CORPORATE MIXED-USE (CMU) ZONING DISTRICT TRANSPORTATION MASTER PLAN

Prepared for:

TOWN OF FRAMINGHAM, MASSACHUSETTS

October 2016

Prepared by:

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PREFACE

Vanasse & Associates, Inc. (VAI) has been retained by the Town of Framingham to conduct an assessment of the proposed Corporate Mixed-Use (CMU) Zoning District to be located off Worcester Road (Route 9) and generally bounded by the Massachusetts Turnpike (I-90), a CSX rail line, and the Ashland and Southborough town lines, in Framingham, Massachusetts. The purpose of this assessment is to identify the potential impacts on the transportation infrastructure associated with the build-out of properties located within the proposed CMU Zoning Districts (I and II) and to define improvements that may be necessary to support the identified build-out. This assessment has been prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT), and incorporates the comments and written correspondence that have been received.

The proposed CMU Zoning District contains several development parcels that have access to regional transportation network and that afford opportunities for development and redevelopment following "smart growth" principles that allow for a mix of land uses that are complimentary to the corporate campus environment that currently exists within the District. Following these principles, this assessment identifies a balanced approach of roadway improvements and traffic reduction strategies to accommodate future development while recognizing the potential impact that further development may have on already burdened roadways.

As a result of this assessment, specific improvements have been identified that are designed to address current operational and safety deficiencies within the study area, and that will afford sufficient capacity to accommodate the projected build-out potential of the CMU Zoning District. It is envisioned that the identified improvement measures will serve as guidance for future development projects in the proposed CMU Zoning District with the goal of advancing elements of the improvements that may be commensurate with the impacts of a specific development proposal.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted an assessment of the proposed Corporate Mixed-Use (CMU) Zoning District to be located off Worcester Road (Route 9) and generally bounded by the Massachusetts Turnpike (I-90), a CSX rail line, and the Ashland and Southborough town lines, in Framingham, Massachusetts. The purpose of this assessment is to identify the potential impacts on the transportation infrastructure associated with the build-out of properties located within the proposed CMU Zoning District (I and II) and to define specific improvements that may be necessary to support the identified build-out, inclusive of expansion of pedestrian and bicycle accommodations and access to public transportation.

As a result of this evaluation, the location of capacity constraints along the Route 9 corridor and at intersecting roadways within the CMU Zoning District study area have been identified, and specific recommendations for improvements are provided that are designed to accommodate potential future development in the area. These improvements include suggested Transportation Demand Management (TDM) strategies that are designed to reduce the overall volume of traffic in the CMU Zoning District study area.

CMU ZONING DISTRICT DESCRIPTION

The proposed CMU Zoning District is depicted on Figure 1 and are generally bounded by a CSX rail line and commercial properties in the Technology Park Zoning District to the north; I-90 and the Ashland town line to the south; I-90 to the east; and the Southborough town line to the west. CMU Zoning District I is generally situated to the north of Route 9 and includes the area proximate to the I-90/Exit 12 westbound ramps to the south of Route 9. CMU Zoning District II is generally situated to the south of Route 9 and CMU Zoning District I, with a small portion situated north of Route 9 and west of 84 New York Avenue. The area contained within the proposed CMU Zoning District is currently comprised of four (4) Zoning Districts: Business, Technology Park, General Manufacturing and Light Manufacturing; and contain the corporate headquarters for a number of high-technology, research and development, medical device and retail companies, along with general business and manufacturing uses.

Access to the CMU Zoning District is provided from Route 9 and Boston Road (Route 30) by way of California Avenue, Pleasant Street Connector, Crossing Boulevard and New York Avenue. Access to the Interstate Highway System (IHS) is provided at Exit 12 on I-90 to the immediate east of the CMU Zoning District and at Exit 23 on I-495 to the west via Route 9.

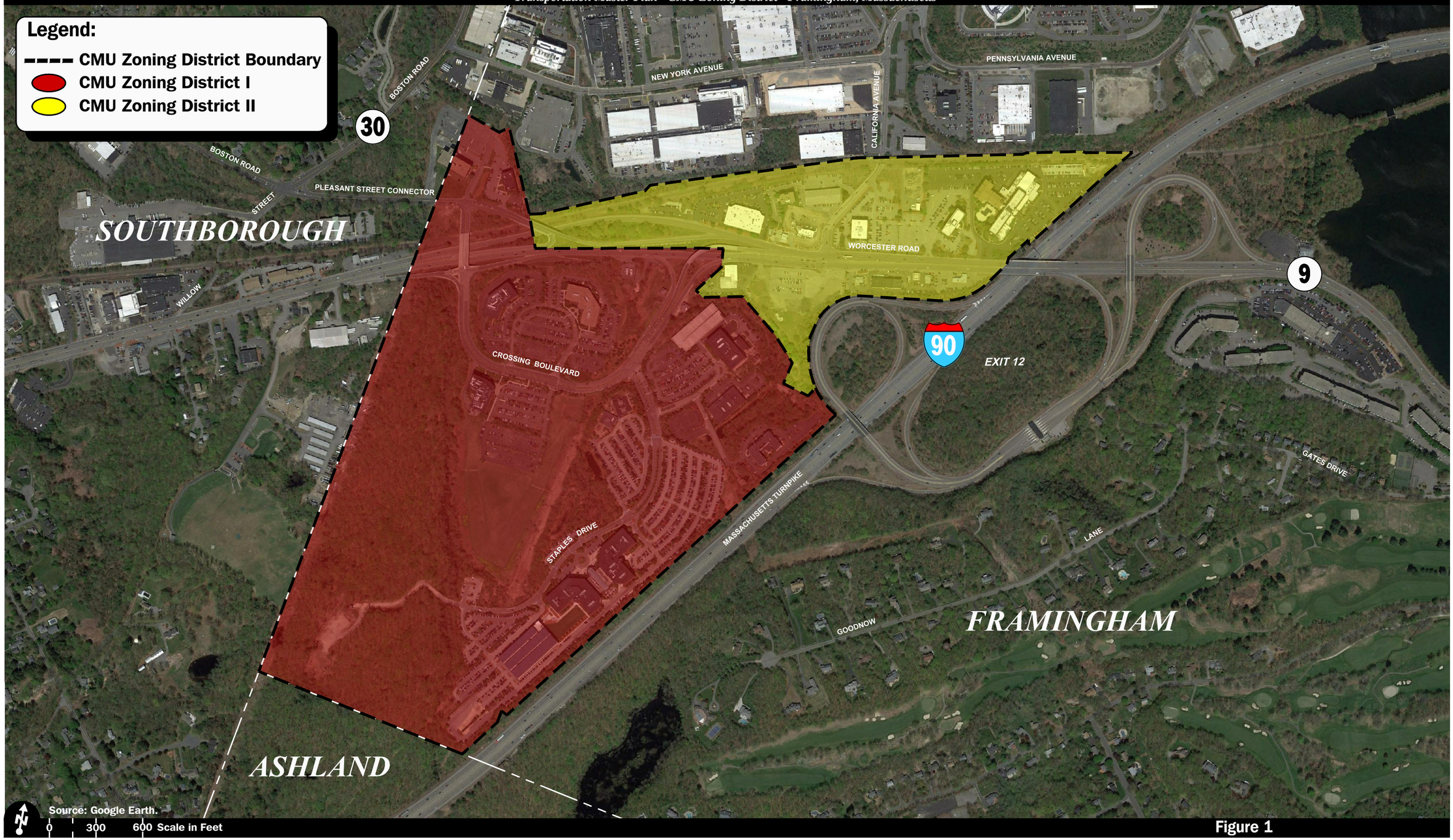

Figure 1

CMU Zoning District

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STUDY METHODOLOGY

This study was prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT); was performed in general accordance with methodologies outlined in MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; public transportation services; observations of traffic flow; and collection of daily and peak period traffic counts.

In the second stage of the study, traffic volumes were projected and analyzed for the potential build-out of the CMU Zoning District. Specific travel demand forecasts were developed for the identified build-out which were then added to the existing condition (2016) baseline traffic volumes. The traffic analysis conducted in stage two identifies projected roadway capacity, traffic safety, and access issues that should be considered for each of the defined development scenarios.

The third stage of the study presents and evaluates potential improvements to the transportation infrastructure that may be necessary to accommodate the potential build-out identified in stage two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in June 2016. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area consisted of the major roadways that provide access to the CMU Zoning District area and included Worcester Road (Route 9), California Avenue, Crossing Boulevard, Boston Road (Route 30) and Temple Street, and the following specific intersections which are listed below and depicted on Figure 2, with Figure 3 indicating roadway jurisdiction and functional classification:

1. Route 9 at Central Street and Oak Hill Road
2. Pleasant Street Connector at Willow Street, Valley Road and Boston Road (Route 30)
3. Pleasant Street Connector at Crossing Boulevard
4. Crossing Boulevard at the Route 9 Eastbound Ramps
5. Crossing Boulevard at Staples Drive and the Route 9 Ramps
6. Route 9 Eastbound at the Crossing Boulevard Off-Ramp
7. Route 9 Westbound at the Pleasant Street Connector Off-Ramp
8. Route 9 Westbound at the Crossing Boulevard Off-Ramp
9. Route 9 Westbound at the Pleasant Street Connector On-Ramp
10. Route 9 Eastbound at the Crossing Boulevard On-Ramp
11. Route 9 at California Avenue and the MassDOT Park-and-Ride Lot
12. Route 9 at Country Club Lane
13. Route 9 at Temple Street and Old Worcester Road
14. California Avenue at New York Avenue
15. Route 30 at New York Avenue

The following describes the study area roadways and intersections.

Roadways

Worcester Road (Route 9)

- Four to six lane urban primary arterial roadway under MassDOT jurisdiction
- Traverses study area in a general east-west direction
- Provides full access interchanges with I-90 (Exit 12) to the immediate east of the proposed CMU Zoning District and with Crossing Boulevard within the District

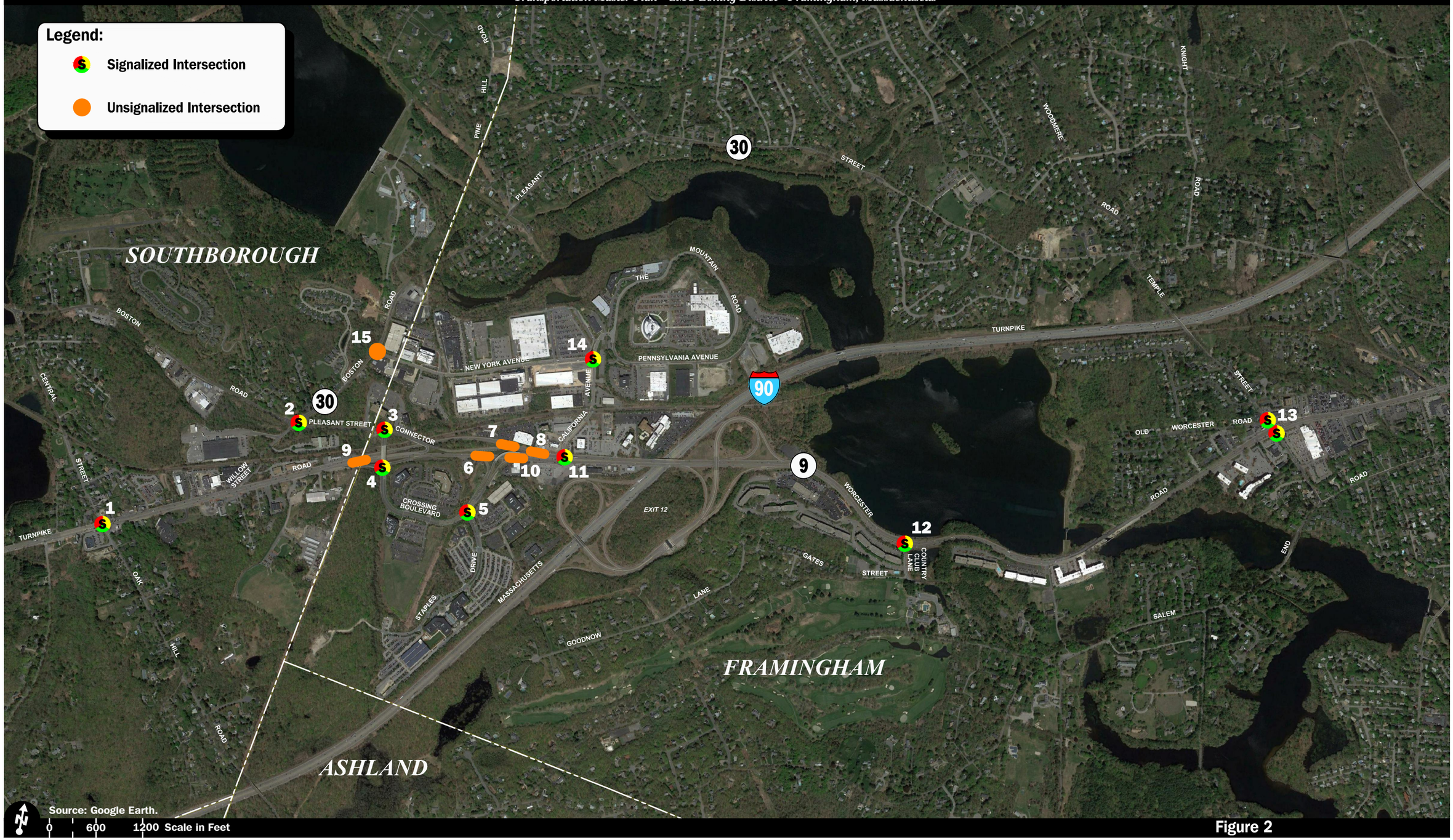

Figure 2

Study Area Map

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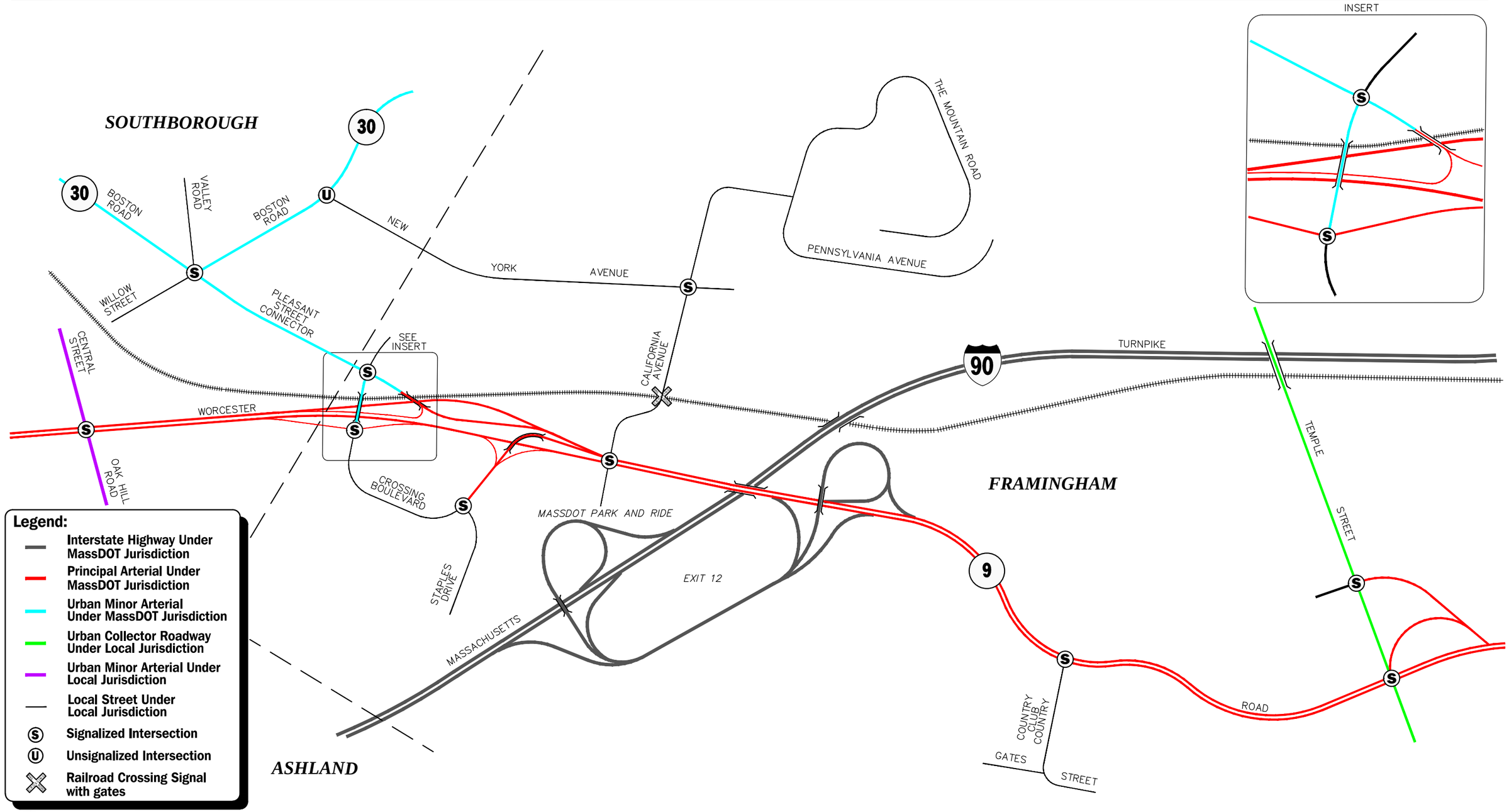

Figure 3

Roadway Jurisdiction and Functional Classification

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- Provides six 12-foot wide travel lanes (three lanes per direction) between I-90 and the Crossing Boulevard interchange, five 12-foot wide travel lanes (three westbound and two eastbound) between the Crossing Boulevard interchange and Central Street/Oak Hill Road, and four 12-foot wide travel lanes to the east and west of the aforementioned roadway segments. Additional turning lanes are provided at major intersections
- The directions of travel are separated by a raised median with concrete barrier or guardrail
- Variable width marked shoulders are provided along both sides of the roadway
- A sidewalk is provided along the north side of the roadway between Central Street/ Oak Hill Road and the I-90 interchange, and between the I-90 interchange and Temple Street; a sidewalk is provided along the south side between Woodland Road and a point approximately 700 feet east of Central Street/Oak Hill Road, and between the Water View Apartments and Temple Street.
- Illumination is provided by way of street lights mounted on wood poles
- The posted speed limit varies between 40 and 50 miles per hour (mph) within the study area
- Land use consists of commercial, multi-family residential, institutional

California Avenue

- Two lane collector roadway under Town jurisdiction
- Traverses study area in a general north-south direction between Route 9 and Pennsylvania Avenue/The Mountain Road
- Provides four 15 to 20-foot wide travel lanes separated by a double-yellow centerline with variable width marked shoulders and additional turning lanes provided at major intersections
- A sidewalk is provided along the west side of the roadway with a crosswalk provided across California Avenue at Route 9 and across New York Avenue (both signalized)
- The CSX rail line crosses California Avenue between Route 9 and New York Avenue by way of an at-grade crossing that includes crossing gates and signals. An inactive rail crossing is also present approaching Pennsylvania Avenue/The Mountain Road
- Illumination is provided by way of street lights mounted on wood poles
- The "prima facie" speed limit is 30 mph based on the nature of the abutting land use[1]
- Land use consists of commercial and industrial properties

Crossing Boulevard

- Four lane collector roadway that is under both MassDOT (ramps and bridges) and Town (surface street) jurisdiction
- Traverses study area in a circuitous north-south direction between Pleasant Street Connector and Route 9
- Provides a grade separated interchange with Route 9

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[1]The "prima facie" speed is defined in M.G.L. Chapter 90, Section 17, as the speed which would be deemed reasonable and proper to operate a motor vehicle. The abutting land use would be classified as a "thickly settled or business district" for the purposes of M.G.L. Chapter 90, Section 17.

- Provides four 12-foot wide travel lanes separated by a double-yellow centerline or raised median with 1 to 4-foot wide marked shoulders and additional turning lanes provided at major intersections
- Sidewalks are provided along one or both sides of the roadway with marked crosswalks provided for crossing major driveways
- Illumination is provided by way of street lights mounted on ornamental steel poles
- The "prima facie" speed limit is 30 mph
- Land use consists of commercial properties and areas of open and wooded space

Boston Road (Route 30)

- Two lane urban minor arterial roadway under MassDOT jurisdiction
- Traverses study area in a general northeast-southwest direction
- Provides two 11 to 12-foot wide travel lanes separated by a double-yellow centerline with variable width marked shoulders and additional turning lanes provided at major intersections
- A sidewalk is not provided within the study area
- Illumination is provided intermittently by way of street lights mounted on wood poles
- The posted speed limit is 40 mph within the study area
- Land use consists of residential and commercial properties, and areas of open and wooded space

Temple Street

- Two lane urban collector roadway under Town jurisdiction
- Traverses study area in a general northwest-southeast direction between Pleasant Street (Route 30) and Salem End Road
- Provides two 12-foot wide travel lanes separated by a double-yellow centerline with no marked shoulders
- A sidewalk is provided along the east side of the roadway with crossings provided at Temple Place (unsignalized intersection) and Old Derby Street South (unsignalized), where the sidewalk shifts to the north side.
- Illumination is provided intermittently by way of street lights mounted on wood poles
- The posted speed limit varies between 25 and 35 mph within the study area
- Land use consists of residential and commercial properties, and areas of open and wooded space

<u>Intersections</u>

Table 1 and Figure 4 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in June 2016.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Rte. 9/Central St./ Oak Hill Rd.	TS	1 left-turn lane, 2 through lanes and 1 through/right-turn lane on Rte. 9; 1 left-turn lane, 1 through lane and 1 right-turn lane on Oak Hill Rd.; 1 lane on Central St.	Yes; 1-foot minimum	Yes – north side of Rte. 9, east side of Oak Hill Rd. and Central St.	Yes - Shared travelled-way[b]
Pleasant St. Connector/ Willow St./ Valley Rd./Rte. 30	TS	2 left-turn lanes and 1 through/right-turn lane on Rte. 30 eastbound; 1 left-turn/through lane and 1 right-turn lane on Rte. 30 southbound; 1 left-turn lane and 1 through/right-turn lane on Pleasant St. Connector; 1 lane on Willow St.; 1 lane on Valley Rd. that diverges approaching the intersection	Yes; 1-foot minimum	No	Yes - Shared travelled-way
Pleasant St. Connector/ Crossing Blvd.	TS	1 right-turn lane and 1 through/left-turn lane on Pleasant St. Connector eastbound; 1 left-turn lane and 1 through/right-turn lane on Pleasant St. Connector westbound; 1 left-turn/through travel lane and 1 right-turn lane on Crossing Blvd.; 1 lane on Genzyme Dwy.	Yes; 1-foot minimum	Yes – west side of Crossing Blvd.	Yes - Shared travelled-way
Crossing Blvd./ Rte. 9 Eastbound Ramps	TS	1 left-turn lane and 1 through lane on Crossing Blvd. southbound; 2 lanes on Crossing Blvd. northbound; l lane on Route 9 off ramp that diverges approaching the intersection	Yes; 1-foot minimum	Yes – west side of Crossing Blvd. north of intersection and east side to the south; crosswalks provided across Rte. 9 off-ramp and Crossing Blvd. south leg; pedestrian signal equipment and phasing is not provided	Yes - Shared travelled-way
Crossing Blvd./ Staples Dr./ Rte. 9 Ramps	TS	1 through lane and 1 right-turn lane on Crossing Blvd.; 1 left-turn lane and 2 right-turn lanes on Staples Dr.; 1 through lane on Rte. 9 eastbound off-ramp; 1 left-turn lane and 1 left-turn/through lane on Rte. 9 westbound off-ramp	Yes; 1-foot minimum	Yes – south side of Crossing Blvd. and both sides of Staples Dr.; traffic signal system includes pushbuttons, signal indications and phasing for crossing Staples Blvd.	Yes - Shared travelled-way
Rte. 9 Eastbound/ Crossing Blvd. Off-Ramp	NC	2 lanes on Rte. 9; 1 lane on off-ramp	Yes; 1-foot minimum on off-ramp and 8-foot minimum on Rte. 9	No	Yes - Shared travelled-way

See notes at end of table.

Table 1 (Continued)
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Rte. 9 Westbound/ Pleasant St. Connector Off-Ramp	NC	2 lanes on Rte. 9; 1 lane on off-ramp	Yes; 2-foot minimum	Yes – north side of Rte. 9	Yes - Shared travelled-way
Rte. 9 Westbound/ Crossing Blvd. Off-Ramp	NC	3 lanes on Rte. 9; 1 lane on off-ramp	Yes; 1-foot minimum on off-ramp and 8-foot minimum on Rte. 9	Yes – north side of Rte. 9	Yes - Shared travelled-way
Rte. 9 Westbound/ Pleasant St. Connector On-Ramp	Y	2 lanes on Rte. 9; 1 lane on on-ramp	Yes; 1-foot minimum on off-ramp and 8-foot minimum on Rte. 9	Yes – north side of Rte. 9	Yes - Shared travelled-way
Rte. 9 Eastbound/ Crossing Blvd. On-Ramp	Y	2 lanes on Rte. 9; 1 lane on on-ramp	Yes; 1-foot minimum on off-ramp and 8-foot minimum on Rte. 9	No	Yes - Shared travelled-way
Rte. 9/ California Ave./ MassDOT Park-and-Ride	TS	2 left-turn lanes, 2 through lanes and 1 through/right-turn lane on Rte. 9 eastbound; 2 through lanes and 1 through/right-turn lane on Rte. 9 westbound (left-turns and U-turns are prohibited); 1 left-turn lane, 1 left-turn/through lane and 1 right-turn lane on California Ave.; 1 left-turn lane and 1 right-turn lane on Park-and-Ride Dwy.	Yes; 1-foot minimum	Yes – north side of Rte. 9 and west side of California Ave.; traffic signal system includes pushbuttons, signal indications and phasing for crossing California Ave.	Yes - Shared travelled-way
Rte. 9/Country Club Ln.	TS	1 U-turn lane, 2 through lanes and 1 right-turn lane on Rte. 9 eastbound; 1 left-turn lane and 2 through lanes on Rte. 9 westbound; 1 left-turn lane and 1 left/right-turn lane on Country Club Ln.	Yes; 2-foot minimum	Yes – north side of Rte. 9	Yes - Shared travelled-way
Rte. 9/Temple St./ Old Worcester Rd.	TS	1 left-turn lane, 2 through lanes and 1 right-turn lane on Rte. 9 eastbound; 3 through lanes on Rte. 9 westbound; 2 left-turn lanes and 1 through/right-turn lane on Old Worcester Rd.; 1 left-turn lane and 1 through/right-turn lane on Temple St. northbound; 1 lane on Temple St. southbound	Yes; 2-foot minimum	Yes – both sides of Rte. 9, north side of Old Worcester Rd. and east side of Temple St.; traffic signal system includes pushbuttons, signal indications and phasing for crossing Rte. 9 east leg, Temple St. south leg and Old Worcester Rd.	Yes - Shared travelled-way

See notes at end of table.

Table 1 (Continued)
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
California Ave./ New York Ave./ Pvt. Dwy	TS	1 left-turn lane and 1 through/right-turn lane on California Ave. northbound; 1 lane on California Ave. southbound; 1 left-turn/through lane and 1 right-turn lane on New York Ave.; 1 lane on Pvt. Dwy.	Yes; 2-foot minimum on California Ave. and New York Ave.	Yes – west side of California Ave. and north side of New York Ave.; traffic signal system includes pushbuttons, signal indications and phasing for crossing New York Ave.	Yes - Shared travelled-way
Rte. 30/New York Ave.	S	1 lane on Rte. 30 northbound; 1 left-turn lane and 1 through lane on Rte. 30 southbound; 1 left-turn lane and 1 right-turn lane on New York Ave.	Yes; 1-foot minimum	No	Yes - Shared travelled-way

[a]TS = traffic signal control; S = STOP-sign control; Y = YIELD-sign control; R = rotary/roundabout control; NC = no control present.
[b]Combined shoulder and travel lane width equal to or exceed 14 feet.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) and vehicle classification counts were obtained from traffic studies prepared by others within the study area[2,3,4] and were supplemented by TMC's conducted as a part of this assessment in June 2016. The critical periods for which the traffic count data was obtained consisted of the weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) commuter periods. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for study area roadway network and the land uses located within the proposed CMU Zoning Districts. The traffic count data was normalized (adjusted and balanced where appropriate) to a common 2016 baseline condition using the June 2016 traffic count data.

The 2016 Existing weekday morning and evening peak-hour traffic volumes are graphically depicted on Figures 5 and 6, respectively.

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[2]*Traffic Impact Study*, Proposed Wendy's Restaurant, Framingham, Massachusetts; Conley Associates; December 2014.

[3]*Traffic Impact and Access Study*, Northside Meadows, 518 Pleasant Street, Framingham, Massachusetts; Vanasse Hangen Brustlin, Inc./VHB; December 3, 2015.

[4]*Traffic Impact and Access Study*, Proposed Crossroads Corporate Center, Framingham, Massachusetts; VAI; 2009.

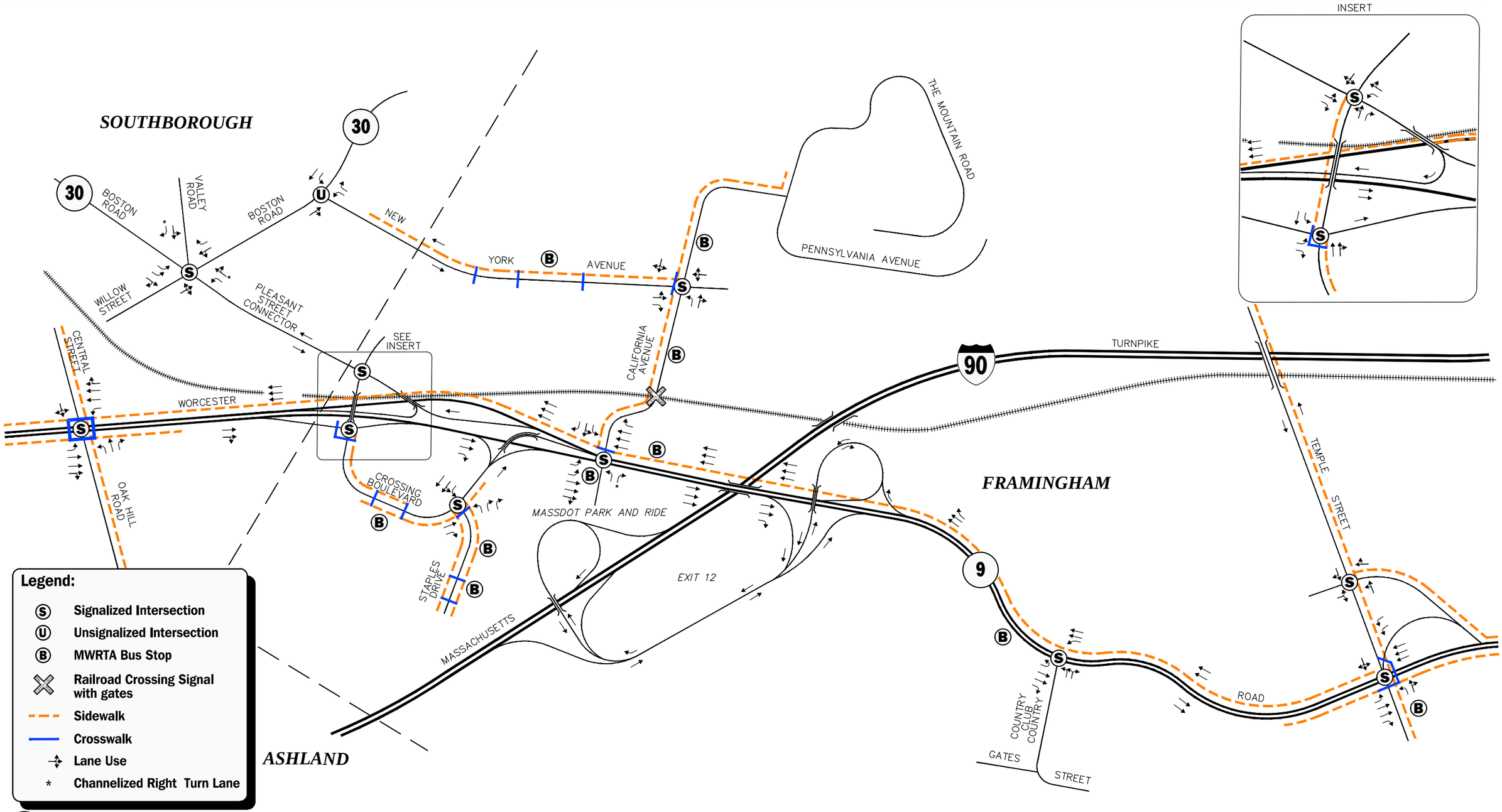

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Figure 4

Existing Lane Use, Traffic Control, and Pedestrian Facilities

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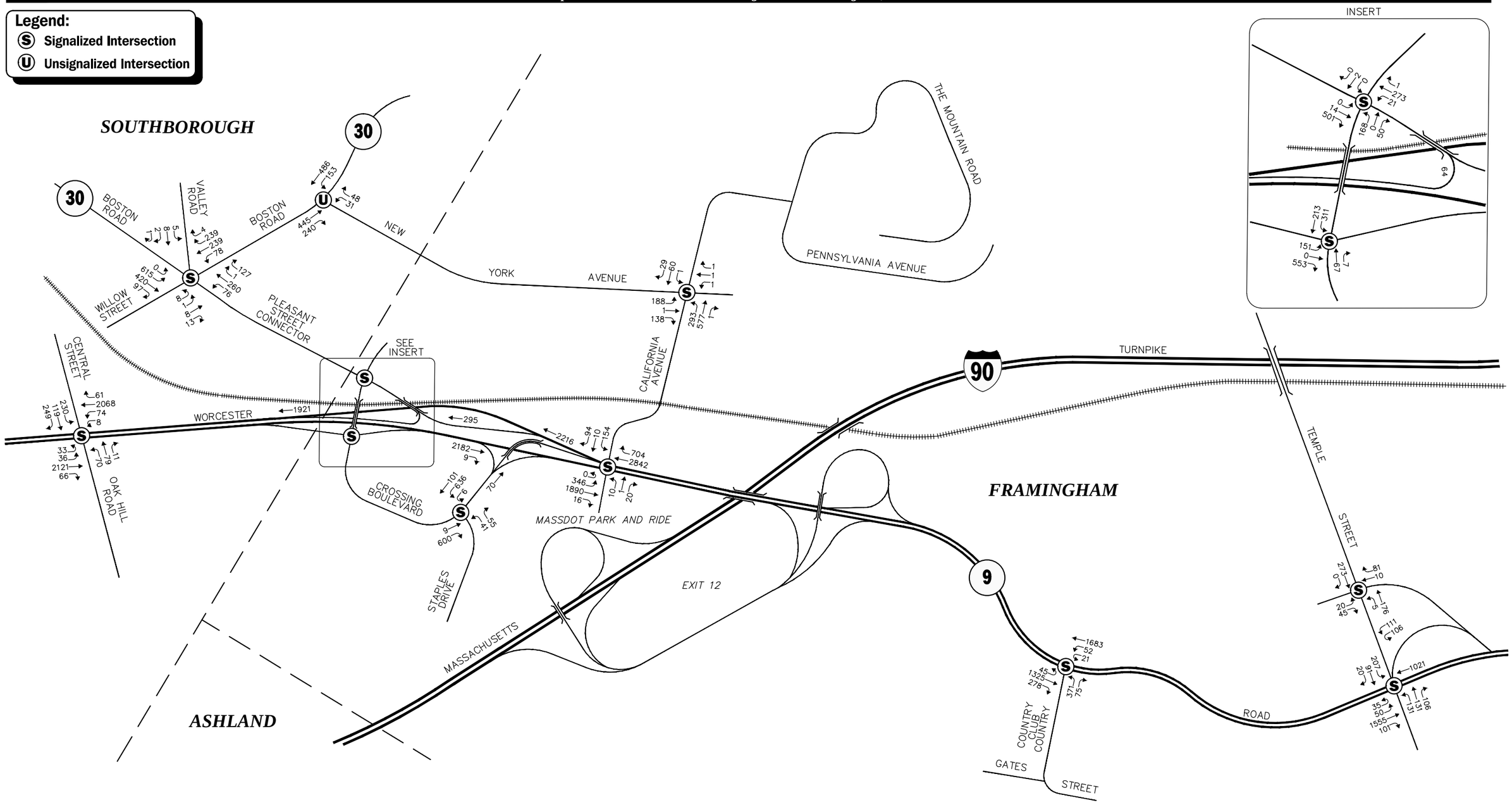

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 5

2016 Existing Weekday Morning Peak Hour Traffic Volumes

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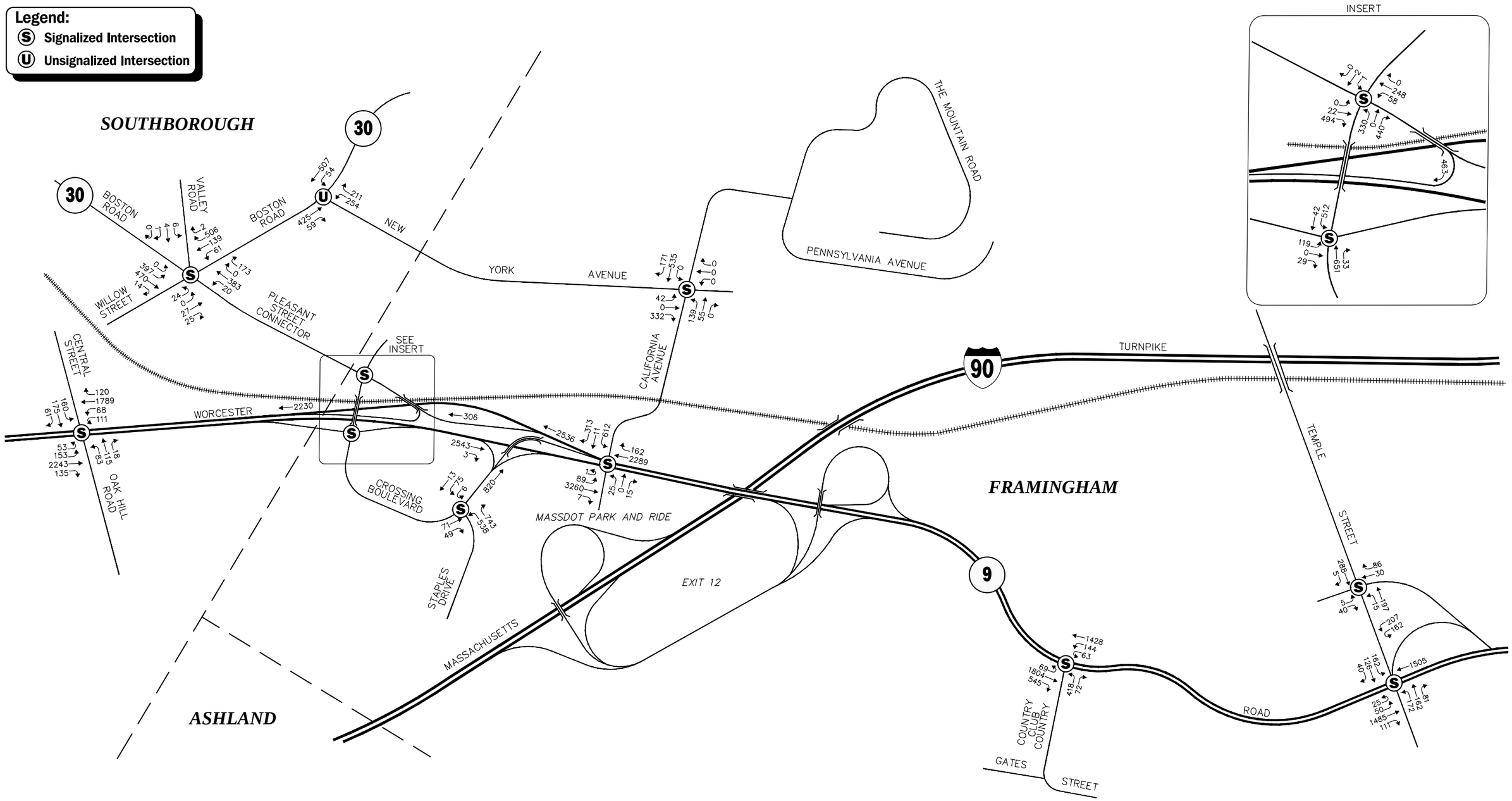

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 6

2016 Existing
Weekday Evening
Peak Hour Traffic Volumes

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PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in June 2016. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. As detailed in Table 1 and depicted on Figure 4, with the exception of Route 30 within the study area, sidewalks are generally provided along one or both sides of the study area roadways. The signalized intersections within the study area include pedestrian traffic signal equipment and phasing where crosswalks are provided.

Formal bicycle facilities were not identified within the study area; however, in general, the study area roadways provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travelled-way configuration.[5]

PUBLIC TRANSPORTATION

Public transportation services are provided within the study area by the Metro West Regional Transit Authority (MWRTA). The MWRTA operates fixed route bus services within the study area by way of Route 7/7C and Route 9, and the Framingham Commuter Shuttle. All MWRTA buses originate at the Blandin Hub located at 15 Blandin Avenue in Framingham. The Route 7/7C bus travels along Route 9 providing service within the study area to Crossing Boulevard and Staples Drive, the MassDOT Park-and-Ride lot opposite California Avenue, Route 9/California Avenue, the Jefferson Hills apartment community and Route 9/Temple Street/Stop & Shop. The Route 7/7C bus provides service Monday through Friday from 5:30 AM to 8:45 PM, and on Saturday from 8:30 AM to 5:30 PM.

The Route 9 bus travels along Route 9 providing service within the study area to California Avenue, New York Avenue, Route 30, Pleasant Street Connector, Crossing Boulevard, Staples Drive, the MassDOT Park-and-Ride lot opposite California Avenue, the Jefferson Hills apartment community and Route 9/Temple Street/Stop & Shop. The Route 9 bus provides service Monday through Friday from 5:50 AM to 8:40 PM.

The Framingham Commuter Shuttle travels along Route 9 and provides service within the study area to the Jefferson Hills apartment community, Staples, and California Avenue/New York Avenue. The Framingham Commuter Shuttle provides service Monday through Friday between 6:10 AM and 7:25 PM.

With the exception of the Framingham Commuter Shuttle, MWRTA buses operate on a flag service policy, which allows buses to stop anywhere along their routes to pick up passengers where it is safe to do so. Passengers can hail MWRTA buses by waving. The Framingham Commuter Shuttle only stops at established bus stops along its service route. All three bus routes that serve the study area include a stop at Framingham Station on the Massachusetts Bay Transportation Authority (MBTA) Worcester/Framingham Line of the Commuter Rail system, which provides service from Union Station in Worcester to South Station in Boston. The detailed MWRTA service routes, schedules and fare information are provided in the Appendix.

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[5] A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared travelled-way condition.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent three-year period available (2012 through 2014, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized on Figure 7 with the detailed crash summary tables and calculations provided in the Appendix.

A total of 153 motor vehicles crashes were identified to have occurred at the study area intersections between 2012 and 2014 based on data available from the Registry of Motor Vehicles and provided by the MassDOT Highway Division, with the majority of crashes reported at four intersections:

1. Route 9/Temple Street/Old Worcester Road (50 crashes)
2. Route 9/Central Street/Oak Hill Road (28 crashes)
3. Route 9/County Club Lane (27 crashes)
4. Route 9/California Avenue/MassDOT Park-and-Ride Lot (24 crashes)

The Route 9/Temple Street/Old Worcester Road intersection was also found to have a motor vehicle crash rate above both the MassDOT statewide and District averages for a signalized for the MassDOT Highway Division District in which the intersections are located (District 3).

A review of the MassDOT statewide High Crash Location List for the study area indicated that the following intersections/locations are included on MassDOT's Highway Safety Improvement Program (HSIP) listing as high crash locations:

- ***Route 9/Central Street/Oak Street*** (2012-2014 HSIP cluster)
- ***Route 9/California Avenue/MassDOT Park-and-Ride Lot*** (No. 56 on the Top 200 High Crash Locations for 2011-2013 and 2012-2014 HSIP cluster)
- ***Route 9/1656-1658 Worcester Road*** (2012-2014 HSIP cluster)
- ***Route 9/Country Club Lane*** (2012-2014 HSIP cluster)
- ***Route 9/Chapel Hill*** (2012-2014 HSIP cluster)
- ***Route 9/Temple Street/Old Worcester Road*** (No. 55 on the Top 200 High Crash Locations for 2011-2013 and 2012-2014 HSIP cluster)

MassDOT defines a HSIP eligible cluster as: *"…a cluster in which the total number of 'equivalent property damage only' crashes is within the top 5 percent of all clusters in that region. 'Equivalent property damage only' is a method of combining the number of crashes with the severity of crashes based on a weighted scale where a fatal crash is worth 10, an injury crash is worth 5 and a property damage only crash is worth 1."* Designation as an HSIP location allows for MassDOT to prioritize funding for safety-related improvements in a specific region of the state.

No fatal motor vehicle crashes were reported at the study area intersections over the three-year review period. The detailed MassDOT Crash Rate Worksheets and High Crash Location mapping are provided in the Appendix.

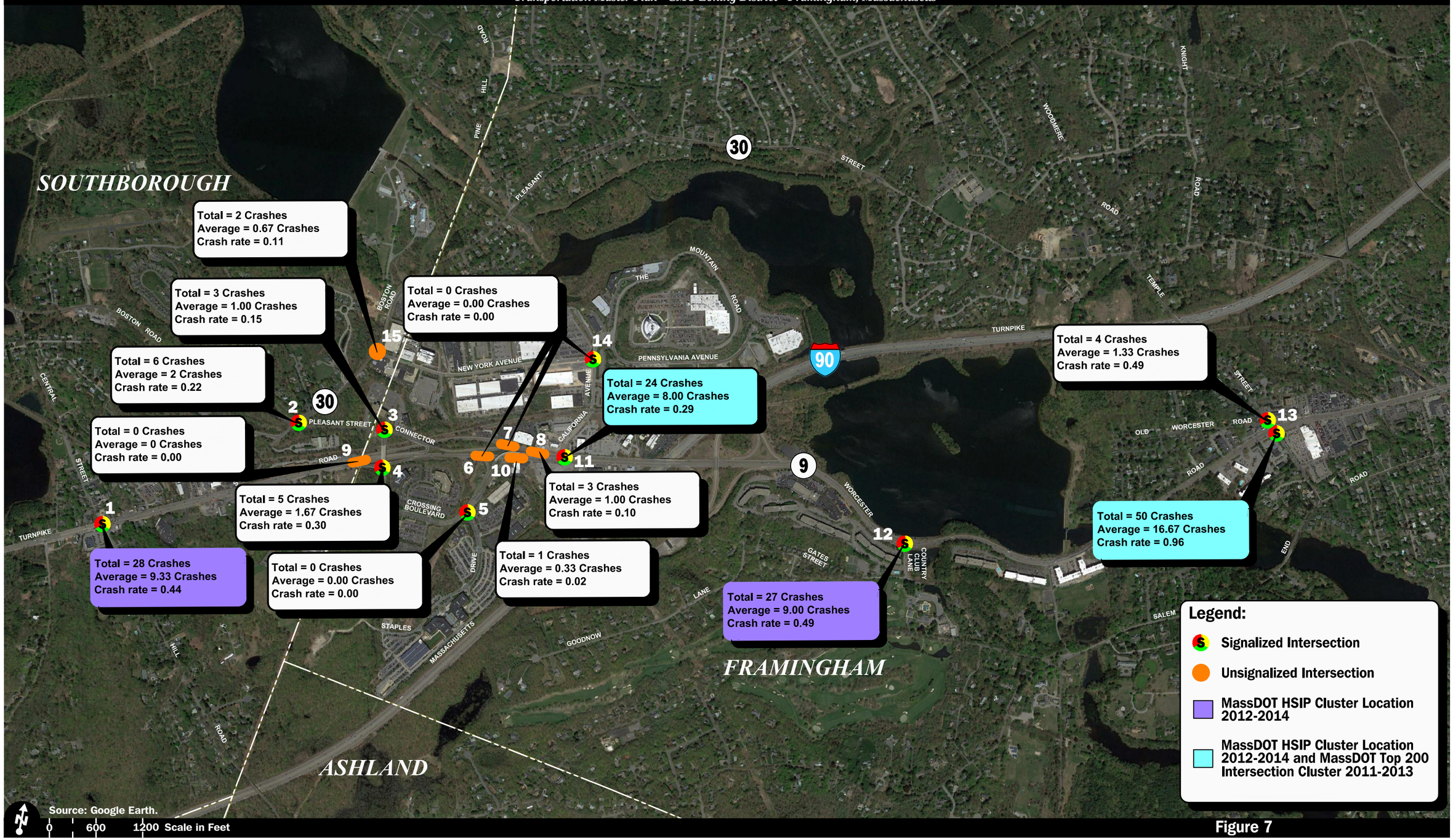

Figure 7

Motor Vehicle Crash Summary

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CMU ZONING DISTRICT BUILD-OUT

Traffic volume projections were developed for potential build-out within the CMU Zoning District based on a review of land use and development patterns within the study area, and consistent with zoning requirements related to height and density. The land use and building programs were identified for individual parcels within each CMU Zoning District and were developed in consultation with the Planning Board Administrator. The identified build-out potential for each CMU Zoning District was as follows:

CMU ZONING DISTRICT I:

- 1,340,000 sf office
- 560 apartment units

CMU ZONING DISTRICT II:

- 296,650 sf office
- 296,650 sf retail/restaurant
- 156 apartment units

TRAFFIC VOLUME PROJECTIONS

In order to determine the traffic characteristics for the identified build-out within the CMU Zoning District, trip-generation methodologies established by the Institute of Transportation Engineers (ITE)[6] were used. The ITE provides trip-generation information for various types of land uses developed as a result of scientific studies that have been conducted over the past 50 plus years, the most recent update of which was published in 2012. This data includes trip estimates for land uses that are similar to those identified for the CMU Zoning District. The following ITE Land Use Codes (LUCs) were used:

- 220, *Apartment*
- 710, *General Office Building*
- 820, *Shopping Center*

[6] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

Pass-By Trips

Not all of the trips expected to be generated by the retail/restaurant component of identified build-out within CMU Zoning District II will be new trips on the roadway network. A significant portion of these trips will consist of pass-by trips or vehicles already traveling along Route 9 and California Avenue for other purposes that will patronize the individual (or multiple) development sites in conjunction with their trip and then continue on to their original destination. These trips are not new trips on the roadway network. Statistics published by the ITE[7] indicate that on average, up to 34 percent of the trips generated by retail uses may consist of pass-by trips. As such and pursuant to MassDOT guidelines,[8] a pass-by trip rate of up to 34 percent was applied to the trip-generation calculations for the retail/restaurant component of the identified development program.

Figures 8 and 9 summarize the identified build-out for CMU Zoning District I and II, respectively, along with the associated daily and peak-hour traffic volumes, with the detailed trip-generation calculations and summary tables provided in the Appendix.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the additional traffic that is expected to result from the identified build-out within the CMU Zoning District was determined based on a review of journey-to-work data obtained from the 2010 U.S. Census and was then refined based on existing traffic patterns within the study area and a review of the regional transportation system. Given the differing nature and directionality of trips associated with the residential and commercial uses, separate trip distribution patterns were developed for each use. The trip distribution pattern is graphically depicted on Figures 10 and 11 for the commercial and residential uses, respectively.

Within each CMU Zoning District, trips were assigned to a specific access roadway based on the trip origin/destination and the location of the specific development parcel within each District. For the purpose of this analysis, it was assumed that the existing access points serving the CMU Zoning District would continue to be used, with no additional roadway connections to be developed. With respect to the potential redevelopment of the MassDOT park-and-ride lot, it was assumed that the Route 9/California Avenue intersection would be reconstructed to permit left-turns from Route 9 westbound into the MassDOT park-and-ride lot.

BUILD-OUT TRAFFIC VOLUMES

Using the trip distribution patterns and access configurations defined above, the traffic volume projections for the identified build-out in the CMU Zoning District was added to the 2016 Existing condition peak-hour traffic volumes. The resulting weekday morning and evening peak-hour traffic volumes are graphically depicted on Figures 12 and 13, respectively. The discrete trip assignments for the additional traffic associated with the build-out of the CMU Zoning District is provided in the Appendix.

---

[7] *Trip Generation Handbook*, 3rd Edition, An ITE Proposed Recommended Practice; Institute of Transportation Engineers; Washington, D.C.; August 2014.

[8] MassDOT limits pass-by trip rates to the lower of 15 percent of the adjacent roadway traffic volume or the average pass-by trip rate obtained from the most recent edition of the ITE *Trip Generation Handbook.*

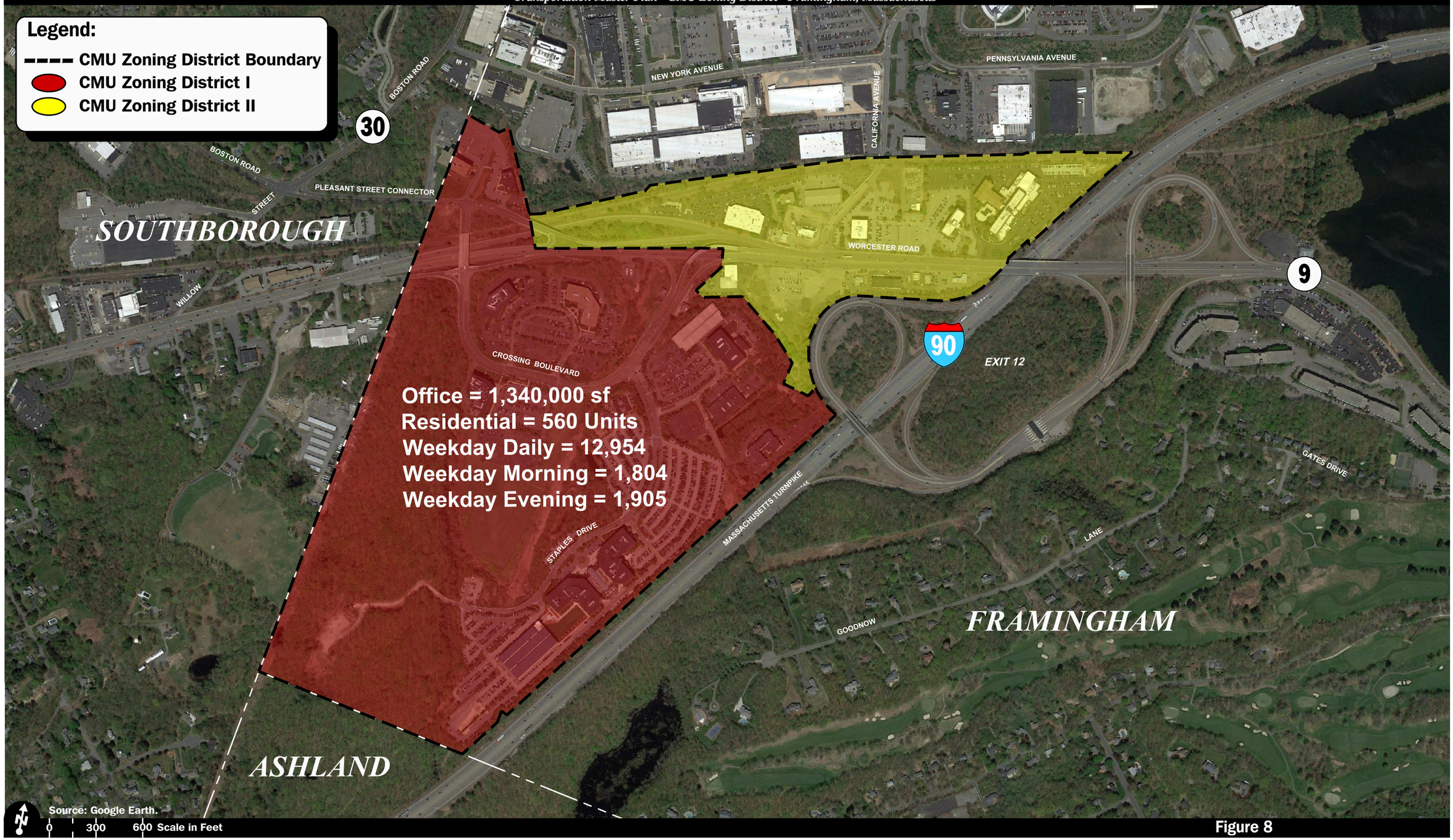

Figure 8

CMU Zoning District I
Build-Out Scenario Summary

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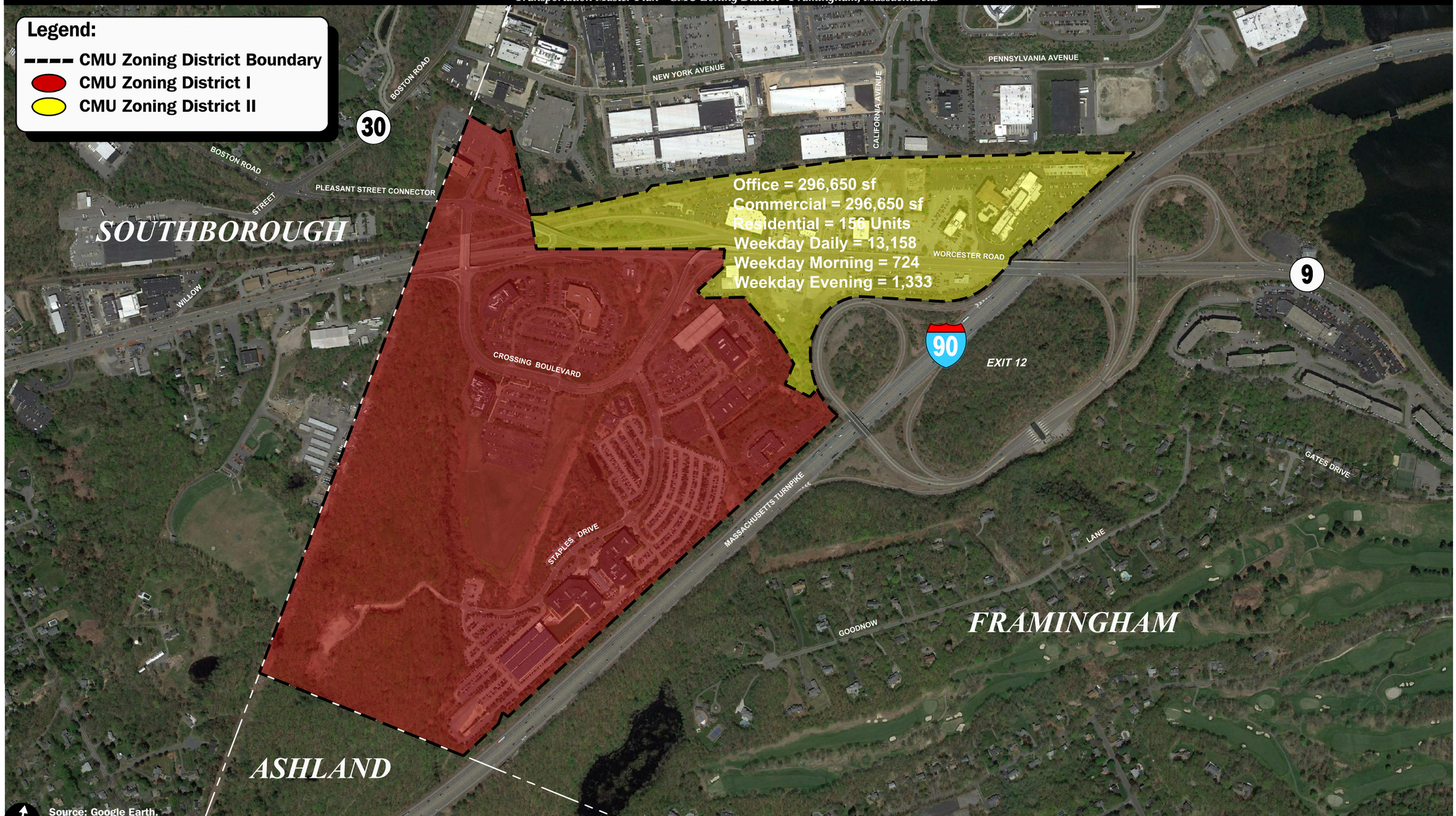

Figure 9

CMU Zoning District II
Build-Out Scenario Summary

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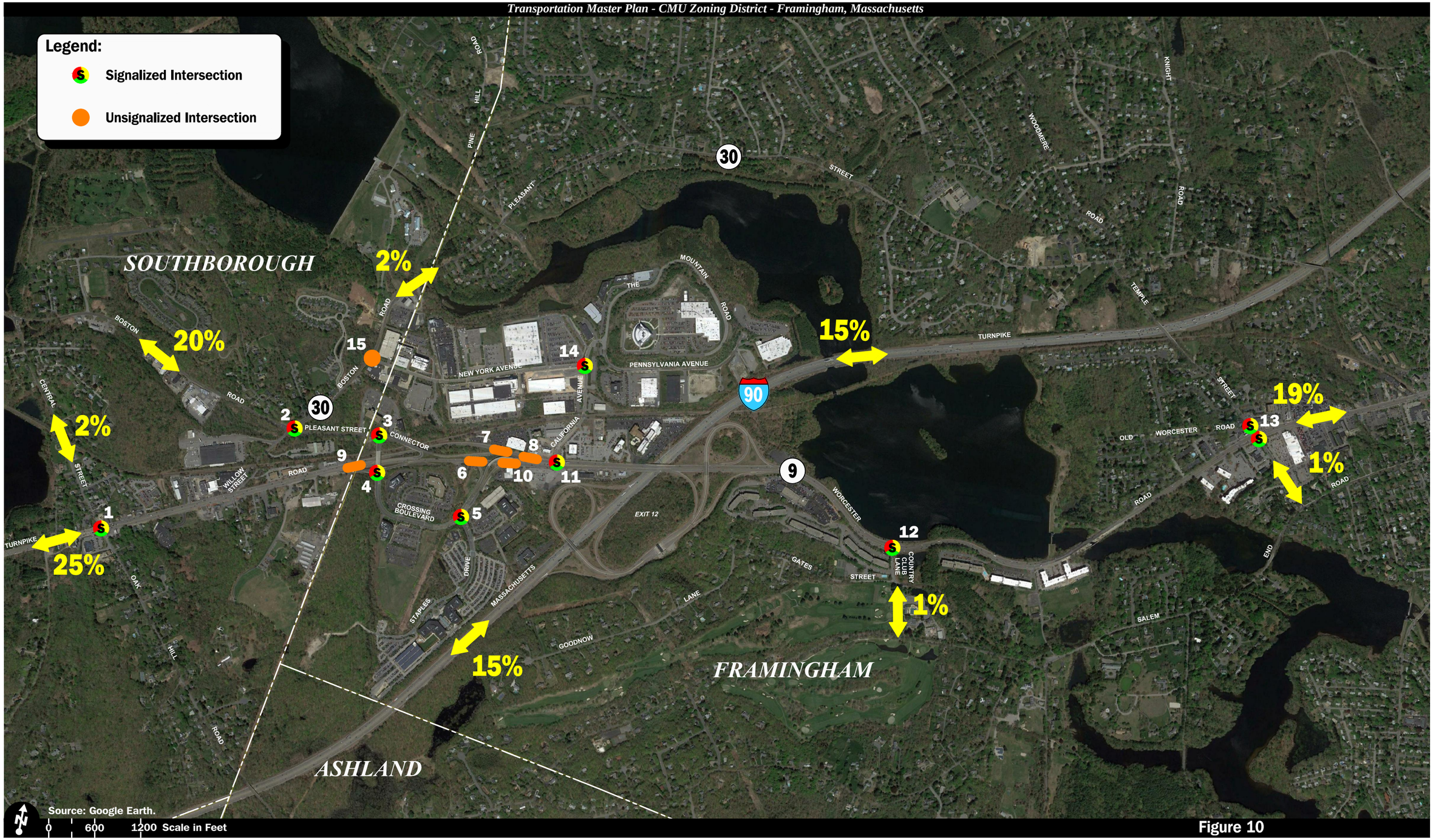

Figure 10

Trip Distribution Map - Commercial Uses

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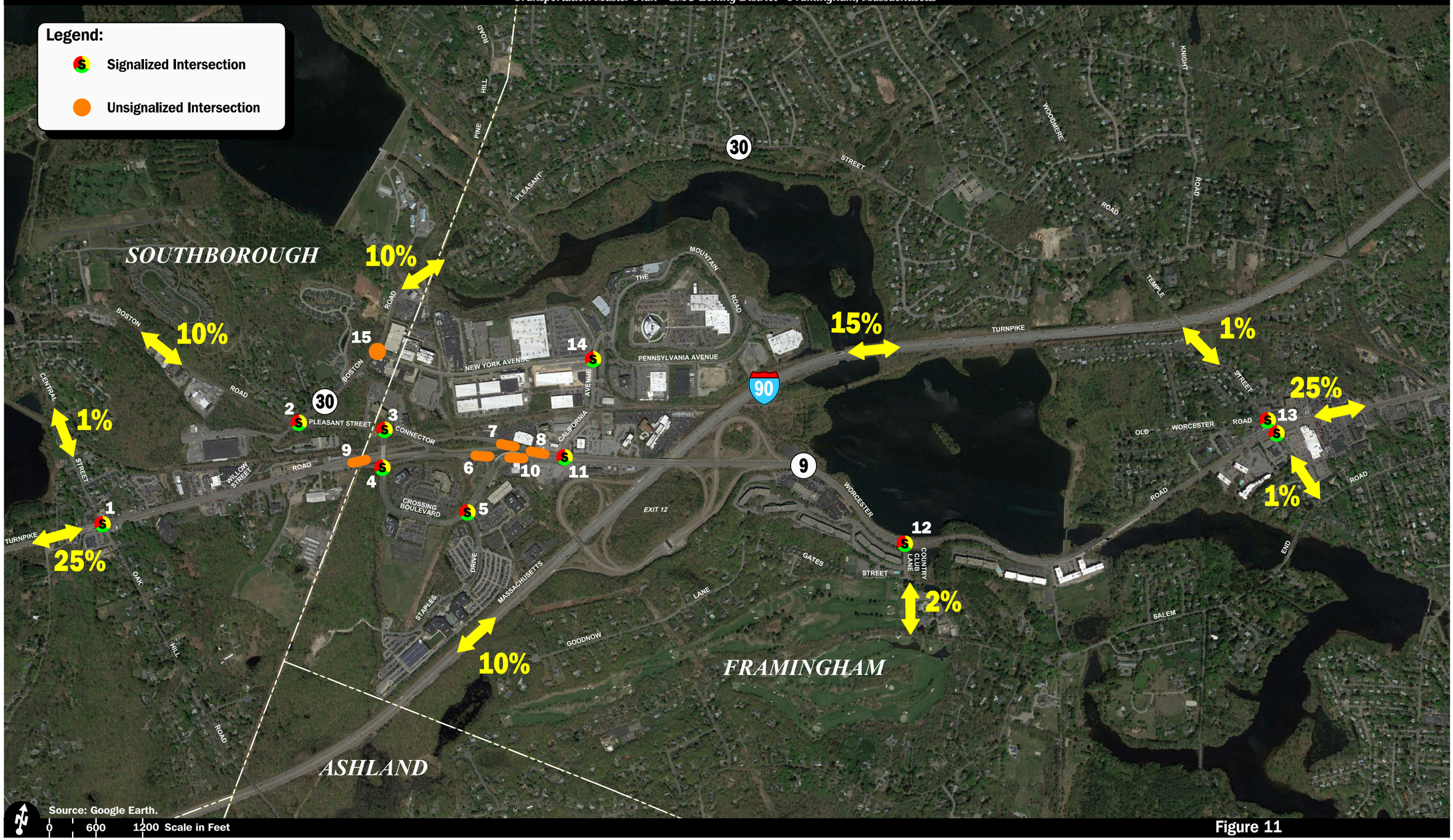

Figure 11

Trip Distribution Map - Residential Uses

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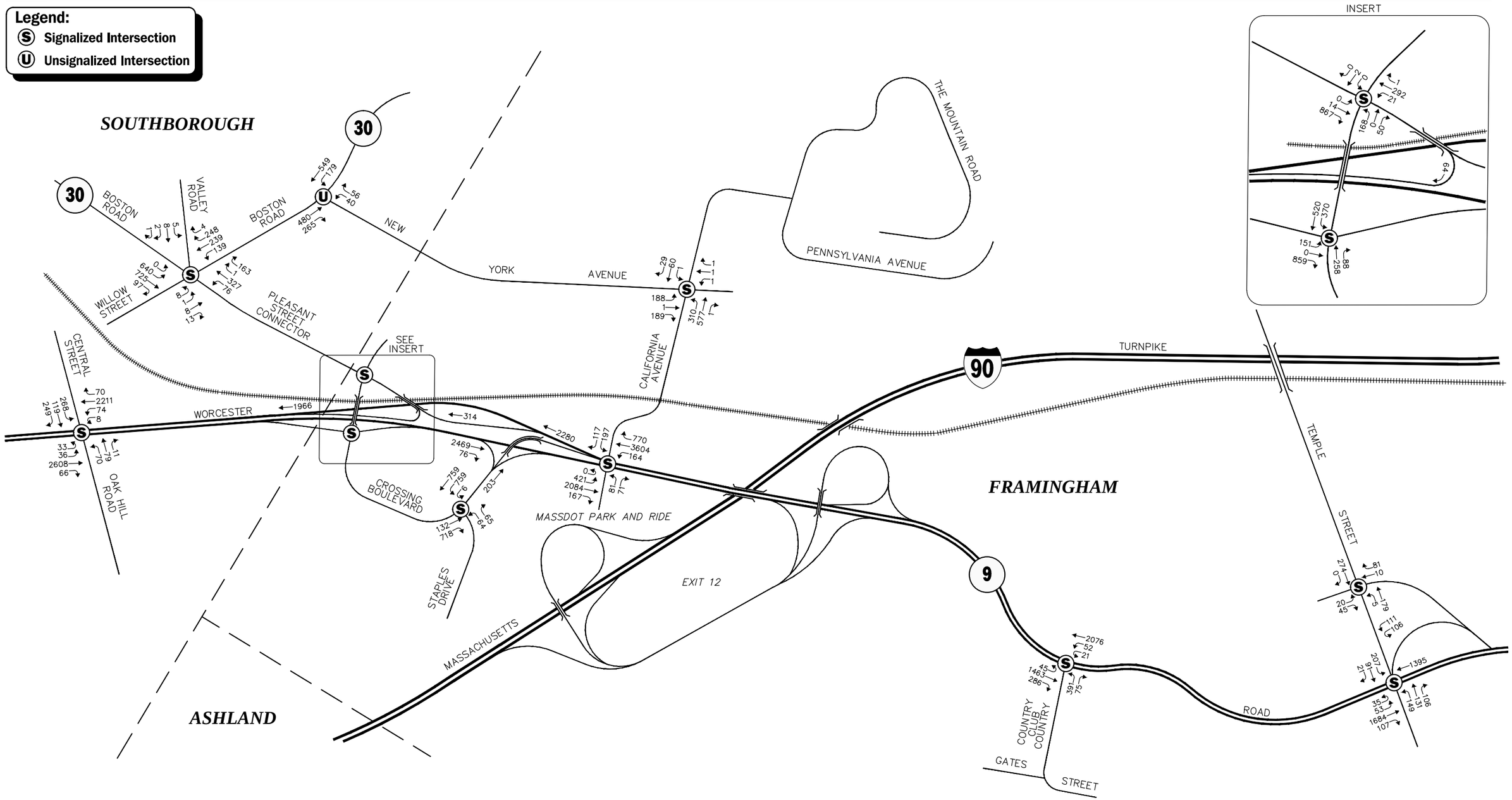

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 12

2016 CMU Zoning District Build-Out Weekday Morning Peak Hour Traffic Volumes

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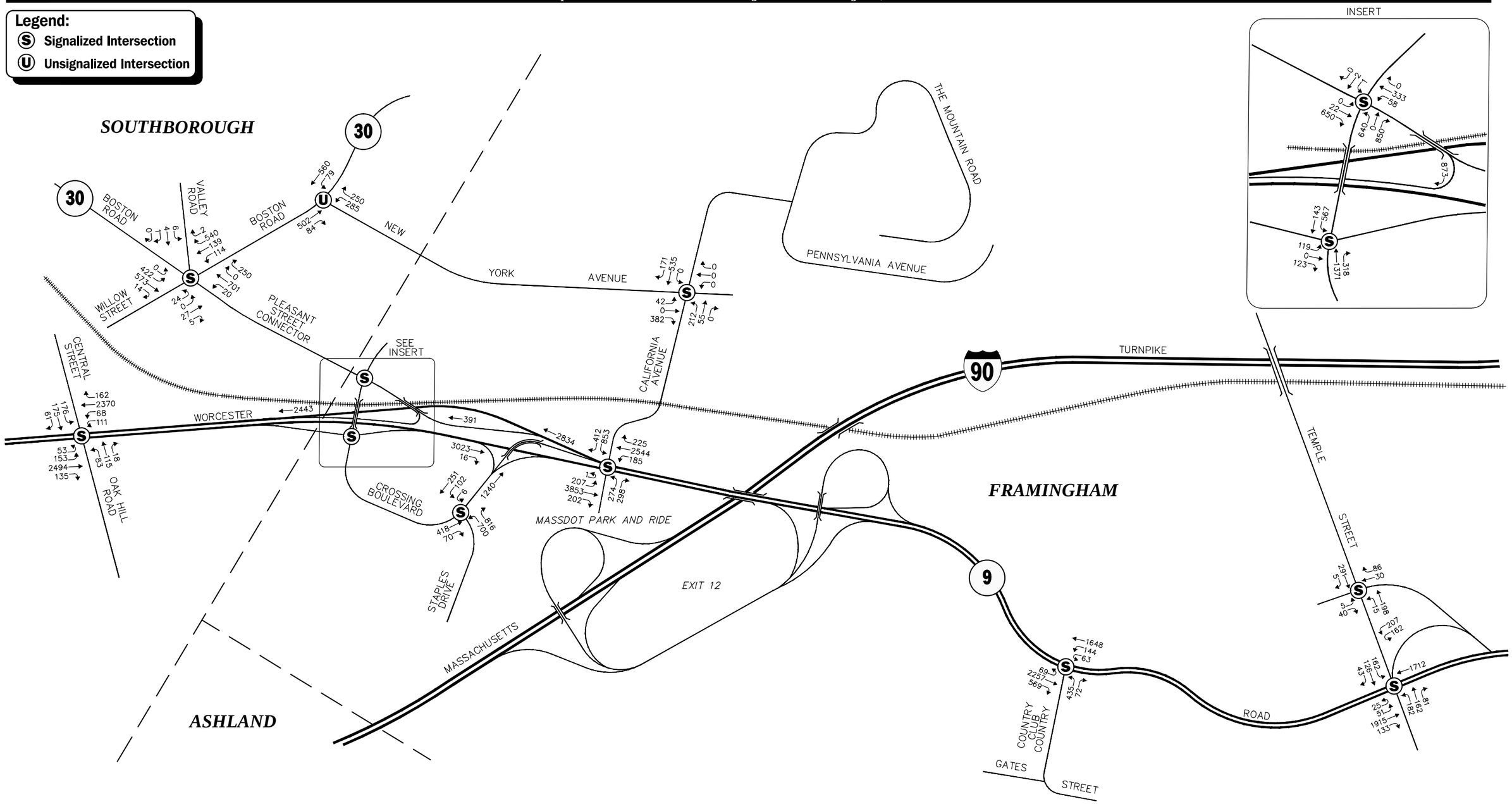

Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale

Figure 13

2016 CMU Zoning District
Build Out
Weekday Evening
Peak Hour Traffic Volumes

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A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 2.

Table 2
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	Vehicle Trips (A) 2016 Existing	(B) 2016 with CMU Build-Out	(A – B) Traffic Volume Increase
Route 9, east of Temple Street:			
Weekday Morning	2,995	3,498	503
Weekday Evening	3,395	4,032	637
Route 9, west of Central Street/Oak Hill Road:			
Weekday Morning	4,676	5,306	630
Weekday Evening	4,570	5,402	832
Central Street, north of Route 9:			
Weekday Morning	774	821	47
Weekday Evening	784	842	58
Oak Hill Road, south of Route 9:			
Weekday Morning	419	419	0
Weekday Evening	594	594	0
Route 30, north of New York Avenue:			
Weekday Morning	1,132	1,264	132
Weekday Evening	1,197	1,391	194
Route 30, west of Willow Street:			
Weekday Morning	1,640	2,046	406
Weekday Evening	1,794	2,274	480
Country Club Lane, south of Route 9:			
Weekday Morning	776	804	28
Weekday Evening	1,179	1,220	41
Temple Street, north of Route 9:			
Weekday Morning	550	554	4
Weekday Evening	581	585	4
Temple Street, south of Route 9:			
Weekday Morning	671	695	24
Weekday Evening	859	891	32

As shown in Table 2, traffic volume increases resulting from the identified build-out within the CMU Zoning Districts external to the study area that is the subject of this assessment were shown to range from 0 to 832 vehicles, with the largest traffic volume increase predicted to occur along Route 9 to the west of Central Street/Oak Street (832 vehicles during the weekday evening peak-hour). Projected traffic volume increases along Temple Street and Country Club Lane were identified to be less than 45 vehicles during the weekday peak commuter hours.

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[9] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

[9]The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual;* Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[10] Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 3 summarizes the relationship between level of service and average control delay for two-way stop controlled and all-way stop controlled intersections.

Table 3
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay (Seconds Per Vehicle)
v/c ≤ 1.0	v/c > 1.0	
A	F	≤10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	>50.0

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

[10]*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- *LOS A* describes operations with very low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than LOS A.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the Synchro™ 8 software as suggested by MassDOT in order to compensate for errors found when employing the 2010 *Highway Capacity Manual* methodology as a part of the software. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on "percentile" delay. Level-of-service designations are based on the criterion of percentile delay per vehicle and is a measure of: i) driver discomfort; ii) motorist frustration; and iii) fuel consumption; and includes a uniform delay based on percentile volumes using a Poisson arrival pattern, an initial queue move-up time, and a queue interaction delay that accounts for delays resulting from queues extending from adjacent intersections. Table 6 summarizes the relationship between level-of-service and percentile delay, and uses the same numerical delay thresholds as the HCM method. The tabulated percentile delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 4
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[a]

Level of Service	Percentile Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

Ramps and Ramp Junctions

The six levels of service for ramps and ramp junctions may be described as follows:

- LOS A represents conditions with unrestricted operations. Merging and diverging maneuvers occur without disruption to through vehicles and with no noticeable turbulence in the ramp influence area.

- LOS B represents conditions when merging and diverging maneuvers begin to create minor delays. Speeds of vehicles in the influence area begin to decline slightly.

- LOS C represents conditions where the average speed within the ramp area begins to decline as a result of increasing turbulence between merging or diverging vehicles and through traffic. Both through and ramp traffic begin to adjust their speeds to accommodate merge or diverge maneuvers. Driving conditions are still comfortable.

- LOS D represents conditions where the level of turbulence becomes greater, causing all vehicles to slow in the influence area. Vehicle queues may begin to appear on the ramps.

- LOS E represents conditions approaching the capacity of the roadway segment. Speeds decline in the influence area, with merge and diverge maneuvers creating turbulence on both the ramp and through traffic streams. Vehicle queues begin to form on the ramp and for the through traffic stream.

- LOS F represents conditions where the approach demand exceeds the discharge capacity of the downstream roadway segment. Queues grow on all approaches resulting in stop-and-go operation.

Levels of service for ramps and ramp junctions are calculated using the procedures described in the 2010 Highway Capacity Manual. Level-of-service is related primarily to the maximum vehicle density within the area of influence. The maximum vehicle density is a function of the influence area geometry; the length of the acceleration, deceleration and transition areas; and the traffic volumes entering and exiting the influence area. The position of the ramp (right- and left-hand ramp) and the proximity of adjacent ramps also affects the density calculations. Table 5

summarizes the relationship between level-of-service and maximum density for both ramp-freeway and ramp-ramp junction areas of influence.

Table 5
LEVEL-OF-SERVICE CRITERIA
FOR MERGE AND DIVERGE SEGMENTS[a]

Level of Service	Density (pc/mi/ln)[b]
A	≤10.0
B	10.1 to 20.0
C	20.1 to 28.0
D	28.1 to 35.0
E	>35.0
F	*[c]

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 13-4.
[b]Passenger car per mile per lane.
[c]Demand exceeds capacity.

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro™ intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual*. The Synchro™ vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro™ reports both the average (50th percentile) the 95th percentile vehicle queue. For unsignalized intersections, Synchro™ reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of 60 minutes during the peak one hour of the day (during the remaining 57 minutes, the vehicle queue length will be less than the 95th percentile queue length).

ANALYSIS RESULTS

Level-of-service analyses were conducted for the study area intersections and ramp junctions under 2016 Existing traffic volume and roadway conditions, and for the 2016 CMU Zoning District Build-Out condition. The results of the capacity analyses are summarized on Figures 14 and 15, with the detailed analysis results and summary tables presented in the Appendix.

With respect to the 2016 CMU Zoning District Build-Out condition, no roadway, intersection or traffic control improvements were assumed to occur within the study area for the base condition,

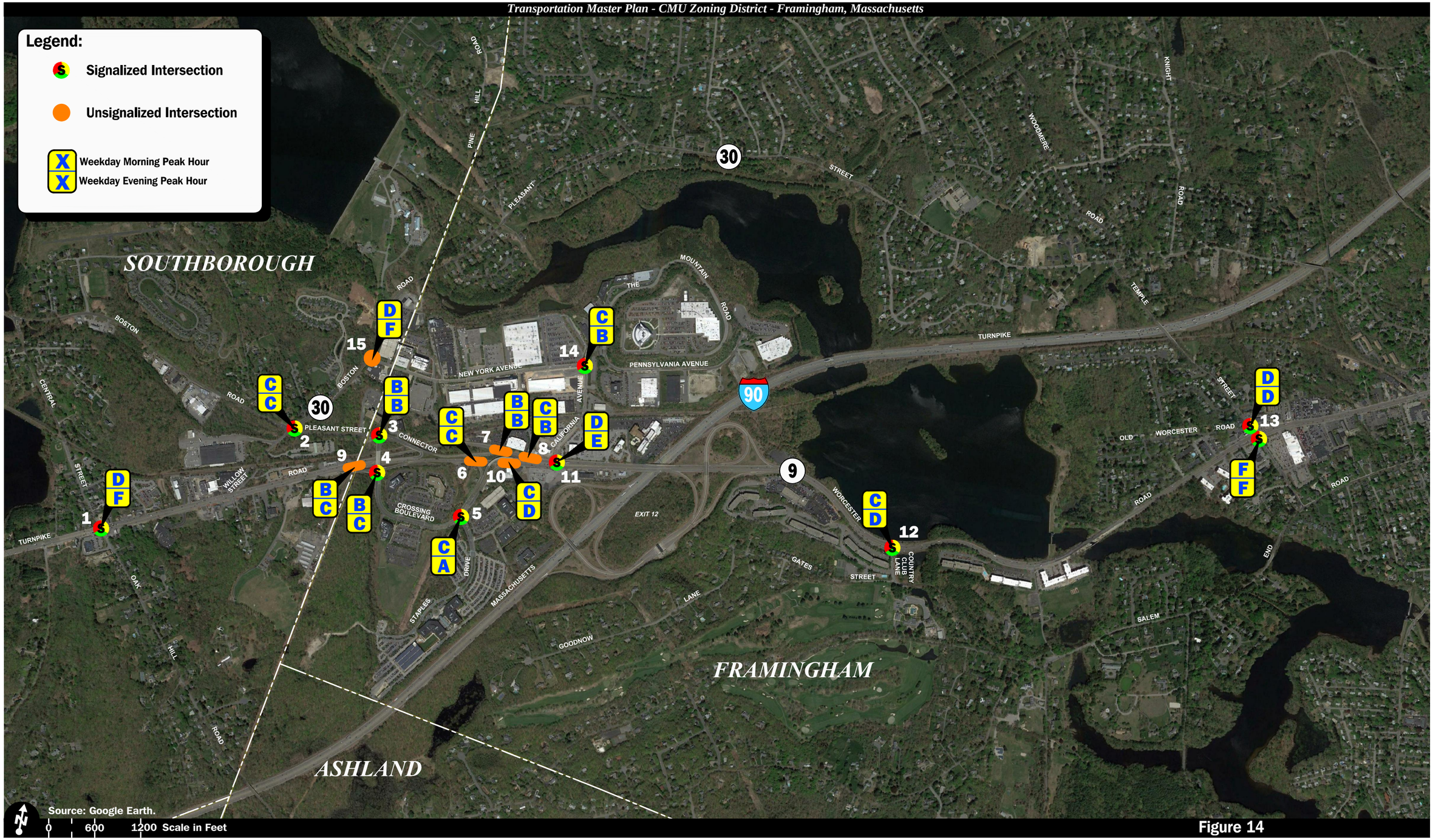

Figure 14

2016 Existing Intersection Level-of-Service Summary

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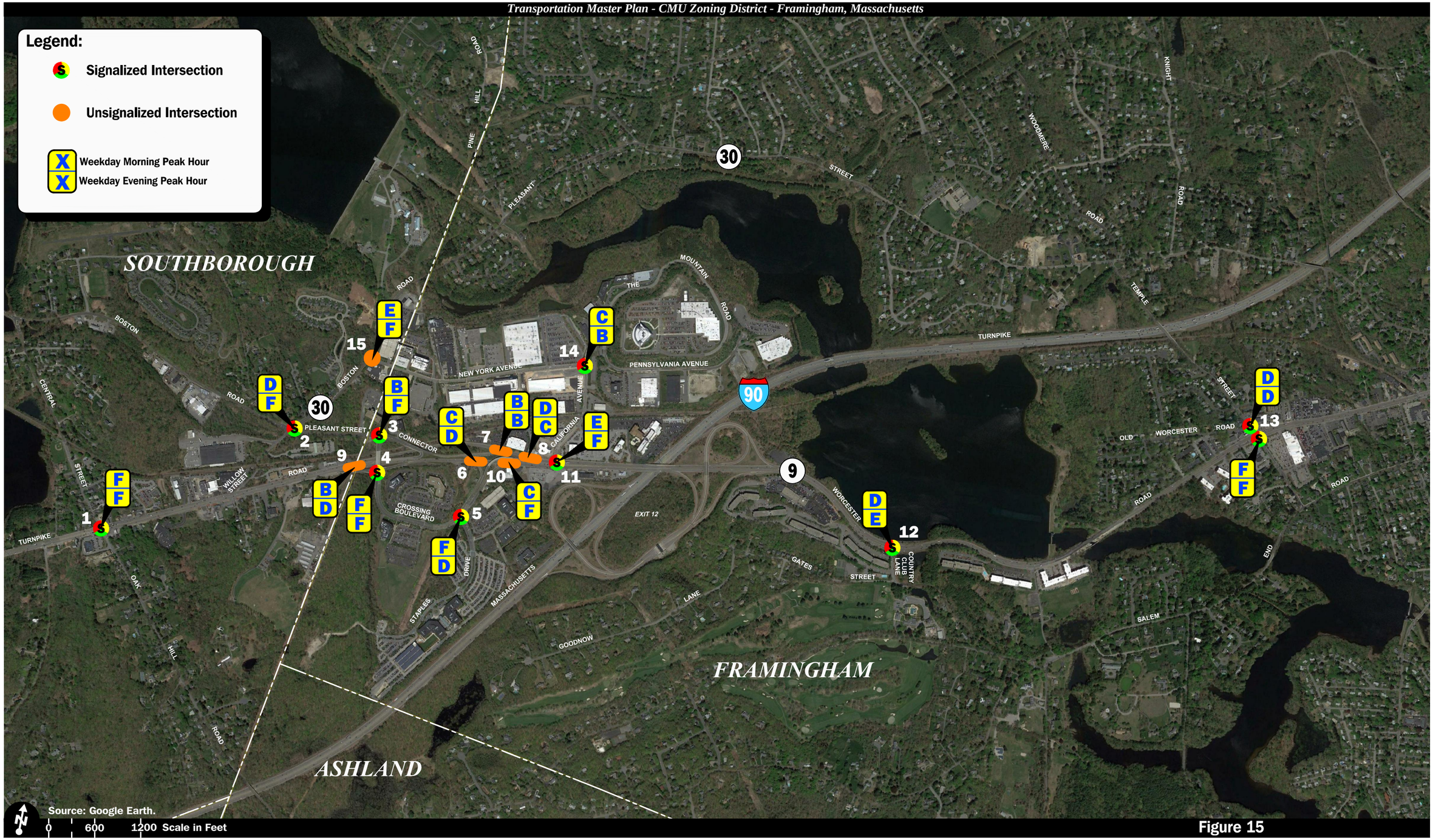

Figure 15

2016 CMU Zoning District
Build-Out Intersection
Level-of-Service Summary

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with the exception of at the Route 9/California Avenue intersection where it was assumed that the intersection would be reconstructed to accommodate the addition of a westbound left-turn lane on Route 9 to allow access for the redevelopment of the MassDOT park-and-ride lot.

The following is a summary of level-of-service analyses for the intersections and ramp junctions within the study area.

2016 Existing Conditions (Figure 14):

The majority of the intersections and ramp junctions within the study area were identified to be operating at LOS D or better during both the weekday morning and evening peak hours, where an LOS of "D" or better is generally defined as "acceptable" operating conditions. The following is a summary of those locations that were found to be operating below LOS D during one or both peak hours under 2016 Existing conditions:

Route 9/Central Street/Oak Hill Road – This signalized intersection was identified to be operating at an overall LOS D during the weekday morning peak-hour and at LOS F during the weekday evening peak-hour.

Route 9/California Avenue – This signalized intersection was identified to be operating at an overall LOS D during the weekday morning peak-hour and at LOS E during the weekday evening peak-hour.

Route 9/Temple Street – This signalized intersection was identified to be operating under constrained conditions (LOS F) during both the weekday morning and evening peak hours.

Route 30/New York Avenue – Critical movements at this unsignalized intersection (all movements exiting New York Avenue) were identified to be operating at LOS D during the weekday morning peak-hour and at LOS F during the weekday evening peak-hour.

CMU Zoning District Build-Out (Figure 15):

With the potential build-out of the CMU Zoning District, traffic operations were shown to degrade below LOS D during one or both peak hours at critical intersections within the study area as a result of the predicted increase in traffic. This observation in not unexpected given that the majority of the intersections and ramp junctions were identified to be operating at LOS C or D during the peak hours under 2016 Existing conditions, an indication that limited reserve capacity is available to accommodate future traffic volume increases.

The following is a summary of those locations that were found to be operating below LOS D during one or both peak hours under the 2016 CMU Zoning District Build-Out condition:

Route 9/Central Street/Oak Hill Road – Overall operating conditions at this signalized intersection were shown to degrade from LOS D to LOS F during the weekday morning peak-hour and to continue to operate at LOS F during the weekday evening peak-hour.

Pleasant Street Connector/Willow Street/Valley Road/Route 30 – Overall operating conditions at this signalized intersection were shown to degrade from LOS C to LOS D during the weekday morning peak-hour and from LOS C to LOS F during the weekday evening peak-hour.

Pleasant Street Connector at Crossing Boulevard – Overall operating conditions at this signalized intersection were shown to remain at LOS B during the weekday morning peak-hour and to degrade from LOS B to LOS F during the weekday evening peak-hour.

Crossing Boulevard/Route 9 Eastbound Ramps – Overall operating conditions at this signalized intersection were shown to degrade from LOS B to LOS F during the weekday morning peak-hour and from LOS C to LOS F during the weekday evening peak-hour.

Crossing Boulevard/Staples Drive/Route 9 Ramps – Overall operating conditions at this signalized intersection were shown to degrade from LOS C to LOS F during the weekday morning peak-hour and from LOS A to LOS D during the weekday evening peak-hour.

Route 9 Eastbound/Crossing Boulevard On-Ramp – Operating conditions at this ramp junction were shown to remain at LOS C during the weekday morning peak-hour and to degrade from LOS D to LOS F during the weekday evening peak-hour.

Route 9/California Avenue – Overall operating conditions at this signalized intersection were shown to degrade from LOS D to LOS E during the weekday morning peak-hour and from LOS E to LOS F during the weekday evening peak-hour.

Route 9 at Country Club Lane – Overall operating conditions at this signalized intersection were shown to degrade from LOS C to LOS D during the weekday morning peak-hour and from LOS D to LOS E during the weekday evening peak-hour.

Route 9/Temple Street – This signalized intersection was identified to continue to operate at LOS F during both the weekday morning and evening peak hours.

Route 30/New York Avenue – Operating conditions for the critical movements at this unsignalized intersection (all movements exiting New York Avenue) were shown to degrade from LOS D to LOS E during the weekday morning peak-hour and to continue to operate at LOS F during the weekday evening peak-hour.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has conducted an assessment of the proposed Corporate Mixed-Use (CMU) Zoning District to be located off Worcester Road (Route 9) and generally bounded by the Massachusetts Turnpike (I-90), a CSX rail line, and the Ashland and Southborough town lines, in Framingham, Massachusetts. The purpose of this assessment was to identify the potential impacts on the transportation infrastructure associated with the build-out of properties located within the proposed CMU Zoning District (I and II) and to define specific improvements that may be necessary to support the identified build-out, inclusive of expansion of pedestrian and bicycle accommodations and access to public transportation.

As a result of this assessment, specific improvements have been identified that are designed to address current operational and safety deficiencies within the study area, and that will afford sufficient capacity to accommodate the projected build-out potential of the CMU Zoning District.

RECOMMENDATIONS

A review of the transportation system serving the CMU Zoning District indicates that specific improvements will be required to accommodate the build-out potential of the parcels within the District. These improvements range from traffic signal timing adjustments, the widening of roadways and intersections, and the installation of traffic control signals. The specific improvement measures and the timing of their implementation will be dependent on the location, type and size of a specific development or redevelopment project; however, these recommendations should serve as a guide for future improvements as development within the CMU Zoning District advances.

The following improvements have been identified for the CMU Zoning District and are depicted on Figure 16, with the resulting improvement in operating conditions (level-of-service) summarized on Figure 17. In addition, Transportation Demand Management (TDM) strategies have also been identified that are designed to reduce the overall amount of new traffic that may result from future development in the area. It is important to note that a determination as to the availability of public right-of-way to accommodate the recommended improvements (i.e., no permanent private property impacts) was beyond the scope of this assessment and will need to be reviewed when a formal design is advanced for a specific improvement measure.

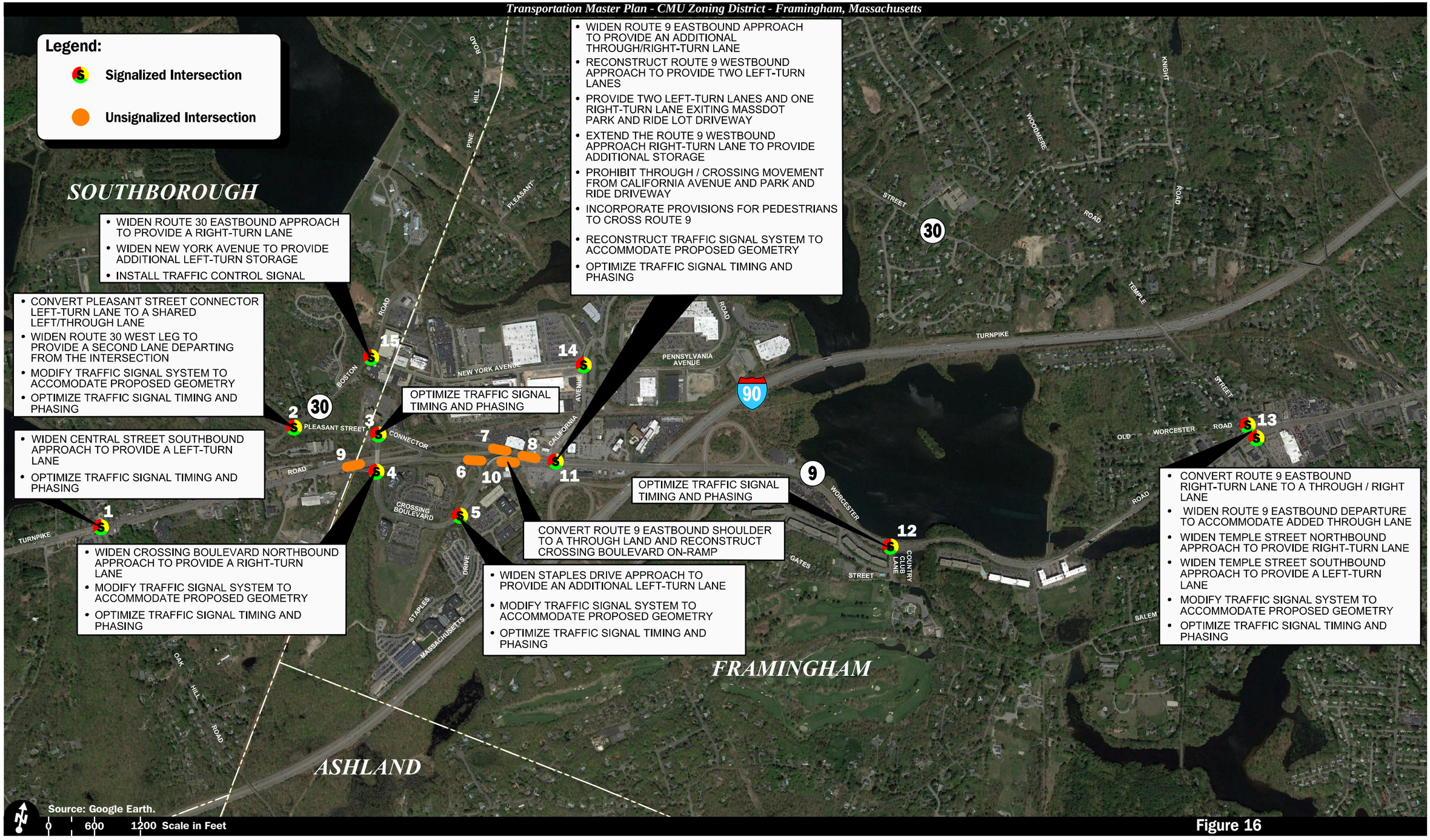

Figure 16

2016 CMU Zoning District Build-Out Recommended Improvement Summary

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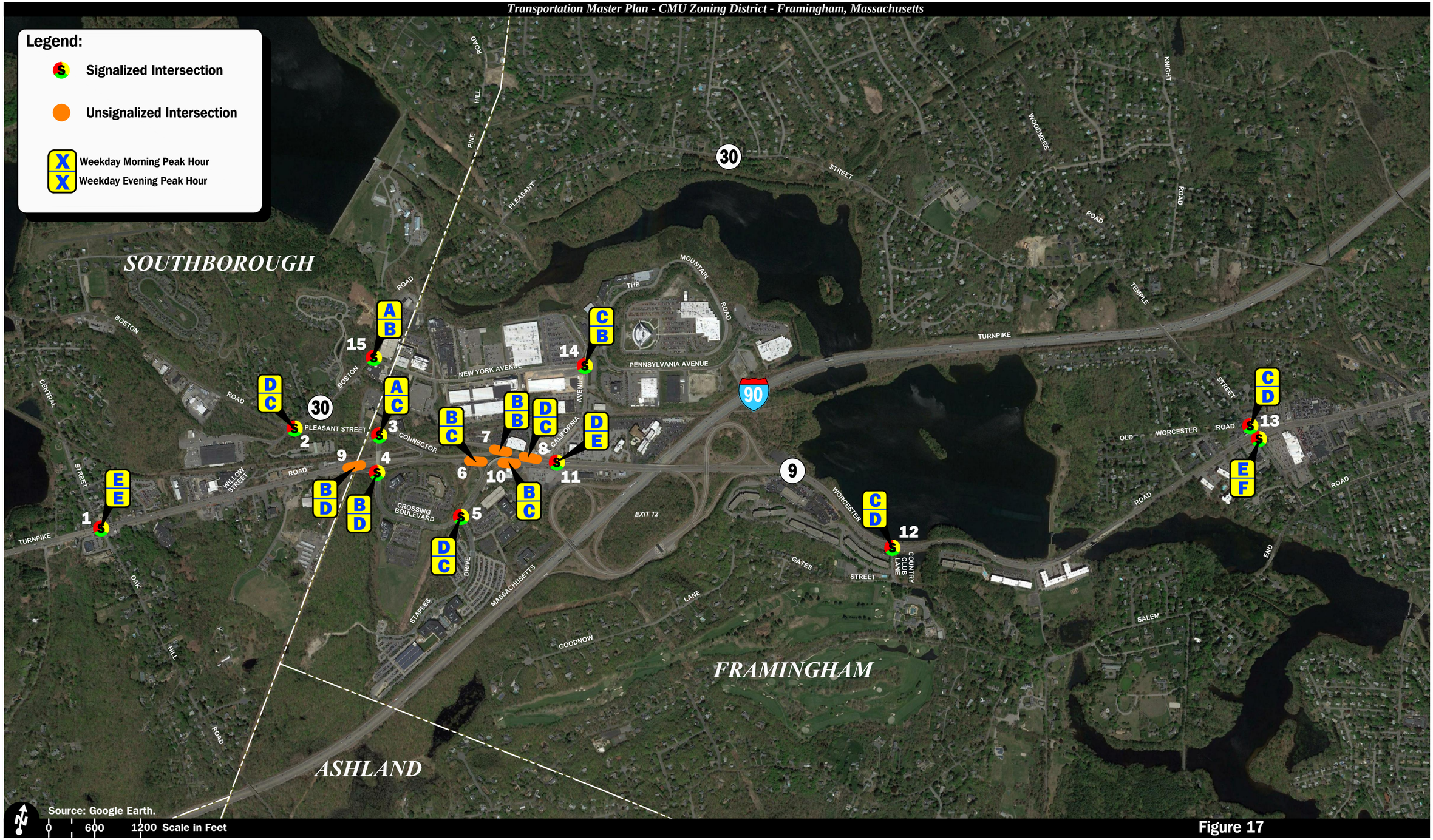

Figure 17

2016 CMU Zoning District
Build-Out with Improvements
Level-of-Service Summary

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The following provides a brief description of the improvements that have been identified to accommodate the projected build-out of the CMU Zoning District:

Route 9 at Central Street and Oak Hill Road

- Widen the Central Street southbound approach to provide a left-turn lane
- Optimize traffic signal timing and phasing

Pleasant Street Connector at Willow Street, Valley Road and Route 30

- Convert the Pleasant Street Connector left-turn lane to a shared left-turn/through travel lane
- Widen the Route 30 west leg to provide a second lane departing from the intersection (westbound)
- Modify the traffic signal system to accommodate the recommended geometry
- Optimize traffic signal timing and phasing

Pleasant Street Connector at Crossing Boulevard

- Optimize traffic signal timing and phasing

Crossing Boulevard at the Route 9 Eastbound Ramps

- Widen the Crossing Boulevard northbound approach to provide a right-turn lane
- Modify the traffic signal system to accommodate the recommended geometry
- Optimize traffic signal timing and phasing

Crossing Boulevard at Staples Drive and the Route 9 Ramps

- Widen Staples Drive to provide an additional left-turn lane
- Modify the traffic signal system to accommodate the recommended geometry
- Optimize traffic signal timing and phasing

Route 9 eastbound at the Crossing Boulevard On-Ramp

- Convert the Route 9 eastbound shoulder to a through travel lane approaching the Crossing Boulevard On-Ramp and extending to California Avenue
- Reconstruct and relocate the Crossing Boulevard On-Ramp to accommodate the third travel lane on Route 9 eastbound

Route 9 at California Avenue and the MassDOT Park-and-Ride Lot

- Widen the Route 9 eastbound approach to provide an addition through/right-turn lane (discussed above)
- Reconstruct the Route 9 westbound approach to provide two left-turn lanes and to extend right-turn lane storage
- Provide two left-turn lanes and one right-turn lane exiting the MassDOT Park-and-Ride lot driveway to accommodate the redevelopment of the parking lot

- Prohibit through/crossing movements from both the driveway and California Avenue approaches
- Incorporate provisions for pedestrians to cross Route 9
- Reconstruct the traffic signal system to accommodate the recommended geometry
- Optimize traffic signal timing and phasing

Route 9 at Country Club Lane

- Optimize traffic signal timing and phasing

Route 9 at Temple Street and Old Worchester Road

- Convert the Route 9 eastbound right-turn lane to a through/right-turn lane
- Widen the Route 9 eastbound departure to accommodate the added through travel lane
- Widen the Temple Street northbound approach to provide a right-turn lane
- Widen the Temple Street southbound approach to provide a left-turn lane
- Modify the traffic signal system to accommodate the recommended geometry
- Optimize traffic signal timing and phasing

Route 30 at New York Avenue

- Widen the Route 30 eastbound approach to provide a right-turn lane
- Widen New York Avenue to provide additional left-turn storage
- Install a traffic signal control

The following intersections were shown to continue to operate at or over capacity with the identified improvements, and would require a more extensive improvement strategy that could entail grade separated interchanges, frontage roads or similar strategies that are of a more regional nature:

- ***Route 9/Central Street/Oak Hill Road*** (LOS E/E)
- ***Route 9/California Avenue*** (LOS D/E)
- ***Route 9/Temple Street*** (LOS E/F)

Transportation Demand Management Strategies

Given the level of existing and potential future development in CMU Zoning District, it is important that a robust Transportation Demand Management (TDM) program be developed in order to reduce the overall volume of new traffic in the area and afford opportunities for the use of alternative modes of transportation to single-occupant vehicles. The following general TDM strategies should be considered and advanced by the Town and area developers in a public-private partnership:

- Establish a regional Transportation Management Association (TMA) for the CMU Zoning District either as a partner or expansion of the MetroWest/495 Transportation Management Association or as a new TMA. The TMA could be funded through fees provided by members of the TMA with opportunities for state and Federal TMA grants.

- Coordinate with MassDOT, the MWRTA and the Metropolitan Area Planning Council (MAPC) to expand the frequency and service routes for fixed-route bus service within the CMU Zoning District, with additional connections to the Framingham Commuter Rail Station.

- Improve pedestrian and bicycle access and accommodations along Route 9 and within the CMU Zoning District, with links to and between properties to provide connectivity.

- Consider the establishment of off-road pathways and connections that accommodate pedestrians and bicycles outside of the Route 9 corridor.

- Development and redevelopment projects should be designed to include secure bicycle parking, including exterior bicycle racks proximate to building entrances and interior or covered parking where parking garages are proposed.

- Development and redevelopment projects should include a TDM program that is designed to inform employees, residents and patrons of available public transportation options, car/vanpool services and pedestrian and bicycle amenities, and to encourage their use.

- Development and redevelopment projects should be required to coordinate with MassDOT and MassRIDES, MassDOT's rideshare coordinator, to develop and implement a TDM program.

- Development and redevelopment projects should not provide more parking than required by Town Zoning unless justified for the proposed use, with the use of "land banked" or reduced parking encouraged.

TDM goals and objectives should be developed for each project that would include a defined target for traffic volume reductions that are specific to the land use that is being developed and would identify the metrics by which the target will be measured. An annual report would be submitted to the Town in order to document the success of the TDM program at achieving the trip reduction goal and to allow for expansion or modification of the TDM program as necessary to achieve the targeted trip reduction.