traffic Volume Summary	8.2
8.2	FUTURE (2045) TRAFFIC OPERATIONS.....	8.4
8.2.1	VISSIM Corridor Analysis.....	8.4
8.2.2	Synchro and HCS Capacity Analyses	8.9
8.2.3	Future Traffic Operations Summary	8.25
8.3	SAFETY ASSESSMENT	8.29



LIST OF TABLES

Table 2.1: Total Pedestrians and Bicycles by Intersection – Fall 2016	2.18
Table 3.1: Turning Movement Counts at Selected Intersections, Peak Periods, 2015	3.3
Table 3.2: Turning Movement Counts at Selected Intersections, Peak Periods, 2016	3.3
Table 3.3: ATR Count Descriptions.....	3.9
Table 3.4: 2018 Traffic Data Collection Table	3.21
Table 3.5: 2016 and 2018 TMC Comparison at Key Locations and CAGR Summary	3.22
Table 3.6: Route 15 Peak Period Travel Speed Summary	3.23
Table 3.7: Route 7 Peak Period Travel Speed Summary	3.28
Table 3.8 Main Avenue Peak Period Travel Speed Summary	3.31
Table 3.9 85 th Percentile Travel Speed Summary	3.34
Table 3.10: Travel Time Comparison – Stantec Data vs Skycomp Data	3.34
Table 3.11: Skycomp O-D Study Summary – Peak Hour Traffic Volumes and Average Travel Time for Route 7 / Route 15 Incomplete Movements.....	3.41
Table 4.1: Three-year (2012-2014) Crash Summary – Routes 7/15 Interchange	4.1
Table 4.2: Three-year (2012-2014) Crash Summary – Route 15/Main Avenue Interchange.....	4.1
Table 4.3: Three-year (2012-2014) Intersection Crash Summary	4.2
Table 5.1: Overall Model Performance.....	5.4
Table 5.2: Volume Calibration – Select Segments	5.5
Table 5.3: Speed Calibration – Select Segments.....	5.5
Table 5.4: AM Peak Hour Measures of Effectiveness	5.6
Table 5.5: PM Peak Hour Measures of Effectiveness	5.8
Table 5.6: LOS Criteria – Signalized and Unsignalized Intersections	5.10
Table 5.7: Intersection LOS Summary.....	5.10
Table 5.8: LOS Criteria – Basic Freeway Segments	5.12
Table 5.9: LOS Criteria – Merge and Diverge Sections	5.12
Table 5.10: LOS Criteria – Weaving Segments.....	5.13
Table 5.11: Route 15 LOS Summary.....	5.13
Table 5.12: Route 7 LOS Summary.....	5.14
Table 5.13: Route 15 On-/Off-Ramp LOS Summary	5.14
Table 5.14: Route 7 On-/Off-Ramp LOS Summary	5.15
Table 5.15: Summary of Locations that Operation Below LOS D – Existing Conditions (2016)	5.15
Table 6.1: Route 7 and Route 15 Design Criteria.....	6.2
Table 6.2: Minimum Vertical Clearances	6.5
Table 6.3: Existing Bridge Vertical Clearances within the Study Area	6.6
Table 6.4: Route 15 Mainline Geometry Review	6.7
Table 6.5: Route 7 Mainline Geometry Review	6.8
Table 6.6: Review of Ramp Design Speeds (mph)	6.9
Table 6.7: Routes 7/15 Interchange Ramp Geometrics Review	6.10
Table 6.8: Main Avenue/Route 15 Interchange Ramp Geometrics Review	6.11



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Table 6.9: Main Avenue Geometrics Review	6.12
Table 6.10: Glover Avenue Geometrics Review	6.12
Table 6.11: Creeping Hemlock Drive Geometrics Review	6.13
Table 6.12: Bridge Construction, Rehabilitation, and Inspection Data	6.14
Table 6.13: NBIS Rating Scale.....	6.15
Table 6.14: Bridge Condition Ratings and Overall Structural Evaluation Summary	6.16
Table 8-1: Average Daily Traffic Volume Comparison by Corridor	8.3
Table 8-2: Weekday AM and Weekday PM Traffic Volume Comparison – No Build Alternative vs. Alternative 21D and No Build vs. Alternative 26	8.3
Table 8-3: VMT Comparison – 2016 Existing Conditions vs. 2045 Alternatives	8.5
Table 8-4: VHT Comparison – 2016 Existing Conditions vs. 2045 Alternatives	8.6
Table 8-5: Average Speed Comparison – 2016 Existing Conditions vs. 2045 Alternatives.....	8.7
Table 8-6: Travel Time Comparison – 2016 Existing Conditions vs. 2045 Alternatives.....	8.8
Table 8-7: Average Speed Comparison – 2016 Existing Conditions vs. 2045 Alternatives.....	8.9
Table 8-8: AM Peak Hour Intersection LOS Summary	8.11
Table 8-9: PM Peak Hour Intersection LOS Summary	8.12
Table 8-10: AM Peak Hour Main Ave Arterial LOS Summary	8.13
Table 8-11: PM Peak Hour Main Ave Arterial LOS Summary.....	8.14
Table 8-12: AM Peak Hour Northbound Route 15 On-/Off-Ramp LOS Summary	8.16
Table 8-13: PM Peak Hour Northbound Route 15 On-/Off-Ramp LOS Summary	8.17
Table 8-14: AM Peak Hour Southbound Route 15 On-/Off-Ramp LOS Summary	8.18
Table 8-15: PM Peak Hour Southbound Route 15 On-/Off-Ramp LOS Summary	8.19
Table 8-16: AM Peak Hour Northbound Route 7 On-/Off-Ramp LOS Summary	8.20
Table 8-17: PM Peak Hour Northbound Route 7 On-/Off-Ramp LOS Summary	8.21
Table 8-18: AM Peak Hour Southbound Route 7 On-/Off-Ramp LOS Summary	8.22
Table 8-19: PM Peak Hour Southbound Route 7 On-/Off-Ramp LOS Summary	8.23
Table 8-20: Routes 15 & Route 7 Interchange Weaving LOS Summary (Alternative 21D)	8.24
Table 8-21: Summary of Locations Projected to Operate Below LOS D in the 2045 Design Year	8.25



LIST OF FIGURES

Figure 2.1: Project Area	2.2
Figure 2.2: Study Area.....	2.3
Figure 2.3: Route 7/Route 15 Interchange Missing Movements	2.6
Figure 2.4: Route 15/Main Avenue Stop Control Ramps without Acceleration Lanes	2.7
Figure 2.5: Norwalk Transit District Fixed Routes Map	2.12
Figure 2.6: Work Commute by Transportation Mode	2.19
Figure 3.1: Count Location Map.....	3.2
Figure 3.2: Adjusted 2016 Traffic Volumes, AM Peak Hour 8:00 AM to 9:00 AM.....	3.5
Figure 3.3: Adjusted 2016 Traffic Volumes, PM Peak Hour 5:00 PM to 6:00 PM	3.7
Figure 3.4: Traffic Volumes by Day of Week (ATR Location A; Main Ave south of Grist Mill Rd)	3.11
Figure 3.5: Traffic Volumes by Day of Week (ATR Location O; Main Ave south of Rt. 15 Bridge)	3.11
Figure 3.6: Traffic Volumes by Day of Week (ATR Location W; Main Ave north of Broad St)	3.12
Figure 3.7: Traffic Volumes by Day of Week (ATR Location X; Main Ave south of Delaware Ave)	3.12
Figure 3.8: Average Weekday Hourly Traffic Volumes – Route 15 Corridor	3.13
Figure 3.9: Average Weekday Hourly Traffic Volumes – Route 7 Corridor	3.14
Figure 3.10: Average Weekday Hourly Traffic Volumes – Main Avenue Corridor	3.15
Figure 3.11: Average Weekday Peak Hour Traffic Volumes – Various Corridors	3.16
Figure 3.12: Average Weekday Peak Hour Traffic Volumes – Main Avenue at Route 15 Interchange	3.17
Figure 3.13: Average Weekday Peak Hour Traffic Volumes – Routes 7/15 Interchange, Perry Avenue, and Glover Avenue	3.18
Figure 3.14: Average Weekday Peak Hour Traffic Volumes – Route 7 and New Canaan Avenue Interchange	3.19
Figure 3.15: 2018 Traffic Data Collection Map	3.21
Figure 3.16: Northbound Main Ave and Route 15 Travel Speeds – AM Peak Period	3.24
Figure 3.17: Southbound Route 15 and Main Ave Travel Speeds – PM Peak Period.....	3.25
Figure 3.18: Northbound Route 15 Travel Speeds – PM Peak Period	3.26
Figure 3.19: Southbound Route 15 Travel Speeds – AM Peak Period.....	3.27
Figure 3.20: Northbound Route 7 Travel Speeds – AM Peak Period.....	3.29
Figure 3.21: Northbound Route 7 Travel Speeds – PM Peak Period	3.29
Figure 3.22: Southbound Route 7 Travel Speeds – AM Peak Period.....	3.30
Figure 3.23: Southbound Route 7 Travel Speeds – PM Peak Period	3.30
Figure 3.24: Northbound Main Ave Travel Speeds – AM Peak Period	3.32
Figure 3.25: Northbound Main Ave Travel Speeds – PM Peak Period	3.32
Figure 3.26: Southbound Main Ave Travel Speeds – AM Peak Period	3.33
Figure 3.27: Southbound Main Ave Travel Speeds – PM Peak Period	3.33



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Figure 3.28: Skycomp O-D Study ALs – Route 7 at Grist Mill Road and Main Avenue	3.35
Figure 3.29: Skycomp O-D Study ALs – Main Avenue / Route 15 Interchange	3.36
Figure 3.30: Skycomp O-D Study ALs – Route 7 / Route 123 Interchange	3.36
Figure 3.31: Weekday AM Peak Hour Patterns – Northbound Route 7 Off-Ramp to Route 123.....	3.37
Figure 3.32: Weekday PM Peak Hour Patterns – Northbound Route 7 Off-Ramp to Route 123.....	3.38
Figure 3.33: Weekday AM Peak Hour Patterns – Southbound Route 15 Off-Ramps to Main Ave	3.39
Figure 3.34: Weekday PM Peak Hour Patterns – Southbound Route 15 Off-Ramps to Main Ave	3.40
Figure 4.1: Study Area Crash Summary (2012-2014).....	4.3
Figure 4.2: Route 15 Crash Summary (2010-2014).....	4.4
Figure 4.3: Route 15 Crash Summary (2015-2018).....	4.5
Figure 5.1: VISSIM Simulation Model Roadway Network.....	5.3
Figure 5.2: Level of Service Summary – Existing (2016) Weekday AM Peak Hour	5.16
Figure 5.3: Level of Service Summary – Existing (2016) Weekday PM Peak Hour	5.17
Figure 8.1: Level of Service Summary – 2045 No Build Alternative (AM Peak Hour and PM Peak Hour)	8.26
Figure 8.2: Level of Service Summary – 2045 Alternative 21D (AM Peak Hour and PM Peak Hour).....	8.27
Figure 8.3: Level of Service Summary – 2045 Alternative 26 (AM Peak Hour and PM Peak Hour)	8.28

LIST OF ATTACHMENTS (AVAILABLE UPON REQUEST)

Attachment A – Memo containing additional Skycomp O-D graphics

Attachment B – Existing Conditions Capacity Analysis Results

Attachment C – January 2019 Crash Data Comparison Memo (VN Engineers, Inc.)

Attachment D – Volume Diagrams (Future Conditions)

Attachment E – Future Conditions Capacity Analysis Reports



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Summary of Revisions to The Analysis, Needs, and Deficiencies Report
December 6, 2017 (Revised May 8, 2020)

SUMMARY OF REVISIONS TO THE ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

This version of the *Analysis, Needs, and Deficiencies* Report (“report”) includes additional analyses performed since the report was first issued on December 6, 2017:

- Supplemental traffic data was collected in 2018 and compared against traffic data collected in 2016 to determine changes in background traffic growth. A review of this data confirmed that the existing (2016) traffic data continues to be valid for use in this Project. Refer to Section 3.1.4 for further information.
- The original report included crash analyses which assessed safety over an older analysis period (2012-2014). Supplemental crash analyses were performed for the study area and for the entire Merritt Parkway (Route 15) corridor to reflect a more recent analysis period and to determine if any changes in crash patterns have occurred. Refer to Section 4.1 and Section 4.2 for further information.
- Traffic analysis results presented within this report were updated to reflect updates to the traffic analysis software (Synchro, HCS, and VISSIM). Refer to Section 5.1 and Section 5.2 for further information on the versions of traffic analysis software used; and
- Future (2045) transportation conditions were evaluated for reasonable alternatives presented within the EA/EIE document. Refer to Chapter 8.0 for the evaluation of traffic volumes, traffic operations, and safety in the study area.

Additionally, certain graphics within this report have been updated to be consistent with those illustrated within the Environmental Assessment and Environmental Impact Evaluation (EA/EIE) document.

This document serves as an appendix to the EA/EIE document for CTDOT Project No. 102-358. There are other resources evaluated within the EA/EIE document that are reliant on traffic data and those resources were evaluated using the traffic data presented and evaluated herein.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Introduction

December 6, 2017 (Revised May 8, 2020)

1.0 INTRODUCTION

The Connecticut Department of Transportation (CTDOT) proposes to construct improvements (Project) at the Route 7 and the Merritt Parkway (Route 15) interchange and to improve Route 7/Route 15 interconnections with local roads in the City of Norwalk (Norwalk), Connecticut. The principal elements of the Project are designed to provide a full directional interchange with direct access between Route 7 and Route 15 and to improve traffic operations and safety at the Route 15 and Main Avenue interchange as well as along Main Avenue and Glover Avenue in the vicinity of the interchange. This Project does not preclude any potential for further improvements to the Route 7 corridor though, as of now, there are no formal plans to do so.

The Project is being reviewed pursuant to the Connecticut Environmental Protection Act (CEPA) and the National Environmental Policy Act (NEPA). This report, as the title implies, focuses on identifying transportation-related deficiencies and issues in the Project study area. Chapter 2.0 through Chapter 6.0 of this document presents detailed existing (2016) conditions data and information regarding the following transportation topics:

- Transportation network including highways, interchanges, and intersections;
- Transit facilities;
- Bicyclist and pedestrian facilities;
- Traffic volumes;
- Travel speeds;
- Origin-Destination patterns;
- Crash data and safety;
- Traffic operations (level of service); and
- Roadway geometry.

The data presented in this report pays specific attention to particular movements, locations, and elements that are deficient. All the transportation-related deficiencies identified through this study are summarized in Chapter 7.0 of this document.

Chapter 8.0 of this document evaluates future (2045) transportation conditions (traffic volumes, traffic operations, and safety) for reasonable alternatives carried forward for assessment in the EA/EIE document – No Build Alternative, Alternative 21D, and Alternative 26.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

2.0 TRANSPORTATION NETWORK

This section describes the key roadways, interchanges, and intersections and discusses the specific movements lacking in the study area. The available transit options as well as the status of bicyclist and pedestrian facilities in the study area are also discussed herein.

2.1 ROADWAY NETWORK

The project area (presented in Figure 2.1 on the following page) extends along Route 15 from approximately 0.5 miles west of Route 7 to approximately 0.5 miles east of Main Avenue and along Route 7 from approximately 0.5 miles south of New Canaan Avenue to approximately 0.5 miles north of Route 15.

Due to the projected changes in mobility associated with the project, the traffic study area extends well beyond the overall project area. The expanded traffic study area was developed based on a review of the surrounding roadway network and coordination with CTDOT. As shown in Figure 2.2, the traffic study area generally includes longer portions of Route 7 and Main Avenue through New Canaan Avenue (Route 123) in Norwalk as well as a portion of the Route 7 corridor in Wilton.

A study area was also identified for pedestrian and bicyclists to assure that those modes of transportation are evaluated as part of the project. The pedestrian and bicyclist study areas were developed based on a review of the surrounding bicycle and pedestrian network and coordination with CTDOT. The pedestrian and bicyclist study areas are generally comprised of the area surrounding the Route 15 / Main Avenue interchange with a focus on the following locations:

- **Main Avenue** – The segment of Main Avenue between the Creeping Hemlock Drive / Glover Avenue and Merritt View / Shopping Center intersections;
- **Creeping Hemlock Drive** – The segment of Creeping Hemlock Drive between the Main Avenue and Silent Grove Court intersections; and
- **Glover Avenue** – The segment of Glover Avenue between the Main Avenue intersection and the Metro-North Danbury Branch Railroad crossing.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

Figure 2.1: Project Area

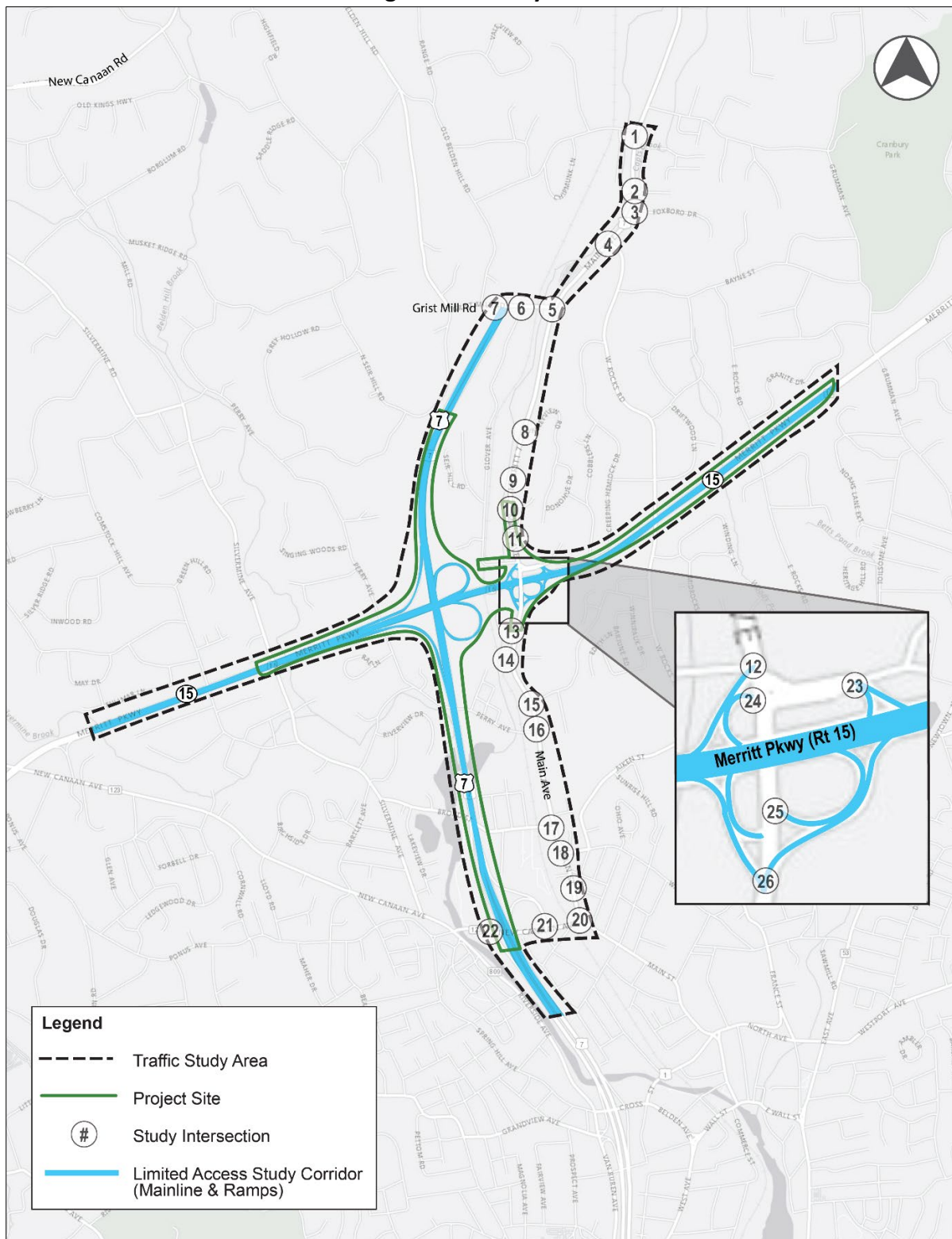


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

Figure 2.2: Study Area



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

2.1.1 Mainlines and Interchanges

This section of the report provides further information on the following critical mainlines and interchanges as they each relate to the Project:

- Merritt Parkway (Route 15) Corridor;
- Route 7 Corridor;
- Route 15 and Route 7 Interchange (No. 39);
- Route 15 and Main Avenue Interchange (No. 40); and
- Route 7 and New Canaan Avenue (Route 123) Interchange.

Merritt Parkway (Route 15) Corridor

The Merritt Parkway, also known as Route 15, is approximately 37 miles long and connects the Hutchinson River Parkway at the New York State line in Greenwich to the Wilbur Cross Parkway at the Housatonic River in Stratford. In the traffic study area, the Route 15 corridor is generally bounded by Silvermine Avenue to the west and West Rocks Road to the east. It carries traffic over Perry Avenue, Route 7, and Main Avenue as well as the Norwalk River and the Danbury Branch of Metro-North Railroad. The area includes the partially completed interchange with Route 7 (No. 39) and the full interchange with Main Avenue (No. 40); these two interchanges are approximately 1,500 feet apart. Within the traffic study area, the Route 15 corridor consists of two travel lanes in each direction and has posted speeds of 55 mph. Median treatments vary along the urban freeway between concrete and box wooden posts and shoulders are generally not present along either side of the roadway. Acceleration and deceleration lanes are present along some but not all ramps connecting to and from Route 15 at these two interchanges.

Route 7 Corridor

Regionally, Route 7 serves as an important north-south transportation corridor in southwestern Connecticut, connecting Interstate 84 (I-84) in Danbury and Interstate 95 (I-95) in Norwalk. Throughout the corridor, Route 7 provides essential service to residential communities and businesses in the towns of Ridgefield, Redding, and Wilton as well as the cities of Danbury and Norwalk. The traffic study area for the Route 7 corridor is generally bounded by Kent Road to the north (in the Town of Wilton) and Route 123 to the south. Within the traffic study area, the Route 7 corridor operates as both a local roadway and a limited access facility.

North of Grist Mill Road, Route 7 is a State-maintained urban principal arterial with a posted speed limit of 35 mph and is generally comprised of two travel lanes in each direction. There are multiple driveways accessing various commercial and/or retail uses along either side of the



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

corridor. Left turn bays are present along certain intersection approaches where the roadway geometry permits. There are no shoulders along either side of the roadway.

South of Grist Mill Road, Route 7 is a State-maintained urban freeway. This portion of Route 7 has a posted speed limit of 55 mph and consists of two travel lanes in each direction with paved shoulders and a concrete median barrier. The limited access portion of Route 7 has two interchanges within the study area: the partially completed interchange with Route 15 (Exit 3) and the full interchange with Route 123 (Exit 2). It should be noted that the posted speed limit along northbound Route 7 is reduced to 40 mph approximately 2,000 feet south of Grist Mill Road (just north of Route 15).

Route 7 and New Canaan Avenue (Route 123) Interchange (No. 38)

This interchange in the southern part of traffic study area provides connections in all directions between Route 7 and Route 123. These access ramps intersect Route 123 at signalized intersections located less than 1,000 feet apart from each other. The signalized intersection providing access to and from Route 7 northbound is less than 500 feet from the Danbury branch railroad crossing, which is just to the west of the Route 123 intersection with Main Avenue.

Route 15 and Route 7 Interchange (No. 39)

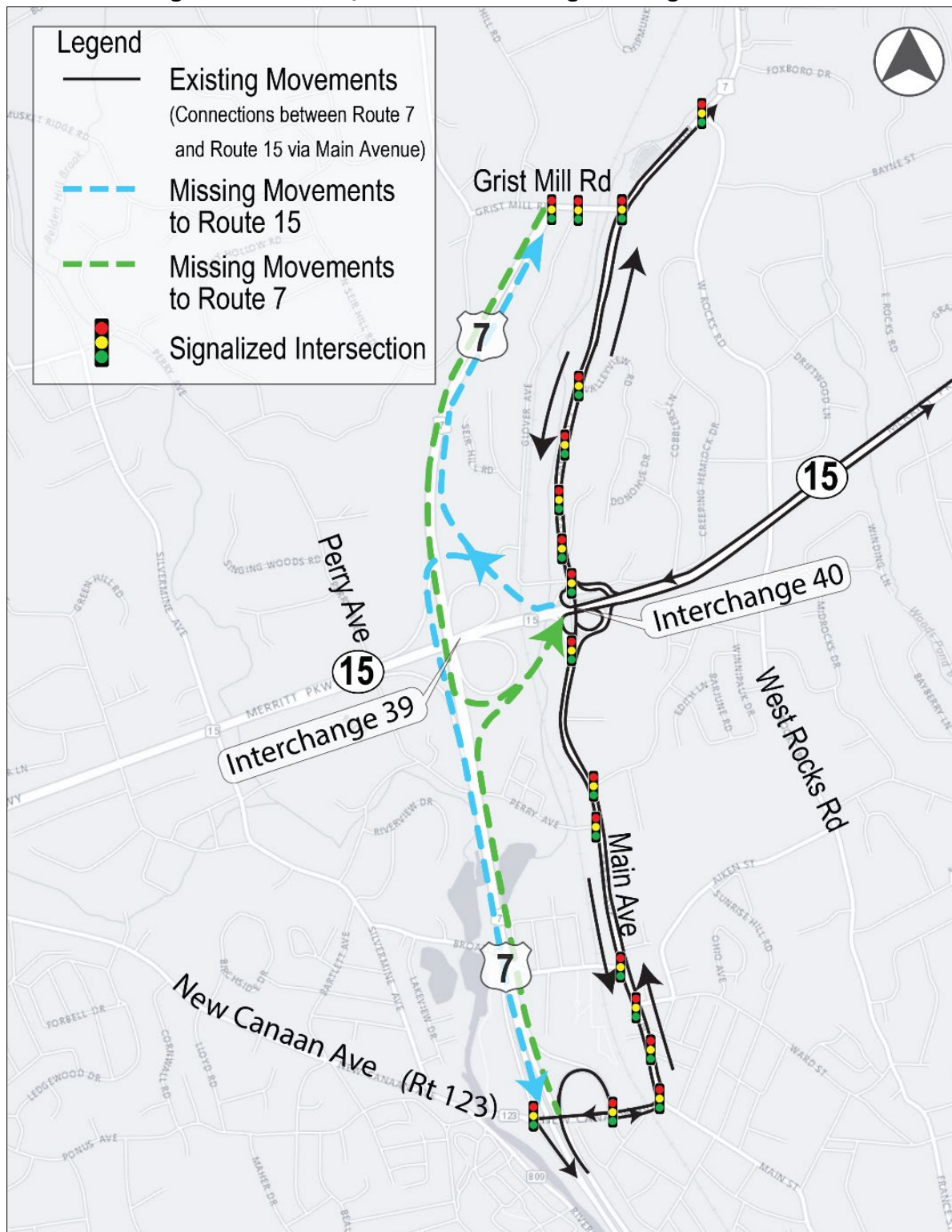
Interchange No. 39 provides partial connections between Route 7 and Route 15. Connections are provided from Route 7 northbound to Route 15 southbound, from Route 7 southbound to Route 15 southbound, from Route 15 northbound to Route 7 northbound, and from Route 15 northbound to Route 7 southbound. Connections between Route 7 and Route 15 to and from the north/east are not provided. Due to the missing connections, southbound Route 15 motorists must use the Route 15/Main Avenue interchange to access Route 7 northbound (via Exit 40B and Main Avenue) and to access Route 7 southbound at the Route 123 interchange (via Exit 40A or Exit 40B, Main Avenue, and New Canaan Avenue). Similarly, motorists on Route 7 have no direct access to Route 15 northbound and therefore must use Main Avenue to access Route 15. Figure 2.3 identifies the complete and missing movements at Interchange No. 39.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
 December 6, 2017 (Revised May 8, 2020)

Figure 2.3: Route 7/Route 15 Interchange Missing Movements



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

Route 15 and Main Avenue Interchange (No. 40)

Interchange No. 40 is located approximately 1,500 feet east of the Route 7 and Route 15 interchange and provides connections in all directions between Route 15 and Main Avenue. Two of the Route 15 on-ramps at this interchange are stop-controlled (as noted in Figure 2.4 below) and have no acceleration lanes: Main Avenue southbound to Route 15 northbound and Main Avenue northbound (via Creeping Hemlock Drive) to Route 15 southbound.

Figure 2.4: Route 15/Main Avenue Stop Control Ramps without Acceleration Lanes



Although this interchange generally resembles a typical cloverleaf interchange, its proximity to the Main Avenue intersection with Glover Avenue and Creeping Hemlock Drive results in several unusual ramp movements (particularly for traffic entering and exiting Route 15 southbound). In both directions on Route 15, Exit 40A is intended for vehicles heading southbound on Main Avenue, and Exit 40B is intended for vehicles going northbound on Main Avenue. However, Exit 40B southbound directs traffic onto Creeping Hemlock Drive which then permits vehicles to turn left toward Main Avenue southbound at the signalized intersection. Vehicles have been observed following this circuitous route rather than using Exit 40A southbound presumably to avoid the tight loop off-ramp immediately west of Main Avenue.

Northbound traffic on Main Avenue is directed to turn right onto Creeping Hemlock Drive to access Route 15 southbound via a stop-controlled on-ramp. Instead, some northbound vehicles turn left at the signalized intersection onto the Route 15 southbound on-ramp near Glover Avenue (which is not stop-controlled). Similarly, even though southbound traffic on Main Avenue



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

is directed to turn right at the Glover Avenue intersection for access to Route 15, vehicles are also permitted to turn left toward the Route 15 southbound on-ramp (via Creeping Hemlock Drive).

2.1.2 Local Roads and Key Intersections

This section of the report provides further information on the following local roads and key intersections as they each relate to the Project:

- Main Avenue Corridor;
- New Canaan Avenue (Route 123) Corridor;
- Grist Mill Road Corridor;
- Main Avenue at Glover Avenue/Creeping Hemlock Drive; and
- Main Avenue at Merritt View Drive/Shopping Center.

Main Avenue Corridor

The traffic study area for the Main Avenue (Route 719) corridor is bounded by Grist Mill Road to the north and Route 123 to the south. Main Avenue operates as a City-maintained urban minor arterial within the traffic study area. Generally, there are multiple driveways accessing various commercial, retail, and/or residential uses along either side of the corridor. Left turn bays are present along certain intersection approaches where the roadway geometry permits. There are no shoulders along either side of the roadway and sidewalks are generally present on at least one side of the road. Main Avenue is generally comprised of two travel lanes in each direction. The posted speed limit of Main Avenue is 30 mph. Connections between Route 7 and Main Avenue do not exist in the vicinity of Interchange No. 39 or Interchange No. 40.

The traffic signals along the Main Avenue corridor are part of a Computerized Traffic Signal System (CTSS). This coordinated, closed loop system consists of 25 traffic signals within the City of Norwalk and a portion of the Town of Wilton. All of the traffic signals along Main Avenue between Route 123 in Norwalk and Grumman Hill Road in Wilton are part of the CTSS. Per discussions with CTDOT, the interconnections for the CTSS has been compromised due to the addition of traffic signals into the original (existing) CTSS. The CTSS is over 25 years old and is not adequate to handle the volume of data received from traffic control signal devices. Furthermore, the system is not equipped to handle further expansions as needed to accommodate potential changes to the roadway network.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

It should be noted that the traffic study area does not include three Main Avenue intersections that are in the CTSS but are further away from the Routes 7/15 Interchange (intersections at Kensett Avenue, the Driveway to/from the Perkin Elmer Building, and Grumman Hill Road in Wilton).

New Canaan Avenue (Route 123) Corridor

The traffic study area for the Route 123 corridor is bounded by Route 7 to the west and Main Avenue (Route 719) to the east. Route 123 is a State-maintained urban minor arterial with two travel lanes in each direction. Within the traffic study area, the corridor has a posted speed limit of 30 mph.

The Route 123 / Main Avenue intersection is a three-legged signalized intersection that is less than 200 feet from the Danbury branch railroad crossing. Traffic turning from Main Avenue onto New Canaan Avenue, traffic coming from New Canaan Avenue west of the crossing, and traffic exiting northbound Route 7 at New Canaan Avenue have been observed to queue for up to five minutes as Danbury branch trains pass through Route 123.

All of the traffic signals along the Route 123 corridor within the traffic study area are part of the CTSS.

Grist Mill Road Corridor

Grist Mill Road, located in the northern portion of the traffic study area, is a 0.3-mile segment of roadway connecting neighborhood streets west of Route 7 to Main Avenue. Within that small stretch, Grist Mill Road has three signalized intersections with Route 7, Glover Avenue, and Main Avenue.

West of the Route 7 intersection, Grist Mill Road operates as a City-maintained urban minor arterial with one travel lane in each direction. The speed limit along this segment of Grist Mill Road is 25 mph (it is not posted).

East of the Route 7 intersection, Grist Mill Road operates as a State-maintained urban principal arterial with a speed limit of 25 mph (which is not posted). This section of the corridor is generally comprised of five lanes (two travel lanes in the westbound direction and three travel lanes in the eastbound direction). There is less than 500 feet between the Grist Mill Road intersections with Route 7, Glover Avenue, and Main Avenue.

Both the limited access portion of Route 7 and Glover Avenue terminate with “T” intersections at Grist Mill Road. Double turn bays are provided for several high-volume movements: (1) northbound Route 7 vehicles turning right onto eastbound Grist Mill Road, (2) northbound Route 7 vehicles turning left onto northbound Main Avenue, and (3) southbound Route 7 vehicles turning left from Grist Mill Road and heading south towards the Route 15 interchange. Most vehicles who turn right onto Grist Mill Road from northbound Route 7 continue onto northbound



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

Main Avenue; similarly, most vehicles who turn right onto Grist Mill Road from southbound Main Avenue continue onto southbound Route 7.

All of the traffic signals along the Grist Mill Road corridor within the traffic study area are part of the CTSS.

Main Avenue at Glover Avenue/Creeping Hemlock Drive

Glover Avenue connects with Creeping Hemlock Drive at the signalized intersection with Main Avenue. Glover Avenue carries traffic over the Norwalk River to and from the Merritt 7 train station located north of Route 15 between Route 7 and Main Avenue. The Danbury branch crosses Glover Avenue approximately 500 feet west of the Main Avenue intersection. Creeping Hemlock Drive continues eastward past the ramps to/from southbound Route 15 into the residential community northeast of the Route 15/Main Avenue interchange.

The intersection that ties Main Avenue, Glover Avenue, and Creeping Hemlock Drive together is also interconnected to the Route 15/Main Avenue interchange. For instance, the northbound right turn lane to Creeping Hemlock Drive also serves vehicles accessing the ramp to Route 15 southbound. Although this intersection is part of the CTSS, it is not capable of handling current peak period traffic demand. Deployment of a police officer is routinely required during the evening peak period to manage traffic at this intersection.

Main Avenue at Merritt View Drive/Shopping Center

The signalized intersection at Main Avenue and Merritt View Drive/Shopping Center is approximately 250 feet south of the on and off ramps to and from Route 15 northbound. Congestion on Route 15 northbound can lead to queues spilling back onto Main Avenue northbound at this intersection. In the same way, queues at the southbound approach to this intersection can prevent vehicles from merging onto Main Avenue from the Exit 40A exit ramp.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

2.2 TRANSIT NETWORK

Bus and rail service in the study area is provided by the Norwalk Transit District bus service and Metro-North Railroad, respectively. Although the project does not directly address transit services, improvements to the existing roadway network should improve access to the Merritt 7 train station and improve service and reliability of the bus routes that pass through the study area.

2.2.1 Bus Transportation

The Norwalk Transit District's *WHEELS hub* is located about 1 mile south of the traffic study area east of Route 7. As shown in Figure 2.5, several bus routes use Main Avenue and Route 7 including the 7 Link which passes the Merritt 7 train station and serves employment sites along the Route 7 corridor between Danbury and Norwalk.

Additional bus routes that travel along the study area's key corridors include:

- WHEELS Route 3 (shown in Figure 2.5)
- Main Ave Shuttle
- Merritt 7 – Glover Ave Commuter Shuttle
- 10-20 Westport Rd Shuttle

While the WHEELS Route 3 and Main Ave Shuttle have daily bus service, the 7 Link, Merritt 7 – Glover Ave Commuter Shuttle, and 10-20 Westport Rd Shuttle only operate Monday through Friday. The 7 Link provides hourly bus service between 6:00 AM and 9:00 AM and between 3:00 PM and 6:00 PM. WHEELS Route 3 operates every 20 minutes during the week (3 buses per hour), every 40 minutes on Saturdays, and no service on Sundays. The Main Ave Shuttle operates hourly during weekday and Saturday evenings and hourly on Sundays from 9:00 AM to 6:00 PM. Both the Merritt 7 – Glover Ave and 10-20 Westport Rd shuttles coincide their schedules with train arrival times, operating approximately every 15 to 30 minutes during the week (approx. 3 buses per hour). These schedules result in at least 10 buses per hour servicing the Main Avenue corridor during the morning and evening peak periods.

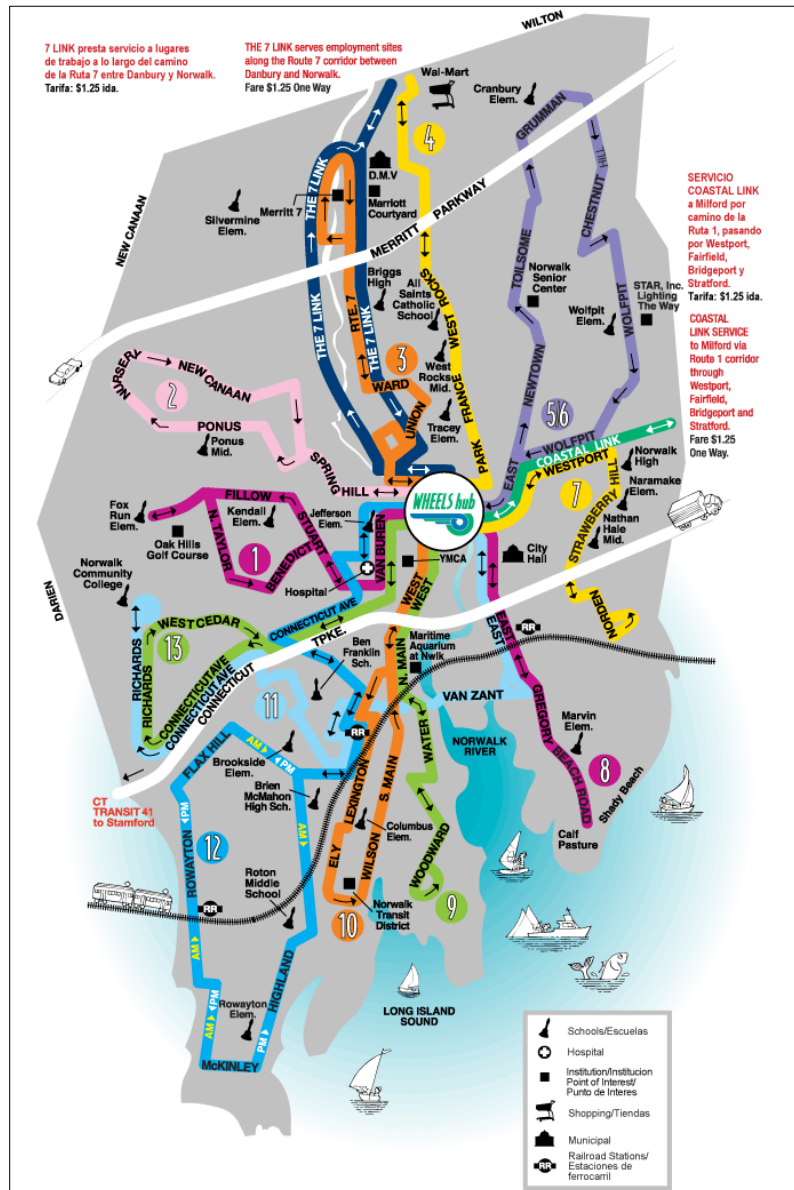


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Transportation Network

December 6, 2017 (Revised May 8, 2020)

Figure 2.5: Norwalk Transit District Fixed Routes Map



Source: Norwalk Transit District (<https://www.norwalktransit.com/norwalk>; Accessed in 2017).



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

2.2.2 Rail Transportation

The Merritt 7 train station, located along Glover Avenue just north of the Project, is the first stop on the Danbury Branch of Metro-North Railroad's New Haven Line. All parking (including overnight) for the train station is free, but on a first-come first-serve basis. Although parking is limited (approximately 75 spaces), the lot is rarely fully utilized. Connecting bus services to all routes mentioned in the prior section except for the Main Ave Shuttle are available to and from the Merritt 7 train station.

With the exception of peak period, peak-directional service, branch trains operate with two-hour headways in each direction (one train per hour on the single-track branch line). Peak period, peak-directional service operates with typical headways of 30-40 minutes.

2.3 BICYCLIST AND PEDESTRIAN ACCESSIBILITY

Existing pedestrian and bicycle facilities were identified and assessed using an array of different methods and resources. A field visit was conducted, pedestrian and bicycle counts were taken at two major intersections, and several plans relating to transportation in Norwalk were reviewed.

As previously mentioned in Section 2.1, the pedestrian and bicyclist study areas are comprised of the area surrounding the Route 15 /Main Avenue interchange with focus on the following locations:

- **Main Avenue** – The segment of Main Avenue between the Creeping Hemlock Drive / Glover Avenue and Merritt View / Shopping Center intersections;
- **Creeping Hemlock Drive** – The segment of Creeping Hemlock Drive between the Main Avenue and Silent Grove Court intersections; and
- **Glover Avenue** – The segment of Glover Avenue between the Main Avenue intersection and the Metro-North Danbury Branch Railroad crossing.

However, it should be noted that additional information regarding bicyclist and pedestrian accessibility within the bigger traffic study area has been provided to provide better context to overall accessibility in the area.

2.3.1 Assessment of Key Roadways

The area in the immediate vicinity of the Routes 7/15 Interchange is largely commercial, with an increasing amount of apartment buildings projected in the project area. To the east of Main Avenue are neighborhoods generally composed of single-family houses and condominium complexes. The Metro-North Railroad tracks run through the area, parallel to the Norwalk River and Main Avenue. Commercial and office buildings line either side of Main Avenue. These uses lead to significant numbers of pedestrians and bicycles traveling along and crossing Main Avenue.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

There are sidewalks in some parts of the study area, but they are not continuous and do not encourage bicycle and pedestrian travel. Smaller streets in the area, to the east and west of Main Avenue, generally have even poorer sidewalk conditions.

The remainder of this section provides an assessment of the Main Avenue, Creeping Hemlock Drive, and Glover Avenue corridors in the context of bicyclist and pedestrian accessibility.

Main Avenue

Main Avenue runs parallel to the Norwalk River, the Metro-North Railroad tracks, and Route 7. Commercial and office buildings line Main Avenue, but the buildings sit behind large parking lots, encouraging vehicular travel. Main Avenue is a four-lane roadway with high vehicle speeds. This is also the primary corridor for north-south pedestrian and bicycle travel in the area. There are sidewalks on both sides of Main Avenue from the Merritt View Shopping Center (on the southern end) to the northbound Route 15 on/off ramps, just south of Route 15. The sidewalks on Main Avenue up to the Route 15 on/off ramps are between three and five feet wide but are narrower where utility poles or signage create an obstruction. North of the Route 15 on/off ramps, the sidewalk coverage along Main Avenue is discontinuous. At some of the transitions between sidewalk and street, there are no curb ramps. There is no dedicated bike lane, and shoulder widths are less than one foot in most places. Vehicle speeds are too high for most bicyclists to feel comfortable riding in the roadway. Thus, most bicyclists in the area generally ride on the sidewalks. The only marked crosswalks on Main Avenue exist at the Merritt View Shopping Center intersection. Crosswalks within the study area are also located on Main Avenue at 101, 201 & 301, 401, 601 Merritt 7 Buildings and at Linden Street.

Creeping Hemlock Drive

Creeping Hemlock Drive is located just north of Route 15, east of Main Avenue. This roadway serves as the on/off-ramp for southbound traffic on Route 15 and connects Main Avenue to the Creeping Hemlock Neighborhood. In the westbound direction, there are two vehicle lanes, while there is only one vehicle lane in the eastbound direction. A median separates the two travel directions on Creeping Hemlock Drive. There are no sidewalks here, and the shoulders are less than one foot wide.

Glover Avenue

Glover Avenue is a north/south roadway located west of Main Avenue and originating at a bridge over the Norwalk River north of Route 15. Glover Avenue is a two-lane roadway that provides access to the Merritt 7 train station from Main Avenue. There are no bike lanes on this street and no shoulders. However, the roadway is narrower than Main Avenue, which discourages high vehicle speeds and makes bicycle travel in the roadway more appealing. There are sidewalks on both sides of Glover Avenue from the Norwalk River in the east to the Metro-North Railroad tracks in the west. The sidewalks and curb ramps in this segment are fully compliant with ADA



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network
December 6, 2017 (Revised May 8, 2020)

(Americans with Disabilities Act) standards. Street trees and building frontage on either side of Glover Avenue in this segment lend to a more enclosed feeling for pedestrians and bicyclists, which helps provide a friendlier bicycle and pedestrian environment. After Glover Avenue crosses the railroad tracks, there is only a sidewalk on the western side of the roadway until the railroad station. The sidewalk width along Glover Avenue varies between three and five feet until Glover Avenue reaches the Merritt 7 train station.

2.3.2 Field Review of Bicycle and Pedestrian Environment

A field review of the bicycle and pedestrian environment in the area revealed that there are a significant number of pedestrians and bicyclists that travel through the area, despite a lack of facilities and numerous deficiencies in the network. The most critical deficiencies in the network that were observed are listed below.

Issues Concerning Bicycle Travel:

- There are no bike lanes in the study area;
- All shoulders in the area are less than 1 foot wide and are not wide enough for bicyclists to use;
- None of the roadways in the study area are marked or signed as sharrows (shared use lanes with lane markings); and
- Vehicle speeds on Main Avenue are too high for bicyclists to feel comfortable traveling in the roadway. Bicyclists were observed using the sidewalks for travel along Main Avenue.

Issues Concerning Bicycle Crossings:

- There are no curb ramps at several crossing locations along Main Avenue;
- Bicyclists traveling on the sidewalks must dismount their bicycles at these locations without curb ramps; and
- Painted crosswalks along Main Avenue in the study area are limited to the intersection of Main Avenue and Merritt View Shopping Center; 101, 201 & 301, 401, 601 Merritt 7 Buildings; and Linden Street.

Issues Concerning Pedestrian Travel:

- There are no sidewalks at the following locations:
 - Along the eastern side of Main Avenue from the Route 15 on/off ramps to Creeping Hemlock Drive. The sidewalk on the eastern side of Main Avenue ends abruptly at the



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

- Route 15 on/off ramps with no crosswalk provided here that would allow pedestrians to cross to the western side of Main Avenue. The nearest crosswalk across Main Avenue is located at the Merritt View Plaza intersection;
 - On either side of Creeping Hemlock Drive. This prevents pedestrians and bicyclists from safely accessing the Creeping Hemlock Neighborhood from Main Avenue;
 - On either side of Glover Avenue from Main Avenue to the point at which Glover Avenue crosses the Norwalk River; and
 - On the eastern side of Glover Avenue from the point at which Glover Avenue crosses the Metro-North Railroad tracks to the Merritt 7 train station.
- The existing sidewalk on the western side of Main Avenue is extremely narrow (approximately 3 feet) underneath the Route 15 bridge.

Issues Concerning Pedestrian Crossings:

- There is no curb ramp between the transition from the sidewalk to the street at the locations listed below. This presents a serious problem for disabled persons in wheelchairs, the vision-impaired, the elderly, and for bicyclists who may be using the sidewalk:
 - The intersection of Main Avenue and the eastbound on/off ramps to Route 15 on the western side of Main Avenue;
 - The intersection of Main Avenue and the westbound on/off ramps to Route 15 on the western side of Main Avenue; and
 - The intersection of Main Avenue and Glover Avenue.
- Pedestrians must travel approximately 80 feet to cross Main Avenue (a four/five-lane road);
- Painted crosswalks along Main Avenue in the study area are limited to the intersection of Main Avenue and Merritt View Shopping Center; 101, 201 & 301, 401, 601 Merritt 7 Buildings; and Linden Street.
- No intersections in the study area have crosswalks along all four legs of the intersection;
- Except for the Main Avenue intersections at Perry Avenue, Linden Street, 101/201 Merritt 7 Buildings, and West Rocks Road/iPark Driveway, exclusive pedestrian phases are not present at signalized intersections in the study area; and
- The sidewalk ends abruptly, with no immediate crosswalk provided, at the following locations:



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

- Along the eastern side of Main Avenue at the eastbound on/off ramps to Route 15; and
- Along the eastern side of Main Avenue at the driveway to Extended Stay America.

2.3.3 Review of ADA Issues

Within the study area, only one segment (approximately 300' in length) along Glover Avenue, between the Norwalk River and the Metro-North Railroad tracks, is fully compliant with ADA standards. Other areas are not ADA compliant because one or more of the following facilities is not present:

- Tactile material to warn visually impaired pedestrians of the transition between the sidewalk and the street edge at the curb ramps;
- Sidewalk on either side of the roadway;
- Curb ramps to provide a sloped curb from the sidewalk to the street;
- Crosswalks at intersections – none of the intersections in the area have crosswalks along all four legs of the intersections; and
- Audible information for visually impaired pedestrians where there is a pedestrian push button provided at signalized intersections.

In addition, street furniture, such as lamp posts and utility poles, block the center of the sidewalk in several locations and inhibit pedestrians' pathways.

2.3.4 Bicycle and Pedestrian Counts

As part of the overall traffic analysis, bicycle and pedestrian counts were collected throughout a typical weekday in Fall 2016 as well as on a Saturday afternoon at 23 locations presented in Table 2.1 on the following page. Although the pedestrian and bicycle study area were centered around the Main Avenue/Route 15 interchange, data is presented for all 23 locations to provide additional information on peak period pedestrian and bicycle usage in the area.

Creeping Hemlock Drive / Main Avenue The data indicated that the majority of pedestrian and bicycle traffic occurs in the evening hours from 4:00 PM – 6:00 PM. Except for certain intersections, there was very little pedestrian and bicycle traffic in the morning hours which suggests that most of the pedestrian and bicycle trips are not people commuting from home to work. Instead, these trips likely represent people traveling from work to nearby restaurants or retail locations throughout the workday. It should be noted that pedestrian and bicycle volumes are considered low given that peak hour volumes are under 100 pedestrians and/or bicycles.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

Table 2.1: Total Pedestrians and Bicycles by Intersection – Fall 2016

Int. No	Intersection	AM Peak Period	PM Peak Period
1	Main Ave (Route 7) at Kent Rd	0	0
2	Route 7/Gateway Plaza South Dr./Strip Mall	0	0
3	Route 7/Foxboro Drive	0	0
4	Route 7/West Rocks Rd	3	3
5	Route 7/Main Av/DMV	0	0
6	Route 7/Grist Mill/Glover	0	0
7	Route 7/Grist Mill Rd	0	0
8	Main Ave at Valley View Rd / Merritt 201/301	16	19
9	Main Ave at Merritt 401/501 / Shopping Center	17	35
10	Main Ave at Merritt 601	55	37
11	Main Ave at Merritt River Towers 801/901	12	20
12	Main Ave at Glover Avenue / Creeping Hemlock Dr. / SB CT 15 Ramps	3	25
13	Main Ave at Merritt View/Shopping Center	3	29
14	Main Ave at Nottingham Pl	1	17
15	Main Ave at Linden St	0	4
16	Main Ave at Perry Ave	2	15
17	Main Ave at Broad St	4	12
18	Main Ave at Ward St	2	9
19	Main Ave at Delaware Ave/Shopping Center	4	18
20	Main Ave at New Canaan Ave (CT 123)	1	4
21	New Canaan Ave at NB US 7 Ramps	0	1
22	New Canaan Ave at SB US 7 Ramps	1	2
23	Creeping Hemlock Dr. at SB CT 15 Ramps	0	0

2.3.5 Bicycle and Pedestrian Crash Analysis

Bicycle and pedestrian crash records for the years of 2012-2015 were obtained from the Connecticut Crash Data Repository (CTCDR). There were 12 bicycle crashes and 30 pedestrian crashes in the City of Norwalk across the 4-year period. Only one of these crashes occurred in the vicinity of the study area. It was a pedestrian crash that occurred at the intersection of Main Avenue and Linden Street. The crash was attributed to “unsafe use of highway by the pedestrian.” This could mean, e.g., that the pedestrian was crossing the street without a crosswalk. The majority of the other bicycle and pedestrian crashes occurred on the southern portion of Main Avenue.



2.3.6 Bicycling and Walking Demand Analysis

Assessment of Current Biking and Walking Origins and Destinations

There are several office buildings, dining options, and retail establishments along Main Avenue. Examples are General Electric Capital Corporation, the Merritt 7 Corporate Park, and Stop & Shop. The commercial establishments attract bicycle and pedestrian activity, particularly during lunch hours on weekdays. Many people cross Main Avenue during this time to access the dining options.

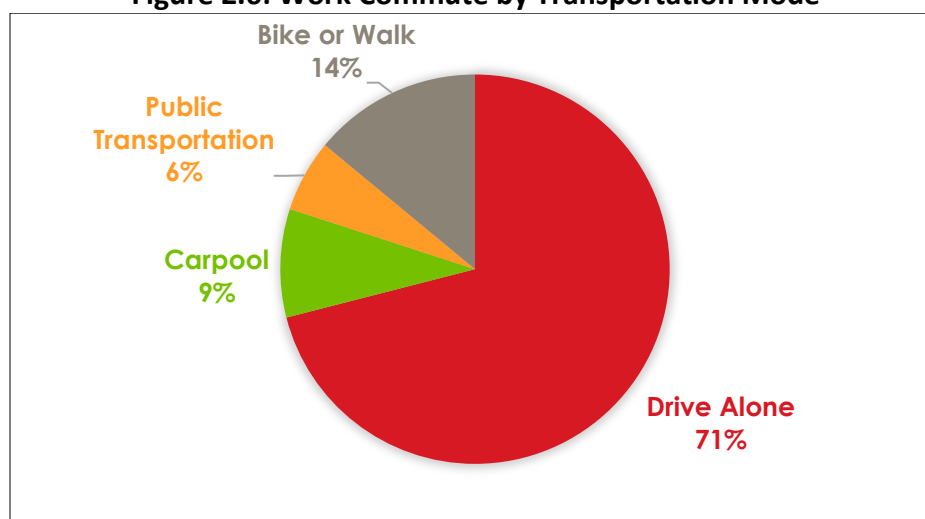
There are also several residential developments in the area, such as the Merritt River Apartments, that contribute to a high level of bicycle and pedestrian activity. Many of these residents walk or bike to and from work as well as for recreation. Approximately 1,500 apartment units are planned to be built just south of Grist Mill Road, which would contribute to an increase in the number of people walking and biking in the area. The surrounding area primarily consists of suburban development.

Walking and Biking Latent Demand Analysis

According to US Census data collected between the years of 2009-2013, approximately 58% of employed residents in Norwalk commute to surrounding areas for work, with the majority of people traveling to Stamford, Greenwich, Westport, Wilton, or locations in New York.

Of the remaining employed residents, i.e., those that both live and work in Norwalk (approximately 42%), the majority of people drive to work alone. The full breakdown by transportation mode is shown in the graph below.

Figure 2.6: Work Commute by Transportation Mode



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Transportation Network

December 6, 2017 (Revised May 8, 2020)

Based on the proportion there is currently only a small amount of estimated latent walking and biking demand in comparison to the amount of motorists who drive alone to and from the area. Field reviews of the biking and walking in the area support this finding. The demand for walking and biking will, however, continue to increase with future residential and commercial developments that prioritize pedestrian and bicyclist friendly environments along with increased investment in facilities for bicyclists and pedestrians throughout the City's transportation network.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

3.0 EXISTING TRAVEL PATTERNS

From a regional perspective, peak travel movements are generally in the southbound direction during the AM rush hour (towards points both south and west) and the northbound direction (towards points north and east) during the PM rush hour. Within the study area, traffic along study area corridors mostly follow regional travel trends. An example of how localized travel varies from regional travel is Main Avenue, where travel is actually higher in the southbound direction during the PM rush hour. This is primarily due to the influx of traffic from the Merritt 7 office buildings and other office buildings further north in Wilton to either Route 15 or I-95 further south in Norwalk.

Consequently, peak hour travel demand results in congestion and slow travel speeds along study area corridors. Vehicles making the missing movements at the Route 7/Route 15 interchange are directed to travel via local roads such as Main Avenue, increasing congestion on the local roadway network. There is a safety concern surrounding the Main Avenue/Route 15 interchange; the two stop-controlled on-ramps have severe congestion and queueing, the Main Avenue intersection with Creeping Hemlock Drive/Glover Avenue/southbound Route 15 ramps operates at poor levels of service, and most of interchange off-ramps either have minimal or no deceleration lanes. The intersection of Route 7 at Grist Mill Road also operates at below-average levels of service and there are safety concerns at that location as well (indicated by the high number of crashes).

3.1 TRAFFIC VOLUMES

To evaluate traffic conditions, a comprehensive data collection program was conducted in September 2016 (additional data were collected in October 2016, December 2016, and October 2018). Generally, weekday morning and weekday evening peak periods were targeted for analysis purposes as traffic volumes are highest during these periods of time. However, as discussed below, some counts were performed for several days or during other time periods to confirm that the data are reflective of typical traffic conditions. The data collection program consisted of turning movement counts (TMCs) and automatic traffic recorder counts (ATRs).

To the extent practicable, data were collected during dry weather conditions with good visibility, and while local public schools and colleges were open. All ATR and TMC count locations are shown in Figure 3.1. It should be noted that the noise monitoring locations are also shown in Figure 3.1 (see *Noise* section of the EA/EIE for more information).

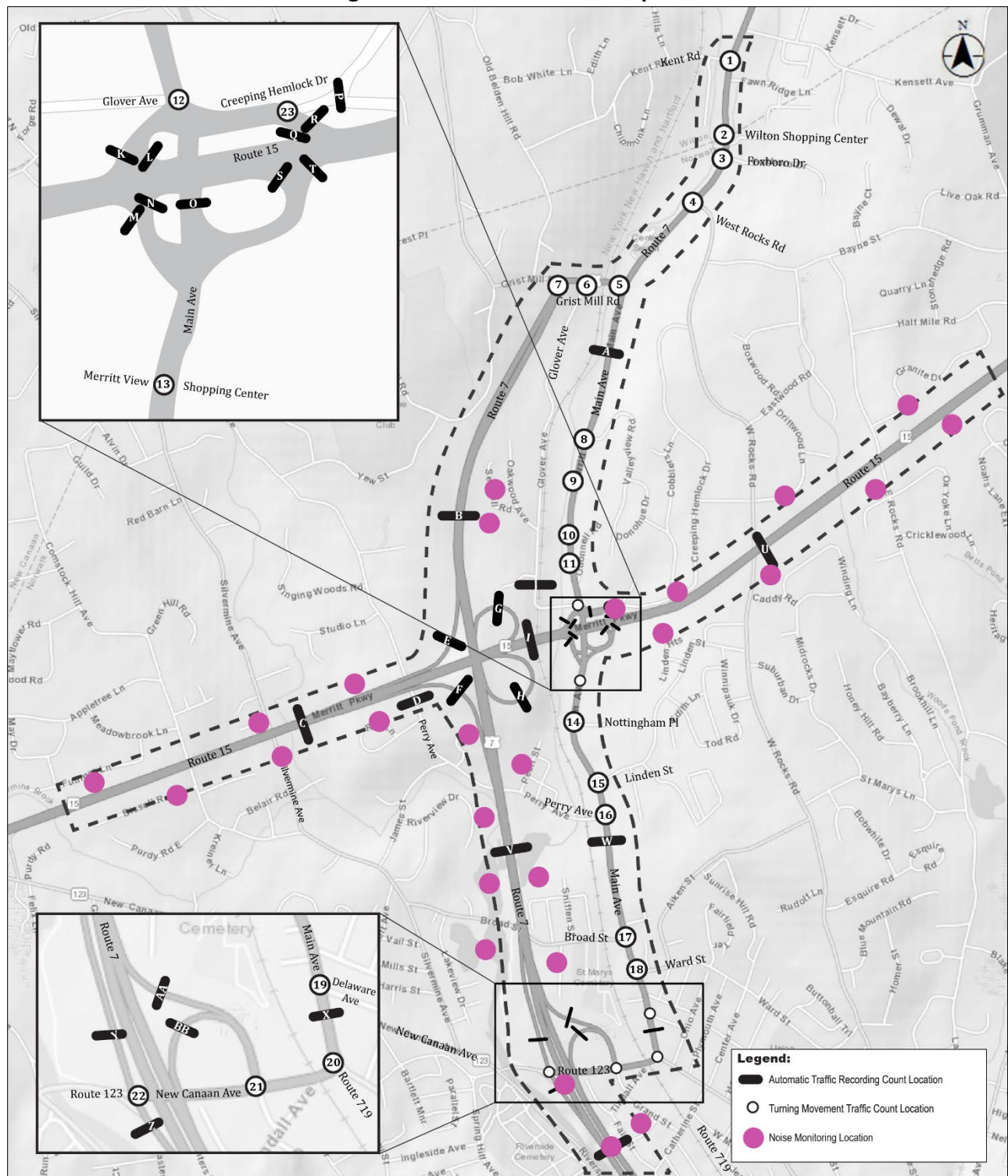


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.1: Count Location Map



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

3.1.1 Turning Movement Counts (TMC)

2015 TMC data were obtained from CTDOT in 15-minute intervals. Counts were collected on Monday, September 14, 2015 and Tuesday, September 15, 2015 during the AM (7:00 AM to 9:00 AM), midday (11:00 AM to 1:00 PM), and PM (4:00 PM to 6:00 PM) peak periods at the intersections listed in Table 3.1.

Table 3.1: Turning Movement Counts at Selected Intersections, Peak Periods, 2015

Location No.	Description	Type
1	Route 7 at Kent Rd	Signalized
2	Route 7 at Wilton Shopping Center	Signalized
3	Route 7 at Foxboro Dr	Signalized
4	Route 7 at West Rocks Rd	Signalized
5	Grist Mill Rd at Main Ave (CT 719)	Signalized
6	Grist Mill Rd at Glover Ave	Signalized
7	Grist Mill Rd at Route 7	Signalized

The 2016 count program collected TMCs in 15-minute intervals on Tuesday, September 20 and Wednesday, September 21, 2016. Counts were conducted during the AM (7:00 AM to 9:00 AM), midday (11:00 AM to 1:00 PM), and PM (4:00 PM to 6:00 PM) peak periods at the signalized and unsignalized intersections listed in Table 3.2.

Table 3.2: Turning Movement Counts at Selected Intersections, Peak Periods, 2016

Location No.	Description	Type
8	Main Ave at Valley View Rd/Merritt 7 (201/301)	Signalized
9	Main Ave at Merritt 7 (401/501)/Shopping Center	Signalized
10	Main Ave at Merritt 7 (601)	Signalized
11	Main Ave at Merritt River Towers (801/901)	Signalized
12	Main Ave at Glover Avenue/Creeping Hemlock Dr	Signalized
13	Main Ave at Merritt View/Shopping Center	Signalized
14	Main Ave at Nottingham Pl	Unsignalized
15	Main Ave at Linden St	Signalized
16	Main Ave at Perry Ave	Signalized
17	Main Ave at Broad St	Signalized
18	Main Ave at Ward St	Signalized
19	Main Ave at Delaware Ave/Shopping Center	Signalized
20	Main Ave at New Canaan Ave (CT 123)	Signalized
21	New Canaan Ave at NB Route 7 Ramps	Signalized
22	New Canaan Ave at SB Route 7 Ramps	Signalized
23	Creeping Hemlock Dr at SB Route 15 Ramps	Unsignalized



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

It should be noted that the intersection of Main Ave at Merritt 7 (101/201) was not analyzed due to ongoing construction at that entrance during the Fall of 2016.

After an evaluation of the TMC data collected at the intersections listed above, the peak hours for the study area were determined to be 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM. The resulting observed AM and PM peak hour traffic volumes were submitted to CTDOT for review and further analysis. CTDOT then produced demand-adjusted volume diagrams for use in Stantec's traffic analyses. These adjustments were necessary in order to accurately analyze traffic operations as the analysis of lower traffic volumes, reflecting the peak hour congestion that is present along study area roadways, would produce more favorable analysis results which would not correlate to actual traffic operations. Furthermore, this would result in more favorable analysis results when evaluating future year traffic conditions with and without proposed improvements. The adjusted AM and PM peak hour traffic volume diagrams are shown in Figure 3.2 and Figure 3.3.

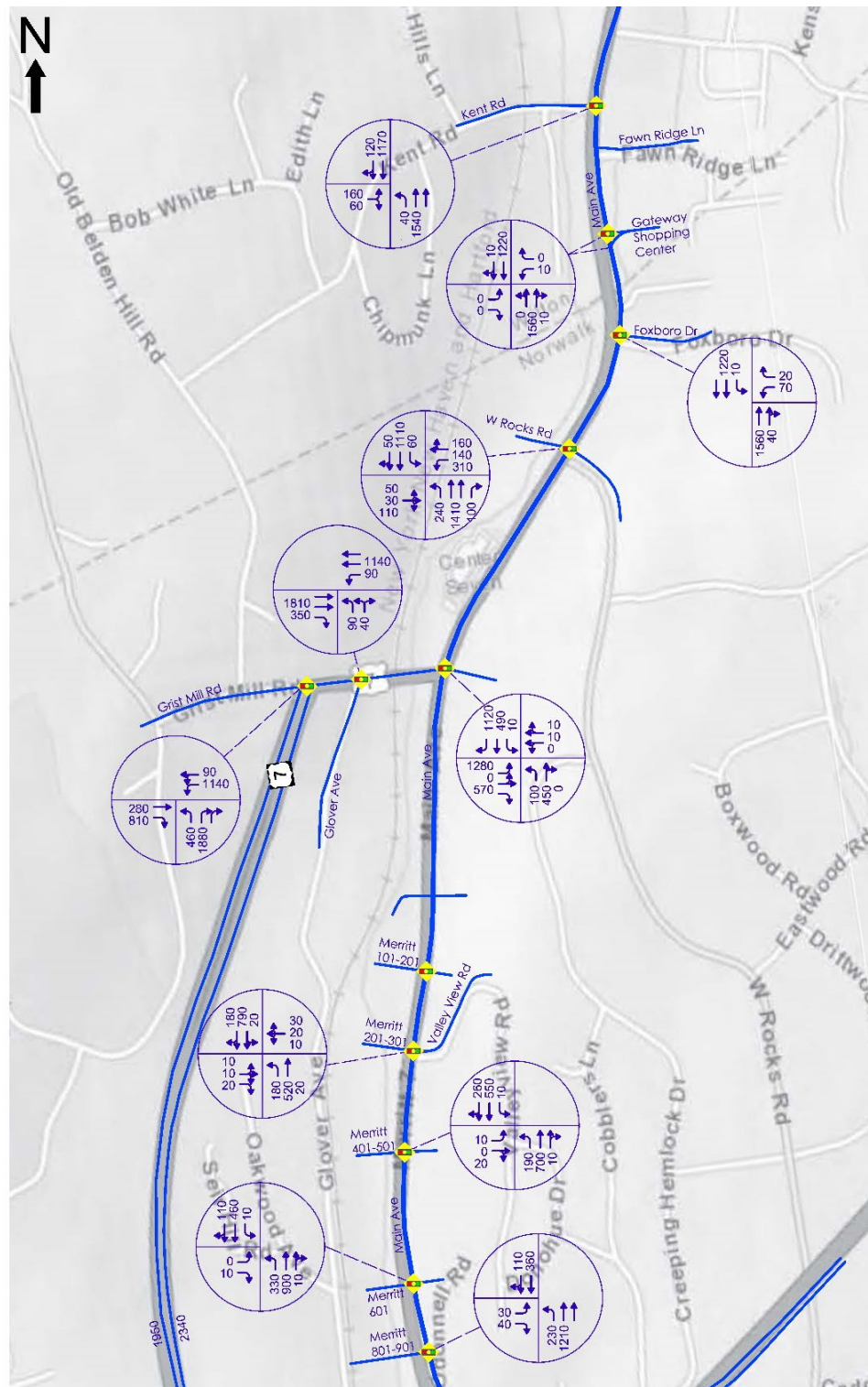


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.2: Adjusted 2016 Traffic Volumes, AM Peak Hour 8:00 AM to 9:00 AM

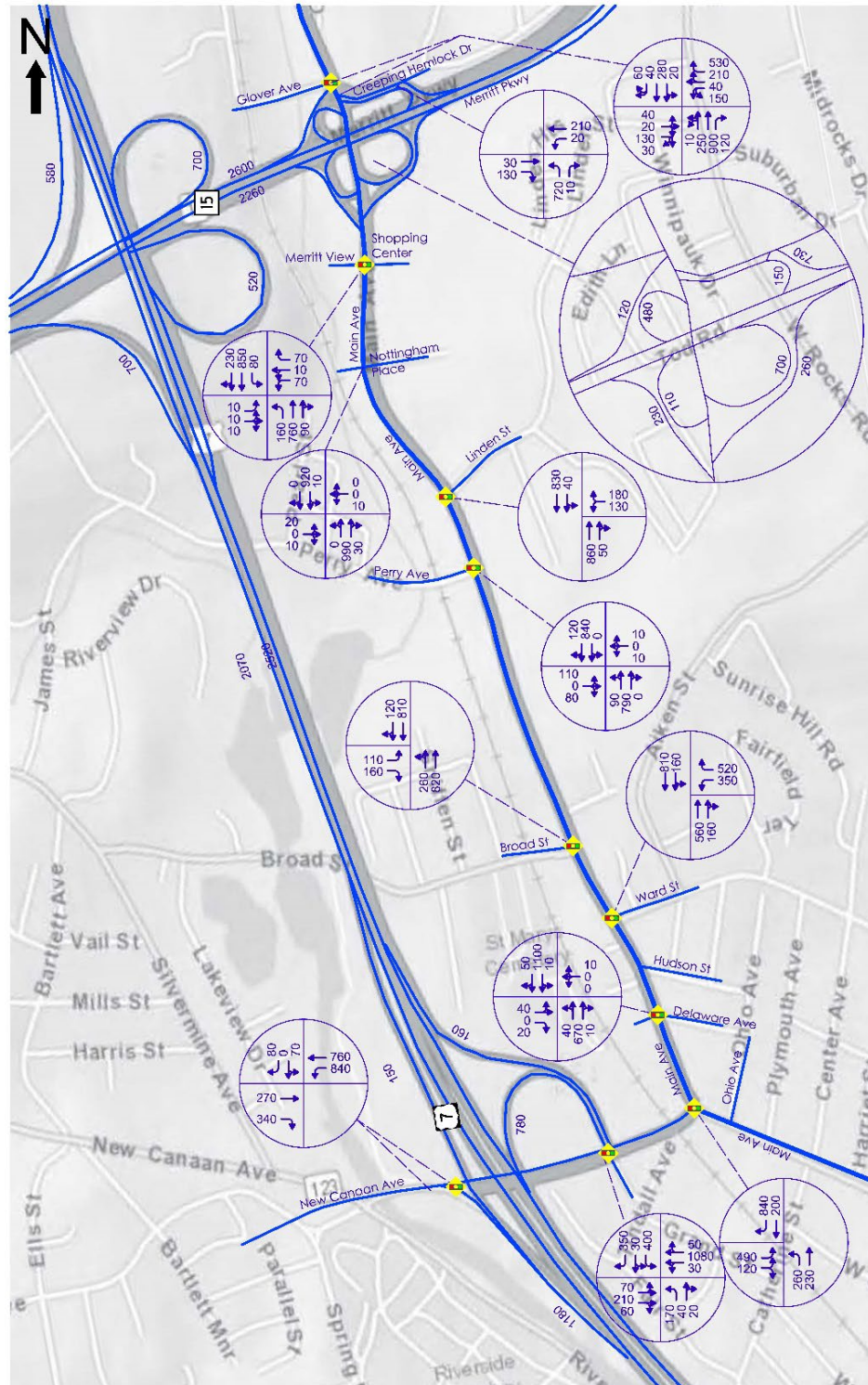


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.2: Adjusted 2016 Traffic Volumes, AM Peak Hour 8:00 AM to 9:00 AM (continued)

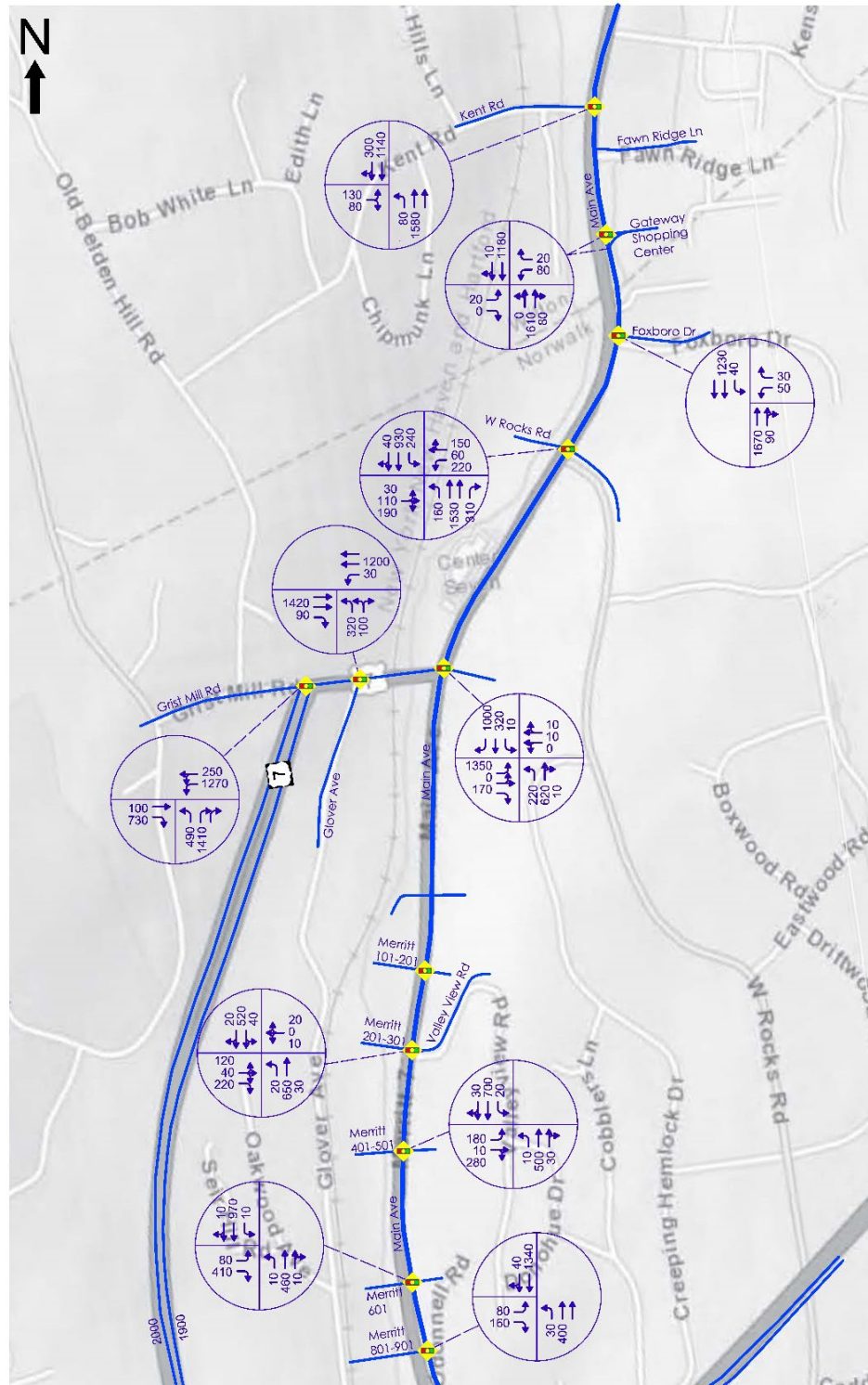


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.3: Adjusted 2016 Traffic Volumes, PM Peak Hour 5:00 PM to 6:00 PM

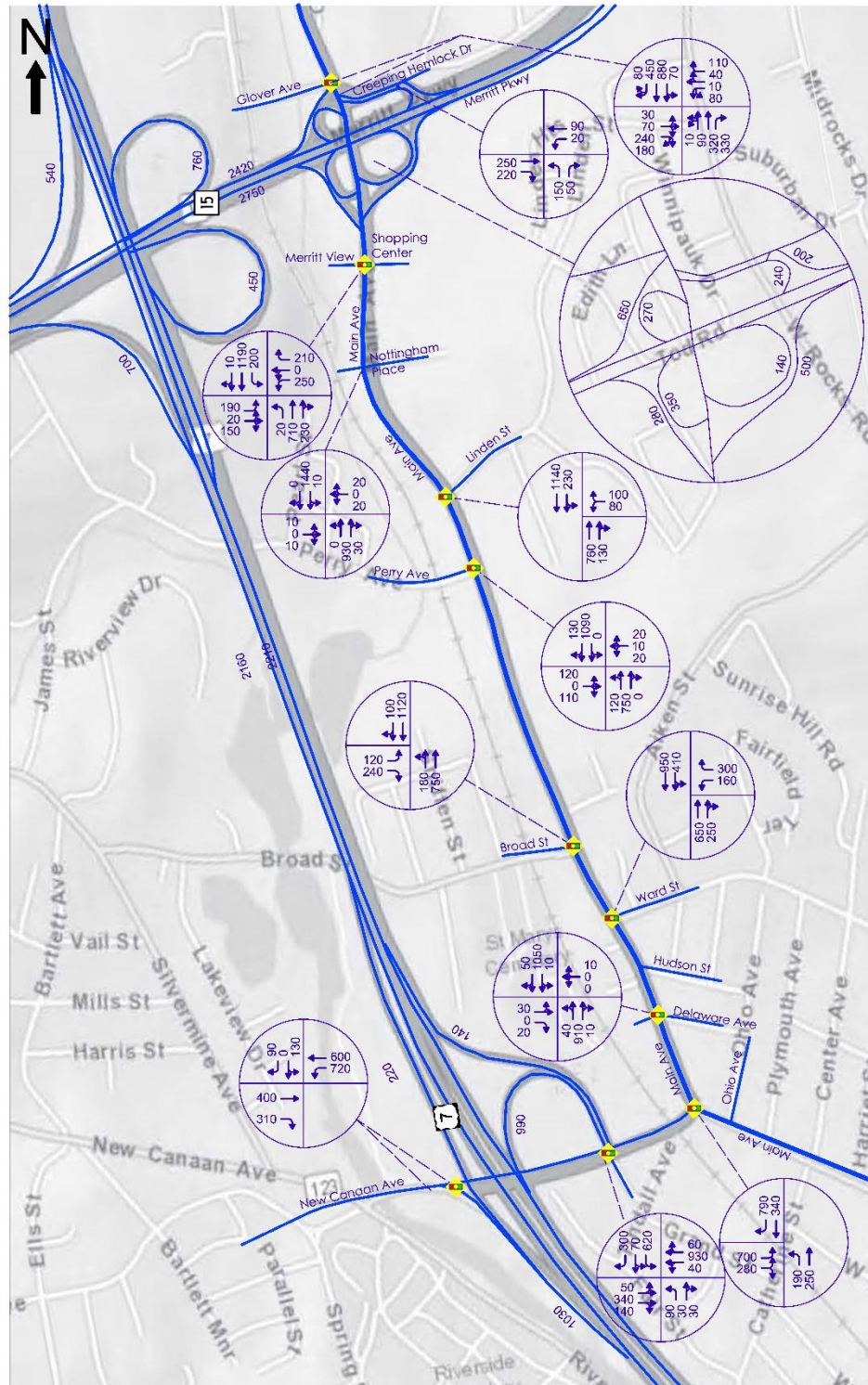


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.3: Adjusted 2016 Traffic Volumes, PM Peak Hour 5:00 PM to 6:00 PM (continued)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

3.1.2 Automatic Traffic Recorders (ATR)

Automated traffic recorder (ATR) counts were conducted for a 3-day to 7-day period to obtain volume data, 85th percentile speed data, and/or the vehicular classification (“class”) distinction between passenger vehicles and heavy vehicles (e.g., trucks and buses) during a typical weekday. ATRs collected hourly traffic volume data for several weeks in Fall 2016 at the locations identified in Figure 3.1 and summarized in Table 3.3. Video (Miovision) was used to record two full days of traffic data on high-speed roadways on the dates listed in Table 3.3.

Table 3.3: ATR Count Descriptions

Location No.	Description	Type	Dates
A	Main Ave south of Grist Mill Rd	Volume/Speed/Class	12/1 – 12/8
B	Route 7 south of Grist Mill Rd	Volume (Miovision)	9/20 – 9/22
C	Route 15 east of Silvermine Ave	Volume (Miovision)	10/5 – 10/7
D	Perry Ave south of Route 15 overpass	Volume/Speed/Class	12/1 – 12/8
E	SB Route 7 off-ramp to SB Route 15	Volume	9/20 – 9/27
F	NB Route 15 off-ramp to SB Route 7	Volume	9/20 – 9/27
G	NB Route 7 off-ramp to SB Route 15	Volume	9/20 – 9/27
H	NB Route 15 off-ramp to NB Route 7	Volume	9/20 – 9/27
I	Route 15 west of Metro-North underpass	Volume (Miovision)	11/30–12/2
J	Glover Ave west of Metro-North Station	Volume/Speed/Class	12/1 – 12/8
K	SB Route 15 on-ramp from SB Main Ave	Volume	9/20 – 9/27
L	SB Route 15 off-ramp to SB Main Ave	Volume	9/20 – 9/27
M	NB Route 15 off-ramp to SB Main Ave	Volume	9/20 – 9/27
N	NB Route 15 on-ramp from SB Main Ave	Volume	9/20 – 9/27
O	Main Ave south of Route 15 bridge	Volume/Speed/Class	12/1 – 12/8
P	Creeping Hemlock Dr east of SB Route 15 ramps	Volume	9/20 – 9/27
Q	SB Route 15 on-ramp from NB Main Ave	Volume	9/20 – 9/27
R	SB Route 15 off-ramp to NB Main Ave	Volume	12/1 – 12/8
S	NB Route 15 off-ramp to NB Main Ave	Volume	9/20 – 9/27
T	NB Route 15 on-ramp from NB Main Ave	Volume	9/20 – 9/27
U	Route 15 east of West Rocks Rd	Volume (Miovision)	10/4 – 10/6
V	Route 7 south of Perry Ave underpass	Volume (Miovision)	9/20 – 9/22
W	Main Ave north of Broad St	Volume/Speed/Class	12/1 – 12/8



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Location No.	Description	Type	Dates
X	Main Ave south of Delaware Ave	Volume/Speed/Class	12/1 – 12/8
Y	SB Route 7 off-ramp to Route 123	Volume/Class	9/20 – 9/27
Z	SB Route 7 on-ramp from Route 123	Volume/Class	9/20 – 9/27
AA	NB Route 7 on-ramp from Route 123	Volume/Class	9/20 – 9/27
BB	NB Route 7 off-ramp to Route 123	Volume/Class	12/1 – 12/8
CC	Route 7 south of New Canaan Ave	Volume (Miovision)	10/4 – 10/7

It should be noted that 85th percentile speed data could only be obtained along local roadways as CTDOT prohibits the collection of speed data along the Merritt Parkway and Route 7 due to safety concerns. To collect 85th percentile speed data safely along limited access roadways, travel time runs were performed (see Section 3.2 for more information).

Volumes by Day of Week

An examination of peak hour data collected by the ATRs confirms the AM and PM peak hours, as determined by TMC data, of 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM. Comparisons of average Tuesday to Thursday (average weekday) data to Saturday and Sunday data for four locations along Main Avenue (where weekend data was collected) are presented in Figure 3.4 through Figure 3.7. The comparisons confirm that weekend peak hour volumes are generally lower than highest weekday peak hour volumes. It should be noted that Saturday midday peak hour traffic is slightly higher than weekday midday peak hour traffic at locations south of Interchange 40, which is primarily due to traffic that is destined for various commercial-use locations along the Main Avenue corridor; however, these volumes are still lower than weekday peak hour volumes, further validating that the weekday peak hours represent the highest volumes of traffic in the study area. These graphs also show that the hourly volumes are more even throughout the day over the weekend whereas the average weekday volumes fluctuate more rapidly.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.4: Traffic Volumes by Day of Week (ATR Location A; Main Ave south of Grist Mill Rd)

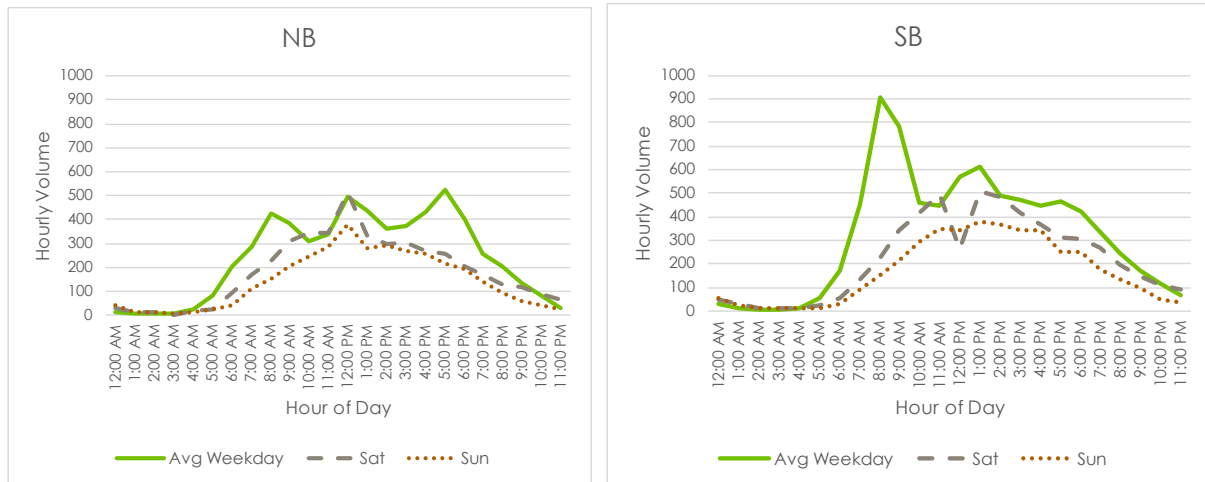
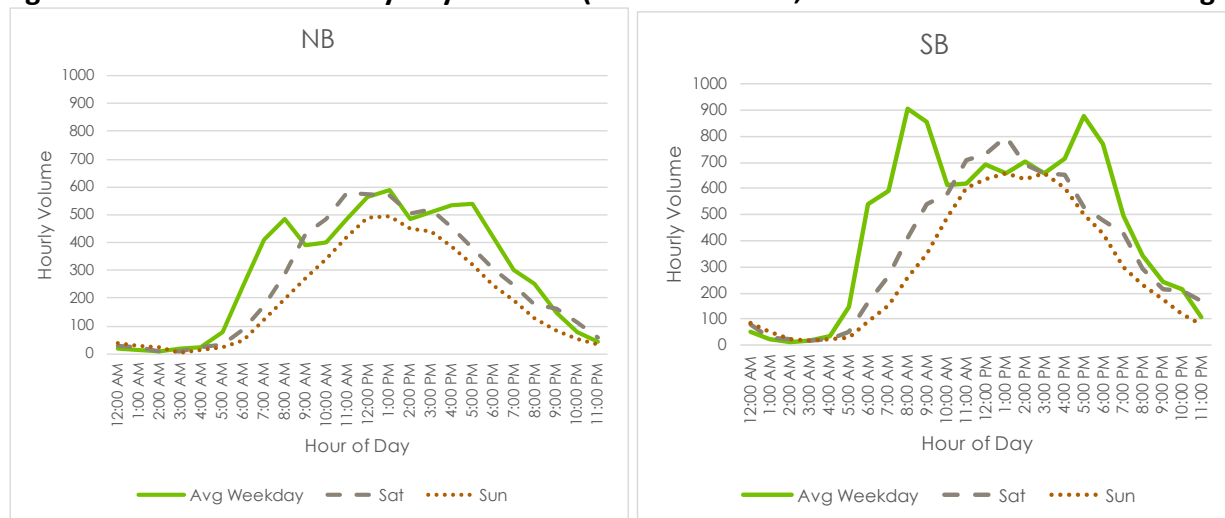


Figure 3.5: Traffic Volumes by Day of Week (ATR Location O; Main Ave south of Rt. 15 Bridge)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.6: Traffic Volumes by Day of Week (ATR Location W; Main Ave north of Broad St)



Figure 3.7: Traffic Volumes by Day of Week (ATR Location X; Main Ave south of Delaware Ave)



Average Weekday Corridor Volumes

Hourly profiles presented in Figure 3.8 through Figure 3.10 show the variation in traffic volumes along the three major study corridors.

Along Route 15 (both west of the Route 7 interchange and east of the Main Avenue interchange), weekday traffic peaks in the southbound direction during the AM peak hour and in the northbound direction during the PM peak hour. The corridor carries a maximum of 3,400 vehicles per hour in the peak direction. Between the Route 7 and Main Avenue interchanges, the hourly distributions are similar. The overall trend on Route 15 is typical of commuter flows and signifies local travel to work in Norwalk, Stamford, and points further south from towns and cities to the east. The similar distribution of traffic on Route 15 between Route 7 and Main Avenue is



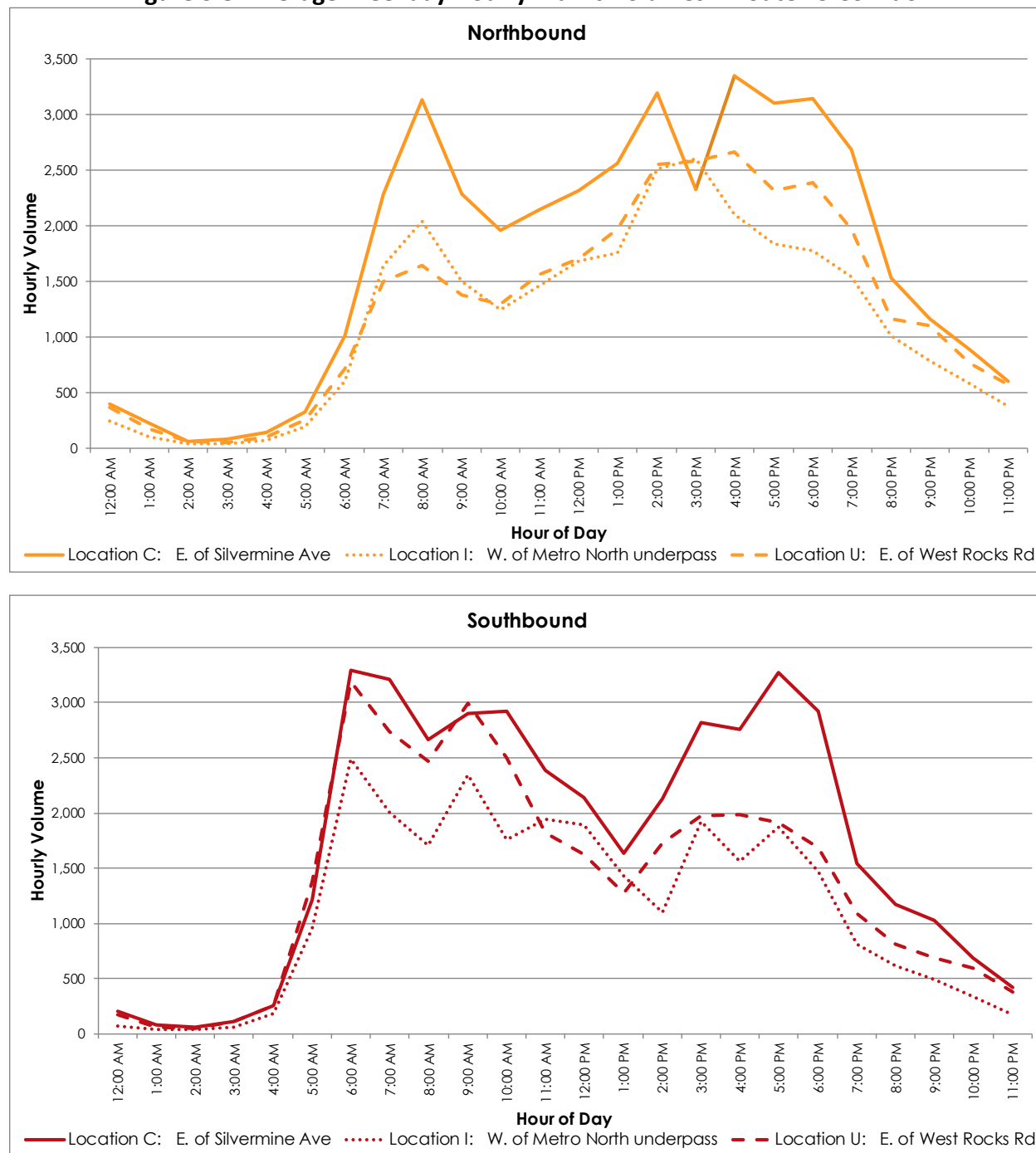
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

indicative of north-south traffic using either Route 7 or Main Avenue to connect between Route 7 and I-95.

Figure 3.8: Average Weekday Hourly Traffic Volumes – Route 15 Corridor



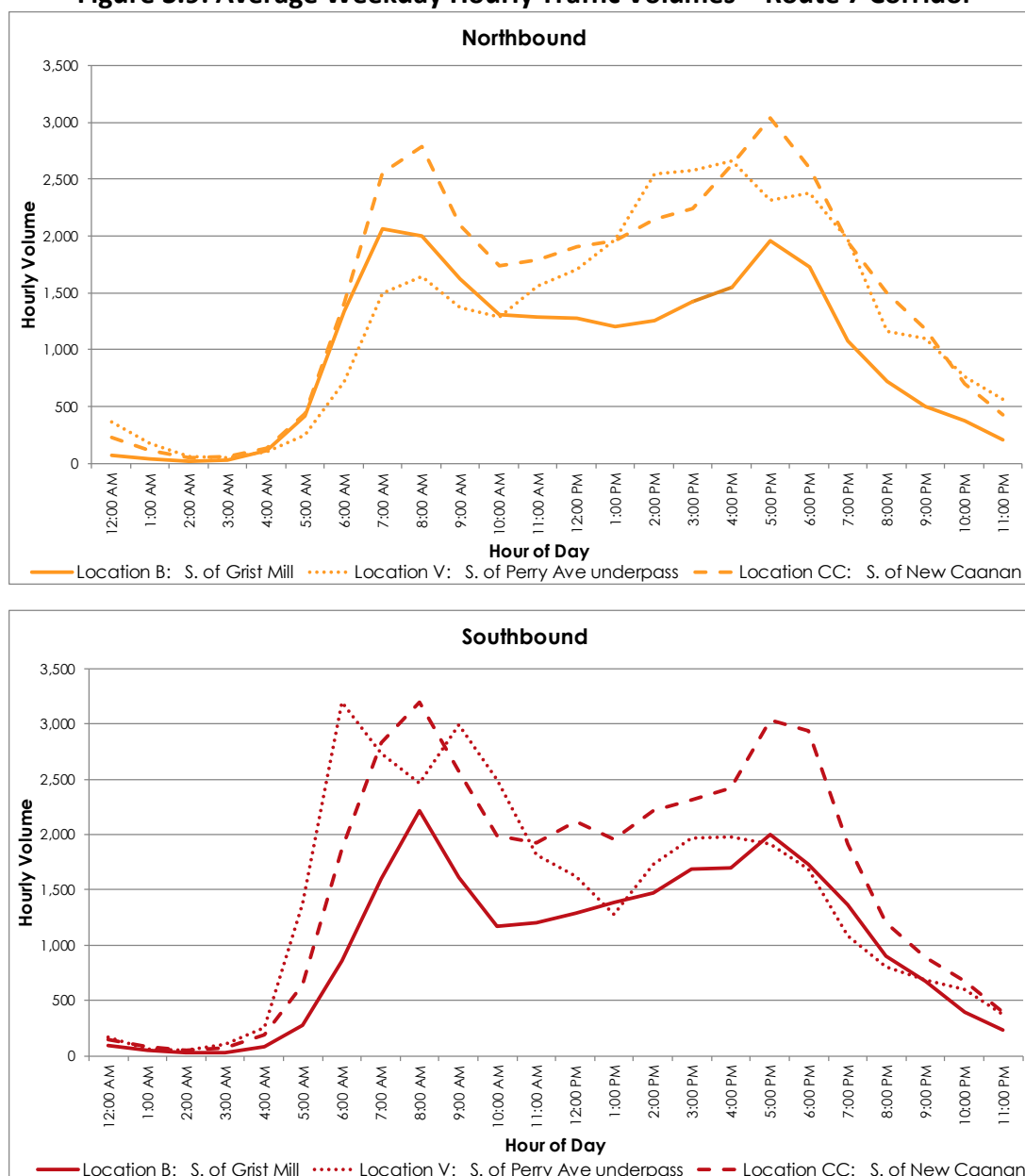
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

The AM and PM hourly volume peaks are less pronounced on Route 7, shown by Locations B and CC traffic plotted in Figure 3.9, and on Route 15 west of the Main Avenue interchange (Location C). Overall, the corridor carries a maximum of 3,200 vehicles per hour in the peak direction. This trend is indicative of corridors that serves as thoroughfares in both directions during the peak hours. Location V (Route 7 between the Route 15 and New Canaan Ave interchanges), peaks in the southbound direction in the morning and in the northbound direction in the evening.

Figure 3.9: Average Weekday Hourly Traffic Volumes – Route 7 Corridor



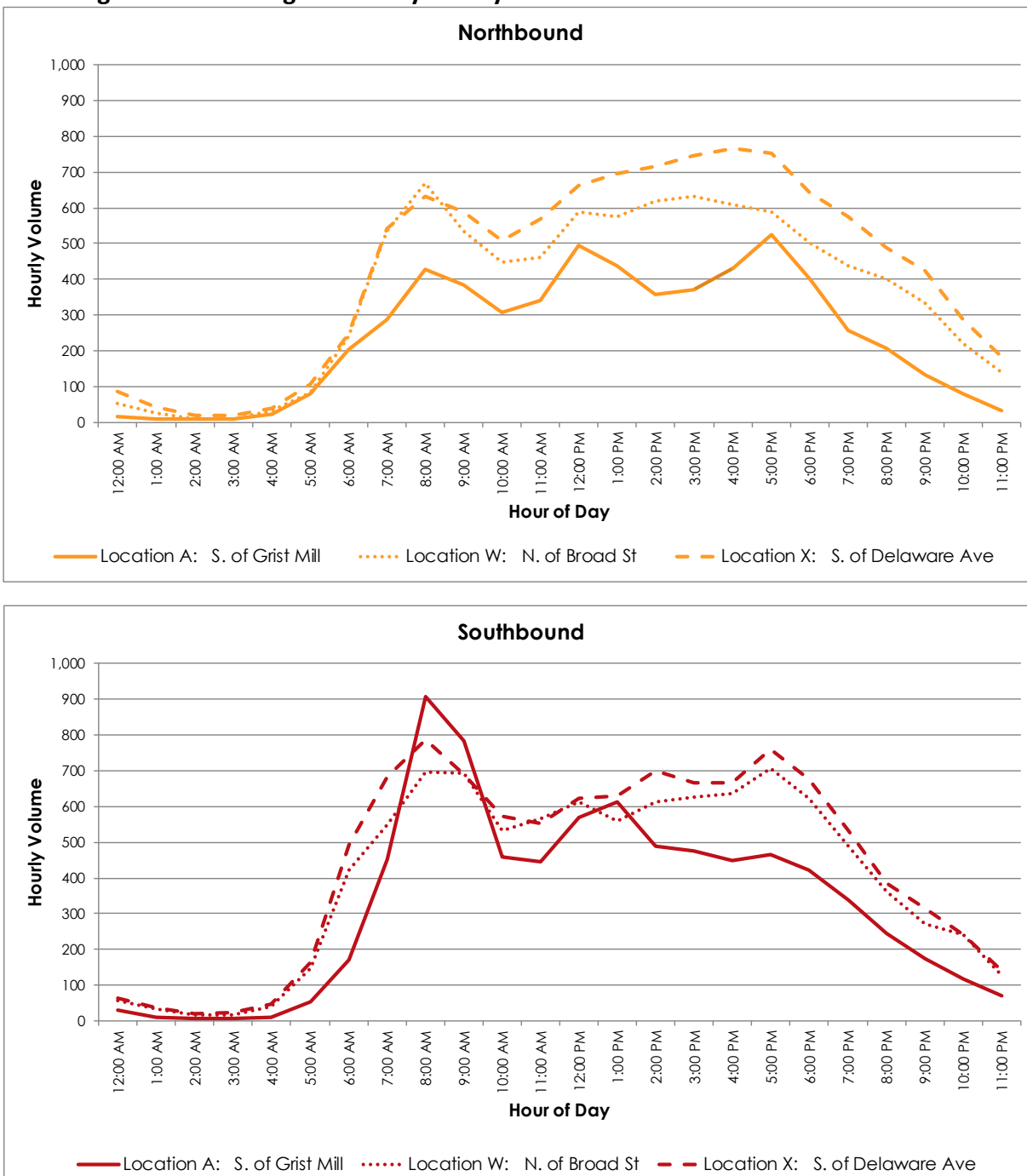
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

The hourly distribution of traffic along Main Avenue is generally flatter than traffic distribution on both Route 7 and Route 15. The Main Avenue corridor carries a maximum of 900 vehicles per hour in the peak direction.

Figure 3.10: Average Weekday Hourly Traffic Volumes – Main Avenue Corridor



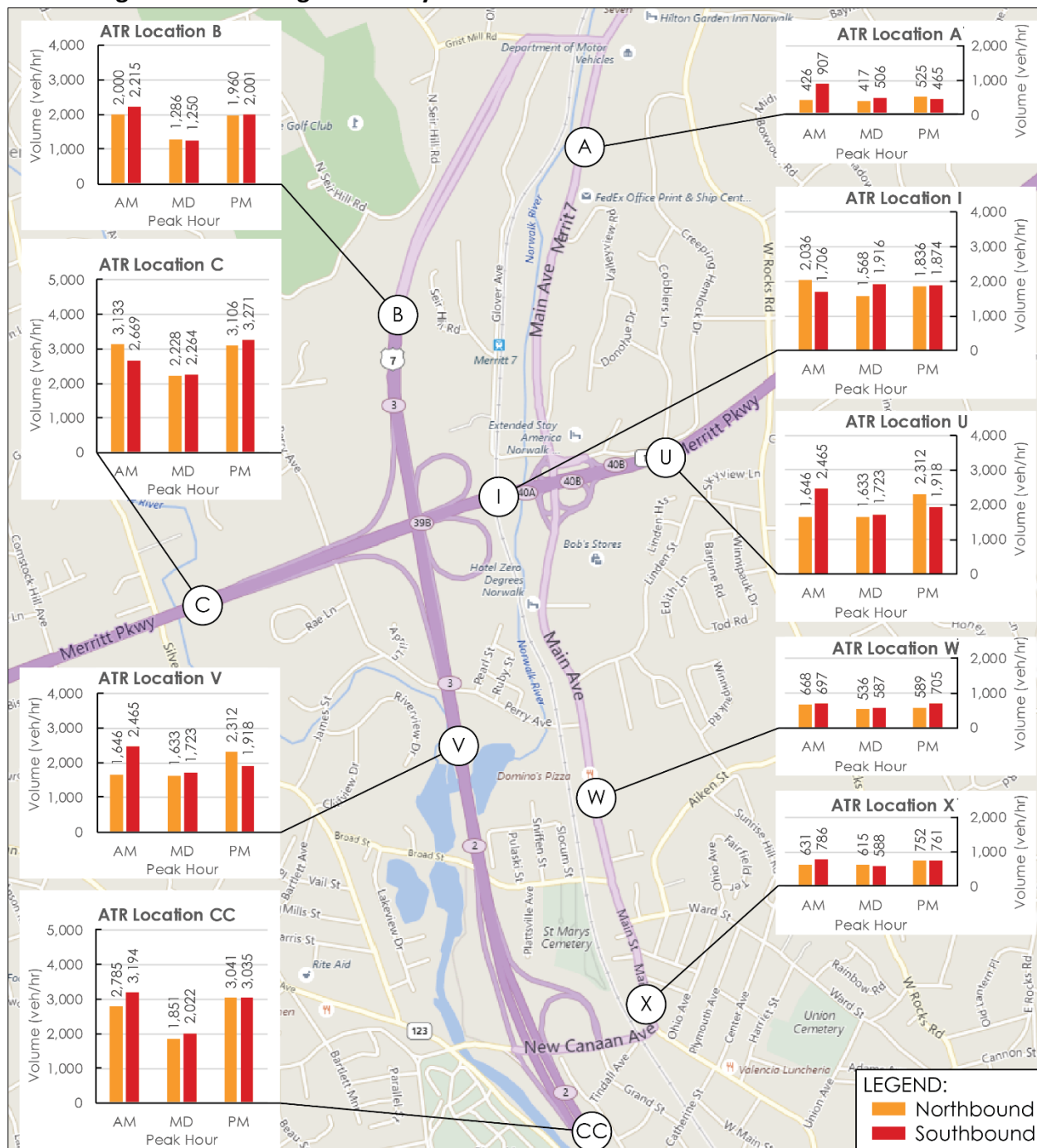
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.11 compares the average weekday peak hour volumes in both directions at various locations. As previously stated, weekday morning and evening peak hour traffic volumes are generally greater than weekday midday peak hour traffic volumes.

Figure 3.11: Average Weekday Peak Hour Traffic Volumes – Various Corridors



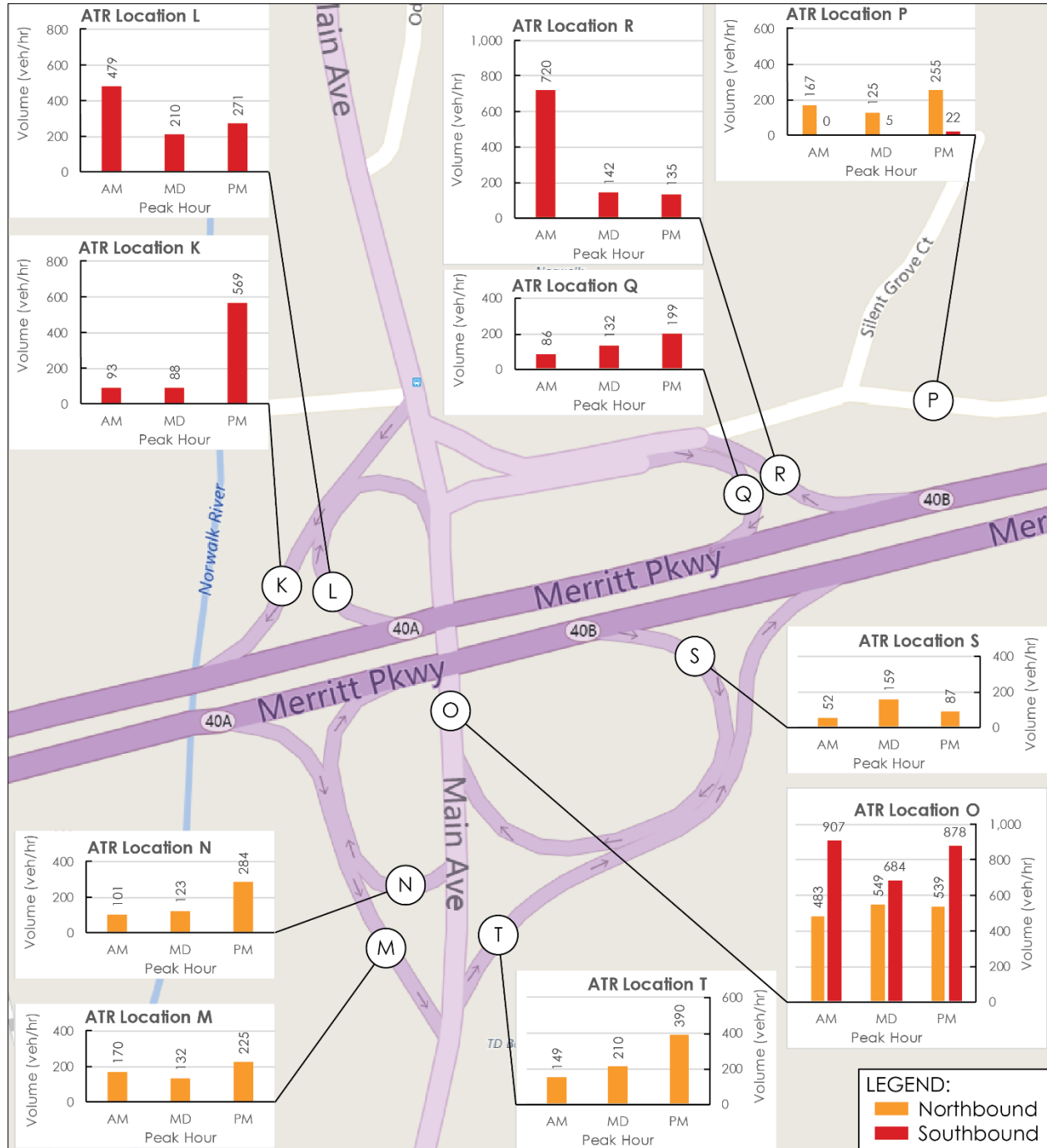
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.12, Figure 3.13, and Figure 3.14 show the average weekday peak hour volumes at certain key intersections within the traffic study area.

Figure 3.12: Average Weekday Peak Hour Traffic Volumes – Main Avenue at Route 15 Interchange

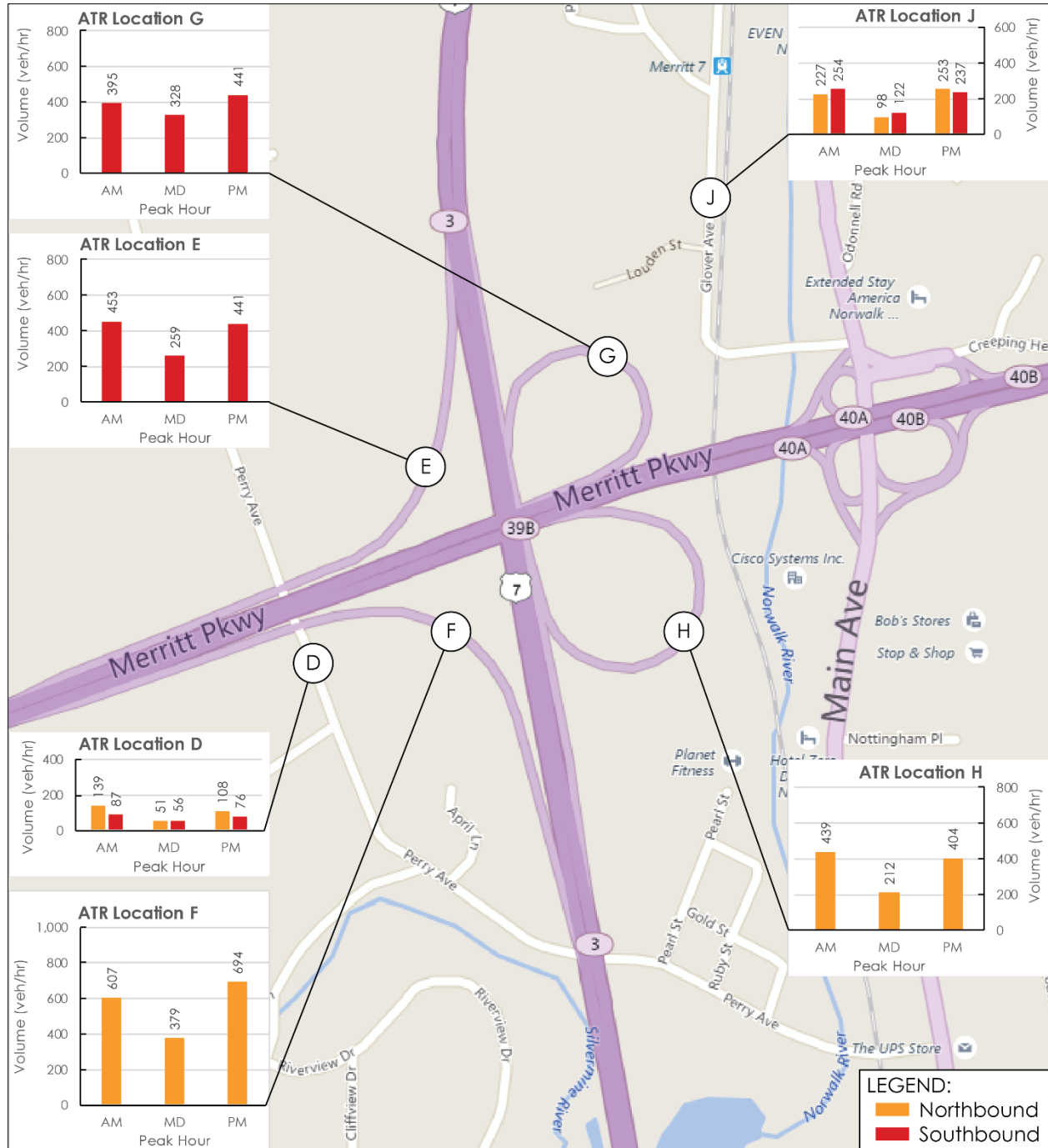


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.13: Average Weekday Peak Hour Traffic Volumes – Routes 7/15 Interchange, Perry Avenue, and Glover Avenue

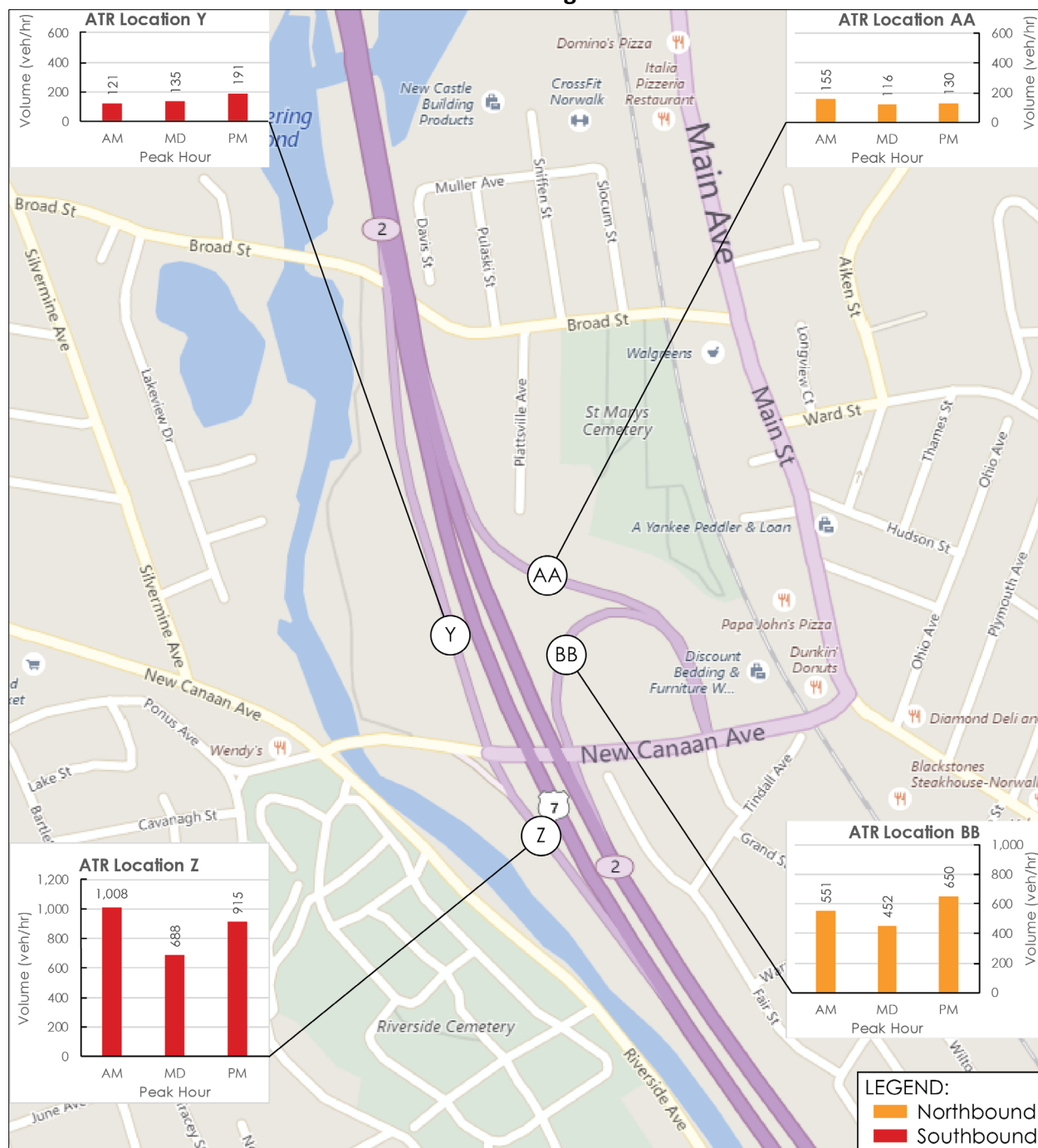


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.14: Average Weekday Peak Hour Traffic Volumes – Route 7 and New Canaan Avenue Interchange



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

3.1.3 Heavy Vehicles

Peak period classification data show that truck traffic as a percentage of total traffic volume varies between zero and seven percent along the Main Avenue corridor. Truck traffic percentages on the Route 7 ramps to and from the north average between one and three percent. Truck traffic percentages are higher – between five and eight percent – on the Route 7 ramps to and from the south. No trucks travel on Route 15 since trucks are prohibited.

3.1.4 Validation of 2016 Traffic Data

A supplemental traffic data collection program was conducted in October 2018 to evaluate the growth in traffic between 2016 and 2018. Per discussion with CTDOT, 15 locations from the 2016 study were selected to be recounted in the 2018 study to provide a comparison between 2016 and 2018 traffic volumes. Those locations are summarized in Figure 3.15 on the following page. Similar to the 2016 traffic data collection program, data were collected during dry weather conditions with good visibility, and while local public schools and colleges were open.

It should be noted that the two intersections of Main Avenue at Merritt 7 Building 101 driveway and Main Avenue at Merritt 7 Building 201/301 driveway were not included in the evaluation due to some inconsistencies in the traffic conditions between 2016 and 2018. The northernmost Merritt 7 driveway, Building 101, was closed during the 2016 data collection and therefore the intersection of Main Avenue at Merritt 7 Building 101 was not in operation. This closure diverted the building traffic to the next driveway to the south, Building 201/301, which was counted with the additional traffic.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.15: 2018 Traffic Data Collection Map

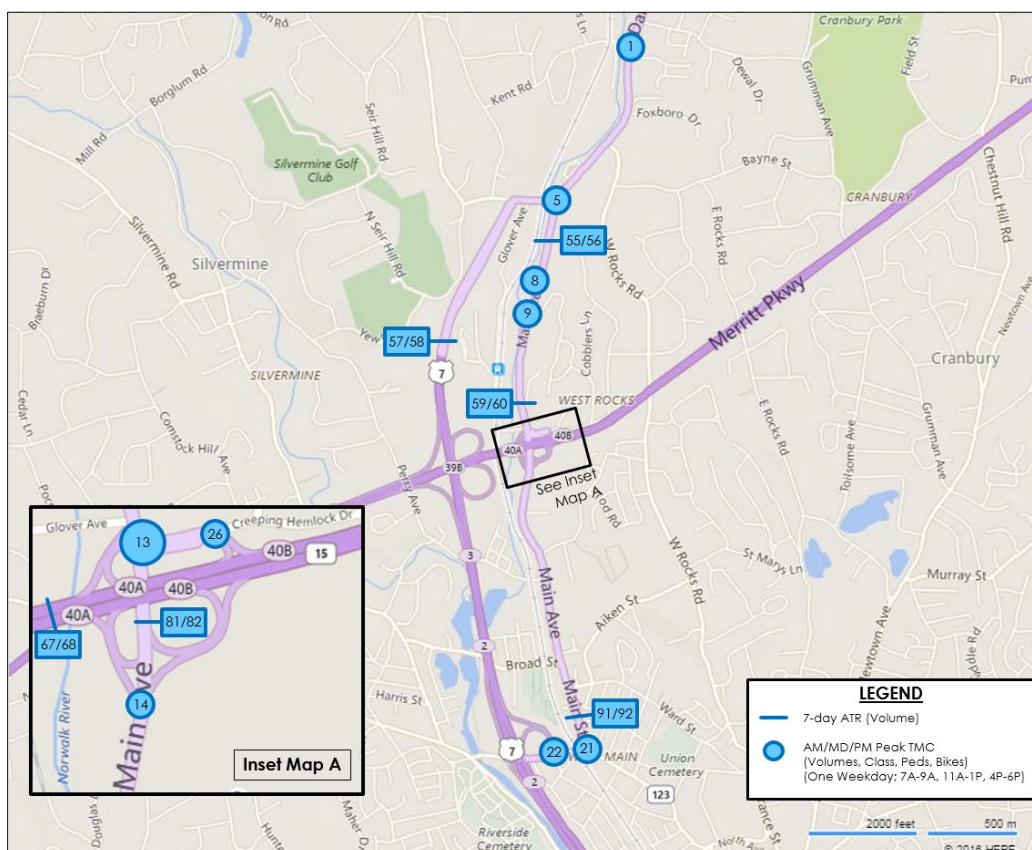


Table 3.4: 2018 Traffic Data Collection Table

Location No.	Description	Data Collection
1	Main Avenue at Kent Road/Kensett Ave	TMC
5	Grist Mill Rd (Route 7) at Main Ave	TMC
8	Main Ave (CT 719) at Valley View Rd/Merritt 7 (101)	TMC
9	Main Ave (CT 719) at Valley View Rd/Merritt 7 (201/301)	TMC
13	Main Ave (CT 719) at Glover Ave/Creeping Hemlock Dr/SB CT 15 Ramps	TMC
14	Main Ave (CT 719) at Merritt View/Shopping Center	TMC
21	Main Ave (CT 719) at New Canaan Ave (CT 123)	TMC
22	New Canaan Ave (CT 123) at NB US 7 Ramps	TMC
26	Creeping Hemlock Dr at SB Ct 15 Ramps	TMC
55/56	NB/SB Main Ave (CT 719) south of Grist Mill Rd	ATR
57/58	NB/SB US 7 south of Grist Mill Rd	ATR
59/60	NB/SB Main Ave (CT 719) north of Glover Ave	ATR
67/68	NB/SB CT 15 west of the Metro-North Danbury line	ATR
81/82	NB/SB Main Ave south of CT 15 bridge	ATR
91/92	NB/SB Main Ave (CT 719) south of Delaware Ave	ATR



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Total peak hour traffic volumes at the selected study area intersections during the AM, midday, and PM were compared between 2016 and 2018. Table 3.5 below shows the results of the comparison at each location along with the Compound Annual Growth Rate (CAGR) based on the 2016 and 2018 traffic counts. Furthermore, the CAGR of total traffic volumes at the selected intersections from 2016 to 2018 were compared to the CAGR projections that were used to determine future traffic volumes in the 2016 study. The CAGRs for all time periods and scenarios are summarized in the table below.

Table 3.5: 2016 and 2018 TMC Comparison at Key Locations and CAGR Summary

#	Description	AM Peak Hour (vph)			MD Peak Hour (vph)			PM Peak Hour (vph)		
		2016	2018	CAGR	2016	2018	CAGR	2016	2018	CAGR
1	Main Avenue, south of Kensett Ave ¹	2,714	2,562	-2.8%	2,252	2,082	-3.8%	2,876	2,644	-4.1%
5	Grist Mill Rd (US 7) at Main Ave	3,674	3,803	1.7%	2,917	3,062	2.5%	3,309	3,210	-1.5%
13	Main Ave (CT 719) at Glover Ave/Creeping Hemlock Dr/SB CT 15 Ramps	2,840	3,026	3.2%	1,887	1,870	-0.5%	2,874	2,756	-2.1%
14	Main Ave (CT 719) at Merritt View/Shopping Center	2,052	2,074	0.5%	2,146	1,976	-4.0%	2,496	2,189	-6.4%
21	Main Ave (CT 719) at New Canaan Ave (CT 123)	1,939	1,932	-0.2%	1,841	1,755	-2.4%	2,321	2,014	-6.8%
22	New Canaan Ave (CT 123) at NB US 7 Ramps	2,248	2,333	1.9%	1,741	1,698	-1.2%	2,436	2,129	-6.5%
26	Creeping Hemlock Dr at SB Ct 15 Ramps	869	1,083	11.6%	369	375	0.8%	643	656	1.0%
Total		16,336	16,813	1.4%	13,153	12,818	-1.3%	16,955	15,598	-4.1%

Note: 1) TMC 1 data was not collected in 2016. The Main Avenue corridor screenline south of Kensett Ave was used for comparison.

Comparison between Years	Annual Growth Rate		
	AM Peak Hour	MD Peak Hour	PM Peak Hour
Comparison between 2018/2016 (2-year)	1.4%	-1.3%	-4.1%
Comparison between 2025/2016 (9-year)	2.0%	2.0%	2.7%
Comparison between 2045/2016 (29-year)	0.9%	1.0%	1.1%

Based on the results of the analysis, the average percent change in traffic volumes between 2016 and 2018 at the selected locations is 2.9% over the two-year period which represents an annual growth of 1.45% per year. While some locations had a higher growth rate over the two-year period, volumes fluctuate over time and these locations will likely taper off in the future and align



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

with the previously projected volumes. The overall 1.45% per year growth is not significantly different from the growth rates used in the 2016 study to project future volumes (between 0.9% and 2.0%). Therefore, the 2016 traffic data continues to be valid for use in assessing traffic impacts and traffic operations without and with the Project.

3.2 TRAVEL SPEEDS

3.2.1 Travel Time and Speed Studies

Travel time and speed data were collected to further document existing conditions within the traffic study area. The data were also incorporated into traffic models used to evaluate traffic operations. Travel time studies were conducted on Tuesday, September 20 and Wednesday, September 21, 2016 during the AM and PM peak periods using the floating car method and data collected from a GPS device. During the AM peak period, delay and queuing was recorded on Route 15 in the southbound direction from West Rocks Road to Route 123, averaging as low as nine miles per hour (mph) through the Main Avenue and Route 7 interchanges. The PM peak period experienced delays in the northbound direction along the same segments (as shown in Table 3.6). Observed speeds from the Route 15 travel time runs conducted in the off-peak directions (northbound in the AM peak and southbound in the PM peak) are shown in Figure 3.16 and Figure 3.17. Speeds in both off-peak directions along the Route 15 corridor were observed to be free-flow, or 50 mph or greater. It was observed to take about 8 minutes to travel the 6.5-mile segment of Route 15 in either off-peak period direction.

Table 3.6: Route 15 Peak Period Travel Speed Summary

Route 15 Speeds (mph)		Northbound		Southbound	
Segment From	Segment To	AM	PM	AM	PM
Route 123	Silvermine Rd	59	<u>39</u>	<u>20</u>	48
Silvermine Rd	Route 7	59	<u>20</u>	<u>9</u>	-
Route 7	Main Ave	49	<u>10</u>	<u>9</u>	<u>3</u>
Main Ave	West Rocks Rd	-	<u>10</u>	<u>12</u>	<u>29</u>

*Underlined speeds indicate travel speeds that are below the speed limit by at least 10 mph.

Note: Some segments missing data due to circuitous travel route during data collection.

Figure 3.18 shows the northbound observed speeds from two of the Route 15 PM peak period travel time runs. Northbound congestion begins as early as 4:00 PM east of Route 123 and east of Route 53 towards Wilton. By 5:30 PM, the entire length of the corridor is congested with speeds of 25 mph or less between Route 7 and Route 33. As indicated by the travel time runs, it takes about 20 minutes to travel the 6.5-mile northbound section of Route 15 in evening.

During the AM peak period, southbound Route 15 speeds are mostly 35 mph or less around 7:30 AM as shown in Figure 3.19. After 9:00 AM, speeds are somewhat faster with segments with more severe congestion near New Canaan Avenue/Route 123. To travel southbound on this 6.5-mile segment in the morning, it can take 20 to 30 minutes as determined by the travel time runs.

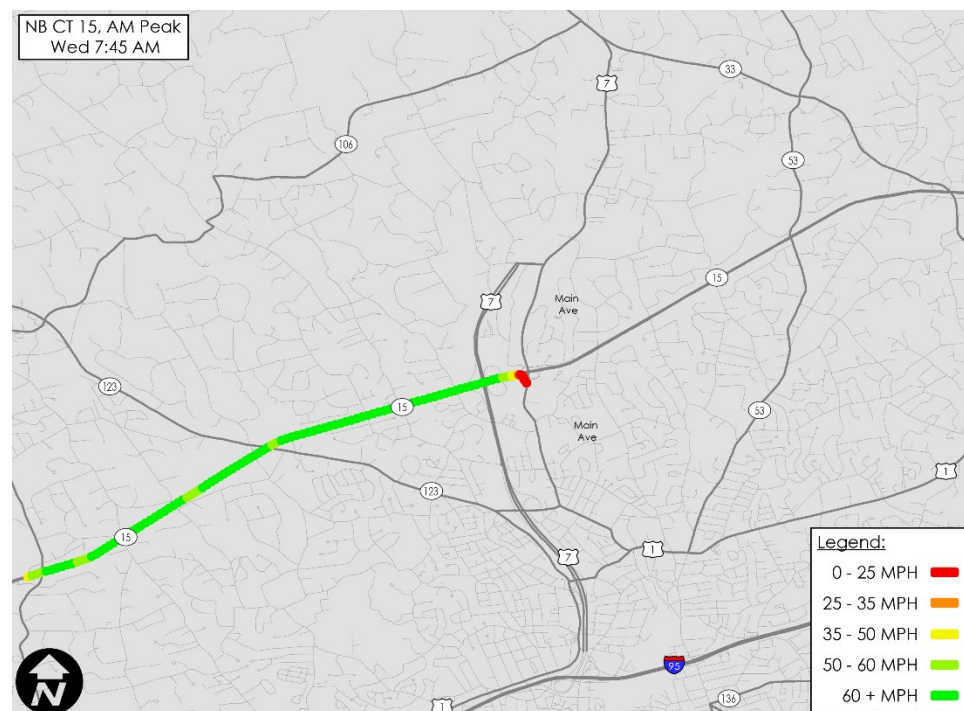
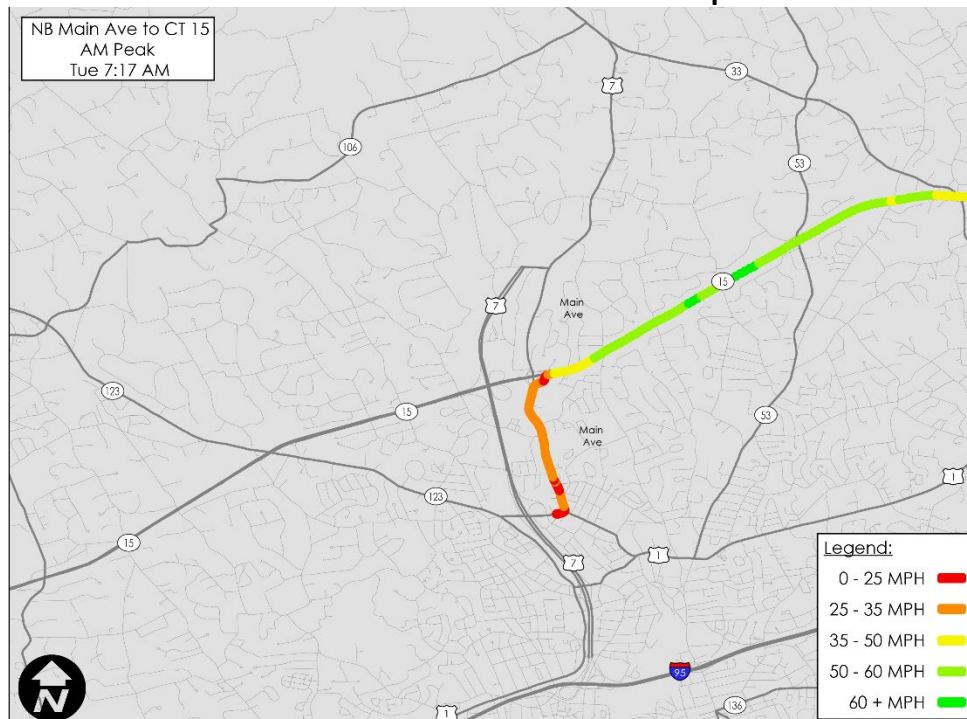


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.16: Northbound Main Ave and Route 15 Travel Speeds – AM Peak Period

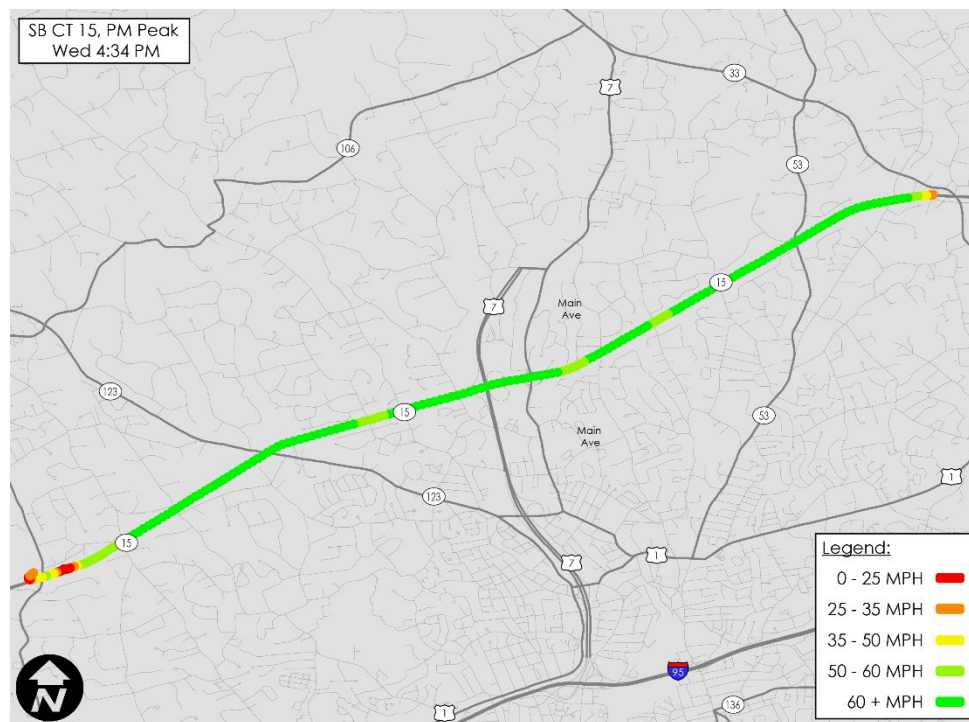
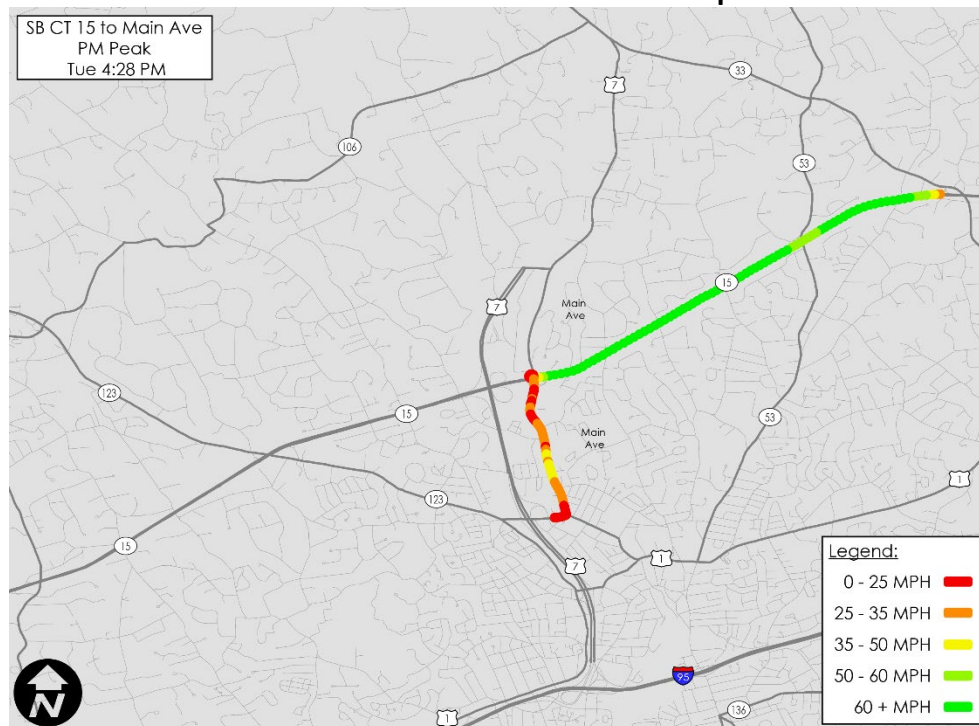


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.17: Southbound Route 15 and Main Ave Travel Speeds – PM Peak Period

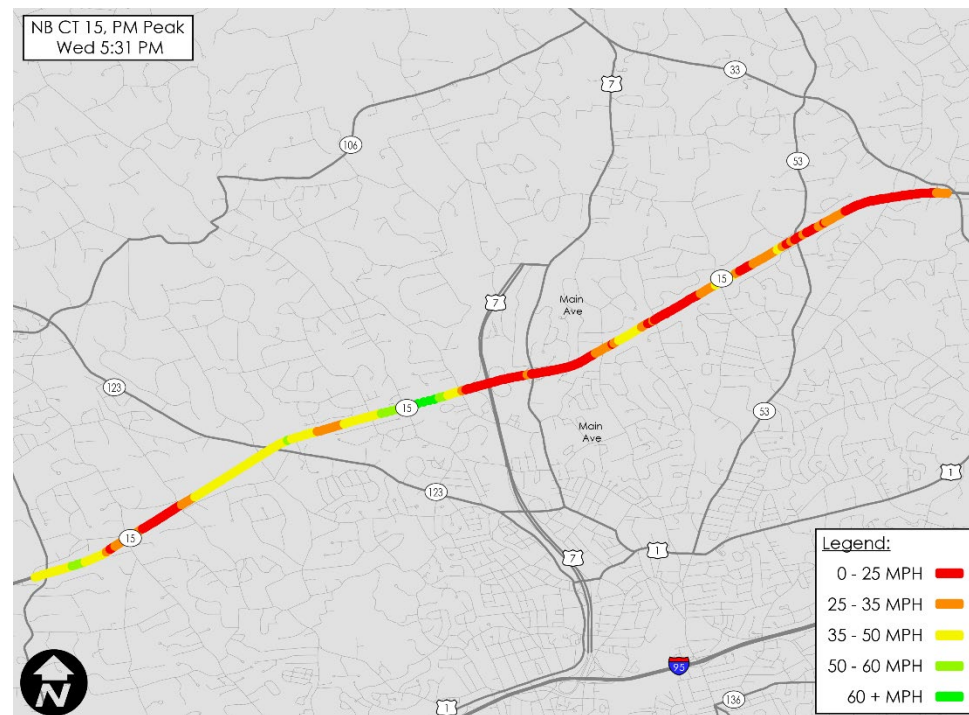
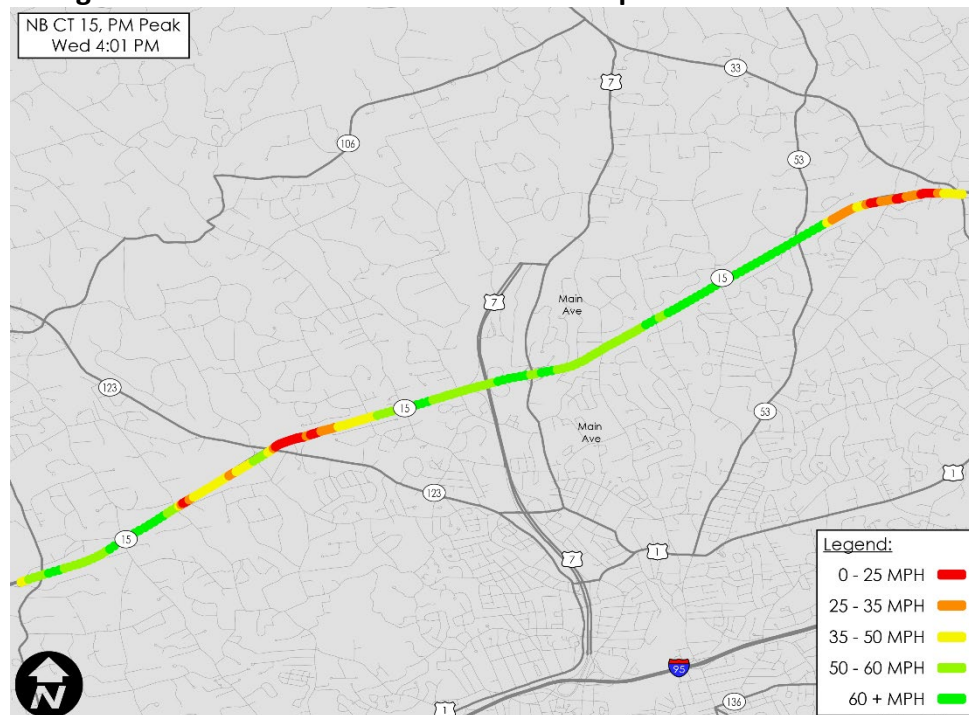


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.18: Northbound Route 15 Travel Speeds – PM Peak Period

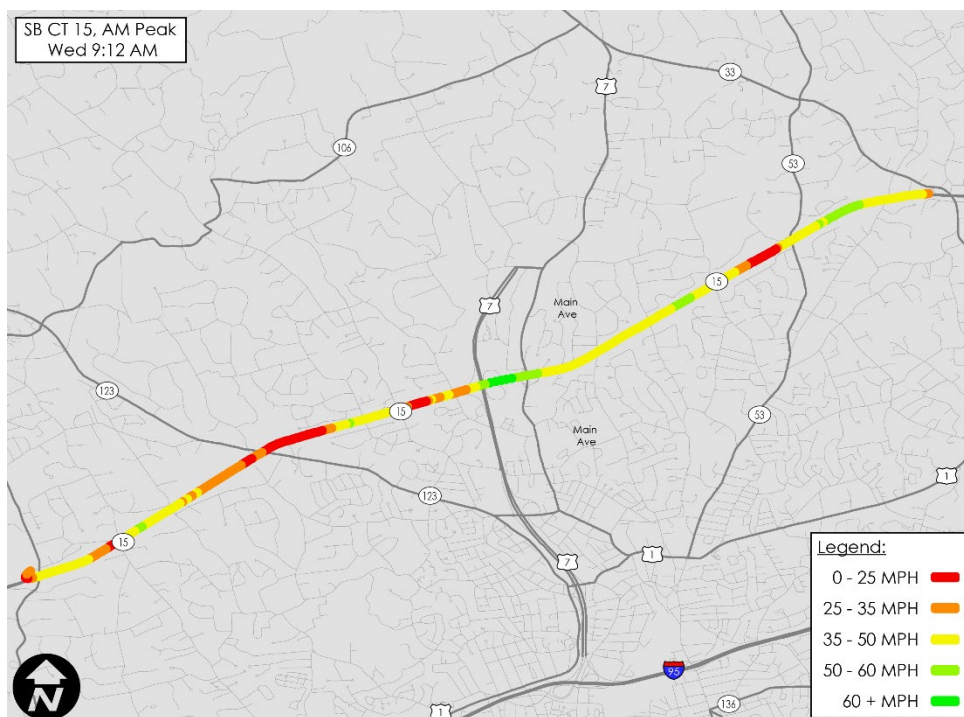
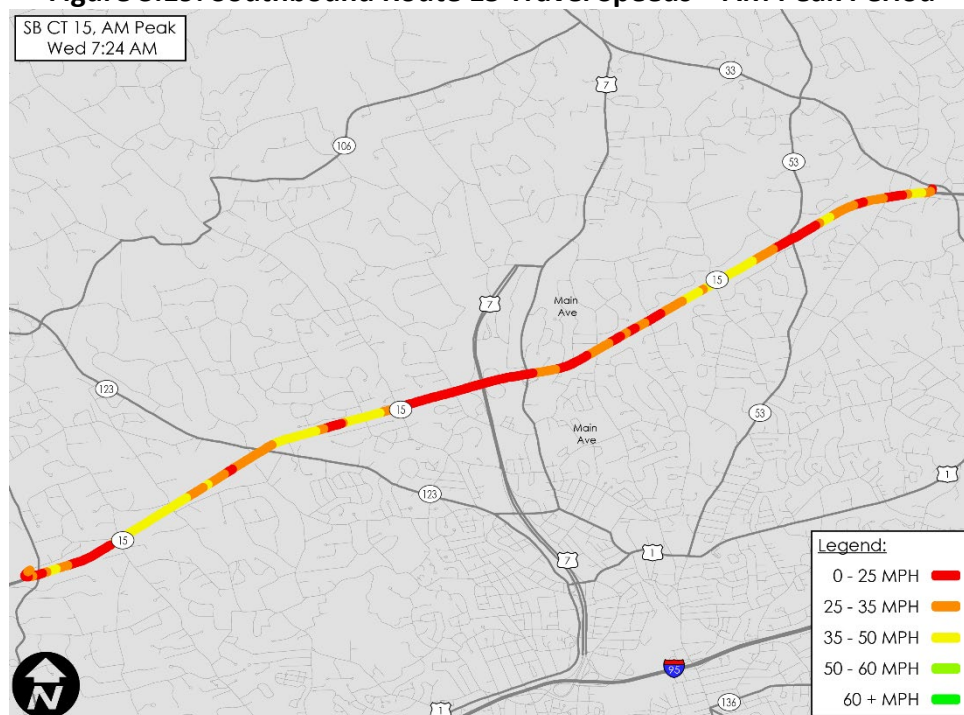


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.19: Southbound Route 15 Travel Speeds – AM Peak Period



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Route 7 experiences congestion along the signalized corridor in the northbound and southbound directions during both the AM and PM peak periods. The heaviest Route 7 congestion occurs along Grist Mill Road to Main Avenue and sometimes further north to West Rocks Road. During the PM peak period, some delay and queuing was recorded on Route 7 between Route 123 and the Norwalk River in both directions (as shown in Table 3.7), primarily due to the changes in topography in this area.

Table 3.7: Route 7 Peak Period Travel Speed Summary

Route 7 Speeds (mph)		Northbound		Southbound	
Segment From	Segment To	AM	PM	AM	PM
Route 123	Broad St	60	<u>22</u>	63	<u>15</u>
Broad St	Route 15	58	69	67	75
Route 15	Grist Mill Rd	56	<u>28</u>	57	62
Grist Mill Rd	Main Ave	<u>7</u>	<u>7</u>	<u>7</u>	<u>6</u>
Main Ave	Kensett Ave	<u>17</u>	<u>13</u>	<u>11</u>	-

*Underlined speeds indicate travel speeds that are below the speed limit by at least 10 mph.

Note: Some segments missing data due to circuitous travel route during data collection.

Figure 3.20 through Figure 3.23 present observed speeds collected during travel time studies along Route 7. As shown in these maps, speeds of 25 mph or less were observed to be isolated to northern segments close to Grist Mill Road and Main Avenue (signalized intersections are along this portion of the corridor). Generally, the travel time runs showed that it took less than 5 minutes to traverse the 2.5-mile segment of Route 7 between Route 123 and Main Avenue despite the queuing along the northern portion of the corridor.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.20: Northbound Route 7 Travel Speeds – AM Peak Period

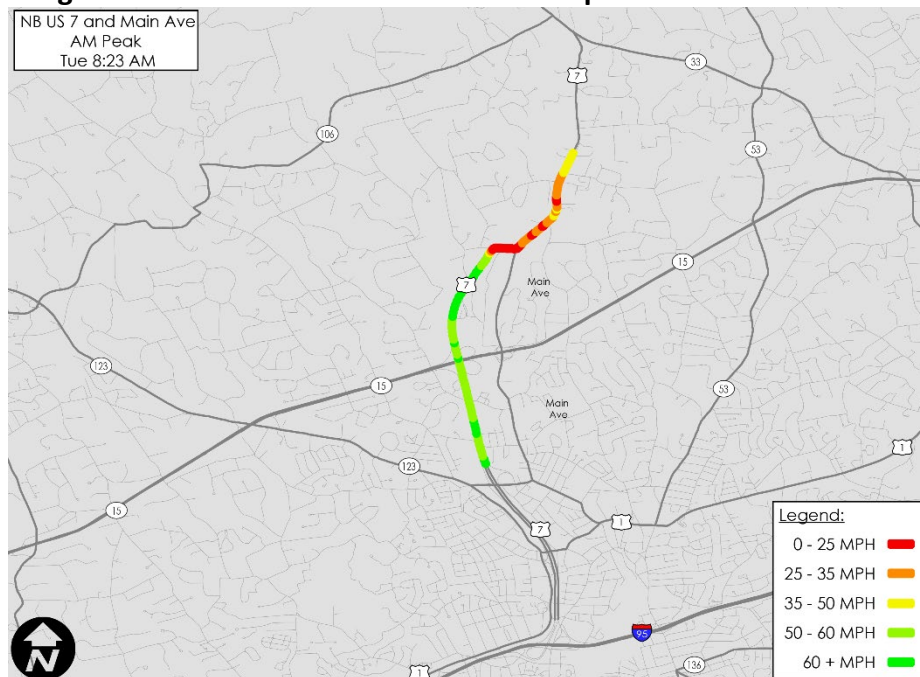
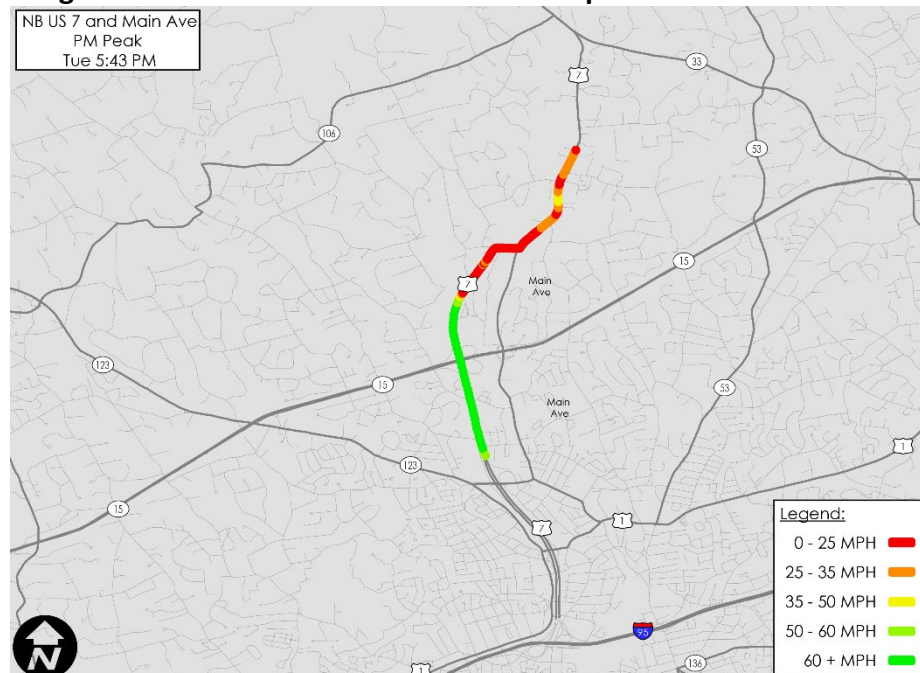


Figure 3.21: Northbound Route 7 Travel Speeds – PM Peak Period



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.22: Southbound Route 7 Travel Speeds – AM Peak Period

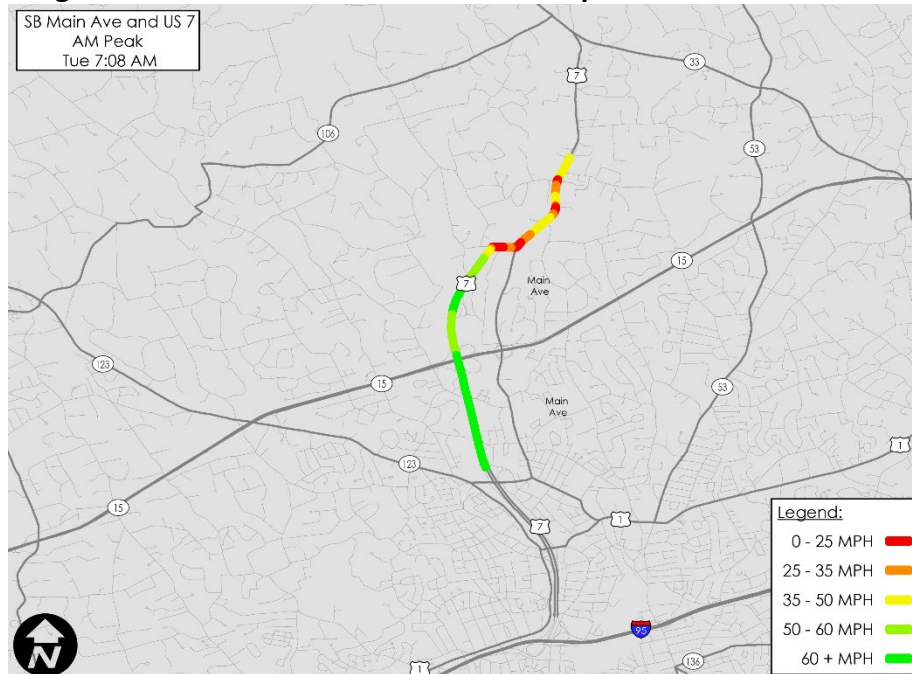
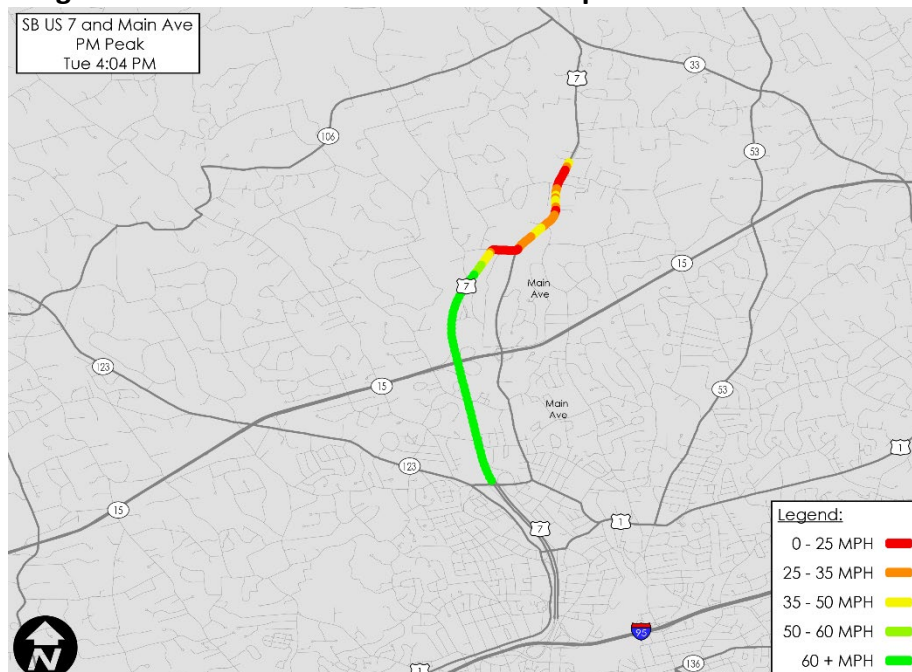


Figure 3.23: Southbound Route 7 Travel Speeds – PM Peak Period



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Main Avenue experiences periodic congestion along the signalized corridor in the northbound and southbound directions during both the AM and PM peak periods. The heaviest Main Avenue congestion occurs during the PM peak period between New Canaan and Glover Avenue. Traffic north of Grist Mill Road was observed to be particularly affected by left-turning vehicles entering and exiting businesses. This observation was prevalent in both directions during both peak periods. Speeds observed along Main Avenue are summarized in Table 3.8.

Table 3.8 Main Avenue Peak Period Travel Speed Summary

Route 7 Travel Speeds (mph)		Northbound		Southbound	
Segment From	Segment To	AM	PM	AM	PM
Route 123	Broad St	31	<u>15</u>	<u>11</u>	24
Broad St	Perry Ave	34	36	28	<u>15</u>
Perry Ave	Linden St	<u>7</u>	<u>18</u>	36	<u>5</u>
Linden St	Merritt View/Stop & Shop	24	<u>5</u>	34	30
Merritt View/Stop & Shop	Glover Ave	<u>15</u>	<u>14</u>	21	26
Glover Ave	Merritt River Towers 801/901	31	37	<u>5</u>	26
Merritt River Towers 801/901	Merritt 601	34	45	<u>22</u>	<u>19</u>
Merritt 601	Merritt 401/501 / Shopping Center	43	37	37	37
Merritt 401/501 / Shopping Center	Valley View Rd / Merritt 201/301	39	39	39	39
Valley View Rd / Merritt 201/301	Grist Mill Rd	26	<u>15</u>	37	41
Grist Mill Rd	Kensett Ave	<u>19</u>	<u>21</u>	<u>13</u>	<u>21</u>

*Underlined speeds indicate travel speeds that are below the speed limit by at least 10 mph.

Figure 3.24 through Figure 3.27 present the observed speeds for each travel time run along the Main Avenue corridor. These maps reflect the behavior of a congested, signalized corridor such that all speeds are less than 50 mph with small segments of speeds slower than 25 mph close to the signalized intersections. It was observed to take between 7 and 11 minutes to travel this 2.75-mile segment of Main Avenue with the longest travel time occurring during the PM peak period in the northbound direction (11 minutes), and second-longest travel time occurring during the AM peak period in the southbound direction (9 minutes). There are 17 signals along this 2.75-mile segment of Main Avenue.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.24: Northbound Main Ave Travel Speeds – AM Peak Period

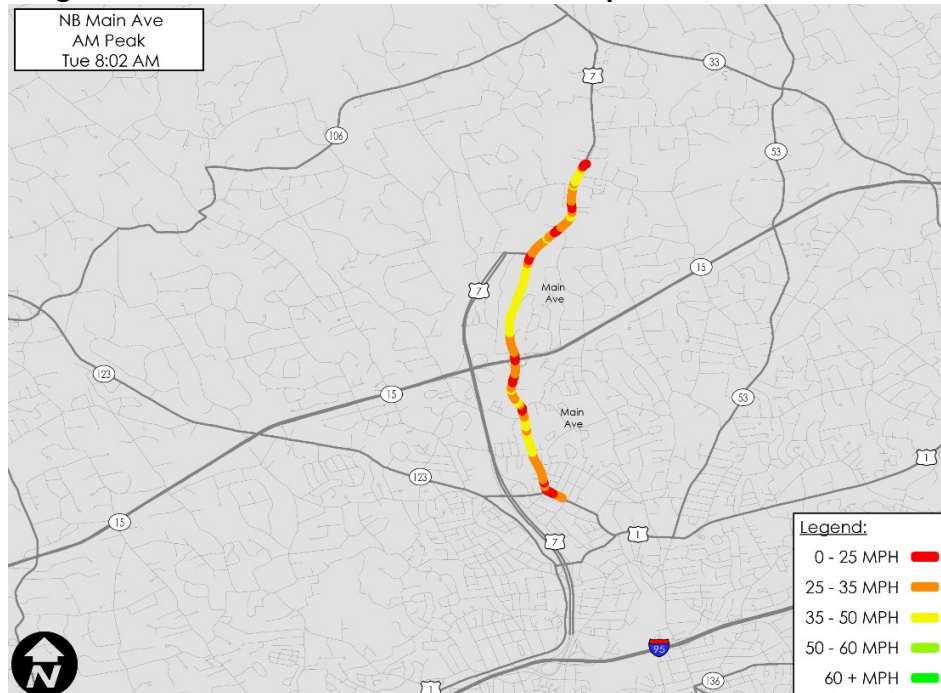
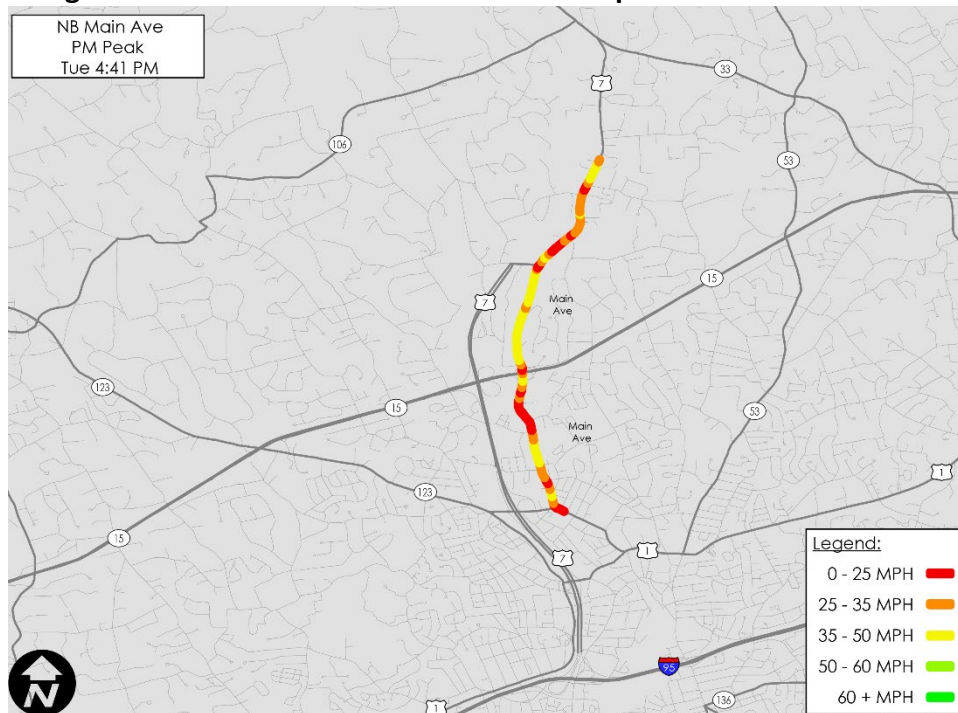


Figure 3.25: Northbound Main Ave Travel Speeds – PM Peak Period



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.26: Southbound Main Ave Travel Speeds – AM Peak Period

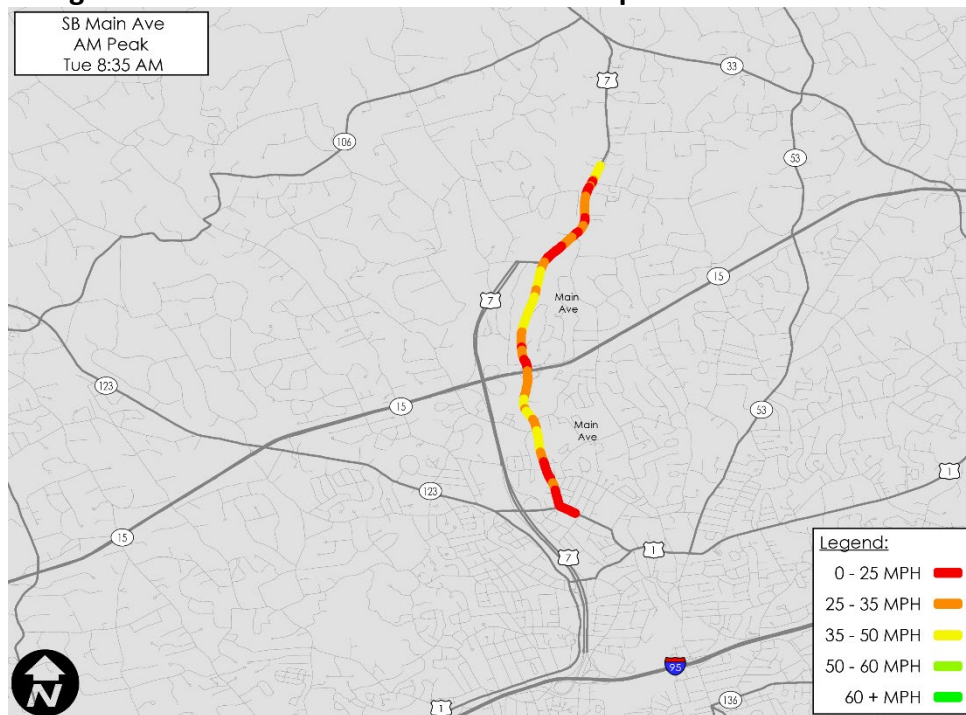
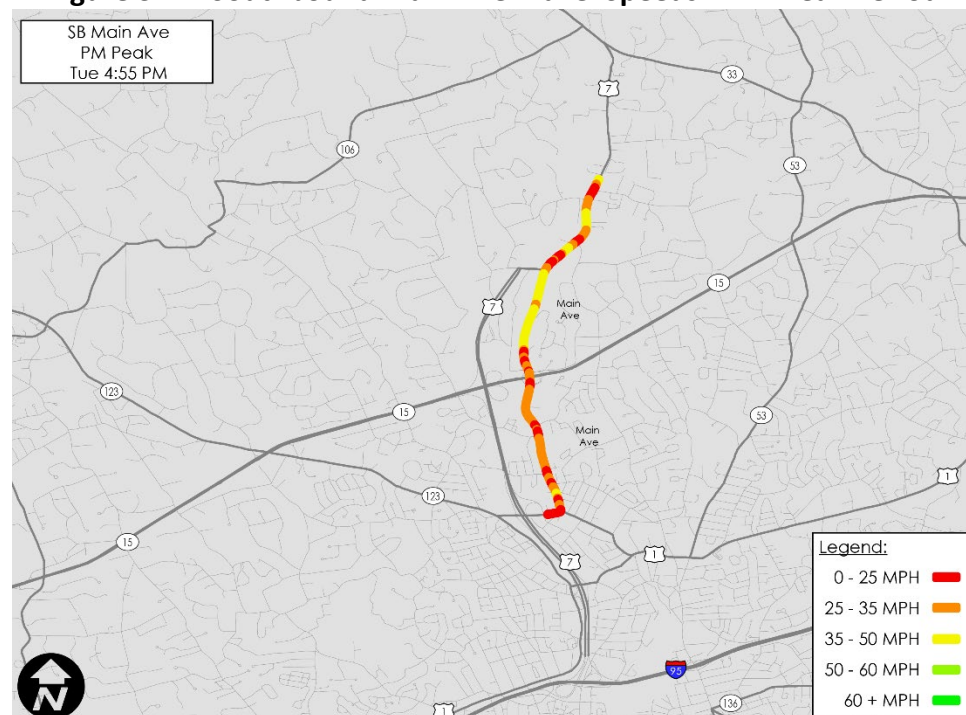


Figure 3.27: Southbound Main Ave Travel Speeds – PM Peak Period



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

85th Percentile (Free Flow) Travel Speeds

In addition to collecting travel speeds during the peak periods, when there is typically the most congestion, travel speeds were also collected during off-peak periods using the floating car method. This supplemented speed data collected by ATRs at certain locations. Both of these sources were used to derive 85th percentile (free flow) speeds for the study area corridors. Calculated 85th percentile travel speeds along with the posted speed limits are shown in Table 3.9. In general, 85th percentile speeds are 5-10 mph above the posted speed limit.

Table 3.9 85th Percentile Travel Speed Summary

Corridor (Segment)	85 th Percentile Travel Speeds (mph)	Posted Speed Limit
Main Avenue (Route 123-Glover Avenue)	35	30
Main Avenue (Glover Avenue-Grist Mill Road)	40	35
Route 7 (Route 123- Route 15 Interchange)	65	55
Route 7 (Route 15 Interchange-Grist Mill Road)	60	40
Route 7 (Grist Mill Road; Route 7 – Main Avenue)	30	25
Route 7 (Grist Mill Road-Kent Road)	40	35
Route 15 (Route 124 (Darien) – Route 33 (Wilton))	65	55

Validation of Travel Time Data

Travel time data were collected as part of Skycomp’s analysis of origin-destination pairs which is discussed in further detail in Section 3.3. Table 3.10 shows a comparison of travel time data collected by both Stantec and Skycomp. Travel times and speeds observed during Stantec’s field visit are comparable to and validated by Skycomp’s data.

Table 3.10: Travel Time Comparison – Stantec Data vs Skycomp Data

Segment			AM Travel Time		PM Travel Time	
From	To	Direction	Stantec	Skycomp	Stantec	Skycomp
Main Ave at Route 123	Main Ave at Grist Mill Rd	NB	5.0	5.8	8.7	8.7
Main Ave at Grist Mill Rd	Main Ave at Route 123	SB	6.1	4.5	5.5	7.0
Route 7 at Route 123	Main Ave at Grist Mill Rd	NB	3.8	3.2	4.3	3.6
Main Ave at Grist Mill Rd	Route 7 at Route 123	SB	3.2	3.5	3.3	3.6
Route 7 at Route 123	Route 15 at Main Ave	NB	4.0	4.7	5.7	8.0
Route 15 at Main Ave	Route 7 at Route 123	SB	No data	5.6	5.3	5.8



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

3.3 ORIGIN-DESTINATION PATTERNS

Given the Project’s intent to improve system linkages, origin-destination data were also collected to record the amount of traffic that currently makes the missing movements at the Route 7/Merritt Parkway interchange (as previously illustrated in Figure 2.3). Origin-destination data were recorded on Tuesday, September 20, 2016 (weekday PM peak period) and Wednesday, September 21, 2016 (weekday AM and MD peak periods) using rapid aerial digital photography by Skycomp. Skycomp used helicopters to hover over the study area and take high-resolution photos every second in order to track vehicles from their origin to their destination.

The origin and destination points of all vehicles were tracked at eight specific points, or “assignment lines”, throughout the study area roadway network and area surrounding the partial Route 7/Route 15 interchange and the associated missing movements shown previously in Figure 2.3. A sample number of vehicles were selected at eight locations, or “assignment lines”, across main roadways at the north, south, and east ends of the survey area and were traced backward to their origins and/or forward to their destinations. Figure 3.28 through Figure 3.30 show the assignment lines (AL) which were traced.

The vehicles crossing these lines are traced to origins and destinations marked by the white boxes. Vehicles were traced as needed until leaving (or entering) the survey area across a black boundary line. A sample rate at each AL was selected to produce a sample size of 10% of 90 minutes of flow, or 150 vehicles, whichever was larger, for each AL for each peak period. The sample size was selected in coordination with Skycomp and represents a threshold where the sampled data is statistically significant enough to discern travel patterns. In order to produce reliable tracing results, Skycomp used proprietary software to perform computer-assisted manual tracing from the aligned aerial imagery.

Figure 3.28: Skycomp O-D Study ALs – Route 7 at Grist Mill Road and Main Avenue



**ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

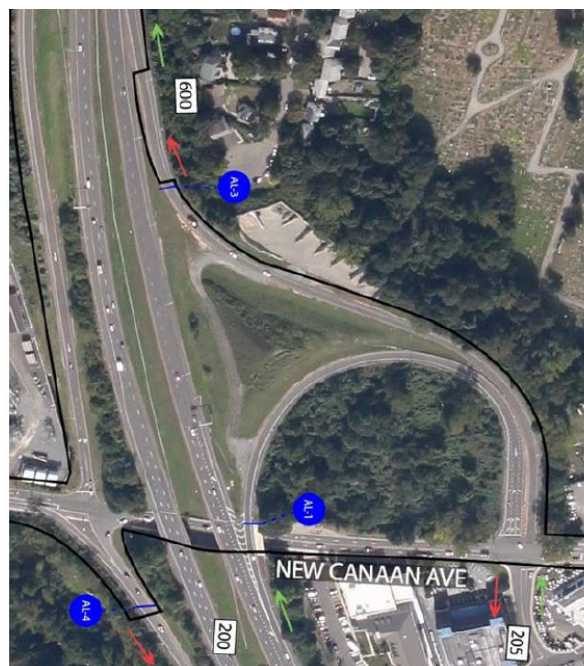
Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.29: Skycomp O-D Study ALs – Main Avenue / Route 15 Interchange



Figure 3.30: Skycomp O-D Study ALs – Route 7 / Route 123 Interchange



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.31 through Figure 3.34 illustrate weekday AM and weekday PM travel patterns for the incomplete movements between Route 7 to/from the south and Route 15 to/from the east. As shown in Figure 3.31, approximately 20% of vehicles getting off northbound Route 7 at Route 123 have destinations within reasonable proximity to the Main Avenue/Route 15 interchange. The average recorded travel time to get to these destinations is five minutes.

Figure 3.31: Weekday AM Peak Hour Patterns – Northbound Route 7 Off-Ramp to Route 123

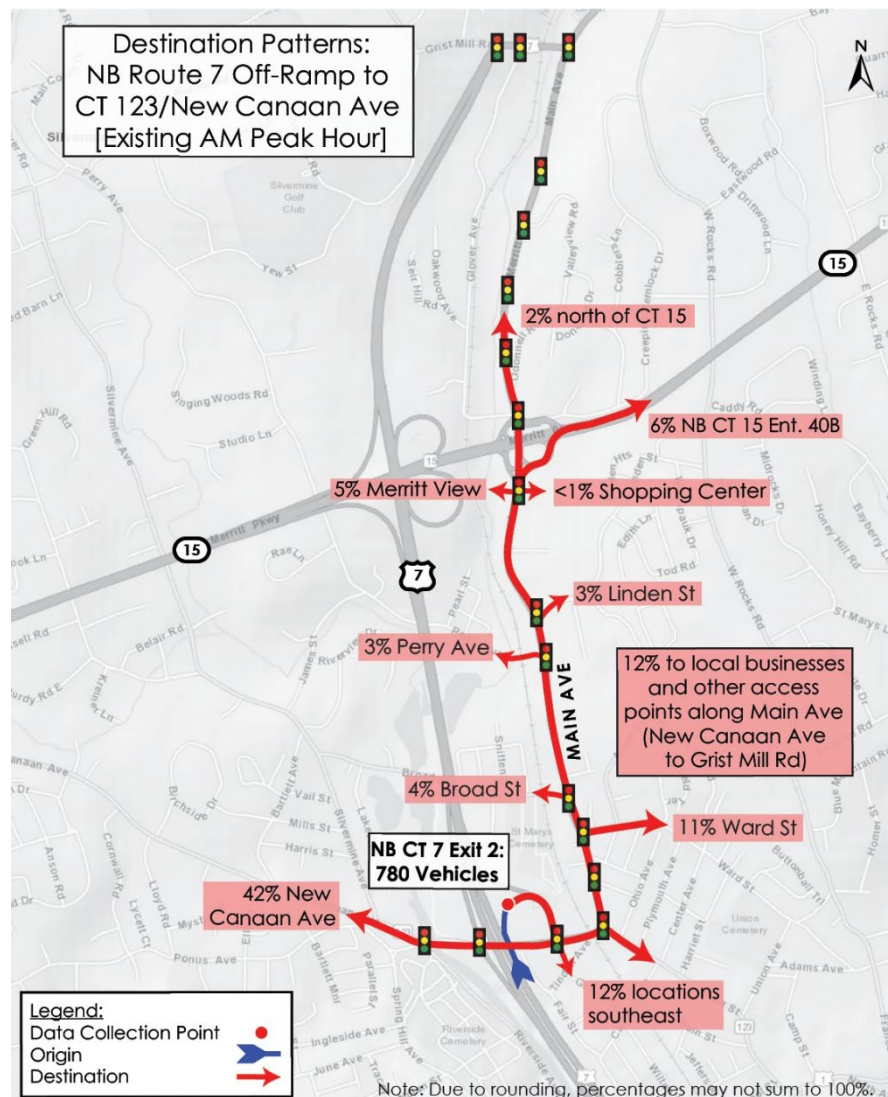


Figure 3.32 illustrates evening peak hour travel patterns for vehicles utilizing the northbound Route 7 off-ramp to Route 123. Approximately 15% of vehicles getting off have destinations within 1 mile of the Main Avenue/Route 15 interchange. The average recorded travel time to get to these destinations at this hour is eight minutes.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.32: Weekday PM Peak Hour Patterns – Northbound Route 7 Off-Ramp to Route 123

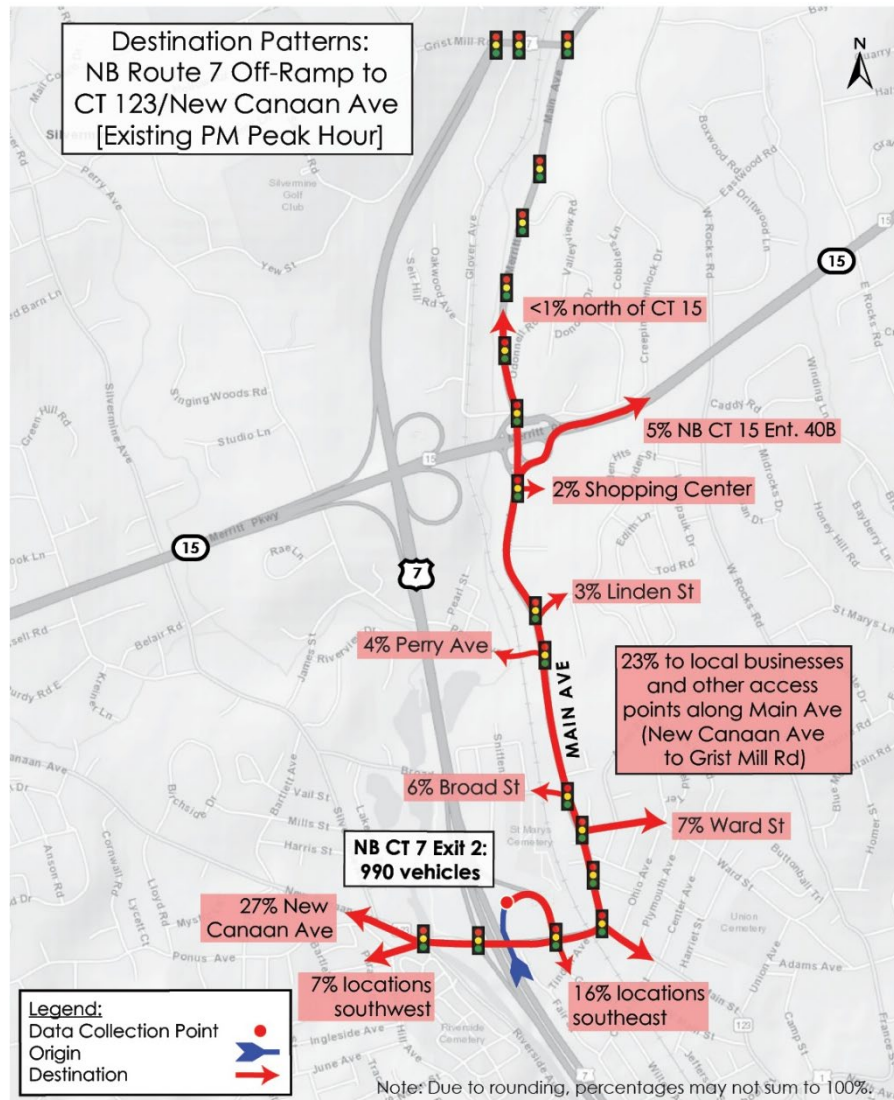


Figure 3.33 illustrates the weekday morning peak hour travel patterns for vehicles utilizing the southbound Route 15 off-ramps at the Main Avenue interchange. Approximately 20% of vehicles getting off southbound Route 15 at Main Avenue are destined for southbound Route 7, and approximately one in every three vehicles exiting southbound Route 15 at Main Avenue has a destination in reasonable proximity to the interchange. The average recorded travel time to get to these destinations at this hour is six minutes.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.33: Weekday AM Peak Hour Patterns – Southbound Route 15 Off-Ramps to Main Ave

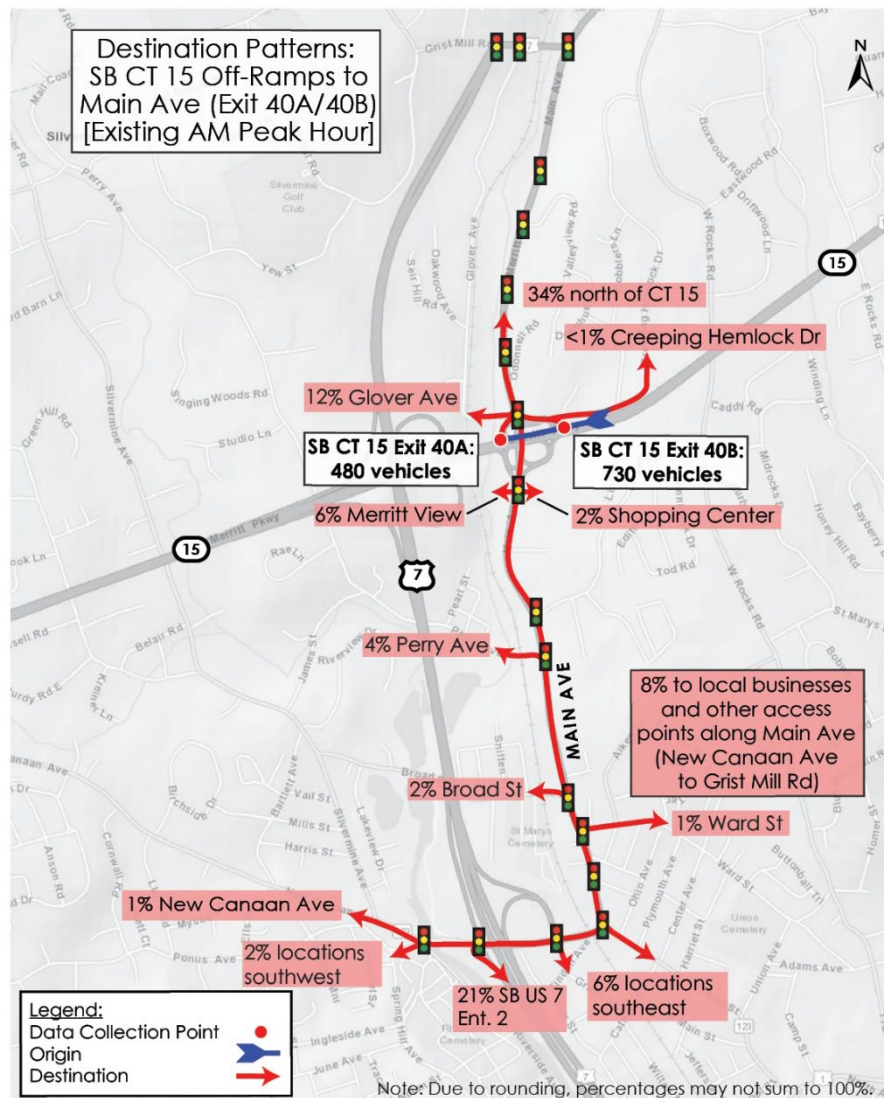


Figure 3.34 illustrates the weekday evening peak hour travel patterns for vehicles utilizing the southbound Route 15 off-ramps at the Main Avenue interchange. Approximately 15% of vehicles getting off southbound Route 15 at Main Avenue are destined for southbound Route 7, and approximately one in every five vehicles exiting southbound Route 15 at Main Avenue has a destination in reasonable proximity to the interchange. The average recorded travel time to get to these destinations at this hour is seven minutes.

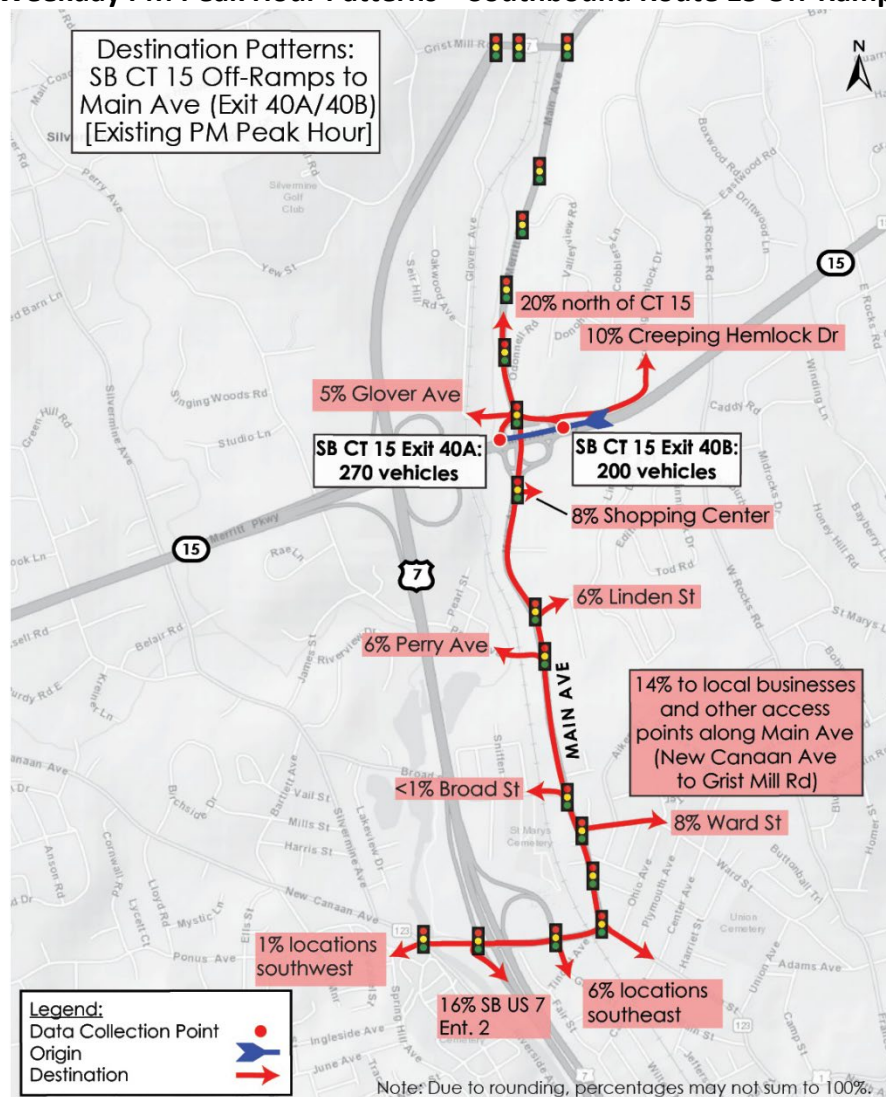


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

Figure 3.34: Weekday PM Peak Hour Patterns – Southbound Route 15 Off-Ramps to Main Ave



A supplemental memo which contains O-D graphics for each of the ALs is included as Attachment A.

A further review of the O-D data indicates that the most intensive use of Main Avenue as a supplemental link between points north of Grist Mill Road and south of Route 123 occurs during the AM peak hour. Nearly 250 vehicles use Main Avenue to make the connection from southbound Route 15 to southbound Route 7 during the AM peak hour. As shown in Table 3.11, there is an unmet demand of at least 390 AM peak hour vehicles that would benefit from a completed 7/15 Interchange which would allow them to bypass Main Avenue between Grist Mill Road and Route 123 entirely. The heaviest demand is from southbound Route 15 to southbound Route 7. It should be noted that the northbound Route 15 to northbound Route 7 demand could



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Travel Patterns

December 6, 2017 (Revised May 8, 2020)

be higher than what is exhibited in Table 3.11 during the PM peak hour due to the fact that typical peak period travel in the corridor has a more concentrated duration in the morning whereas peak period travel in the afternoon/evening is spread out amongst a greater number of hours. This spreading of traffic during the afternoon/evening is caused by additional trip making that typically occurs during this time.

Table 3.11: Skycomp O-D Study Summary – Peak Hour Traffic Volumes and Average Travel Time for Route 7 / Route 15 Incomplete Movements

Missing Movement	AM Peak Hour Volume	Avg. Travel Time (min)	PM Peak Hour Volume	Avg. Travel Time (min)
NB Route 7 to NB Route 15	47	4.7	52	7.9
SB Route 7 to NB Route 15	21	—*	49	4.8
SB Route 15 to SB Route 7	248	6.0	75	6.4
SB Route 15 to NB Route 7	76	2.7	76	3.9
Total	392		252	

*Not enough samples to establish an average travel time.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Crash Analyses
December 6, 2017 (Revised May 8, 2020)

4.0 CRASH ANALYSES

4.1 STUDY AREA CRASH ANALYSES

Crash records obtained through the Connecticut Crash Data Repository for the three-year period from January 2012 through December 2014 documented that 1,617 total crashes with 326 injuries and two fatalities occurred along the Route 7, Route 15, Route 719, and Route 123 corridors within the study area during those three years. Approximately 25 percent of the reportable crashes occurred at 28 study area intersections. This represents the latest data set that was available for use at the time that this report was originally issued (December 2017). A crash analysis was performed for each study area intersection, the Route 7/Route 15 interchange, and the Main Avenue/Route 15 interchange. Findings are tabulated in Table 4.1, Table 4.2, Table 4.3, and illustrated in Figure 4.1.

Table 4.1: Three-year (2012-2014) Crash Summary – Routes 7/15 Interchange

Roadway	Mile Marker Begin	Mile Marker End	Length (mi)	Total Crashes	Injury Crashes	Fatal Crashes	Ramp Crashes
Route 7	2.6	3.20	0.61	29	8	0	6
Merritt Parkway	16.77	17.42	0.66	48	10	0	4
Total Interchange				77	18	0	10

Table 4.2: Three-year (2012-2014) Crash Summary – Route 15/Main Avenue Interchange

Roadway	Mile Marker Begin	Mile Marker End	Length (mi)	Total Crashes	Injury Crashes	Fatal Crashes	Ramp Crashes
Main Ave	1.03	1.18	0.16	25	6	0	--*
Merritt Parkway	17.43	17.78	0.36	75	214	1	33
Total Interchange				100	220	1	33

*No ramps associated with Main Avenue.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Crash Analyses

December 6, 2017 (Revised May 8, 2020)

Table 4.3: Three-year (2012-2014) Intersection Crash Summary

Intersection	Property Damage Only	Injury	Fatality	Total
CT 123/New Canaan Avenue				
New Canaan Avenue & Route 7 Southbound Ramps	4	2	0	6
New Canaan Avenue & Route 7 Northbound Ramps	4	1	0	5
New Canaan Avenue & Railroad Tracks/Dunkin' Donuts	4	1	0	5
Total*	12	4	0	16
CT 719/Main Avenue				
Main Avenue & New Canaan Avenue	25	4	0	29
Main Avenue & Delaware Avenue	19	1	0	20
Main Avenue & Hudson Street	5	3	0	8
Main Avenue & Ward Street	18	1	0	19
Main Avenue & Broad Street	26	4	0	30
Main Avenue & Maplewood Terrace	0	1	0	1
Main Avenue & Perry Avenue	8	2	0	10
Main Avenue & Linden Street	14	2	0	16
Main Avenue & Nottingham Place	3	0	0	3
Main Avenue & Stop & Shop Entrance	8	1	0	9
Main Avenue/Glover Avenue/SB Merritt Parkway Ramps	15	5	0	20
Main Avenue & 601 Merritt 7 Apartments	1	1	0	2
Main Avenue & 401/501 Merritt 7 Apartments	2	0	0	2
Main Avenue & Valley View Road	3	3	0	6
Main Avenue & 101 Merritt 7 Apartments	1	1	0	2
Main Avenue & Grist Mill Road	6	2	0	8
Total*	154	31	0	185
Route 7				
Route 7 & Grist Mill Road	49	12	1	62
Route 7 & Glover Avenue	23	5	0	28
Route 7 & Route 719/Main Avenue	38	7	0	45
Route 7 & West Rocks Road	24	8	0	32
Route 7 & Foxboro Drive	4	0	0	4
Route 7 & Heathcote Road	1	1	0	2
Route 7 & Fawn Ridge Lane	2	0	0	2
Route 7 & Kent Road	3	2	0	5
Route 7 & Kensett Avenue	17	5	0	22
Total*	161	40	1	202

*Totals do not include midblock crashes.

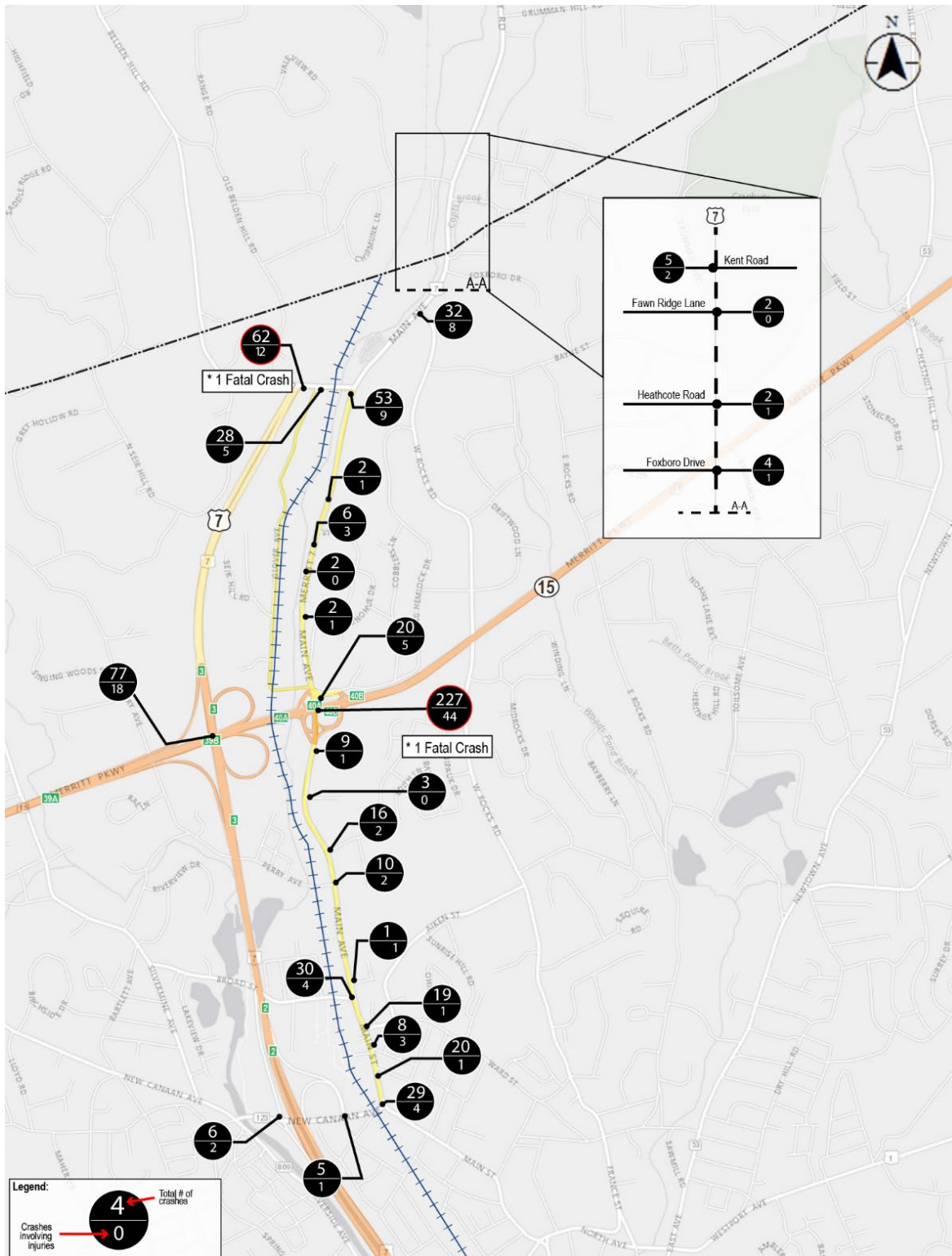


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Crash Analyses

December 6, 2017 (Revised May 8, 2020)

Figure 4.1: Study Area Crash Summary (2012-2014)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Crash Analyses

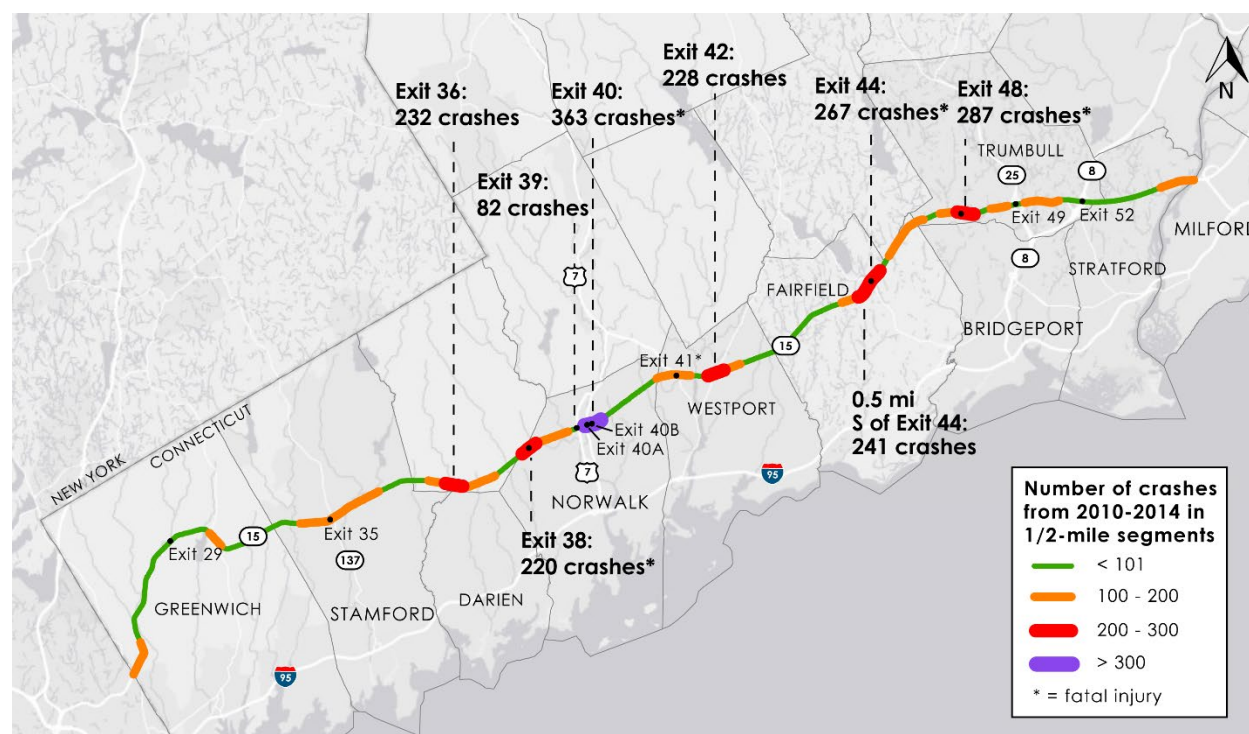
December 6, 2017 (Revised May 8, 2020)

Supplemental crash analyses were performed for the traffic study area to understand how crash patterns have changed since 2016. While the original crash analyses focused on the 2012-2014 period, the supplemental crash analyses evaluated crash patterns during the 2015-2017 analysis period. The total amount of crashes within the study area (Route 7, Route 15, and local roadways) decreased by a total of 11 percent. However, crashes along Route 15 increased by a total of 10 percent; rear-end crashes accounted for nearly 80 percent of all crashes. Further information on the supplemental study area crash analyses is provided within Attachment C.

4.2 MERRITT PARKWAY CORRIDOR CRASH ANALYSES

To further understand crash patterns at the Route 15 interchanges with Route 7 and Main Avenue, additional analyses were performed to determine how crash patterns at the interchanges compare in relation to other locations along the Route 15 corridor. Crashes per 0.5-mile segment were summarized based on crash records obtained through the Connecticut Crash Data Repository for the five-year period from January 2010 through December 2014. Although a three-year period is typical for crash analyses, a five-year period was evaluated to further understand historical crash patterns. As shown in Figure 4.2, the highest density of crashes along the entire Route 15 corridor occurs at the Exit 40 interchange with Main Avenue. It is the only location which has more than 300 crashes within a 0.5-mile segment within the five-year period.

Figure 4.2: Route 15 Crash Summary (2010-2014)



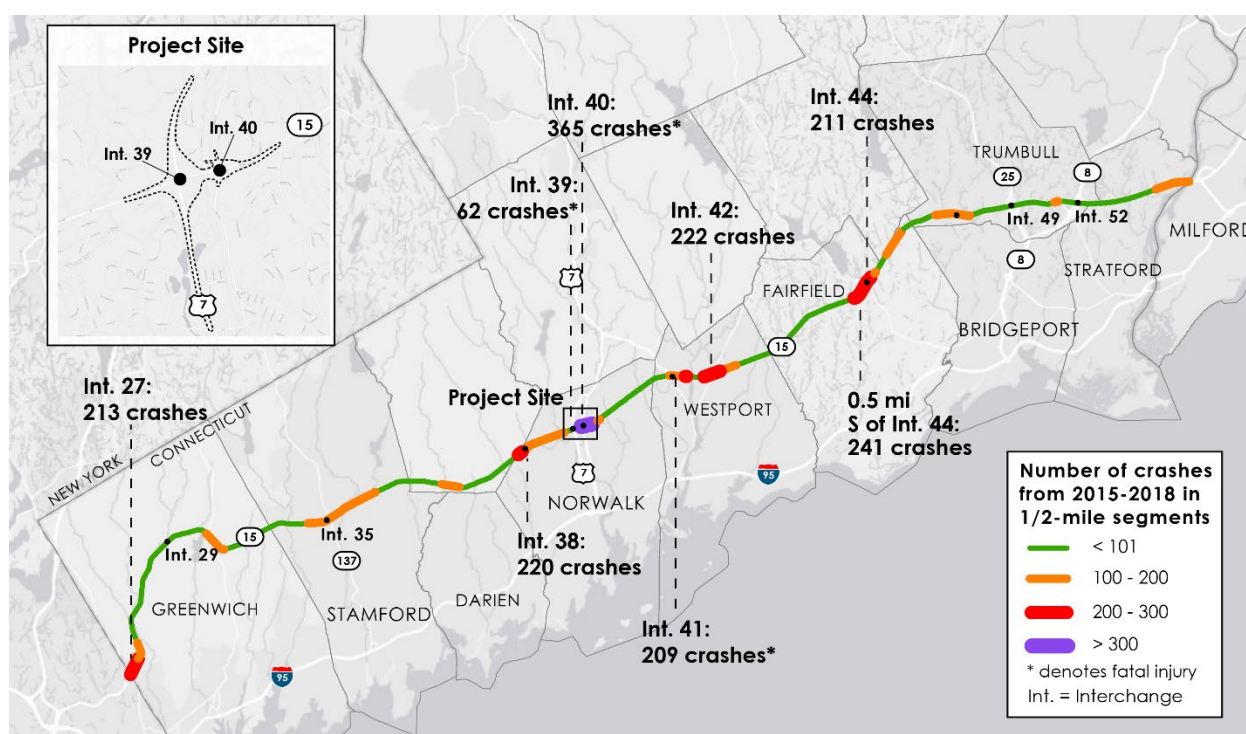
ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Crash Analyses

December 6, 2017 (Revised May 8, 2020)

A supplemental Merritt Parkway crash analysis was performed for the corridor in 2019 to see whether crash patterns at the Route 15 interchanges with Route 7 and Main Avenue, and at other locations along the Merritt Parkway corridor, have changed since the 2010 through 2014 analysis period. Crashes per 0.5-mile segment were summarized based on crash records obtained through the Connecticut Crash Data Repository for the four-year period from January 2015 through December 2018. Although a three-year period is typical for crash analyses, a four-year period was evaluated to reflect the latest data that is currently available. As shown in Figure 4.3, the highest density of crashes along the entire Merritt Parkway corridor continues to occur at the Exit 40 interchange with Main Avenue. It continues to be the only location which has more than 300 crashes within a 0.5-mile segment within the four-year analysis period.

Figure 4.3: Route 15 Crash Summary (2015-2018)



5.0 EXISTING TRAFFIC OPERATIONS

This section of the report describes existing traffic operations within the traffic study area.

5.1 VISSIM CORRIDOR ANALYSIS

A VISSIM microsimulation model of the Routes 7/15 interchange and adjoining roadways was developed to evaluate various roadway improvement alternatives. This section discusses the model development and calibration to existing traffic conditions.

5.1.1 Methodology/Criteria

A VISSIM microsimulation model, discussed herein, was developed to be one of the tools for traffic evaluation. Microsimulation models simulate traffic on an individual car-by-car basis. This approach differs from models such as Highway Capacity Software (HCS) or Synchro models, which are regression based in nature and represent a macroscopic modeling approach. The VISSIM model is meant to be a companion to the HCS and Synchro models.

The microsimulation model focuses on operations on the Routes 7/15 interchange, including its adjoining roadways: Route 7, Route 123, Main Avenue, Glover Avenue, and Grist Mill Road. The model was built to analyze traffic during the AM peak hour from 8:00 AM to 9:00 AM and the PM peak hour from 5:00 PM to 6:00 PM, but also simulates traffic from 7:00 AM to 8:00 AM and from 4:00 PM to 5:00 PM. The coverage area of the model is described as follows:

- Main Avenue from south of Route 123 to north of Grist Mill Road
- Glover Avenue between Grist Mill Road and Main Avenue
- Route 7 between Grist Mill Road and south of Route 123
- Route 15 from east of Main Avenue to west of Route 123

The following section discusses the development of the 2016 Base Year (Existing Conditions) microsimulation model and calibration.

Base Year Model Development and Calibration

The microsimulation modeling process requires four general steps described below:

1. Coding the roadway network to be analyzed (lanes, ramps, intersections, local roadways);
2. Adding traffic control devices to the model (traffic signals, stop signs, etc.);
3. Developing and inputting traffic volumes; and
4. Iteratively calibrating the VISSIM model to match observed existing conditions, such that it is a reliable predictor of current and future traffic operations.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)

ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Roadway Network

In the case of the Routes 7/15 microsimulation model, the network includes Main Avenue, Grist Mill Road, Glover Avenue, Route 7, Route 15, and Route 123. The boundaries are Grist Mill Road to the north, Route 123 to the south, the West Rocks Road Bridge over Route 15 to the east, and Route 123 at the Route 15 interchange to the west. Figure 5.1 shows the extents of the simulation model network.

Traffic Signals

Following the development of the roadway network, traffic signals and stop signs were coded. The simulation area includes 21 signalized intersections modeled along Main Avenue, Grist Mill Road, and CT 123 / New Canaan Avenue. Traffic signal timings were taken from CTDOT records, as verified via independent field observations. These timings vary with time of day, so AM and PM peak hour timings are different in response to changes in traffic demand.

Volumes

The primary traffic input for the VISSIM microsimulation model is an origin and destination (O-D) matrix of volumes for the AM and PM peak hours. Balanced existing conditions traffic volumes for the AM and PM peak hours are used in conjunction with O-D patterns taken from aerial surveys to develop an O-D matrix. These volumes result in each simulated vehicle being assigned a network origin and destination. For example, a vehicle's origin would be defined with a place designation such as Main Avenue south of CT 123 while a vehicle's destination would be defined similarly with a place designation such as Grist Mill Road west of US 7. O-D volumes were developed for the 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM peak hours. To accurately simulate traffic, it is necessary to pre-load the traffic network with vehicles prior to the start of the peak hour to be analyzed. Traffic O-D matrices were developed for the 6:45 AM to 8:00 AM and 3:45 PM to 5:00 PM periods in order to preload the network with traffic and complete the peak hour simulation. It should be noted that the O-D volume matrices developed are representative of traffic demand in the corridor during the AM and PM peak hours, irrespective of whether the throughput is as high; that is, it is possible that only 3,500 vehicles could be processed on southbound Route 15 during the AM peak hour even though there is a demand of 4,000 vehicles who want to travel south on Route 15 during that same hour.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Figure 5.1: VISSIM Simulation Model Roadway Network



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Model Calibration, General Procedure

Before the model can be used to simulate the impact of potential roadway improvements on traffic, it is necessary to tune, or calibrate, the model so that it can be considered a reliable predictor of traffic conditions. There are three general goals of the calibration process:

1. Match the model's traffic volume capacity to levels observed during field visits,
2. Match the model's travel speeds to levels observed during field visits, and
3. Match the relative distribution of traffic between parallel roadways (e.g., Route 7 vs. Main Avenue).

To calibrate the model, an iterative process of adjusting driver behaviors and preferences such as typical headways between vehicles, lane changing behavior, and desired travel speeds was employed to replicate the throughput volumes and field observations seen during the traffic data collection program. Sensitivities to travel time savings and distance traveled were adjusted until the balance of traffic volume across the model's various roadways was deemed satisfactory.

Simulation models in general will deviate somewhat from observed traffic volumes, speeds, and queues, so a set of guidelines was employed to identify whether the model is replicating existing travel behavior at an acceptable level. The standards sourced from the FHWA's *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software, July 2004* were used as a guideline for determining whether the model was sufficiently calibrated. Table 5.1 illustrates the model's overall match to actual traffic volumes.

Table 5.1: Overall Model Performance

Statistic	AM Peak	PM Peak
Overall Traffic Volume GEH	2.98	1.99
% of TMCs within GEH 5	78%	91%

A review of various calibration statistics, using the GEH statistic¹, demonstrated that both the AM and PM peak hours were reasonably well represented by the model. Further information on calibrated traffic volumes and speeds is presented in Table 5.2 and Table 5.3. The results demonstrate that the model can replicate the capacity of the congested southbound Route 15 during the peak hours, as well as the recurring congestion that is observed along northbound Route 15. Congestion and volumes at heavily traveled intersections including Main Avenue at Grist Mill Road and Grist Mill Road at Route 7 are also replicated by the simulation model. The following sections provide a more detailed discussion of the model's performance.

¹ The GEH statistic, named for inventor Geoffrey E. Havers, is used for a variety of traffic analysis purposes. The statistic compares two sets of volumes and is used when comparing modeled traffic volumes versus collected traffic volumes. Typically, a GEH value of less than 5.0 represents a good match between modeled and collected traffic volumes.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Table 5.2: Volume Calibration – Select Segments

Select Volume Targets	AM Peak			PM Peak		
	Target	Model	GEH	Target	Model	GEH
SB Route 15 north of Main Ave	2,420	2,290	2.7	2,000	1,980	0.4
NB Route 15 north of Main Ave	1,700	1,570	3.2	2,320	2,560	5.0
SB Route 15 south of Route 7	2,730	2,980	4.7	3,720	3,610	1.8
NB Route 15 south of Route 7	3,480	3,220	4.4	3,110	2,870	4.4
NB Route 7 south of Grist Mill Rd	2,340	2,180	3.3	1,900	1,850	1.1
SB Route 7 south of Grist Mill Rd	1,950	1,770	4.1	2,000	1,870	3.1
NB Main Ave south of Grist Mill Road	550	370	8.6	850	670	6.4
SB Main Ave south of Grist Mill Road	1,060	750	10.2	490	510	0.9
WB Grist Mill Road east of Route 7 Intersection	1,230	1,140	2.7	1,520	1,760	5.9
EB Grist Mill Road east of Route 7 Intersection	2,160	1,860	6.8	1,510	1,610	2.5
NB Main Ave south of Route 15 (s/o of Perry Ave)	880	1,050	5.4	870	880	0.4
SB Main Ave south of Route 15 (s/o of Perry Ave)	930	710	7.8	1,220	1,230	0.4

Table 5.3: Speed Calibration – Select Segments

Select Speed Targets	AM Peak		PM Peak	
	Target	Model	Target	Model
CT 15 NB: CT 123 to East Rocks Rd	58	32	17	12
CT 15 SB: East Rocks Rd to CT 123	10	9	63	57
Main Ave NB: CT 123 to Grist Mill Rd	24	25	14	24
Main Ave SB: Grist Mill Rd to CT 123	20	25	14	17
US 7 NB: CT 123 to Grist Mill Rd	57	37	33	46
US 7 SB: Grist Mill Rd to CT 123	62	58	65	60

5.1.2 Results

The existing conditions VISSIM model shows numerous areas of congestion during the AM and PM peak hours. The modeled congestion and volumes are consistent with levels of congestion observed during field visits.

AM Peak Hour - Modeled Congestion

Measures of Effectiveness

Several measures of effectiveness are collected from the microsimulation model to quantify operations, including vehicle miles of travel and vehicle hours of travel per segment, and average speed and travel time on each segment. During the morning peak period, the vehicle hours of travel and travel time on southbound Merritt Parkway are significantly larger relative to the



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

northbound direction. Measures of effectiveness collected for the AM peak hour are presented in Table 5.4.

Table 5.4: AM Peak Hour Measures of Effectiveness

Mainline	Segment Start	Segment Finish	VMT	VHT	Avg Spd	Travel Time
NB Route 15	Main Ave	East Rocks Road	1,345	22	60.8	0.9
	US 7	Main Avenue	610	11	55.0	0.3
	Silvermine River	US 7	1,296	22	60.3	0.5
	CT 123	Silvermine River	3,016	168	17.7	3.3
SB Route 15	East Rocks Road	Main Ave	1,970	240	8.2	6.5
	Main Avenue	US 7	481	92	5.2	3.3
	US 7	Silvermine River	1,264	147	8.5	3.5
	Silvermine River	CT 123	2,776	195	14.3	3.9
NB Main Ave	CT 123	Merritt Parkway	1,209	53	23.2	3.0
	Merritt Parkway	Grist Mill Road	575	18	28.8	1.8
SB Main Ave	Grist Mill Road	Merritt Parkway	453	15	26.9	1.9
	Merritt Parkway	CT 123	839	37	23.7	2.9
NB Route 7	CT 123	NB US 7 Svc Rd S	4,220	72	58.0	1.6
	NB US 7 Svc Rd S	NB US 7 Svc Rd N	1,445	28	53.2	1.4
	NB US 7 Svc Rd N	Grist Mill Road	1,564	99	15.7	2.8
SB Route 7	Grist Mill Road	NB US 7 Svc Rd N	2,070	38	55.5	1.4
	NB US 7 Svc Rd N	NB US 7 Svc Rd S				
	NB US 7 Svc Rd S	CT 123	3,296	55	59.9	1.6

Southbound Route 15 throughout the study area. Route 15 is severely over capacity during the AM peak hour, and congestion was observed to start near Route 123 by 7:00 AM. The model shows average travel times of 17 minutes to traverse the 2.6 miles of Route 15 from East Rocks Road to Route 123, which translates to a speed of 9 mph. It should be noted that Route 15



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

congestion is rooted from the High Ridge Road interchange (Exit 35) in Stamford CT, over five miles away. Southbound congestion continues further east through the study area and into Wilton and points east by the end of the AM peak hour. Both areas east and west of the study area are not modeled and therefore Route 15 congestion is modeled as fixed.

Southbound Main Avenue approaching Grist Mill Road. During the AM peak hour, a high southbound right turn volume from southbound Main Avenue onto westbound Grist Mill Road causes southbound queuing on Route 7. The model shows queues of over 2,000 feet during the AM peak hour, which are consistent with field-observed queues extending as far north as West Rocks Road. The model shows throughput during the peak hour of approximately 1,070 vehicles, which is within five percent of the observed 1,020 vehicles. The primary cause of congestion is the high demand for the movement (over 1,100 vehicles per hour) and capacity that is insufficient to process that demand. The capacity of this movement is limited because only one lane is available for the right turning traffic, and only 30 seconds of the 90 second cycle are provided for the right turn.

Westbound Grist Mill Road approaching US 7. The model shows westbound Grist Mill Road operating with high volumes. The turning movement with the highest volume is the left turn onto southbound Route 7 towards Route 15 and I-95. This left turn is modeled with throughput of 1,070 vehicles per hour which is in-line with observed traffic counts. Additionally, the steep upgrade from Main Avenue to the east also reduces the throughput of traffic.

Southbound CT 123 at Main Avenue. A high southbound right turn volume from Main Avenue onto northbound Route 123 results in some congestion and queuing. The model shows vehicles queuing for approximately 200 feet along Main Avenue while just under 800 vehicles per hour are processed at the southbound right turn at this intersection. Further, the railroad track immediately west of this intersection creates additional queuing since it is required that the track be clear at all times.

PM Peak Hour - Modeled Congestion

Measures of Effectiveness

Like the morning peak period, measures of effectiveness are collected from the microsimulation model for the evening peak hour. During the PM Peak Hour, the vehicle hours of travel and travel time on northbound Merritt Parkway are significantly larger relative to the southbound direction, as expected. In addition, the northbound US 7 approach to Grist Mill Road experiences increased vehicle hours of travel, and lower average speed, as northbound vehicles navigate the congested intersection. Measures of effectiveness collected for the PM peak hour are presented in Table 5.5.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Table 5.5: PM Peak Hour Measures of Effectiveness

Mainline	Segment Start	Segment Finish	VMT	VHT	Avg Spd	Travel Time
NB CT 15	Main Ave	East Rocks Road	2,197	217	10	5.3
	US 7	Main Avenue	569	68	8	2.2
	Silvermine River	US 7	1,144	70	16	1.8
	CT 123	Silvermine River	2,648	190	14	4.3
SB CT 15	East Rocks Road	Main Ave	1,731	29	59	0.9
	Main Avenue	US 7	619	12	54	0.3
	US 7	Silvermine River	1,589	29	56	0.5
	Silvermine River	CT 123	3,372	59	57	1.0
NB Main Ave	CT 123	Merritt Parkway	993	42	23	3.0
	Merritt Parkway	Grist Mill Road	443	19	25	2.1
SB Main Ave	Grist Mill Road	Merritt Parkway	703	66	14	3.6
	Merritt Parkway	CT 123	1,434	69	21	3.4
NB US 7	CT 123	NB US 7 Svc Rd S	4,059	69	58	1.6
	NB US 7 Svc Rd S	NB US 7 Svc Rd N	1,306	25	53	1.4
	NB US 7 Svc Rd N	Grist Mill Road	1,334	48	27	1.6
SB US 7	Grist Mill Road	NB US 7 Svc Rd N	2,217	39	58	1.4
	NB US 7 Svc Rd N	NB US 7 Svc Rd S				
	NB US 7 Svc Rd S	CT 123	3,336	54	61	1.5

Northbound Route 15 throughout the study area. The simulation model shows heavy congestion along northbound Route 15 for the length of the study area during the 5:00 PM to 6:00 PM peak hour. The 2.6-mile trip along Route 15 within the study area takes approximately 14 minutes in the model during the 5:00 PM to 6:00 PM period, which translates to an average travel speed of approximately 12 mph. Congestion forms further north along Route 15, well east of the study area, and that congestion limits the amount of traffic that northbound Route 15 can process during the peak hour (over 2,500 vehicles near the West Rocks Road overpass).

Northbound Route 7 (Grist Mill Road). The model shows queuing along northbound Route 7 approaching Grist Mill Road during the PM peak hour. Queues extend approximately 1,050 feet south of the intersection at Grist Mill Road, which is shorter than the maximum 3,000 feet long queue observed in the field. A high amount of turning vehicles (over 350 vehicles turning left and over 1,450 vehicles turning right during the peak hour) coupled with capacity constraints due to traffic signals along both Grist Mill Road and Main Avenue are the principal sources of congestion.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Main Avenue at Grist Mill Road (Route 7). The model demonstrates congestion on eastbound Grist Mill Road approaching Main Avenue. The eastbound left turn to northbound Main Avenue is shown to process over 1,500 vehicles per hour. This high demand contributes to the queuing observed in the model and verified in the field through observations. Southbound Main Avenue also experiences congestion during the PM peak hour like it does during the AM peak hour. The high-demand southbound right turn is modeled with about 1,100 vehicles being processed per hour, which contributes to modeled queues of about 600 feet (extending to halfway between the Main Avenue intersections at Grist Mill Road and West Rocks Road).

5.2 CAPACITY ANALYSIS

Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed for study area intersections using Synchro 10 traffic analysis software, which conforms to the 2000 Highway Capacity Manual (HCM)². This software package provides average control delay and level of service (LOS) for each lane group and for the overall intersection. Control delay at a signalized intersection is generally defined as the delay attributed to the traffic signal operation.

5.2.1 Synchro Analysis

Synchro is the preferred capacity analysis application for transportation networks with a series of closely spaced signalized intersections, such as the Main Avenue corridor within the study area. Under these conditions, Synchro can accurately model the effects that the traffic operations (such as poor LOS or extensive queuing) at one intersection may have on operations at an adjacent intersection.

Synchro Analysis Methodology/Criteria

Intersection LOS is an evaluation of the quality of operation based on the measure of the average delay a driver experiences while traveling through the intersection. LOS is dependent upon a range of defined operating conditions such as roadway lane geometry and traffic signal timing.

LOS ranges from scores of A to F based upon the extent of average calculated control delay per vehicle. For a signalized intersection, LOS A indicates operations with an average control delay less than 10 seconds per vehicle, while LOS F describes operations with an average control delay greater than 80 seconds per vehicle. For an unsignalized intersection, LOS A indicates operations with an average control delay less than 10 seconds per vehicle, while LOS F describes operations with an average control delay greater than 50 seconds per vehicle. An intersection is generally assumed to operate acceptably if it operates at overall LOS D or better. The 2000 Highway

² The 2010 version of the HCM was not used for intersection analyses since it currently does not allow for the analysis of intersections with pedestrian phasing, which is present at most intersections within the traffic study area.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Capacity Model (HCM) delay criteria for signalized and unsignalized intersections are summarized in Table 5.6.

Table 5.6: LOS Criteria – Signalized and Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	Less than or equal to 10.0	Less than or equal to 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	Greater than 80.0	Greater than 50.0

Source: 2000 Highway Capacity Manual

Traffic conditions were analyzed during the weekday morning and weekday evening peak periods as traffic flow and congestion within the study area are at highest levels during these periods.

Synchro Analysis Results

2016 Existing Condition intersection volumes for the AM and PM peak hours were modeled in Synchro 10 to determine capacity analysis results, summarized in Table 5.7. All existing intersections within the study area operate at LOS D or better except for the following:

1. *Main Avenue at Glover Avenue / Creeping Hemlock Drive / SB Route 15 Ramps* operates at LOS E during the AM peak hour;
2. *Southbound Route 15 Off-Ramp at Creeping Hemlock Drive* operates at LOS F during the AM peak hour;
3. *Northbound Main Avenue at the Northbound Route 15 Exit 40B Ramp* operates at LOS F during the AM peak hour;
4. *Main Avenue at West Rocks Road* operates at LOS E during the PM peak hour; and
5. *Route 7 at Grist Mill Road* operates at LOS F and E during the AM and PM peak hours, respectively.

Table 5.7: Intersection LOS Summary

Intersection	AM PEAK HOUR	PM PEAK HOUR
Main Ave at Kent Rd	B	B
Main Ave at Gateway Shopping Ctr	A	B
Main Ave at Foxboro Dr	A	A
Main Ave at West Rocks Rd	C	E
Main Ave at Grist Mill Rd	C	D
Glover Ave at Grist Mill Rd	C	C
Route 7 at Grist Mill Rd	F	E
Main Avenue at Valley View Road/Merritt 7 (201/301)	B	B
Main Avenue at Merritt 7 (401/501)/Shopping Center	A	B



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Intersection	AM PEAK HOUR	PM PEAK HOUR
Main Avenue at Merritt 7 (601)	A	B
Main Avenue at Merritt River Towers (801/901)	A	B
Glover Ave/Creeping Hemlock Dr at Main Ave	E	D
SB Route 15 Off-Ramp to Creeping Hemlock Drive	F	C
Main Ave at SB Route 15 Off-Ramp	C	B
Main Ave at New Ramp D (to SB Route 15 and NB/SB Route 7)	-	-
NB Route 15 Off-Ramp at NB Main Ave and On-Ramp at SB Main Ave	F	B
NB Route 15 Off-Ramp at SB Main Ave and On-Ramp at NB Main Ave	C	B
Main Ave at New Ramp SE (from NB/SB Route 7 and NB Route 15)	-	-
Main Ave at Merritt View/Main Ave Shopping Center	B	C
Main Ave at Nottingham Place	C	C
Main Ave at Linden St	C	B
Main Ave at Perry Ave	B	B
Main Ave at Broad St	A	B
Main Ave at Ward St	C	B
Main Avenue at Delaware Avenue/Shopping Center	A	A
Route 123 at Main Ave	C	B
Grand St/Route 7 NB Off-Ramp at Route 123	D	C
SB Route 7 On/Off Ramps at Route 123	B	B
Route 7 at SB Route 15 Ramps	-	-
Route 7 at NB Route 15 Ramps	-	-

*Red text denotes intersections with unacceptable LOS.

5.2.2 HCS Segment Analysis

Traffic conditions along roadway segments within the study area were analyzed following the standard methodology set forth in the 2010 HCM using Highway Capacity Software (HCS), Version 6.5. The traffic analysis considers a variety of prevailing conditions, including inputs such as traffic volumes, corridor free-flow speed, and a variety of geometric conditions (e.g., lane widths, lengths of weaving sections). Per HCM guidance, the highest hourly volumes from peak travel periods were used as inputs to the HCS model to determine an appropriate level of service (LOS). A roadway segment is generally assumed to operate acceptably if it achieves LOS D or better.

HCS Segment Analysis Methodology/Criteria

Freeway Segments

Capacity analyses were performed at most freeway mainline segments along Route 7 and Route 15 within the study area. The analyses were performed using the HCS Basic Freeway Segments module within the HCS software package. The analysis area for a single segment is comprised of a one-directional freeway segment between merge, diverge, or weaving locations. It includes all through lanes within the vicinity (the “influence area”). The LOS within the influence area is determined by the density (measured in passenger cars per mile per lane, or pc/mi/ln) for all



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

cases of stable operation (LOS A-E). LOS F exists when corridor demand exceeds the capacity of the corridor segment or where the off-ramp demand exceeds the off-ramp capacity. Table 5.8 presents the LOS criteria for basic freeway segments.

Table 5.8: LOS Criteria – Basic Freeway Segments

LOS	Density (pc/mi/ln)
A	≤ 11
B	$> 11 - 18$
C	$> 18 - 26$
D	$> 26 - 35$
E	> 35
F	Demand exceeds capacity

Source: 2010 Highway Capacity Manual

Merge / Diverge Roadway Segments

Capacity analyses were performed at all ramp merge and diverge segments within the study area. The analyses were performed using the HCS Ramp Junctions module within the HCS software package. The influence area for a single merge/diverge segment is bounded by a distance of 1,500 feet downstream/upstream of the merge/diverge point and includes the acceleration/deceleration lane and the right two lanes of the mainline. The LOS of the influence area is determined by the traffic density (measured in passenger cars per mile per lane, or pc/mi/ln) for all cases of stable operation (LOS A-E). LOS F exists when corridor demand exceeds the capacity of the corridor segment or where the off-ramp demand exceeds the off-ramp capacity. Table 5.9 presents the LOS criteria for merge and diverge segments.

Table 5.9: LOS Criteria – Merge and Diverge Sections

LOS	Density (pc/mi/ln)
A	≤ 10
B	$> 10 - 20$
C	$> 20 - 28$
D	$> 28 - 35$
E	> 35
F	Demand exceeds capacity

Source: 2010 Highway Capacity Manual

Weaving Segments

Capacity analyses were performed at all weaving segments along the Route 7 and Route 15 corridors within the study area. The analyses were performed using the HCS Weaving module within the HCS software package. The influence area for a single weaving segment is defined by the distance between barrier markings and includes all continuous lanes through the weaving



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

segment. One-sided weaving segments between multi-lane roadways are present along the Route 7 and Route 15 corridors. The LOS of the weaving segment is determined by the traffic density (pc/mi/ln) for all cases of stable operation (LOS A-E). LOS F exists when demand exceeds the capacity of the weaving segment. Table 5.10 presents the LOS criteria for weaving segments.

Table 5.10: LOS Criteria – Weaving Segments

LOS	Density (pc/mi/ln)
A	≤ 12
B	> 12 – 24
C	> 24 – 32
D	> 32 – 36
E	> 36
F	Demand exceeds capacity

Source: 2010 Highway Capacity Manual

HCS Segment Analysis Results

Freeway Mainlines

2016 Existing Condition freeway volumes for the AM and PM peak hours were modeled in HCS to determine capacity analysis results, summarized in Table 5.11 and Table 5.12. All existing freeway mainlines were determined to operate at LOS D or better except for the following segments:

1. *Southbound Route 15 from Exit 37 to Exit 38* operates at LOS E during the AM peak hour; and
2. *Northbound and southbound Route 15 from Exit 38 to Exit 39A* operate at LOS E during the AM peak hour.

Table 5.11: Route 15 LOS Summary

Road	From Exit	To Exit	Northbound		Southbound	
			AM	PM	AM	PM
Route 15 Mainline	37	38	D	D	E	D
	38	39A	E	D	E	D
	39A	39B	D	D	D	D
	39B	40A	B	C	C	C
	40B	41	B	D	D	B

*Red text denotes mainline locations with unacceptable LOS.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Table 5.12: Route 7 LOS Summary

Road	From Exit	To Exit	Northbound		Southbound	
			AM	PM	AM	PM
Route 7 Mainline	2 off	2 on	C	B	A	B
	2 on	3 off	C	B	B	B
	3 off	3 on	B	B	B	B
	3 on	Grist Mill Rd	C	B	B	B

Freeway Ramps

2016 Existing Condition freeway ramp volumes for the AM and PM peak hours were modeled in HCS to determine capacity analysis results, summarized in Table 5.13 and Table 5.14. All existing freeway ramps were determined to operate at LOS D or better except for the following locations:

1. *Northbound Route 15 Exit 39A off-ramp* operates at LOS E during both the AM and PM peak hours;
2. *Northbound Route 15 Exit 40A stop-controlled on-ramp* operates at LOS E and F during the AM and PM peak hours, respectively;
3. *Southbound Route 15 Exit 40B off-ramp* operates at LOS E during the PM peak hour; and
4. *Southbound Route Exit 40B stop-controlled on-ramp* operates at LOS F during both the AM and PM peak hours.

Table 5.13: Route 15 On-/Off-Ramp LOS Summary

Roadway	Interchange	Northbound		Southbound	
		AM	PM	AM	PM
Route 15 Ramps	39A off/on	E	E	D	D
	39B off/on	C	C	C	C
	40A off	C	D	D	C
	40A on ¹	E	F	C	C
	40B off	C	D	E	C
	40B on ¹	B	D	F	F

Notes:

Stop controlled on-ramps LOS shown in bold and calculated based on approach delay.

Red text denotes mainline locations with unacceptable LOS.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Table 5.14: Route 7 On-/Off-Ramp LOS Summary

Roadway	Interchange	Northbound		Southbound	
		AM	PM	AM	PM
Route 7 Ramps	2 off	C	C	B	B
	2 on	C	C	-	-
	3 off	C	C	B	B
	3 on	C	B	B	B

5.2.3 Existing Traffic Operations Summary

A summary of existing locations that operate below acceptable levels of service (LOS D) is provided in Table 5.15. Figure 5.2 and Figure 5.3 illustrate a holistic view of LOS throughout study area corridors (including intersection, ramp, and mainline LOS) for the weekday AM and weekday PM peak hours, respectively. It should be noted that arterial LOS is also shown to provide additional context as to how segments of key arterials are operating (e.g., Main Avenue, Grist Mill Road, and New Canaan Avenue). While arterial LOS is not a metric that is typically evaluated, the information provides a better understanding of traffic operations along segments of the local roadway network.

Table 5.15: Summary of Locations that Operation Below LOS D – Existing Conditions (2016)

Analysis Element	AM Peak Hour	PM Peak Hour
Intersections and Ramp Segments	8	5
Limited Access Mainline Segments (Route 7 south of Grist Mill Road and Route 15)	2	0
Total	10	5
Notes: Locations that operate below LOS D under existing conditions are shown in red on Figure 5.2 and 5.3. Local Mainline Segments (Main Avenue and New Canaan Avenue) are not summarized in this table as arterial levels of service are not a metric that is typically evaluated.		

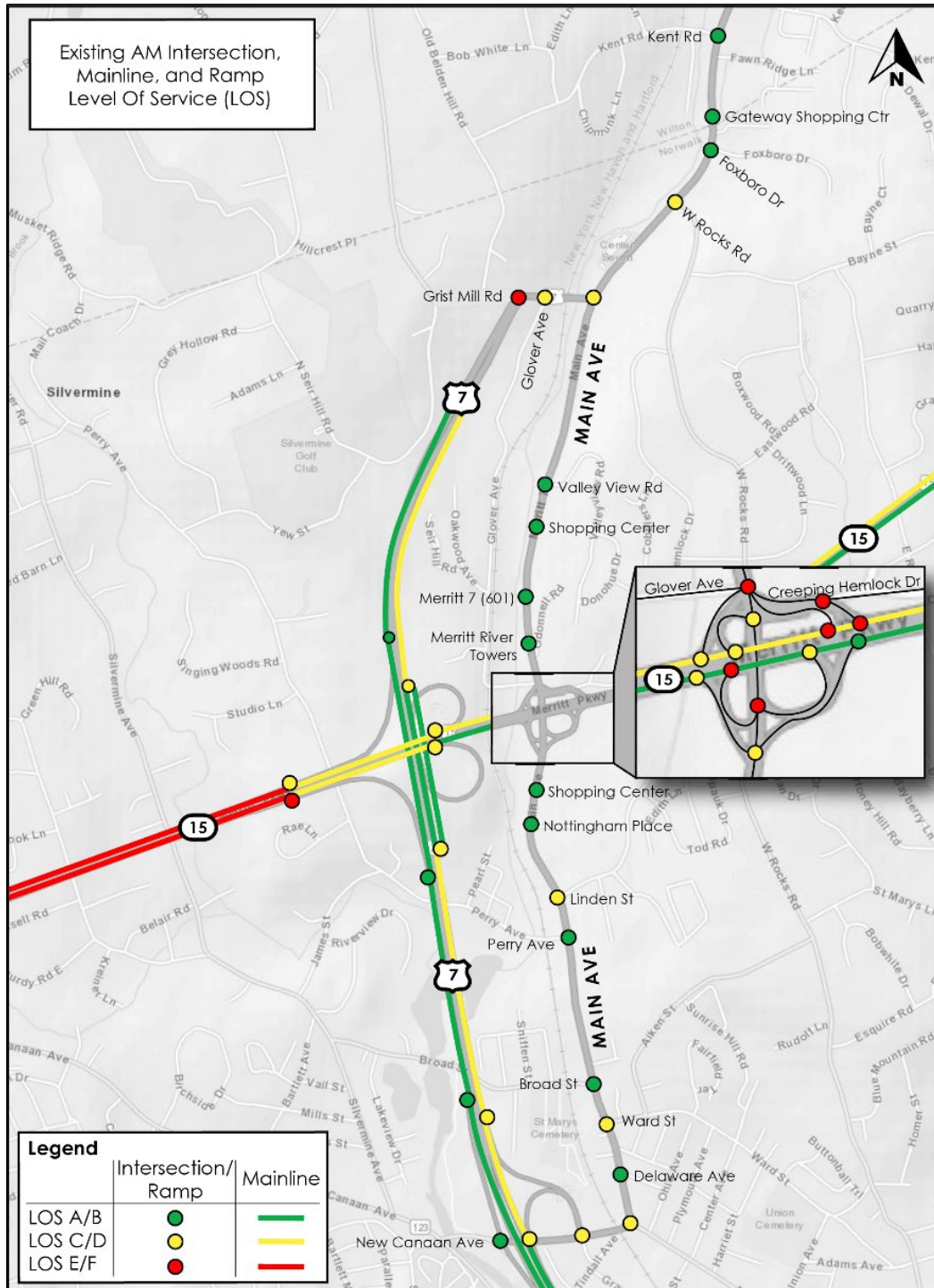


ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Traffic Operations

December 6, 2017 (Revised May 8, 2020)

Figure 5.2: Level of Service Summary – Existing (2016) Weekday AM Peak Hour



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

6.0 EXISTING ROADWAY GEOMETRY AND STRUCTURES REVIEW

This section describes the evaluation of existing roadway geometry and structures within the project study area (extents depicted in Figure 2.1). Locations which do not currently meet highway design guidelines and other pertinent criteria will be identified, as well as their potential impacts to traffic operations and safety. The evaluation centers around the Route 15 interchanges with Route 7 (Exit 39) and Main Avenue (Exit 40) as well as the Main Avenue corridor (also known as Route 719) in the vicinity of the interchange with Route 15.

The Route 15 interchanges with Route 7 and Main Avenue were constructed in 1991 and 1942, respectively. As such, these interchanges were designed to what was considered to be the appropriate design standards and design year traffic volumes at that time. Since these interchanges have been designed, traffic volumes along the Route 15 corridor have continued to increase, resulting in further increases in congestion and deteriorations in safety. Roadway geometries evaluated within this section of the memo have been compared to the latest available standards, which are established in the sources identified below:

- CTDOT, *Highway Design Manual* (2003 Edition including Revisions through February 2013) (CTHDM); and
- American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets* (6th Edition, 2011).

6.1 ROADWAY GEOMETRY REVIEW

6.1.1 Methodology

Using information gathered from several field visits; ongoing reviews of the latest record plans, photogrammetry and survey data, and inspection reports; and the latest available design criteria, geometric conditions were evaluated for the Route 15 interchanges with Route 7 and Main Avenue. This review includes an evaluation of the following design criteria:

- Posted Speed Limit,
- Lane Width,
- Shoulder Width,
- Horizontal Curvature,
- Superelevation,
- Cross Slope,
- Stopping Sight Distance,
- Maximum / Minimum Grades, and
- Vertical Clearance.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

In addition to controlling design criteria, the following operational characteristics were also reviewed:

- Interchange Spacing, and
- Highway Ramp Weaving.

Minimum design values for each controlling design criteria listed are predicated on roadway classifications and selected corresponding speed. Based on the latest functional classification maps, CTDOT classifies both Route 15 and Route 7 as a Principal Arterial – Other Expressway. For this project, the following geometric conditions for Route 7 and Route 15 were reviewed based on recommended standards from the CTDOT (CTHDM Figure 5B) for Multi-Lane Principal Urban Arterials. Table 6.1 below summarizes typical design criteria for this class of highway for comparison purposes. Further information on each design element follows.

Table 6.1: Route 7 and Route 15 Design Criteria

Design Element	Design Criteria
Corridor Travel Speed	55 mph (Posted)
Travel Lane Width	12'
Shoulder Width – Right	4' – 8'
Shoulder Width – Left	2' – 4'
Horizontal Curvature	1,065'
Superelevation (e max)	6.0%
Cross Slope (Travel Lane)	1.5 – 2.0%
Stopping Sight Distance	495'
Vertical Curve (K value -crest)	114
Vertical Curve (K value sag)	115
Maximum Grade	6%
Minimum Grade	0.5%
Vertical Clearance (Highway over Minor Arterial)	16'-3"
Vertical Clearance (Highway over non-Electrified Railroad)	20'-6"

Posted Speed Limit

The posted speed limit creates a driver expectation of safe operating speed on a highway or interchange ramp. The posted speed is evaluated for each facility based on the following factors:

- 85th percentile speed
- Roadway geometry
- Functional classification and type of area
- Type and density of roadside development
- Crash experience



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)

ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

- Pedestrian activity

Route 15 and Route 7, the two mainline roadways within the project area, have posted speed limits of 55 mph. The geometry of both mainline roadways consists of large radii or tangent sections that extend throughout the project area. There are twelve ramps connecting the Routes 7/15 and Route 15/Main Avenue interchanges with posted advisory speeds varying from 40 mph to stop conditions. Several ramps do not have posted advisory speed limits.

Lane Width

Based on the CTHDM and AASHTO, lane widths will influence the level of comfort for motorists and may vary between 9 feet and 12 feet depending on roadway functional classification and typical traffic levels along the corridor. On Route 15, where no commercial traffic is permitted, lane widths in both the northbound and southbound directions are 11 feet. On Route 7, where commercial traffic is permitted, travel lanes in both directions are 12 feet wide. In general, the ramps connecting the Routes 7/15 and Main Avenue/Route 15 interchanges have a 12-foot wide travel way.

Shoulder Width

Based on AASHTO Section 4.4.1, the general description of a shoulder is the portion of the roadway contiguous with the travel way that accommodates stopped vehicles and lateral support of subbase, base, and surface course. The “useable” width of a shoulder is the actual width that can be used when a driver makes an emergency or parking stop.

Several of the traffic related advantages of a well-designed and maintained shoulder are as follows:

- Space is provided away from the travel lanes for vehicles to stop (emergencies, flat tires, mechanical difficulties, consult maps);
- Space is provided for evasive maneuvers to avoid potential crashes or reduce their severity;
- Sight distance is improved in cut sections, thereby potentially improving safety;
- Highway capacity is improved because uniform speed is encouraged; and
- Space is provided for maintenance operations such as snow removal and storage.

For the Route 7 and Route 15 corridors, the CTHDM (Figure 5B) requires that the right shoulder be between 4 feet and 8 feet wide and the left shoulder be between 2 feet and 4 feet wide. For typical one-lane or two-lane ramp sections, the CTHDM (Section 12-4.02) requires the standard four-foot left shoulder and 10-foot right shoulder.

Horizontal Curvature

For Route 7 and Route 15 mainline roadways, Figure 5B in the CTHDM requires a minimum radius of 1,065 feet for a 55 mph design speed. Figure 8-2A in the CTHDM lists minimum radius for



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)

ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

ramps (excluding loop ramps) and indicates a minimum radius of 275 feet with a superelevation rate of 6.0 percent for a ramp with a 30 mph design speed.

Loop ramps may be designed for 25 mph speeds where mainline design speeds are greater than 50 mph. Figure 11-4D “Minimum Radii for Turning Roadways” in the CTHDM may be used to determine loop ramp minimum radii; Figure 11-4D indicates a 145-foot minimum radius with a superelevation of 6.0 percent for a loop ramp with a 25 mph design speed.

Ramp radii within the Route 7/Route 15 interchange meet the minimum criteria for horizontal curvature, whereas all ramps located within the Route 15/Main Avenue interchange do not meet the minimum horizontal curvature criteria.

Superelevation

Superelevation is the amount of cross slope or “bank” provided on a horizontal curve to help counterbalance, in combination with side friction, the centrifugal force of a vehicle traveling on a curve. There is a specific superelevation for each combination of horizontal curve and speed of travel. Based on Figure 5B “Multi Lane Principal Urban Arterials” in the CTHDM for the Route 7 and Route 15 design criteria, the maximum superelevation (e_{max}) is 6.0 percent for a 55 mph design speed. The maximum superelevation rate for interchange ramps is also 6.0 percent per CTHDM Section 12-4.

The relatively flat horizontal curves and / or tangent sections along Route 7 and Route 15 do not require superelevation. The interchange ramps connecting the Route 7 and Route 15 mainline roadways are adequately superelevated whereas the Main Avenue/Route 15 interchange ramps are not.

Cross Slope

Surface cross slopes are required for proper drainage of travel lanes on tangent sections. As per the CTHDM, cross slopes for two-lane and multi-lane highways that do not require superelevation should be between 1.5 percent and 2.0 percent sloping away from the roadway centerline. Cross slopes on ramps that do not require superelevation should be 1.5 percent.

Stopping Sight Distance

Stopping Sight Distance (SSD) is the sum of the distance traveled during a driver’s perception/reaction or break reaction time and the distance traveled while breaking to a stop. Stopping Sight Distance is evaluated based on both the vertical and horizontal roadway geometry. Fixed objects may restrict the line of sight of motorists on the inside of horizontal curves. Figure 5B in the CTHDM requires an SSD of 495 feet for a 55 mph design speed. Ramps with a design speed of 30 mph require a 200-foot SSD.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

Maximum / Minimum Grade

Longitudinal grades will significantly impact vehicular operations and safety. Maximum grades are based on functional classification, urban/rural location, and design speeds. The maximum length of an upgrade should also be considered for truck traffic. The minimum longitudinal grade for all roadway types is 0.5 percent to provide for surface drainage.

For Route 7 and Route 15, the CTHDM requires a maximum grade of six percent for a design speed of 55 mph. Figure 12-4C in the CTHDM gives maximum ramp grades ranging between six and eight percent for a 25 mph design speed, between five and seven percent for a 30 mph design speed, and between four and six percent for a 40 mph design speed.

Existing longitudinal grades on all roadways within the project area fall within the required minimum and maximum grade criteria with the exception of the Route 15 segment between Main Avenue and West Rocks Road where the grade is approximately seven percent.

Vertical Clearance

Vertical clearance is the distance above a roadway that is free of obstructions. The minimum vertical clearance for a roadway depends on its functional classification. Table 6.2 below is based on Section 9-4 of the CTHDM which summarizes the minimum vertical clearances for new bridges for various highway classifications and conditions. These minimum clearances apply to the entire roadway width. Table 6.3 summarizes existing vertical clearances for the eleven bridges within study area limits.

Table 6.2: Minimum Vertical Clearances

Roadway Type	Clearance
Freeway/Expressway/Arterial Under	16'-3"
Collector/Local Under	14'-6"
Railroad Under Highway (electrified)	22'-6"
Railroad Under Highway (non-electrified)	20'-6"
Railroad Under Freeway	23'-0"
Highway Under Sign Truss or Pedestrian Bridge	17'-3"



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.3: Existing Bridge Vertical Clearances within the Study Area

Bridge	Facility Carried	Feature Crossed	Vertical Clearance
00530A	NB Route 15	Main Avenue (SR 715)	14'-5"
00530B	SB Route 15	Main Avenue (SR 719)	13'-10"
00719	Route 15	Perry Avenue	12'-8"
00720	Route 15	Metro-North RR	21'-7"
00721	Route 15	Norwalk River	n/a
00722	Route 15	West Rocks Road	13'-3"
04155	Glover Avenue	Norwalk River	n/a
06066	Route 7 & On-Ramp	Perry Avenue	15'-4"
06067	Route 7 Off-Ramp	Perry Avenue	14'-4"
06068	Route 7 On-Ramp	Perry Avenue	15'-8"
06069	Route 15 & On/Off-Ramps	Route 7	20'-9"

6.1.2 Review of Mainline Geometrics

This section presents the review of geometric conditions along study area mainlines. It should be noted that, in all of the tables included in this section, values denoted in red indicate values that are non-standard.

Route 15 (Merritt Parkway) Corridor

The Route 15 corridor has several tangent sections with two horizontal curves extending through the project area between Perry Avenue and West Rocks Road. The first horizontal curve consists of a 2,865-foot radius, approximately 350 feet long, located between the Route 7 and Main Avenue interchanges. The second horizontal curve consists of a 1,860-foot radius, approximately 768 feet long, located between Main Avenue and West Rocks Road.

The vertical alignment of the corridor has a high point between Route 7 and Perry Avenue and a low point near the Main Avenue overpass. The longitudinal slope of the corridor is approximately seven percent between Main Avenue and West Rocks Road, approximately five percent between Route 7 and Main Avenue, and approximately two percent and flatter between Perry Avenue and Route 7.

A summary of mainline geometrics for the Route 15 corridor, including at the interchanges with Route 7 and Main Avenue, is presented in Table 6.4.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.4: Route 15 Mainline Geometry Review

Design Element	CTHDM Section	Standard	Route 15 Interchange with Route 7	Route 15 Interchange with Main Avenue
Functional Classification		Principal Arterial	-	-
Posted / Evaluated Speed	6-2.02	55 mph (suburban area)	55 mph	55 mph
Travel Lane Width	Figure 5A	12'	12'	12'
Right Shoulder Width	Figure 5A	10'	2'-10'	2'-4'
Left Shoulder Width	Figure 5A	8' (4' paved + 4' graded)	0.5'-2'	0.5'-2'
Cross Slope Travel Lane	10-1.01.02	1.5 – 2.0 %	1.5 – 2.0 %	1.5 – 2.0 %
Stopping Sight Distance	7-1.0	495	1400'	2900'
Minimum Radius (e=6.0%)	8-2.02	1065	2820'	1825'
Maximum Superelevation	8-2.02	6.0%	3.5%	5.0%
Maximum Grade	9-2.03	5.0%	5.5%	7.25%
Minimum Grade	9-2.03	0.5%	0.5%	0.5%
Vertical Clearance – Highway over Minor Arterial	9-4.0	16'-3"	-	-
Vertical Clearance – Arterial Under	9-4.0	16'-3"	-	-
Vertical Clearance – Non-Electrified RR	9-4.0	20'6"	-	-

Route 7 Corridor

The Route 7 horizontal alignment is tangent from the south project limits through the Route 15 interchange with a 3,800-foot radius located near the northern limit of the project area. Route 7 has a Collector-Distributor (C-D) Roadway that distributes traffic to and from the Route 15 on and off loop ramps.

There are no high or low points along Route 7 within the project limits. The roadway longitudinal slope ranges from approximately one percent to approximately 2.5 percent and increases from the south to north.

A summary of mainline geometrics for the Route 7 corridor, including at the interchange with Route 15, is presented in Table 6.5.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.5: Route 7 Mainline Geometry Review

Design Element	CTHDM Section	Standard	Route 7 Interchange with Route 15
Functional Classification		Principal Arterial	-
Posted / Evaluated Speed	6-2.02	55 mph (suburban area)	55 mph
Travel Lane Width	Figure 5A	12'	12'
Right Shoulder Width	Figure 5A	10'	10'
Left Shoulder Width	Figure 5A	8' (4' paved + 4' graded)	6'
Cross Slope Travel Lane	10-1.01.02	1.5 – 2.0 %	1.56%
Stopping Sight Distance	7-1.0	495	1,090'
Minimum Radius (e=6.0%)	8-2.02	1,065	3,800
Maximum Superelevation	8-2.02	6.0%	5.21%
Maximum Grade	9-2.03	5.0%	1.785%
Minimum Grade	9-2.03	0.5%	0.606%
Vertical Clearance – Highway over Minor Arterial	9-4.0	16'-3"	N/A
Vertical Clearance – Arterial Under	9-4.0	16'-3"	N/A
Vertical Clearance – Non-Electrified RR	9-4.0	20'-6"	N/A

6.1.3 Review of Interchange Ramp Geometrics

This section presents the review of geometric conditions at study area interchanges. It should be noted that, in all of the tables included in this section, values denoted in red indicate values that are non-standard.

The Route 15 project corridor has one full interchange with Main Avenue and one partial interchange with Route 7. AASHTO defines a “ramp” as any type, arrangement, and size of turning roadway that connects two or more legs at an interchange. Ramp types (e.g., direct connections, semi-direct connections, diagonals, loops, outer connections) are defined by their geometry and are generally designed for one-way traffic.

Ramp design speeds are based on their horizontal curvature, vertical alignment, and stopping sight distance. Design speeds for ramps, listed in Figure 12-4A of the CTHDM and shown below in Table 6.6, refer to the ramp proper, not the highway / ramp junction. Table 6.6 provides acceptable ranges of ramp design speed based on the design speed of the mainline. The design speed for direct connections should not be less than 40 mph while design speeds for semi-direct ramps should be between the mid and high ranges but not less than 30 mph. For mainline speeds greater than 50 mph, loop ramp design speeds should not be less than 25 mph.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

Table 6.6: Review of Ramp Design Speeds (mph)

Mainline Design Speed	45 mph	50 mph	55 mph	60 mph	65 mph	70 mph
High-Range (85%) Ramp Design Speed	40	45	50	50	55	60
Mid-Range (70%) Ramp Design Speed	35	35	40	45	45	50
Low-Range (50%) Ramp Design Speed	25	25	30	30	30	35

Minimum radius for all ramps, except loop ramps, are indicated in Figure 8-2A of the CTHDM. The minimum ramp radius is 275 feet for a 30 mph design speed, 385 feet for a 35 mph design speed, and 510 feet for a 40 mph design speed. Loop ramps follow the criteria indicated in Figure 11-4D of the CTHDM for “Minimum Radii for Turning Roadways”. Figure 11-4D indicates a loop ramp with a design speed of 25 mph requires a 145-foot radius with a 6.0 percent superelevation.

Deceleration and acceleration ramps should allow vehicles to exit or enter the highway safely and comfortably. Minimum lengths of deceleration lanes are given in F12-3A of the CTHDM and are based on the mainline design speed and the ramp design speed. These deceleration lane lengths should also be adjusted for upgrades and downgrades greater than three percent.

Minimum lengths of acceleration lanes are indicated in Figure 12-3D of the CTHDM and are also based on the mainline design speed and the ramp design speed. These acceleration lane lengths should also be adjusted for upgrades and downgrades greater than three percent.

Routes 7/15 Interchange

The Route 15 interchange with Route 7 has two loop ramps located in the northeast and southeast quadrants with connection from NB Route 7 to SB Route 15 and from NB Route 15 to NB Route 7. Two direct ramps provide connections from SB Route 15 to NB Route 7 and from NB Route 15 to SB Route 7. The Routes 7/15 interchange has two missing ramp connections: one from SB Route 15 to SB Route 7 and from NB Route 7 to NB Route 15. A summary of ramp geometrics for the Routes 7/15 interchange is presented in Table 6.7.

Main Avenue/Route 15 Interchange

Route 15 has a full cloverleaf interchange with Main Avenue. Eight ramps provide access to/from both northbound and southbound Route 15. The ramp types vary at the interchange and include loop, semi-direct, diagonal, and outer connections. Due to tight constraints within the interchange, all four loop ramps have very tight radii ranging from 50 feet to 125 feet. The four other ramps consist of outer connections adjacent to the loops ramps. A summary of ramp geometrics for the Main Avenue/Route 15 interchange is presented in Table 6.8.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.7: Routes 7/15 Interchange Ramp Geometrics Review

Design Element	CTHDM Section	CTDOT Standard	(Ramp 'SW') Route 15 SB ON	(Ramp 'NW') Route 15 SB ON	(Ramp 'WS') Route 15 NB OFF	(Ramp 'WN') Route 15 NB OFF
			From NB Route 7	From SB Route 7	To SB Route 7	To NB Route 7
Functional Classification / Ramp Type	-	-	Loop Ramp	Directional	Directional	Loop Ramp
Posted Speed Limit (Mainline)	6-2.02	55 mph	55 mph	55 mph	55 mph	55 mph
Posted (Ramps)	-	-	Not Posted	40 mph	Not Posted	25 mph
Travel Lane Width	12-4.02	12'	12'	12'	12'	12'
Right Shoulder Width	12-4.02	10'	6'	6'	6'	6'
Left Shoulder Width	12-4.02	4'	6'	6'	6'	6'
Cross Slope Travel Lane & Right Shoulder	12-4.02 Fig 12-4B	1.50%	1.80%	1.80%	6.25%	6.25%
Cross Slope Left Shoulder	12-4.02 (5) Fig 12-4B	4.00%*	1.80%	1.80%	6.25%	6.25%
Acceleration or Deceleration Length / Available Length	13-3.0	Varies by Grade (criteria / actual)	880'	400' weave	400' weave	750'
Stopping Sight Distance	7-1.0	200'	250'	365'	310'	290'
Minimum Radius (e=6.0%)	8-2.02	275'	230'	600'	550'	300'
Maximum Superelevation	8-2.02	6.0%	4.50%	5.75%	5.00%	7.50%
Maximum Grade	12-4.04	7.0%	5.53%	7.00%	6.87%	7.00%
Minimum Grade	9-2.03	0.5%	0.70%	1.92%	1.12%	0.71%
Vertical Clearance – Highway over Arterial	9-4.0	16'-3"	N/A	N/A	N/A	N/A
Vertical Clearance – Highway over Arterial	9-4.0	20'-6"	N/A	N/A	N/A	N/A

Note: *4' width of shoulder should be sloped in opposite direction of the ramp cross slope



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.8: Main Avenue/Route 15 Interchange Ramp Geometrics Review

Design Element	CTHDM Section	CTDOT Standard	Route 15 SB OFF	Route 15 SB ON	Route 15 SB OFF	Route 15 SB ON	Route 15 NB OFF	Route 15 NB ON	Route 15 NB OFF	Route 15 NB ON
			To NB Main Ave	From NB Main Ave	To SB Main Ave	From SB Main Ave	To SB Main Ave	From SB Main Ave	To NB Main Ave	From NB Main Ave
Functional Classification / Ramp Type	-	-	Outer Ramp	Loop Ramp	Loop Ramp	Outer Ramp	Outer Ramp	Loop Ramp	Loop Ramp	Outer Ramp
Posted Speed Limit (Mainline)	6-2.02	55 mph	55 mph	55 mph	55 mph	55 mph	55 mph	55 mph	55 mph	55 mph
Posted (Ramps)	-	-	25 mph	Stop Condition	Not posted	Yield Condition	25 mph	Stop Condition	25 mph	Not Posted
Travel Lane Width	12-4.02	12'	12'	12'	12'	12'	12'	12'	12'	12'
Right Shoulder Width	12-4.02	10'	10'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'
Left Shoulder Width	12-4.02	4'	4'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'	0' – 2'
Cross Slope Travel Lane & Right Shoulder	12-4.02 Fig 12-4B	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Cross Slope Left Shoulder	12-4.02 Fig 12-4B	4.05%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Acceleration or Deceleration Length / Available Length	13-3.0	Varies by Grade (criteria / actual)	100'	0'	0'	150'	100'	0'	0'	250'
Stopping Sight Distance	7-1.0	200'	215'	184'	215'	184'	215'	184'	215'	184'
Minimum Radius (e=6.0%)	8-2.02	275'	105'	50'	70'	115'	120'	60'	118'	155'
Maximum Superelevation	8-2.02	6.0%	5%	5%	6.5%	7.25%	5%	5%	5%	6.5%
Maximum Grade	12-4.04	7.0%	6.3%	5.0%	5.5%	4.0%	5.0%	5.6%	5.0%	4.6%
Minimum Grade	9-2.03	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Vertical Clearance – Highway over Arterial	9-4.0	16'-3"	16'-3"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vertical Clearance – Highway over Arterial	9-4.0	20'-6"	20'-6"	N/A	N/A	N/A	N/A	N/A	N/A	N/A



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

6.1.4 Review of Local Roadway Geometrics

This section presents the review of geometric conditions along various local roadways that interact with the Main Avenue/Route 15 interchange, specifically Main Avenue (Table 6.9), Glover Avenue (Table 6.10), and Creeping Hemlock Drive (Table 6.11). Values denoted in red indicate values that are non-standard.

Table 6.9: Main Avenue Geometrics Review

Design Element	CTHDM Section	Standard	Main Ave
Functional Classification		Minor Urban Arterial	-
Posted / Evaluated Speed	6-3.02	40 mph	40 mph
Travel Lane Width	10-1.01	11' – 12'	12'
Right Shoulder Width	10-1.02	4' - 8'	2' – 4'
Left Shoulder Width	10-1.02	2' – 4'	2' – 4'
Cross Slope Travel Lane	10-1.01.02	1.5 – 2.0 %	2%
Stopping Sight Distance	7-1.0	305'	260'
Minimum Radius (e=4.0%)	8-2.02	490'	680'
Maximum Superelevation	8-2.02	4.0%	6%
Maximum Grade	9-2.03	8.0%	3.17%
Minimum Grade	9-2.03	0.5%	0.50%
Vertical Clearance – Highway over Minor Arterial	9-4.0	16'-3"	13'-10"
Vertical Clearance – Arterial Under	9-4.0	16'-3"	n/a
Vertical Clearance – Non-Electrified RR	9-4.0	20-6"	n/a

Table 6.10: Glover Avenue Geometrics Review

Design Element	CTHDM Section	Standard	Glover Ave
Functional Classification		Minor Urban Arterial	-
Posted / Evaluated Speed	6-3.02	30 mph	30 mph
Travel Lane Width	10-1.01	11' – 12'	11'
Right Shoulder Width	10-1.02	4' - 8'	0'
Left Shoulder Width	10-1.02	2' – 4'	0'
Cross Slope Travel Lane	10-1.01.02	1.5 – 2.0 %	2%
Stopping Sight Distance	7-1.0	200'	200'
Minimum Radius (e=4.0%)	8-2.02	230'	830'
Maximum Superelevation	8-2.02	4.0%	5.1%
Maximum Grade	9-2.03	9.0%	1.7%
Minimum Grade	9-2.03	0.5%	0.50%
Vertical Clearance – Highway over Minor Arterial	9-4.0	16'-3"	n/a
Vertical Clearance – Arterial Under	9-4.0	16'-3"	n/a
Vertical Clearance – Non-Electrified RR	9-4.0	20-6"	n/a



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.11: Creeping Hemlock Drive Geometrics Review

Design Element	CTHDM Section	Standard	Creeping Hemlock Drive
Functional Classification		Urban Collector Streets	-
Posted / Evaluated Speed	6-3.02	30 mph	30 mph
Travel Lane Width	10-1.01	11' – 12'	11'
Right Shoulder Width	10-1.02	4' - 8'	0'
Left Shoulder Width	10-1.02	4' - 8'	0'
Cross Slope Travel Lane	10-1.01.02	1.5 – 2.0 %	2%
Stopping Sight Distance	7-1.0	200'	83'
Minimum Radius (e=4.0%)	8-2.02	230'	167'
Maximum Superelevation	8-2.02	4.0%	6.1%
Maximum Grade	9-2.03	11.0%	5.3%
Minimum Grade	9-2.03	0.5%	0.50%
Vertical Clearance – Highway over Minor Arterial	9-4.0	16'-3"	n/a
Vertical Clearance – Arterial Under	9-4.0	16'-3"	n/a
Vertical Clearance – Non-Electrified RR	9-4.0	20'-6"	n/a

6.2 ROADWAY STRUCTURES REVIEW

6.2.1 Methodology

The existing condition of structures within study area limits were assessed and documented utilizing the latest bridge inspection report data available from CTDOT.

General Description of Bridges

There are eleven bridges within the study area limits that are assessed in this report. These bridges carry, overpass, or underpass the Route 15 mainline, local City streets, the Norwalk River, and the Metro-North Railroad. A majority of the bridges were built either in the 1930s or in the 1990s.

General information about each bridge is presented in Table 6.12. For information on vertical clearances, please see Table 6.3.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.12: Bridge Construction, Rehabilitation, and Inspection Data

Bridge	Facility Carried	Feature Crossed	Structure Type	Bridge Length	Bridge Width	Year Construction Completed	Year Reconstruction Completed	On National Register of Historic Places (NRHP)?	Date of Latest Inspection
00530A	NB Route 15	Main Ave (SR 719)	Concrete Rigid Frame	52.0'	36.7'	1938		Yes, contributing structure within the Merritt Parkway Historic District	12/15/2016
00530B	SB Route 15	Main Ave (SR 719)	Concrete Rigid Frame	52.0'	36.7'	1938	2016	Yes, contributing structure within the Merritt Parkway Historic District	12/15/2016
00719	Route 15	Perry Avenue	Concrete Rigid Frame	33.0'	66.8'	1936		Yes	6/5/2017
00720	Route 15	Metro-North RR	Concrete Rigid Frame	37.0'	105.5'	1937		Yes	8/25/2017
00721	Route 15	Norwalk River	Concrete Arches	99.0'	158.0'	1938	1988	Yes, contributing structure within the Merritt Parkway Historic District	6/21/2016
00722*	West Rocks Road	Route 15	Steel Frame	90.0'	36.1'	1938	1986	Yes	11/13/2017
04155	Glover Avenue	Norwalk River	Masonry Arch	84.0'	34.5'	1912		No; may be eligible	7/13/2016
06066	Route 7 & On-Ramp	Perry Avenue	Prestressed Concrete Multi-Girder	109.0'	110.0'	1991		No; not eligible	12/22/2014
06067	Route 7 Off-Ramp	Perry Avenue	Prestressed Concrete Multi-Girder	97.0'	27.8'	1990		No; not eligible	6/5/2017
06068	Route 7 On-Ramp	Perry Avenue	Prestressed Concrete Multi-Girder	97.0'	27.8'	1990		No; not eligible	6/5/2017
06069	Route 15 & On/Off-Ramps	Route 7	Steel Multi-girder	212.0'	122.2'	1991		No; not eligible	8/19/2014

*Being rehabilitated under Project No. 102-356



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
December 6, 2017 (Revised May 8, 2020)

6.2.2 Existing Structural Conditions

Condition ratings established by the National Bridge Inspection Standards (NBIS) are used to describe an existing bridge compared with its conditions if in fact the bridge is new. As bridges are inspected, they are assigned condition ratings. Ratings range from a high of 9 (excellent condition) to a low of 0 (failed condition). The rating scale is summarized in Table 6.13.

Table 6.13: NBIS Rating Scale

NBIS Code	Condition Description
9	Excellent Condition
8	Very Good Condition – no problems noted
7	Good Condition – some minor problems
6	Satisfactory Condition – structural elements show minor deterioration
5	Fair Condition – all primary structural elements are sound but may have minor corrosion, cracking or chipping. May include minor erosion on bridge piers.
4	Poor Condition – advanced corrosion, deterioration, cracking or chipping. Also, significant erosion of concrete bridge piers.
3	Serious Condition – corrosion, deterioration, cracking and chipping, or erosion of concrete bridge piers have seriously affected deck, superstructure, or substructure. Local failures possible.
2	Critical Condition – advanced deterioration of deck, superstructure, or substructure. May have cracks in steel or concrete, or erosion may have removed substructure support. It may be necessary to close the bridge until corrective action is taken.
1	“Imminent” Failure Condition – major deterioration or corrosion in deck superstructure, or substructure, or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	Failed Condition – out of service and beyond corrective action.
N	Not Applicable

The NBIS rating scale is used in evaluating bridge components such as the deck, superstructure, substructure, and culvert/channel as well as in evaluating the bridge overall. Condition ratings for each bridge element along with the overall structural evaluation for each bridge within study area limits are presented in Table 6.14.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Existing Roadway Geometry and Structures Review
 December 6, 2017 (Revised May 8, 2020)

Table 6.14: Bridge Condition Ratings and Overall Structural Evaluation Summary

Bridge	Deck	Superstructure	Substructure	Channel	Deck Geometry	Structural Evaluation
00530A	N	5	6	N	2	5
00530B	N	6	7	N	2	6
00719	N	6	7	N	3	6
00720	N	5	5	N	4	5
00721	N	6	6	5	2	6
00722*	4	5	6	N	2	5
04155	N	5	5	5	2	5
06066	6	6	7	N	9	6
06067	7	6	6	N	7	6
06068	7	7	7	N	7	7
06069	7	7	7	N	7	7

*Being rehabilitated under Project No. 0102-0356



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Summary of Deficiencies

December 6, 2017 (Revised May 8, 2020)

7.0 SUMMARY OF DEFICIENCIES

This section summarizes area-wide, interchange specific, and corridor specific deficiencies that have been previously identified in earlier sections of the report.

7.1 CORRIDOR DEFICIENCIES

7.1.1 Route 15 Corridor

- Substandard left and right shoulder widths throughout the corridor.
- Substandard roadway grades throughout the corridor.
- Insufficient capacity on southbound Route 15 west of the merge with southbound Route 7.
- Insufficient capacity on northbound Route 15 west of the diverge with southbound Route 7.
- Mainline crashes attributed to roadway geometry and peak period congestion at the Main Avenue (Exit 40) interchange.

7.1.2 Route 7 Corridor

- Substandard left shoulder width throughout the corridor.
- Insufficient capacity along both northbound and southbound Route 7 approaching the intersections with Grist Mill Road, Glover Avenue, Main Avenue, West Rocks Road, and Foxboro Drive.
- Mainline crashes attributed to roadway geometry and peak period congestion at the intersections with Grist Mill Road, Glover Avenue, and Main Avenue.

7.1.3 Main Avenue Corridor

- Substandard stopping sight distance at the Route 15 bridge.
- A lack of sidewalks along either side of Main Avenue at and adjacent to the Route 15 bridge.
- No accommodations for bicycles along the corridor.
- Limited transit and rail service on or adjacent to the corridor.
- Lacking accommodations for transit along the corridor (bus stop signage, etc.).
- Insufficient capacity along both northbound and southbound Main Avenue approaching the intersection with Glover Avenue / Creeping Hemlock Drive.
- Congestion on northbound and southbound Main Avenue between Linden Street and Perry Avenue and between Ward Street and New Canaan Avenue. It should be noted that the congestion on Main Avenue just north of New Canaan Avenue contributes to the congestion on New Canaan Avenue just west of Main Avenue, both to the west and east of the at-grade crossing with the Metro-North Railroad's Danbury Branch.
- Mainline crashes attributed to roadway geometry and peak period congestion at the intersections with Grist Mill Road, Glover Avenue, and Main Avenue.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Summary of Deficiencies

December 6, 2017 (Revised May 8, 2020)

7.1.4 Glover Avenue Corridor

- No left or right shoulders between Main Avenue and the Metro-North Railroad crossing.
- Substandard superelevation along the corridor.
- Lack of sidewalks on the north side of the Glover Avenue Bridge and a lack of sidewalks leading to and from the intersection with Main Avenue.
- No accommodations for bicycles along the corridor.
- Insufficient capacity on the eastbound Glover Avenue approach to the Main Avenue intersection.

7.1.5 Creeping Hemlock Drive Corridor

- No left or right shoulders between Main Avenue and the southbound Route 15 ramps.
- Substandard stopping sight distance along the corridor.
- Substandard minimum radius along the corridor.
- Substandard superelevation along the corridor.
- Insufficient capacity on the westbound Creeping Hemlock Drive approach to the Main Avenue intersection.

7.2 ROUTES 7/15 INTERCHANGE DEFICIENCIES

- Substandard right shoulders on all ramps.
- Substandard left shoulder cross slopes on all ramps.
- Substandard acceleration/deceleration lane lengths on ramps onto Route 15.
- Substandard grades on ramps.
- Congestion on the Route 7 ramps onto southbound Route 15.

7.3 MAIN AVENUE/ROUTE 15 INTERCHANGE DEFICIENCIES

- Substandard left and right shoulder widths on all ramps except for the southbound Route 15 off-ramp to northbound Main Avenue and the southbound Route 15 on-ramp from Creeping Hemlock Drive.
- Substandard radii on all ramps.
- Substandard superelevation on the southbound Route 15 off-ramp to northbound Main Avenue and the northbound Route 15 on-ramp from northbound Main Avenue/Creeping Hemlock Drive.
- Substandard acceleration and deceleration lanes on all ramps.
- Congestion on two substandard, stop-controlled on-ramps – southbound Main Avenue to northbound Route 15 and Creeping Hemlock Drive to southbound Route 15.
- Insufficient capacity and heavy congestion on the southbound Route 15 off-ramp to Creeping Hemlock Drive.
- Poor sight distance on southbound Route 15 approaching the off-ramp to Creeping Hemlock Drive causes abrupt vehicular stops and congestion on both the ramp and the mainline.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

8.0 FUTURE (2045) TRANSPORTATION CONDITIONS

The future transportation conditions analysis evaluates traffic volumes, traffic operations, and safety on the State and local roadway network forecasted for a design year of 2045. The design year represents a period of 20 years after the projected year of construction completion and was chosen as the future analysis year to evaluate impacts to traffic operations. Conditions were evaluated under three reasonable alternatives within the EA/EIE document:

- No Build Alternative – This alternative represents transportation conditions without the proposed improvements to the Route 15 interchanges with Route 7 and Main Avenue;
- Alternative 21D – This alternative represents transportation conditions with proposed improvements to the Route 15 interchanges with Route 7 and Main Avenue under Alternative 21D; and
- Alternative 26 – This alternative represents transportation conditions with proposed improvements to the Route 15 interchanges with Route 7 and Main Avenue under Alternative 26.

Refer to Chapter 2 of the EA/EIE document for further information on each of the alternatives.

8.1 FUTURE (2045) TRAFFIC VOLUMES

8.1.1 Methodology

Future year traffic volumes (for the No Build Alternative and both Build alternatives) were provided by CTDOT. Volumes were developed using CTDOT's travel demand model (TDM), which is a traditional four-step model that uses trip generation, trip distribution, mode choice, and travel assignment to forecast corridor and intersection daily and peak hour traffic volumes.

Background Traffic Growth

The future traffic volumes include background traffic growth, which is reflective of population and employment growth in the study area, and planned developments in vicinity of the study area. The following planned developments were considered in the development of future year traffic volumes:

- **Grist Mill Village (150-174 Glover Avenue)** – Grist Mill Village is a multi-phase residential development on three parcels of land along Glover Avenue north of the Merritt 7 Metro-North Railroad Station. As directed by CTDOT, the future conditions traffic analysis only includes the first phase of Grist Mill Village, which consists of 710 residential apartment units and 1,189 parking spaces. The development is under construction as of the date of this report.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

- **The Village Commercial Development (272-280 Main Avenue)** – The Village is a commercial retail development on multiple parcels of land along the east side of Main Avenue south of Perry Avenue. The development will provide approximately 100,000 square feet (SF) of new retail development and 380 parking spaces. The development has been approved by the City of Norwalk but is still undergoing review with CTDOT as of the date of this report.
- **SoNo Collection Mall** – The SoNo Collection Mall is a 1,000,000 SF mixed-use retail shopping center development adjacent to the I-95 / Route 7 interchange in South Norwalk. The shopping center also provides a new garage with over 3,000 parking spaces. Construction for this development was completed and the development was opened to the public in October 2019.

Future traffic volumes do not incorporate the following project, which, as of the date of this document, is not funded or scheduled to be completed prior to the completion of the Routes 7/15 Interchange project:

- **Grist Mill Road, Glover Avenue, and Route 7 Connector Improvements** – This project would rebuild the existing three-way T-intersection of Grist Mill Road at the Route 7 Connector into a four-way intersection with Glover Avenue.

8.1.2 Traffic Volume Summary

CTDOT provided future year daily and peak hour traffic volumes for the Route 7 and Route 15 corridors (mainline and on- and off-ramps) and for key intersections along the New Canaan Avenue (Route 123) and Main Avenue corridors. Weekday morning and weekday evening peak hour volumes were used to evaluate corridor and intersection operating conditions given the projected travel demand in the 2045 design year for each of the three alternatives.

Projected 2045 weekday AM and weekday PM peak hour volumes under the No Build Alternative, Alternative 21D, and Alternative 26 are provided in Attachment D. Detailed analyses of study area corridors and intersections are provided in subsequent sections of this report.

Table 8-1 compares forecasted average annual percentage traffic growth (or change; AAPTG) for each of the three alternatives. Generally, data from CTDOT's travel demand model projects that daily travel demand would increase by less than one (1) percent per year for the 30-year analysis period. Both Alternative 21D and Alternative 26 are projected to result in slight decreases of average daily traffic along portions of the Main Avenue corridor as more traffic is projected to use the Route 7 corridor under both alternatives (when compared to the No Build Alternative).



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-1: Average Daily Traffic Volume Comparison by Corridor

Corridor (Segment)	Existing ADT (2016)	No Build Alternative (2045)		Alternative 21D (2045)		Alternative 26 (2045)	
		ADT	AAPTG	ADT	AAPTG	ADT	AAPTG
Route 7 (north of Route 15 Interchange)	41,000	50,400	0.7%	50,400	0.7%	50,400	0.7%
Route 7 (south of Route 15 Interchange)	45,200	52,800	0.5%	55,600	0.7%	55,600	0.7%
Route 15 (west of Route 7 Interchange)	71,800	76,400	0.2%	76,400	0.2%	76,400	0.2%
Route 15 (east of Main Avenue Interchange)	54,600	65,700	0.6%	65,700	0.6%	65,700	0.6%
Main Avenue (north of Grist Mill Road)	41,600	50,000	0.6%	50,000	0.6%	50,000	0.6%
Main Avenue (north of Route 15 Interchange)	17,000	20,100	0.6%	18,600	0.3%	18,600	0.3%
Main Avenue (south of Route 15 Interchange)	25,200	33,100	0.9%	27,600	0.3%	27,600	0.3%

It is also important to understand potential changes to peak hour traffic as a result of the project. Table 8-2 compares peak hour traffic growth along segments of corridors within the study area. The project is not expected to change peak hour demand on either direction of Route 15 at the study area limits. Most traffic changes are expected along Main Avenue and Route 7 as vehicles shift from Main Avenue to portions of Route 7 due to the new direct connections provided under either Alternative 21D or Alternative 26.

Table 8-2: Weekday AM and Weekday PM Traffic Volume Comparison – No Build Alternative vs. Alternative 21D and No Build vs. Alternative 26

No Build Alternative (2045) vs. Alternative 21D (2045)						
Corridor (Segment)	AM Peak			PM Peak		
	No Build	Alt. 21D	% Diff.	No Build	Alt. 21D	% Diff.
Route 7 (north of Route 15 Interchange)	5160	5180	0.4%	4830	4780	-1.0%
Route 7 (south of Route 15 Interchange)	5500	6010	9.3%	5420	5880	8.5%
Route 15 (west of Route 7 Interchange)	8560	8560	NC	8980	8980	NC
Route 15 (east of Main Avenue Interchange)	6060	6060	NC	6180	6180	NC
Main Avenue (north of Grist Mill Road)	4000	4000	NC	3980	3980	NC
Main Avenue (north of Route 15 Interchange)	2090	1930	-7.7%	2170	2080	-4.1%
Main Avenue (south of Route 15 Interchange)	2330	1900	-18.5%	3150	2730	-13.3%
Note: "NC" indicates No Change between No Build Alternative and Alternative 21D.						



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

No Build Alternative (2045) vs. Alternative 26 (2045)						
Corridor (Segment)	AM Peak			PM Peak		
	No Build	Alt. 26	% Diff.	No Build	Alt. 26	% Diff.
Route 7 (north of Route 15 Interchange)	5160	5180	0.4%	4830	4780	-1.0%
Route 7 (south of Route 15 Interchange)	5500	6010	9.3%	5420	5880	8.5%
Route 15 (west of Route 7 Interchange)	8560	8560	NC	8980	8980	NC
Route 15 (east of Main Avenue Interchange)	6060	6060	NC	6180	6180	NC
Main Avenue (north of Grist Mill Road)	4000	4000	NC	3980	3980	NC
Main Avenue (north of Route 15 Interchange)	2090	1930	-7.7%	2170	2080	-4.1%
Main Avenue (south of Route 15 Interchange)	2330	1900	-18.5%	3150	2730	-13.3%
Note: "NC" indicates No Change between No Build Alternative and Alternative 26.						

8.2 FUTURE (2045) TRAFFIC OPERATIONS

Future traffic operations have been evaluated for the design year of 2045 using the future traffic volumes identified in Section 8.1. Refer to Chapter 5 of this Report for further information on existing traffic operations.

8.2.1 VISSIM Corridor Analysis

A VISSIM microsimulation model of the Routes 7/15 Interchange and adjoining roadways was developed to evaluate traffic under various roadway improvement alternatives. The VISSIM model was used as one of several tools to evaluate traffic. Microsimulation models simulate traffic on an individual car-by-car basis. This approach differs from models such as Highway Capacity Software (HCS) or Synchro models, which are macroscopic. The VISSIM model is meant to be a companion to the HCS and Synchro models. The remainder of this subsection summarizes VISSIM simulation results for the 2045 AM and PM peak hours. Existing conditions results are also provided to give a better understanding of how conditions change from the base year (2016) to the design year (2045).

The following subsections summarize the results of the future year VISSIM corridor analyses. Results are summarized for Vehicle Miles of Travel (VMT), Vehicle Hours of Travel (VHT), Average Speed, and Travel Time.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Vehicle Miles of Travel (VMT)

VMT is a metric used to measure the amount of travel for all vehicles in a specific corridor over a given period of time. It is expected that peak hour VMT will increase in 2045 when compared to existing conditions, primarily due to projected increases in traffic. A comparison of VMT for existing conditions and each of the three alternatives – No Build Alternative, Alternative 21D, and Alternative 26 – is presented in Table 8-3. Overall, total VMT for the study area is projected to remain comparable under either Build Alternative. Modest decreases are projected for the Main Avenue corridor between Grist Mill Road and Route 123 under either Build Alternative, primarily due to the removal of through traffic that uses the Main Avenue corridor (under the No Build Alternative) to complete the missing movements between Route 7 and Route 15.

Table 8-3: VMT Comparison – 2016 Existing Conditions vs. 2045 Alternatives

Mainline	Segment Start	Segment Finish	AM Peak Hour VMT (Vehicle Miles)				PM Peak Hour VMT (Vehicle Miles)			
			2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26
NB Route 15	Route 123	East Rocks Road	6,268	6,140	5,458	5,761	6,558	6,513	6,140	6,503
SB Route 15	East Rocks Road	Route 123	6,492	6,404	6,428	6,206	7,311	7,593	7,150	7,333
NB Main Ave	Route 123	Grist Mill Road	1,784	2,055	1,959	1,531	1,436	1,980	1,220	1,009
SB Main Ave	Grist Mill Road	Route 123	1,292	1,380	991	990	2,137	2,038	1,998	1,899
NB Route 7	Route 123	Grist Mill Road	7,229	7,714	8,000	8,258	6,698	7,517	8,073	8,098
SB Route 7	Grist Mill Road	Route 123	5,366	5,543	5,350	5,749	5,553	5,730	5,752	6,153
TOTAL VMT			28,431	29,236	28,185	28,494	29,693	31,371	30,332	30,994



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Vehicle Hours of Travel (VHT)

VHT is a metric that is calculated using speed and VMT data to measure the overall quality of service that a corridor provides. Similar to VMT, it is expected that VHT will increase in 2045 when compared to existing conditions and that, again, is attributed to projected increased levels of traffic. A comparison of VHT for existing conditions and each of the three alternatives – No Build Alternative, Alternative 21D, and Alternative 26 – is presented in Table 8-4. Total projected VHT for the study area is comparable under either Build Alternative. Modest decreases are projected for the Main Avenue corridor due to the completion of the Routes 7/15 Interchange.

Table 8-4: VHT Comparison – 2016 Existing Conditions vs. 2045 Alternatives

Mainline	Segment Start	Segment Finish	AM Peak Hour VHT (Vehicle Hours)				PM Peak Hour VHT (Vehicle Hours)			
			2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26
NB Route 15	Route 123	East Rocks Road	223	262	239	223	545	588	675	591
SB Route 15	East Rocks Road	Route 123	674	689	701	749	129	432	359	302
NB Main Ave	Route 123	Grist Mill Road	72	109	87	88	61	101	74	94
SB Main Ave	Grist Mill Road	Route 123	52	110	43	45	136	174	133	137
NB Route 7	Route 123	Grist Mill Road	199	531	175	205	143	336	196	258
SB Route 7	Grist Mill Road	Route 123	93	95	91	107	93	101	101	135
Total VHT			1,313	1,798	1,337	1,417	1,106	1,731	1,538	1,516



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Average Speed

A comparison of average speed (in miles per hour, mph) for existing conditions and each of the three alternatives – No Build Alternative, Alternative 21D, and Alternative 26 – is presented in Table 8-5 below. Average speeds are projected to decrease from 2016 to 2045 due to the projected increases in traffic. Forecasted average speeds are generally projected to be higher for both Build alternatives when compared to the No Build Alternative, reflecting improved mobility under both Build alternatives.

Table 8-5: Average Speed Comparison – 2016 Existing Conditions vs. 2045 Alternatives

Mainline	Segment Start	Segment Finish	AM Peak Hour Speeds (mph)				PM Peak Hour Speeds (mph)			
			2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26
NB Route 15	Route 123	East Rocks Road	31.9	26.1	27.9	30.0	11.7	10.7	8.5	10.5
SB Route 15	East Rocks Road	Route 123	9.1	8.6	8.2	7.4	57.3	14.8	16.4	20.7
NB Main Ave	Route 123	Grist Mill Road	25.3	19.7	22.9	19.7	23.9	20.3	19.6	13.8
SB Main Ave	Grist Mill Road	Route 123	25.0	14.6	24.3	22.7	17.3	13.1	17.2	16.0
NB Route 7	Route 123	Grist Mill Road	36.6	13.1	45.3	37.1	51.0	17.1	40.8	27.6
SB Route 7	Grist Mill Road	Route 123	57.8	57.9	58.5	52.2	59.4	56.6	56.7	44.5



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Travel Time

Comparisons of travel times (in minutes) for existing conditions and each of the three alternatives – No Build Alternative, Alternative 21D, and Alternative 26 – are presented in Table 8-6 for each of the study area corridors. Travel times are projected to increase from 2016 to 2045 due to the projected increases in traffic. Forecasted travel times are generally projected to be lower for both Build alternatives when compared to the No Build Alternative. Some corridors are expected to see slight increases in travel times with the Build alternatives. Travel time along northbound Main Avenue is expected to increase during the PM peak hour under both Build alternatives because of change in intersection spacing and an increase in weaving south of the Route 15 interchange. Travel time along southbound Route 15 during the AM peak hour and northbound Route 15 during the PM peak hour would increase slightly under the Build alternatives. This increase is attributable to improved traffic flow in and around the Route 7 and Main Avenue interchanges as a direct result of implementation of these alternatives. Under the No Build Alternative, congestion around these interchanges along Route 15 prevents traffic from entering the model.

Table 8-6: Travel Time Comparison – 2016 Existing Conditions vs. 2045 Alternatives

Mainline	Segment Start	Segment Finish	AM Peak Hour Travel Times (minutes)				PM Peak Hour Travel Times (minutes)			
			2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26
NB Route 15	Route 123	East Rocks Road	5.0	6.1	5.7	5.3	13.6	15.0	18.7	15.2
SB Route 15	East Rocks Road	Route 123	17.2	18.2	19.1	21.5	2.7	10.7	9.6	7.6
NB Main Ave	Route 123	Grist Mill Road	4.8	6.2	5.3	6.2	5.1	6.0	6.2	8.8
SB Main Ave	Grist Mill Road	Route 123	4.9	8.4	5.0	5.4	7.0	9.3	7.1	7.6
NB Route 7	Route 123	Grist Mill Road	5.8	16.2	5.2	4.7	4.6	10.2	5.7	6.3
SB Route 7	Grist Mill Road	Route 123	3.0	3.0	3.0	3.3	2.9	3.1	3.1	3.9

The presence of operational constraints limits the amount of traffic that can reach downstream segments along Route 15 (south/west of the Routes 7/15 Interchange), and as a result these downstream segments experience less congestion. While this reduction in congestion may appear to indicate that congestion is lower under the No Build Alternative, the congestion is instead greater, but built-up along upstream segments outside of the modeled area. A review of travel speeds at the edge of the modeled area along Route 15 demonstrates that travel speeds on southbound Route 15 during the AM peak hour and northbound Route 15 during the PM peak hour are higher under the Build alternatives than speeds expected under the No Build



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

Alternative. Table 8-7 compares travel speeds along Route 15 at the edge of the modeled areas (southbound direction during the AM peak hour and northbound direction during the PM peak hour) for existing conditions and each of the three alternatives.

Table 8-7: Average Speed Comparison – 2016 Existing Conditions vs. 2045 Alternatives

Mainline Segment	AM Peak Hour Speeds (mph) Southbound Direction				PM Peak Hour Speeds (mph) Northbound Direction			
	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD ALT.	2045 ALT. 21D	2045 ALT. 26
Route 15, North of East Rocks Road	11.9	7.4	9.6	7.7	9.7	9.1	9.7	10.8

8.2.2 Synchro and HCS Capacity Analyses

Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed for study area intersections using Synchro 10 traffic analysis software, which conforms to the Highway Capacity Manual (HCM). Highway Capacity Software (HCS) Version 6.5, which also conforms to the HCM, was used to evaluate traffic conditions on limited access facilities. Future condition capacity analyses are further summarized in this section of the report. Refer to Chapter 5 of this report for further information on existing condition capacity analyses.

It should be noted that capacity analyses were also performed for the 2025 (Estimated Time of Completion) analysis year. Those results are also provided herein. 2016 LOS results are also provided herein to show the projected degradations to LOS given projected increases in traffic volumes from the base year (2016) to either analysis year.

Synchro Analysis Results

All intersections within the study area are projected to operate at LOS D or better in 2045 under the Build condition (that is, under either Build Alternative) except for the following:

1. *Main Avenue at West Rocks Road* is projected to operate at LOS E and F during the AM and PM peak hour, respectively, under the No Build Alternative. The intersection will continue to operate at LOS E and F during the AM and PM peak hours, respectively, under either Build Alternative. The project will not generate additional traffic to the intersection and no impact to traffic operations is expected.
2. *Main Avenue at Grist Mill Road* is projected to operate at LOS E and F during the AM and PM peak hour, respectively, under the No Build Alternative. The intersection will continue to respectively operate at LOS E and F during the AM and PM peak hours under either Build Alternative. There is expected to be a negligible impact on traffic operating conditions.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

3. *Route 7 at Grist Mill Road* is projected to operate at LOS F during both peak hours under the No Build Alternative and either Build Alternative. Both alternatives are projected to slightly reduce delay at the intersection compared to the No Build Alternative (albeit not enough to improve the overall LOS).
4. *Grand Street/Route 7 NB Off-Ramp at Route 123* is projected to operate at LOS E during both peak hours under either Build Alternative. This is a slight improvement as the intersection is projected to operate at LOS F under the No Build Alternative.

The following intersections are projected to operate worse than LOS D under the 2045 No Build Alternative and are improved by either Build Alternative:

1. *Main Avenue at Glover Avenue / Creeping Hemlock Drive* is projected to operate at LOS F during the AM and PM peak hours. Under either Build Alternative, the intersection is projected to improve to LOS D during the AM and PM peak hours.
2. *Southbound Route 15 Off-Ramp at Creeping Hemlock Drive* is projected to operate at LOS F during the AM and PM peak hours. Under either Build Alternative, the intersection is projected to improve to LOS B and LOS A during the AM and PM peak hours, respectively.
3. *Main Avenue at Perry Avenue* is projected to operate at LOS E during the PM peak hour. Under either Build Alternative, the intersection is projected to improve to LOS C (PM peak hour).
4. *Main Avenue at Ward Street* is projected to operate at LOS E during the PM peak hour. Under either Build Alternative, the intersection is projected to improve to LOS C (PM peak hour).
5. *Grand Street/Northbound Route 7 On/Off Ramps at Route 123* is projected to operate at LOS F during the AM and PM peak hours. Under either Build Alternative, the intersection is projected to improve to LOS E during the AM and PM peak hours.
6. *Route 123 at Main Avenue* is projected to operate at LOS E during the AM peak hour. Under either Build Alternative, the intersection is projected to improve to LOS D (AM peak hour).
7. *Southbound Route 7 On/Off Ramps at Route 123* is projected to operate at LOS F during the AM and PM peak hours. Under either Build Alternative, the intersection is projected to improve to LOS B and LOS D during the AM and PM peak hours, respectively.

Either Build Alternative will eliminate the intersection of *NB Route 15 Off-Ramp at NB Main Avenue / On-Ramp at SB Main Avenue*, which operates below LOS D under the No Build Alternative in 2045. Peak hour Synchro analysis results are summarized in Table 8-8 and Table 8-9.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-8: AM Peak Hour Intersection LOS Summary

Intersection	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Main Ave at Kent Rd	B	B	B	B	C	C	C
Main Ave at Gateway Shopping Ctr	A	A	A	A	A	A	A
Main Ave at Foxboro Dr	A	A	A	A	A	A	A
Main Ave at West Rocks Rd	C	D	D	D	E	E	E
Main Ave at Grist Mill Rd	C	D	D	D	E	E	E
Glover Ave at Grist Mill Rd	C	D	D	D	D	D	D
Route 7 at Grist Mill Rd	F	F	F	F	F	F	F
Main Avenue at Valley View Road/Merritt 7 (201/301)	B	B	B	B	B	B	B
Main Avenue at Merritt 7 (401/501)/Shopping Center	A	A	A	A	A	A	A
Main Avenue at Merritt 7 (601)	A	A	A	A	A	A	A
Main Avenue at Merritt River Towers (801/901)	A	A	A	A	A	A	A
Glover Ave/Creeping Hemlock Dr at Main Ave	E	F	C	C	F	D	D
SB Route 15 Off-Ramp to Creeping Hemlock Drive	F	F	B	B	F	B	B
Main Ave at SB Route 15 Off-Ramp	C	D	-	-	E	-	-
Main Ave at New Ramp D (to SB Route 15 and NB/SB Route 7)	-	-	A	A	-	A	A
NB Route 15 Off-Ramp at NB Main Ave and On-Ramp at SB Main Ave	F	F	-	-	F	-	-
NB Route 15 Off-Ramp at SB Main Ave and On-Ramp at NB Main Ave	C	C	-	-	D	-	-
Main Ave at New Ramp SE (from NB/SB Route 7 and NB Route 15)	-	-	B	B	-	B	B
Main Ave at Merritt View/Main Ave Shopping Center	B	B	B	A	B	B	A
Main Ave at Nottingham Place	C	C	D	D	C	D	D
Main Ave at Linden St	C	C	D	D	D	D	D
Main Ave at Perry Ave	B	B	B	B	B	B	B
Main Ave at Broad St	A	B	A	A	C	B	B
Main Ave at Ward St	C	C	C	C	D	C	C
Main Avenue at Delaware Avenue/Shopping Center	A	A	A	A	A	A	A
Route 123 at Main Ave	C	D	C	C	E	D	D
Grand St/Route 7 NB Off-Ramp at Route 123	D	F	D	D	F	E	E
SB Route 7 On/Off Ramps at Route 123	B	D	B	B	F	B	B
Route 7 at SB Route 15 Ramps	-	-	-	B	-	-	C
Route 7 at NB Route 15 Ramps	-	-	-	D	-	-	D

Notes: Red text denotes location with unacceptable LOS. "-" indicates feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-9: PM Peak Hour Intersection LOS Summary

Intersection	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Main Ave at Kent Rd	B	B	B	B	C	C	C
Main Ave at Gateway Shopping Ctr	B	B	B	B	C	C	C
Main Ave at Foxboro Dr	A	B	B	B	C	C	C
Main Ave at West Rocks Rd	E	E	E	E	F	F	F
Main Ave at Grist Mill Rd	D	D	E	E	F	F	F
Glover Ave at Grist Mill Rd	C	D	D	D	D	D	D
Route 7 at Grist Mill Rd	E	F	E	E	F	F	F
Main Avenue at Valley View Road/Merritt 7 (201/301)	B	B	B	B	B	B	B
Main Avenue at Merritt 7 (401/501)/Shopping Center	B	B	B	B	B	B	B
Main Avenue at Merritt 7 (601)	B	B	C	C	B	C	C
Main Avenue at Merritt River Towers (801/901)	B	B	B	B	B	B	B
Glover Ave/Creeping Hemlock Dr at Main Ave	D	E	C	C	F	D	D
SB Route 15 Off-Ramp to Creeping Hemlock Drive	C	E	A	A	F	A	A
Main Ave at SB Route 15 Off-Ramp	B	C	-	-	C	-	-
Main Ave at New Ramp D (to SB Route 15 and NB/SB Route 7)	-	-	A	A	-	B	B
NB Route 15 Off-Ramp at NB Main Ave and On-Ramp at SB Main Ave	B	B	-	-	B	-	-
NB Route 15 Off-Ramp at SB Main Ave and On-Ramp at NB Main Ave	B	B	-	-	C	-	-
Main Ave at New Ramp SE (from NB/SB Route 7 and NB Route 15)	-	-	B	B	-	B	C
Main Ave at Merritt View/Main Ave Shopping Center	C	C	C	C	D	C	C
Main Ave at Nottingham Place	C	C	C	C	C	C	C
Main Ave at Linden St	B	C	C	C	D	C	C
Main Ave at Perry Ave	B	D	C	C	E	C	C
Main Ave at Broad St	B	C	B	B	D	C	C
Main Ave at Ward St	B	D	C	C	E	C	C
Main Avenue at Delaware Avenue/Shopping Center	A	A	A	A	A	A	A
Route 123 at Main Ave	B	D	B	B	D	C	C
Grand St/Route 7 NB Off-Ramp at Route 123	C	E	C	C	F	E	E
SB Route 7 On/Off Ramps at Route 123	B	E	C	C	F	D	D
Route 7 at SB Route 15 Ramps	-	-	-	C	-	-	C
Route 7 at NB Route 15 Ramps	-	-	-	C	-	-	C

Notes: Red text denotes location with unacceptable LOS. "-" indicates feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Future year traffic volumes along study area arterials were also modeled in Synchro 10. Detailed arterial capacity analysis results along Main Ave, Grist Mill Rd, Route 123, and Route 7 (Alternative 26 only) can be found in Attachment E and are represented in the LOS figures presented later in this chapter. In Table 8-10 and Table 8-11, arterial results are shown for the segment of Main Ave which has proposed geometric changes under the Build alternatives.

It is important to note that the arterial LOS information is provided as a supplemental reference to provide insight into traffic operations along local roadway segments. Intersection LOS is the core metric identified under NEPA/CEPA guidelines to assess traffic impacts along the local roadway network; all Main Avenue intersections in the vicinity of the Route 15/Main Avenue interchange are projected to operate at overall acceptable levels of service.

Table 8-10: AM Peak Hour Main Ave Arterial LOS Summary

Corridor	Cross Street	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
NB Main Ave	Merritt View/Main Ave Shopping Center	B	C	C	C	C	C	C
	New Ramps from NB/SB Route 7 & to NB Route 15	-	-	F	F	-	F	F
	New Ramp to NB/SB Route 7 & SB Route 15	-	-	C	C	-	C	C
	Glover Ave/Creeping Hemlock Dr	F	F	F	F	F	F	F
	Merritt River Towers (801/901)	C	C	C	C	C	C	C
SB Main Ave	Merritt River Towers (801/901)	C	C	C	C	C	C	C
	Glover Ave/Creeping Hemlock Dr	E	E	F	F	E	F	F
	New Ramp to NB/SB Route 7 & SB Route 15	-	-	C	C	-	C	C
	New Ramps from NB/SB Route 7 & to NB Route 15	-	-	E	E	-	E	E
	Merritt View/Main Ave Shopping Center	C	D	E	E	D	E	E
Notes: Red text denotes location with unacceptable LOS. "-" indicates feature does not exist in the alternative.								



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-11: PM Peak Hour Main Ave Arterial LOS Summary

Corridor	Cross Street	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
NB Main Ave	Merritt View/Main Ave Shopping Center	B	C	C	C	C	C	C
	New Ramps from NB/SB Route 7 & to NB Route 15	-	-	F	F	-	F	F
	New Ramp to NB/SB Route 7 & SB Route 15	-	-	C	C	-	C	C
	Glover Ave/Creeping Hemlock Dr	F	F	F	F	F	F	F
	Merritt River Towers (801/901)	C	C	C	C	C	C	C
SB Main Ave	Merritt River Towers (801/901)	C	C	C	C	C	C	C
	Glover Ave/Creeping Hemlock Dr	E	E	F	F	E	F	F
	New Ramp to NB/SB Route 7 & SB Route 15	-	-	C	C	-	C	C
	New Ramps from NB/SB Route 7 & to NB Route 15	-	-	E	E	-	E	E
	Merritt View/Main Ave Shopping Center	C	D	E	E	D	E	E
Notes: Red text denotes locations with unacceptable LOS. “-” Indicates the feature does not exist in the alternative.								

HCS Analysis Results

As previously mentioned, capacity analyses were also performed for the 2025 (Estimated Time of Completion) analysis year. Those results are also provided herein. 2016 LOS results are also provided herein to show the projected degradations to LOS given projected increases in traffic volumes from the base year (2016) to either analysis year.

All freeway segments are projected to operate at LOS D or better in 2045 under the Build condition (that is, under either Build Alternative) except for the following:

1. *Northbound Route 15 Mainline South of Study Area* is projected to operate at LOS F during both peak hours under either Build Alternative. There is no degradation in LOS as this segment is projected to operate at LOS F under the No Build Alternative.
2. *Northbound Route 15 Off-Ramp to SB Route 7 and/or Main Avenue* is projected to operate at LOS F during both peak hours under either Build Alternative. There is no degradation in LOS as this segment is projected to operate at LOS F under the No Build Alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

3. *Northbound Route 15 Mainline North of Study Area* is projected to operate at LOS E under Alternate 21D during the AM peak hour. There is no degradation in LOS as this segment is projected to operate at LOS E under the No Build Alternative.
4. *Southbound Route 15 Mainline North of the Study Area* is projected to operate at LOS E under either Build Alternative during the PM peak hour. There is no degradation in LOS as this segment is projected to operate at LOS E under the No Build Alternative.
5. *Southbound Route 15 Off-Ramp to Creeping Hemlock Dr* is projected to operate at LOS E during the AM peak hour under either Build Alternative. There is no degradation in LOS as this off-ramp is projected to operate at LOS E under the No Build Alternative.
6. *Southbound Route 15 On-ramp from SB Route 7 (and Main Ave in the Build alternatives)* is projected to operate at LOS F during both peak hours under the No Build Alternative. This segment is projected to continue to operate at LOS F during the AM peak hour and improve to LOS E during the PM peak hour under either Build Alternative.
7. *Southbound Route 15 Mainline South of the Study Area* is projected to continue to operate at LOS F and LOS E during the AM and PM peak hours, respectively. There is no degradation in LOS as this segment is projected to operate at the same LOS under the No Build Alternative.

The following segments are projected to operate worse than LOS D under the 2045 No Build Alternative and are improved by either Build Alternative:

1. *Route 15 On-Ramp from NB Main Avenue* is projected to operate at LOS E during the PM peak hour. Under either Build Alternative, the segment is projected to improve to LOS D in the PM peak hour.
2. *Route 15 NB Mainline North of the Study Area* is projected to operate at LOS E during the PM peak hour. Under Alternative 21D, the segment is projected to remain at LOS E during the PM peak hour. Under Alternative 26, the segment is projected to improve to LOS D during the PM peak hour. The slight improvement for this segment under Alternative 26 is due to the fact that there is a single off-ramp and single on-ramp under Alternative 26; under Alternative 21D, there are two adjacent on-ramps (one from Route 7 and one from Main Avenue) which result in a slight increase in the density of the ramp area.

Either Build Alternative will eliminate the following stop-controlled on-ramps which are projected to operate below LOS D under the No Build Alternative in 2045:

1. *NB Route 15 On-Ramp from SB Main Avenue*, and
2. *SB Route 15 On-Ramp from Creeping Hemlock Drive*.

Future year peak hour mainline and ramp HCS results are summarized in Table 8-12 through Table 8-19.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-12: AM Peak Hour Northbound Route 15 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 15 NB Mainline	Mainline South of Study Area	E	E	E	E	F	F	F
	Off-Ramp Existing/No Build: to SB Route 7 Alt 21D: to SB Route 7 & Main Ave Alt 26: to NB/SB Route 7 & Main Ave	E	E	D	E	F	F	F
	Mainline between adjacent ramps	D	D	B	C	D	C	C
	Off-Ramp to NB Route 7	C	C	B	-	D	B	-
	Off-Ramp to Main Ave	-	-	-	C	-	-	C
	Mainline between adjacent ramps	B	B	A	A	C	B	B
	Off-Ramp to SB Main Ave	C	C	-	-	C	-	-
	On-Ramp from SB Main Ave	E*	F*	-	-	F*	-	-
	On Ramp from NB/SB Route 7	-	-	B	-	-	B	-
	Off-Ramp to NB Main Ave	C	C	-	-	C	-	-
	On-Ramp from NB Main Ave	B	B	B	B	B	B	B
	Mainline North of Study Area	B	B	B	B	B	B	B
Notes: Red text denotes locations with unacceptable LOS. "*" Indicates the feature was analyzed using HCS TWSC methodology. "-" Indicates the feature does not exist in the alternative.								



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-13: PM Peak Hour Northbound Route 15 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 15 NB Mainline	Mainline South of Study Area	D	E	E	E	F	F	F
	Off-Ramp Existing/No Build: to SB Route 7 Alt 21D: to SB Route 7 & Main Ave Alt 26: to NB/SB Route 7 & Main Ave	E	E	D	E	F	F	F
	Mainline between adjacent ramps	D	D	C	C	D	C	C
	Off-Ramp to NB Route 7	C	C	C	-	D	C	-
	Off-Ramp to Main Ave	-	-	-	C	-	-	C
	Mainline between adjacent ramps	C	C	C	C	C	C	C
	Off-Ramp to SB Main Ave	D	D	-	-	D	-	-
	On-Ramp from SB Main Ave	F*	F*	-	-	F*	-	-
	On Ramp from NB/SB Route 7	-	-	C	-	-	C	-
	Off-Ramp to NB Main Ave	D	D	-	-	D	-	-
	On-Ramp from NB Main Ave	D	D	D	C	E	D	D
	Mainline North of Study Area	D	D	D	D	E	E	D

Notes:

Red text denotes locations with unacceptable LOS.

"*" Indicates the feature was analyzed using HCS TWSC methodology.

"-" Indicates the feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-14: AM Peak Hour Southbound Route 15 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 15 SB Mainline	Mainline North of Study Area	D	E	D	D	E	E	E
	Off-Ramp to Creeping Hemlock Dr	E	E	D	D	E	E	E
	On-Ramp from Creeping Hemlock Dr	F*	F*	-	-	F*	-	-
	Mainline between adjacent ramps	-	-	C	C	-	D	C
	Off-Ramp to SB Main Ave	D	D	-	-	E	-	-
	Off-Ramp to NB/SB Route 7	-	-	D	D	-	D	C
	On-Ramp from SB Main Ave	C	C	-	-	D	-	-
	Mainline between adjacent ramps	C	C	C	C	C	C	C
	On-Ramp From NB Route 7	C	D	C	C	D	D	D
	Mainline between adjacent ramps	D	D	C	C	E	D	D
	On-ramp Existing/No Build: from SB Route 7 Alt 21D/Alt 26: from Route 7 and Main Ave	D	E	E	E	F	F	F
	Mainline South of Study Area	E	E	E	E	F	F	F

Notes:

Red text denotes locations with unacceptable LOS.

""** Indicates the feature was analyzed using HCS TWSC methodology.

"-" Indicates the feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-15: PM Peak Hour Southbound Route 15 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 15 SB Mainline	Mainline North of Study Area	B	C	B	B	C	C	C
	Off-Ramp to Creeping Hemlock Dr	C	C	B	B	C	B	C
	On-Ramp from Creeping Hemlock Dr	F*	F*	-	-	F*	-	-
	Mainline between adjacent ramps	-	-	B	B	-	B	B
	Off-Ramp to SB Main Ave	C	C	-	-	C	-	-
	Off-Ramp to NB/SB Route 7	-	0	B	B	-	C	B
	On-Ramp from SB Main Ave	C	C	-	-	C	-	-
	Mainline between adjacent ramps	C	C	B	B	C	B	B
	On-Ramp From NB Route 7	C	D	C	C	D	C	C
	Mainline between adjacent ramps	D	D	C	C	E	C	C
	On-ramp Existing/No Build: from SB Route 7 Alt 21D/Alt 26: from Route 7 and Main Ave	D	D	D	D	F	E	E
	Mainline South of Study Area	D	E	E	E	E	E	E

Notes:

Red text denotes locations with unacceptable LOS.

""** Indicates the feature was analyzed using HCS TWSC methodology.

"-" Indicates the feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-16: AM Peak Hour Northbound Route 7 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 7 NB Mainline	Mainline South of Study Area	B	B	B	B	C	C	C
	Off-Ramp to Route 123	C	C	C	C	C	C	C
	Mainline between adjacent ramps	C	C	C	C	C	C	C
	On-Ramp from Route 123	C	C	C	C	C	C	C
	Mainline between Route 123 ramps & Route 15 ramps	C	C	C	C	C	C	C
	Off-Ramp to Route 7 aux lane	C	C	-	-	C	-	-
	Off-Ramp to Route 7 aux lane & Main Ave	-	-	C	-	-	D	-
	Weave between NB/SB Route 15 On/Off-Ramps and Route 7 aux lane	B	B	B	-	B	B	-
	Mainline parallel to Route 7 aux lane	B	B	B	-	B	B	-
	On-Ramp from SB Route 15 & Main Ave to Route 7 aux lane	-	-	A	-	-	A	-
	On-Ramp from Route 7 aux lane	C	C	C	-	C	C	-
	Mainline South of Grist Mill Rd	C	C	C	C	C	C	C
Notes: Red text denotes locations with unacceptable LOS. “-” Indicates the feature does not exist in the alternative.								



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-17: PM Peak Hour Northbound Route 7 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 7 NB Mainline	Mainline South of Study Area	B	B	B	B	C	C	C
	Off-Ramp to Route 123	C	C	C	C	C	C	C
	Mainline between adjacent ramps	B	C	C	C	C	C	C
	On-Ramp from Route 123	C	C	C	C	C	C	C
	Mainline between Route 123 ramps & Route 15 ramps	B	C	C	C	C	C	C
	Off-Ramp to Route 7 aux lane	C	C	-	-	C	-	-
	Off-Ramp to Route 7 aux lane & Main Ave	-	-	C	-	-	D	-
	Weave between NB/SB Route 15 On/Off-Ramps and Route 7 aux lane	B	B	B	-	B	B	-
	Mainline parallel to Route 7 aux lane	B	B	B	-	B	B	-
	On-Ramp from SB Route 15 & Main Ave to Route 7 aux lane	-	-	A	-	-	A	-
	On-Ramp from Route 7 aux lane	B	B	B	-	C	C	-
	Mainline South of Grist Mill Rd	B	B	B	B	B	B	B
Notes: Red text denotes locations with unacceptable LOS. “-” Indicates the feature does not exist in the alternative.								



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions

December 6, 2017 (Revised May 8, 2020)

Table 8-18: AM Peak Hour Southbound Route 7 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 7 SB Mainline	Mainline South of Grist Mill Rd	B	B	B	B	C	C	C
	Off-Ramp to SB Route 15	B	B	C	-	C	C	-
	Off-Ramp to NB Route 15 & Main Ave	-	-	B	-	-	B	-
	Mainline between adjacent ramps	B	B	B	-	B	B	-
	On-Ramp from NB Route 15	B	C	-	-	C	-	-
	On-Ramp from NB/SB Route 15 & Main Ave	-	-	C	-	-	C	-
	Mainline between Route 123 ramps & Route 15 ramps	B	B	C	C	C	C	C
	Off-Ramp to Route 123	B	B	C	C	C	C	C
	Mainline South of Off-Ramp to Route 123	B	B	C	C	B	C	C
	Mainline North of On-Ramp from Route 123	A	A	B	B	B	B	B

Notes:

Red text denotes locations with unacceptable LOS.

"-" Indicates the feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-19: PM Peak Hour Southbound Route 7 On-/Off-Ramp LOS Summary

Corridor	Segment	2016 EXISTING LOS	2025 NO BUILD LOS	2025 ALT. 21D LOS	2025 ALT. 26 LOS	2045 NO BUILD LOS	2045 ALT. 21D LOS	2045 ALT. 26 LOS
Route 7 SB Mainline	Mainline South of Grist Mill Rd	B	B	B	B	C	C	C
	Off-Ramp to SB Route 15	B	B	C	-	C	C	-
	Off-Ramp to NB Route 15 & Main Ave	-	-	B	-	-	B	-
	Mainline between adjacent ramps	B	B	B	-	B	B	-
	On-Ramp from NB Route 15	B	C	-	-	C	-	-
	On-Ramp from NB/SB Route 15 & Main Ave	-	-	C	-	-	C	-
	Mainline between Route 123 ramps & Route 15 ramps	B	B	C	C	C	C	C
	Off-Ramp to Route 123	B	B	C	C	C	C	C
	Mainline South of Off-Ramp to Route 123	B	B	B	B	B	C	C
	Mainline North of On-Ramp from Route 123	A	A	B	B	B	B	B

Notes:

Red text denotes locations with unacceptable LOS.

"-" Indicates the feature does not exist in the alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Table 8-20 provides results for the new weaving segments that are proposed under Alternative 21D. All weaving segments are projected to operate at LOS D or better in 2045 under the Build condition.

Table 8-20: Routes 15 & Route 7 Interchange Weaving LOS Summary (Alternative 21D)

Corridor	Segment	AM Peak Hour		PM Peak Hour	
		2045 NO BUILD	2045 ALT. 21D	2045 NO BUILD	2045 ALT. 21D
Route 15 /Route 7	Route 7 SB & Route 15 NB to Weave	B	B	A	A
	Route 15 NB & Weave to Route 7 SB	B	B	B	B
	Route 7 NB & Merge to Main Ave & Route 15 NB	B	B	A	A
	Route 15 SB & Main Ave to Route 7 NB and Weave	A	A	A	A
	Route 7 SB & Weave to Route 15 SB & Merge	B	B	B	B
Notes: Red text denotes locations with unacceptable LOS. “-” Indicates the feature does not exist in the alternative.					



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

8.2.3 Future Traffic Operations Summary

Figure 8.1 through Figure 8.3 illustrate holistic views of LOS throughout study area corridors (including intersection, ramp, and mainline LOS) for the weekday AM and weekday PM peak hours. It should be noted that arterial LOS is also shown to provide additional context as to how segments of key arterials are operating (e.g., Main Avenue, Grist Mill Road, and New Canaan Avenue). While arterial LOS is not a metric that is typically evaluated, the information provides a better understanding of traffic operations along segments of the local roadway network. Both alternatives are projected to provide comparable improvements to traffic operations in the design year and proposed or reconfigured features of the Merritt Parkway interchanges with Route 7 and Main Avenue are projected to operate at acceptable levels of service. A summary of locations projected to operate below acceptable levels of service is provided in Table 8-21.

Table 8-21: Summary of Locations Projected to Operate Below LOS D in the 2045 Design Year

Analysis Element	AM Peak Hour				PM Peak Hour			
	2016 EXISTING	2045 NO BUILD	2045 ALT. 21D	2045 ALT. 26	2016 EXISTING	2045 NO BUILD	2045 ALT. 21D	2045 ALT. 26
Intersections and Ramp Segments	8	16	7	7	5	14	6	6
Mainline Segments (Route 7 and Route 15)	2	7	3	3	0	4	3	2
Total	10	23	10	10	5	18	9	8
Notes: Locations projected to operate below LOS D under future 2045 conditions are shown in red on Figures 8.1 through 8.3. Locations that are projected Local Mainline Segments (Main Avenue and New Canaan Avenue) are not summarized in this table as arterial levels of service are not a metric that is typically evaluated.								

Below are key findings from the traffic impact assessment:

- Both Build alternatives are projected to substantially reduce the amount of intersections, ramp segments, and mainline segments that operate below the acceptable threshold of LOS D when compared to the No Build Alternative;
- Both Build alternatives are projected to provide reduced travel times for newly proposed connections when compared to the No Build Alternative;
- Both Build alternatives are projected to reduce Vehicle Miles Traveled within the study area when compared to the No Build Alternative; and
- Both Build alternatives propose to address safety concerns at the Merritt Parkway interchanges with Route 7 and Main Avenue. The two existing stop-controlled on-ramps from Main Avenue onto the Merritt Parkway would be removed and redesigned ramps would provide standard acceleration and deceleration lanes. Previously identified safety concerns are expected to worsen under the No Build Alternative.

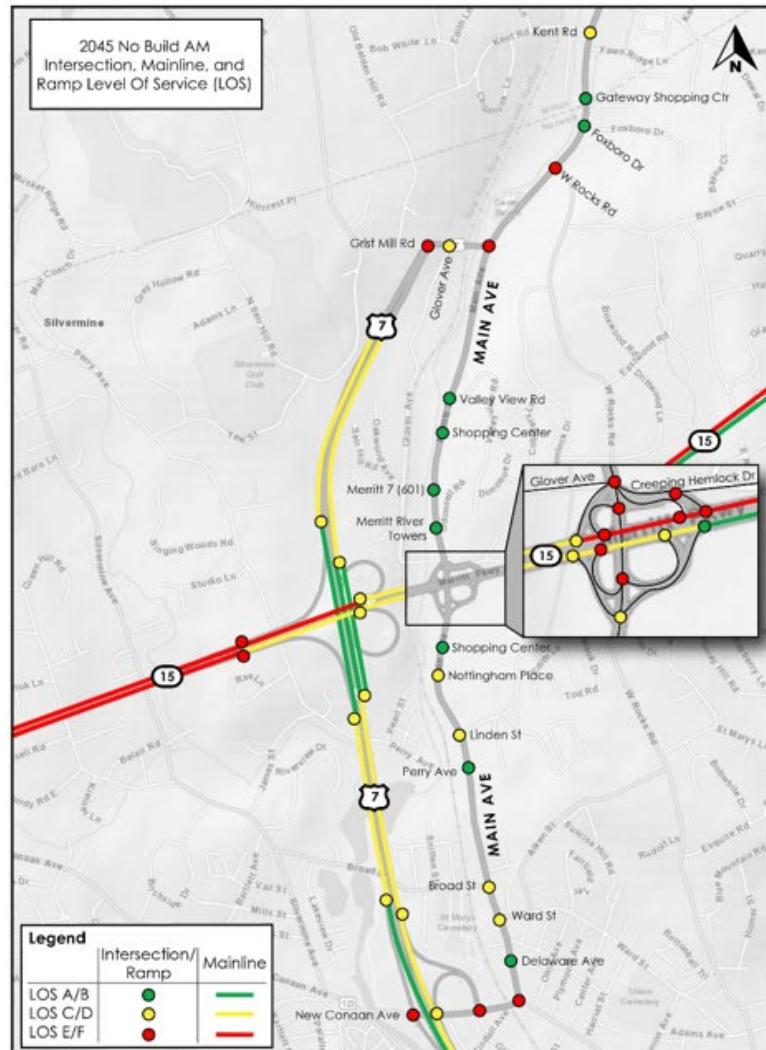
In summary, no significant adverse impacts have been identified for either Build Alternative.



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

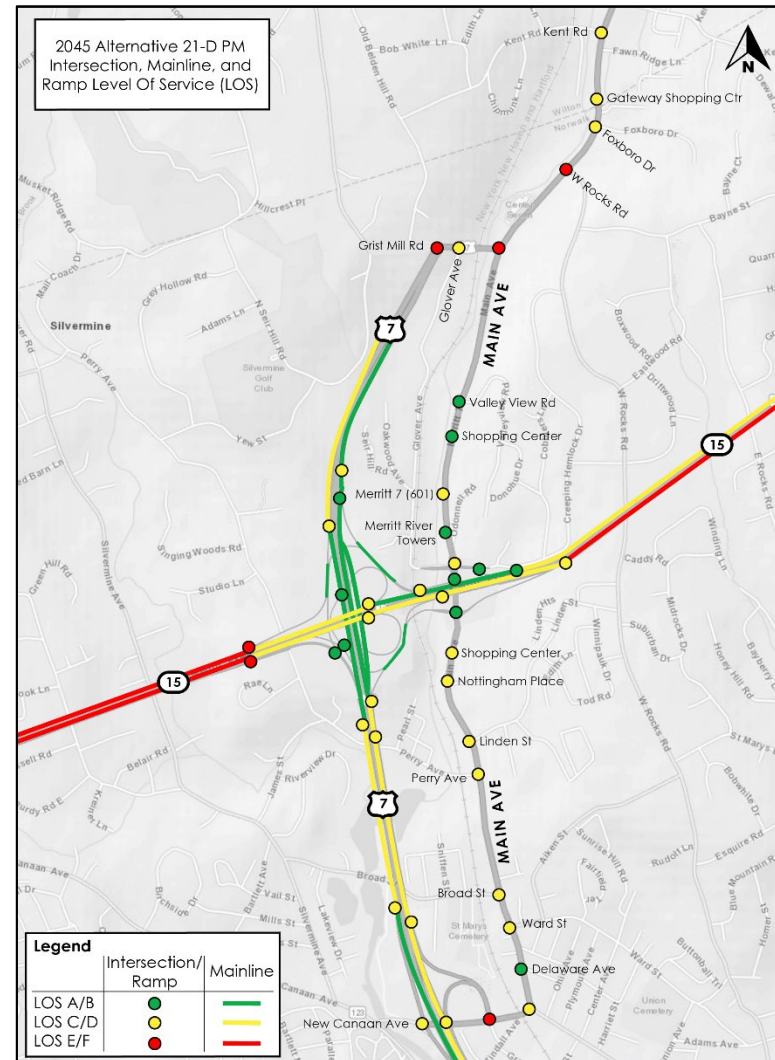
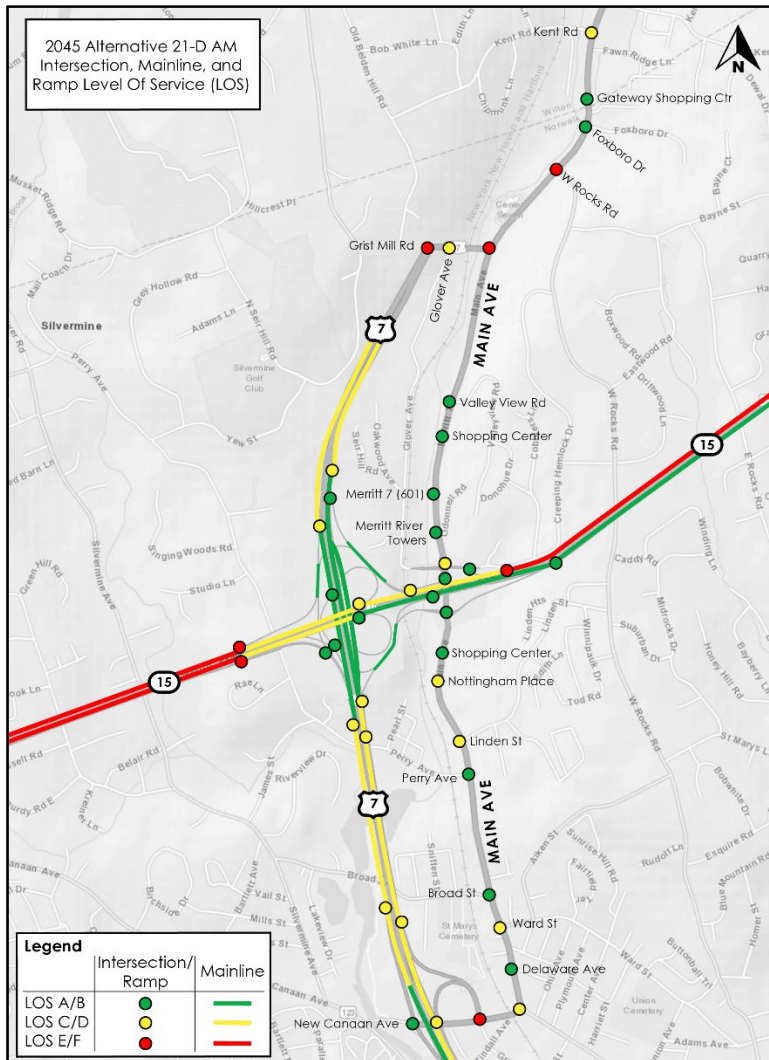
Figure 8.1: Level of Service Summary – 2045 No Build Alternative (AM Peak Hour and PM Peak Hour)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358) **ANALYSIS, NEEDS, AND DEFICIENCIES REPORT**

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

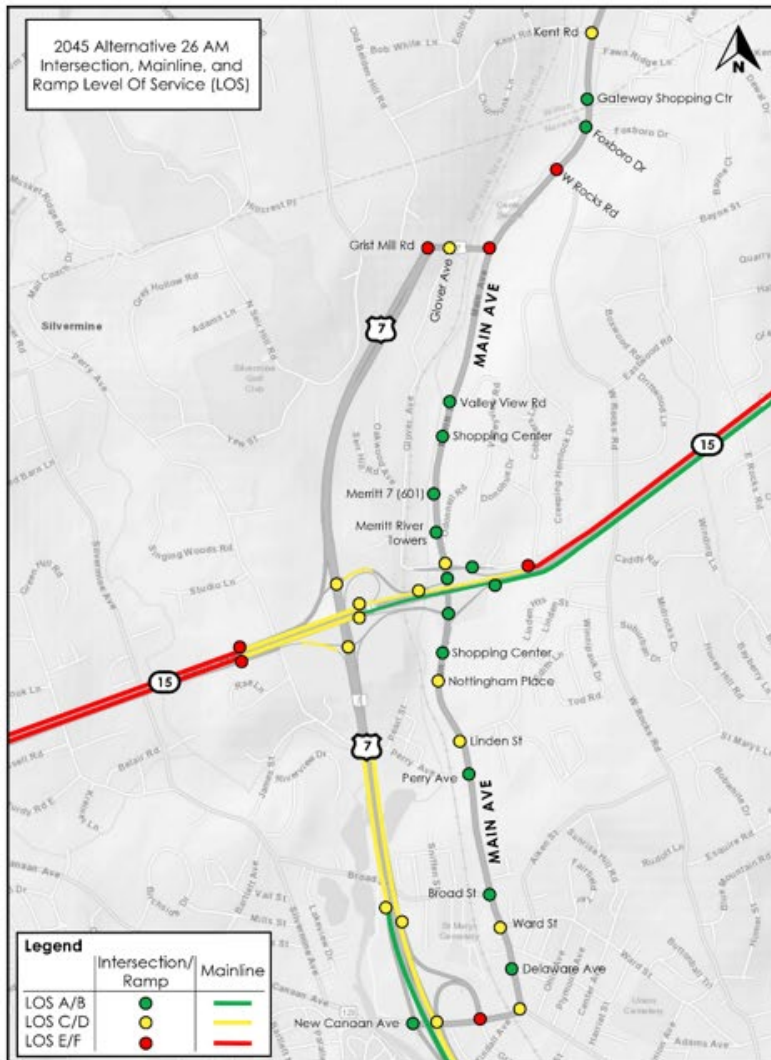
Figure 8.2: Level of Service Summary – 2045 Alternative 21D (AM Peak Hour and PM Peak Hour)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
 December 6, 2017 (Revised May 8, 2020)

Figure 8.3: Level of Service Summary – 2045 Alternative 26 (AM Peak Hour and PM Peak Hour)



ROUTES 7/15 INTERCHANGE – NORWALK, CONNECTICUT (STATE PROJECT NO. 102-358)
ANALYSIS, NEEDS, AND DEFICIENCIES REPORT

Future (2045) Transportation Conditions
December 6, 2017 (Revised May 8, 2020)

8.3 SAFETY ASSESSMENT

Refer to Chapter 4 of this report for further information on crash analyses performed as part of assessing existing conditions within the traffic study area.

Under the No Build Alternative, it is anticipated the number of crashes would increase as the projected increases in traffic are realized. The existing stop-controlled on-ramps to the Merritt Parkway from Main Avenue would remain as they are today under this alternative. While safety improvements are planned for the Merritt Parkway under a separate project, those improvements would not resolve all the safety issues identified earlier in this report.

Both Build alternatives propose to address safety concerns at both of the Merritt Parkway interchanges by reconfiguring the Main Avenue interchange (the two existing stop-controlled on-ramps from Main Avenue onto the Merritt Parkway would be removed and redesigned ramps would provide standard acceleration and deceleration lanes) and providing full access between Routes 7 and 15 at Interchange 39. Furthermore, the Main Avenue corridor would provide more accommodations for pedestrians and bicyclists.

