2.0 TRANSPORTATION ALTERNATIVES

This section presents the analysis of transportation alternatives within the Downtown study area.

2.1 Methodology

The assessment of the DRC's four selected alternatives followed a two tiered approach. First, the alternatives were screened and evaluated based on prevailing physical and environmental constraints. Alternatives passing the tier-one evaluation were then evaluated based for impacts to traffic operations.

2.2 Tier-One Evaluations - Physical and Environmental Constraints

Tier-one assessments included a review of physical and geometric constraints and potential environmental impacts such as impacts to wetland resource areas, park land, properties, and access issues.

Base plans for these assessments were compiled from the Town of Framingham's GIS database including edge of road, driveways, parking lots, pavement markings, parcel lines, storm drains, sanitary sewers and water lines. Plans also depicted existing contour lines at two foot increments. Field reviews were conducted to supplement the GIS data.

Where alternatives followed along existing roadways, assessments considered land use, turning radii, sight distance, existing railroad grade crossings, existing on-street parking, existing truck exclusions, and potential for construction of additional lanes.

Where alternatives would follow new alignments or where significant changes to existing roadway alignments would be required (as with the underpass options), the MassHighway Project Development and Design Guide (Guidebook) was used to establish approximate cross section widths. Exhibit 5.12 of the Guidebook provides widths for usable shoulders and Exhibit 5.14 provides travel lane widths for various classifications of roadways.

2.2.1 Alternative 1: Grade Separation of Route 126 Under Route 135 and the Rail Tracks

Route 135 and Route 126 are each classified as urban principal arterials. This alternative would provide a grade separated crossing at the intersection of Route 135 and Route 126. Route 126 would be depressed under Route 135 and the rail corridor. The depressed section of Route 126 would extend from approximately 550 feet north of Route 135 to approximately 450 feet south of Route 135. This alternative is presented in **Figure 2-1.**

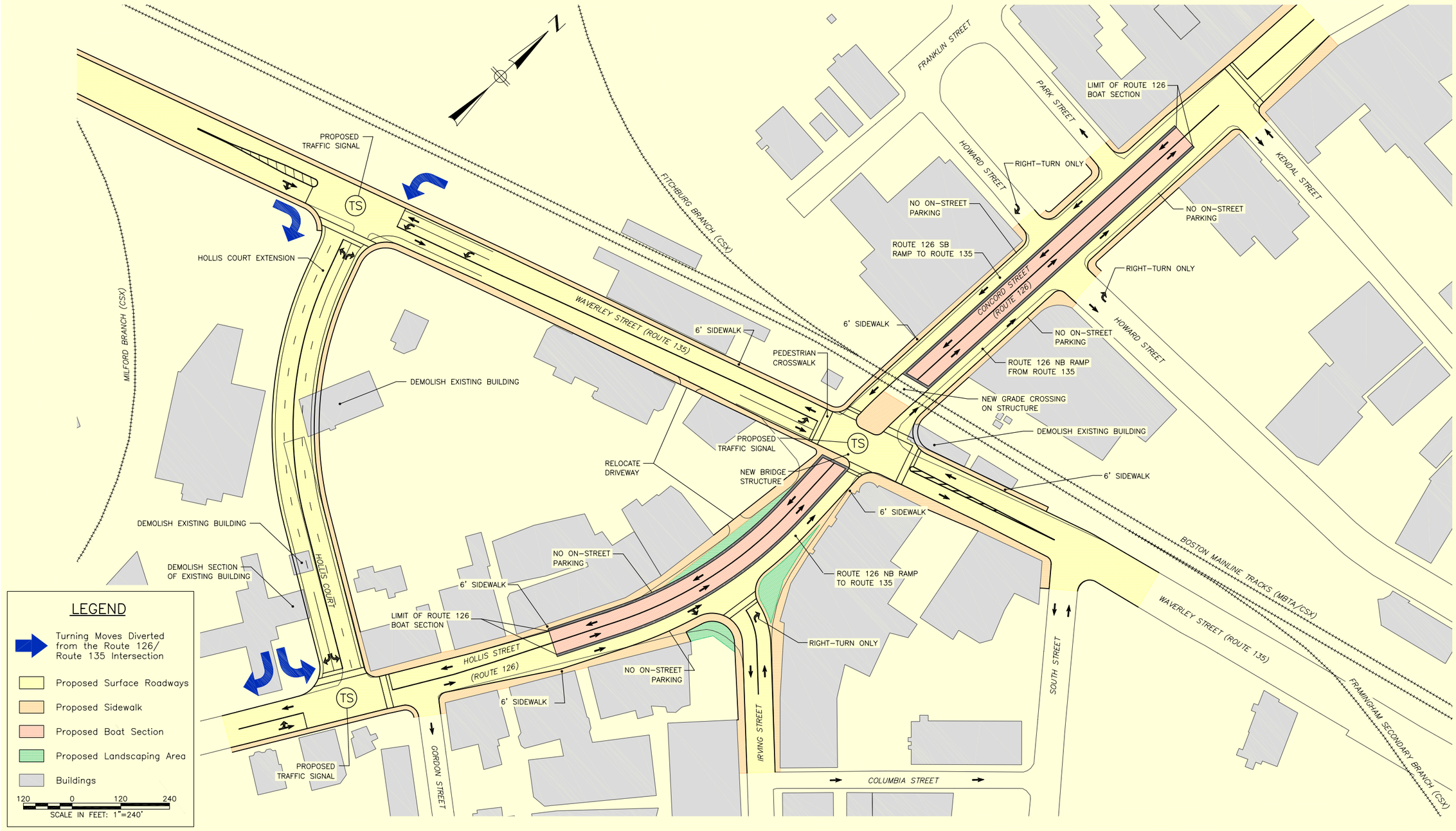

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Figure 2-1
Alternative 1
Route 126 Under Route 135

The proposed cross section for a Route 126 Underpass would include two 11-foot travel lanes with four-foot shoulders to conform to the minimum requirements, shown in Exhibits 5-12 and 5-14 of the Guidebook for arterial roadways. In addition to the roadway, retaining walls would be required on both sides of the roadway. The remaining space within the cross section would be used for sidewalks and/or ramps connecting Route 126 with Route 135. Profiles for the underpass were developed using a minimum vertical clearance of 16.5 feet as shown in Exhibit 4-28 of the Guidebook, a maximum vertical grade of 6.00 percent, and a design speed of 35 miles per hour.

The cross section of Route 126 would be constrained by existing buildings on each side of the roadway between Howard Street and Route 135. The available distance from face-of-building to face-of-building is approximately 80 feet. The proposed cross section in this area would include a 30-foot pavement section; two three-foot thick retaining walls; two 16-foot, one-way, one-lane ramps; and two six-foot sidewalks at-grade on Route 126. The ramps would allow connections from Route 135 to northbound Route 126 and from southbound Route 126 to Route 135. This cross section requires the total available width of approximately 80 feet.

South of Route 135, the proposed depressed section would extend past the Irving Street intersection. South of Irving Street, the available cross section would be constrained to 64 feet by existing buildings on each side of Route 126. The proposed cross section in this area would include a 30-foot pavement section; two three-foot thick retaining walls; one 16-foot wide, one-way, one-lane northbound ramp connection to Route 135; and a minimum six-foot sidewalk on each side, for a total of 64 feet. Irving Street at the intersection with the northbound ramp would be restricted to right turns only.

A proposed bridge structure would carry both Route 135 and the Boston Mainline tracks over Route 126.

Construction of this alternative would be complicated by the need to place the Boston Mainline tracks on a new bridge structure over Route 126, while maintaining both commuter rail and freight service.

A summary of key issues associated with this alternative include:

- The grade separation would facilitate through traffic on Route 126 eliminating disruption by trains at Route 126.
- The required boat section for the underpass would extend beyond the Howard Street and Park Street intersections, north of Route 135, restricting access and egress from these roadways. The Irving Street approach to the ramp roadway would be restricted to right-turn only.
- Pedestrian connections across Route 126 would be impacted along Route 126. Pedestrian crossings of Route 126 would likely be limited to locations near Kendall Street, Route 135, and Gordon Street.
- On-street parking on Route 126 would be eliminated from Park Street to Gordon Street.

- One-lane ramp connections could be provided in three quadrants, allowing traffic to move from southbound Route 126 to Route 135, northbound Route 126 to Route 135 and Route 135 to northbound Route 126. Signalization of Route 135 at the ramps will likely be required to facilitate traffic operations.
- An Extension of Hollis Court would be required to allow an eastbound Route 135 connection to Route 126. Hollis Court Extension is discussed below in Section 2.2.1.1.
- Commuter rail and freight service would need to be maintained during construction, complicating bridge construction.
- Existing utilities on Route 126 and Route 135, including electric, gas, communications, water, and sewer would need to be addressed.
- Storm water issues at the low-point in the underpass would need to be addressed.

While physically feasible, depressing Route 126 under Route 135 presents significant constructability issues, would adversely impact the Downtown environment, and therefore appears undesirable.

2.2.1.1 Hollis Court Extension

An extension of Hollis Court would be required to allow the eastbound Route 135 connection to Route 126. This would extend Hollis Court on a new alignment from its existing terminus northerly, approximately 300 feet, to form a new T-intersection with Route 135. The new intersection would be opposite the existing driveway to the commuter rail parking lot, approximately 600 feet west of Route 126. The Hollis Court Extension would be required for Alterative 1 (Route 126 Underpass) and for Alternative 2 (Route 135 Underpass).

Hollis Court Extension would pass through an existing parking area and between two existing buildings (a plumbing supply store and an auto parts store) located at the northerly end of the existing Hollis Court. Several parking spaces on the easterly side of the plumbing supply store may have to be eliminated. Access to loading bays located on the east side of the plumbing supply store would have to be accommodated.

The Hollis Court Extension approaches to both Route 126 and Route 135 would require two lanes. These intersections would likely require signalization.

The existing pavement width on Hollis Court is approximately 27 feet, with a 35-foot right of way.

Two possible cross sections were evaluated to assess the potential impacts of a Hollis Court Extension:

- Four-lane section from Hollis Street to Route 135 with one six-foot sidewalk.
- Two-lane section with expansion to separate left-turn and right-turn lanes at each intersection. A six-foot sidewalk would be provided on one side.

The total section width of the four lane section would be approximately 58 feet (four 11-foot lanes, two 4-foot shoulders, and one six-foot sidewalk). If sidewalk is desired on each side, then the cross section of approximately 64 feet, and would require property takings.

Maintaining the approximate curb line along the northerly edge of Hollis Court would require a partial taking of the gas station/garage parcel on the southwest corner of the Hollis Street/Hollis Court intersection. The taking would impact an isolated pump bay and part of the main building, including apparent office space and one garage bay. Alternately, if the southerly curb line (adjacent to the gas station/garage) were to be maintained, then the two existing buildings on the northerly side would need to be acquired/demolished. With either scenario, the auto parts store just north of the existing terminus of Hollis Court would need to be acquired and demolished.

The two-lane cross section (with added turning lanes at Hollis Street and Route 135) would reduce the overall footprint of the proposed roadway. The overall section width at the intersection approaches would be approximately 47 feet (three 11-foot lanes, two 4-foot shoulders, and one six-foot sidewalk). The proposed cross section would still require some land acquisition from the existing gas station/garage to avoid impacts to the existing buildings in the northeast quadrant of the Hollis Street/Hollis Court intersection and to allow for truck turning movements from Hollis Street to Hollis Court. The proposed alignment would impact an existing isolated pump bay, and would be at the face of the existing building. It is likely that the auto parts building would be impacted.

The four-lane section is recommended, as it would provide additional roadway capacity and it would provide for storage of queued turning vehicles at each traffic signal.

A summary of key issues associated with a Hollis Court Extension include:

- The Hollis Court Extension would provide “missing ramp” connections for Alternatives 1 and 2, as well as provide increased connectivity between Route 135 and Route 126.
- Land acquisitions would be required to accommodate a widened cross section for Hollis Court. These would likely include acquisition and demolition of the existing auto parts store and partial acquisition and possible partial demolition of the existing gas station/garage.
- The existing corner radii at Hollis Court and Hollis Street are substandard for a WB-40 design vehicle. Improvements would be needed to accommodate truck turning movements.

- Consideration should be given to consolidating the driveway openings for the gas station on the south side of Hollis Court.

2.2.2 Alternative 2: Grade Separation of Route 135 Under Route 126

This alternative would provide a grade separated crossing at the intersection of Route 135 and Route 126. Route 135 would be depressed under Route 126, with Route 126 approximately maintaining its existing alignment. The depressed section of Route 135 would extend from approximately 500 feet west of Route 126 to approximately 480 feet east of Route 126. The westerly limit of the depressed section would begin immediately east of a potential Hollis Court Extension. The easterly limit of the depressed section would be approximately 125 feet west of the existing at-grade crossing of the Framingham Secondary track.

This alternative is presented in **Figure 2-2**.

The proposed cross section for a Route 135 Underpass would include two 11-foot travel lanes with 4-foot shoulders to conform to the minimum requirements shown in Exhibits 5-12 and 5-14 of the Guidebook. In addition to the roadway section, retaining walls would be required on both sides of the roadway. The remaining space within the section would be used for sidewalks and/or ramps connecting Route 135 with Route 126. Profiles for the underpass were developed using a minimum vertical clearance of 16.5 feet, as shown in Exhibit 4-28 of the Guidebook a maximum vertical grade of 5.27 percent, and a design speed of 35 miles per hour.

The available cross section would be constrained by existing buildings on both sides of the road west of the Route 126 intersection, including two buildings on the south side and the historic train station on the north side. The available distance from face-of-building to face-of-building is approximately 56 feet. Due to the existing constraints, the proposed cross section, west of the intersection, would be a 30-foot pavement section with two three-foot thick retaining walls and two 10-foot wide sidewalks at-grade on Route 135.

East of the intersection, three buildings on the south side of Route 135 directly abut the back of sidewalk. On the north side, two small buildings sit between Route 135 and the Boston Mainline tracks. The existing distance between the buildings is approximately 66 feet. In order to make a partial connection between Route 135 and Route 126, ramps were considered on Route 135, east of the intersection. These would consist of a 16-foot, one-way, one-lane ramp eastbound from Route 126 to Route 135 and a 16-foot, one-way one-lane ramp from westbound Route 135 to Route 126. The total cross section width would be approximately 74 feet, including three-foot thick retaining walls and a six-foot sidewalk on the south side. Provision of ramps to the east of the intersection would require acquisition and demolition of the two small buildings between Route 135 and the railroad corridor.

Ramp connections between Route 135 and Route 126 would be provided on the east side of the intersection. These ramps would operate as right-in and right-out movements. The eastbound on-ramp to Route 135 would

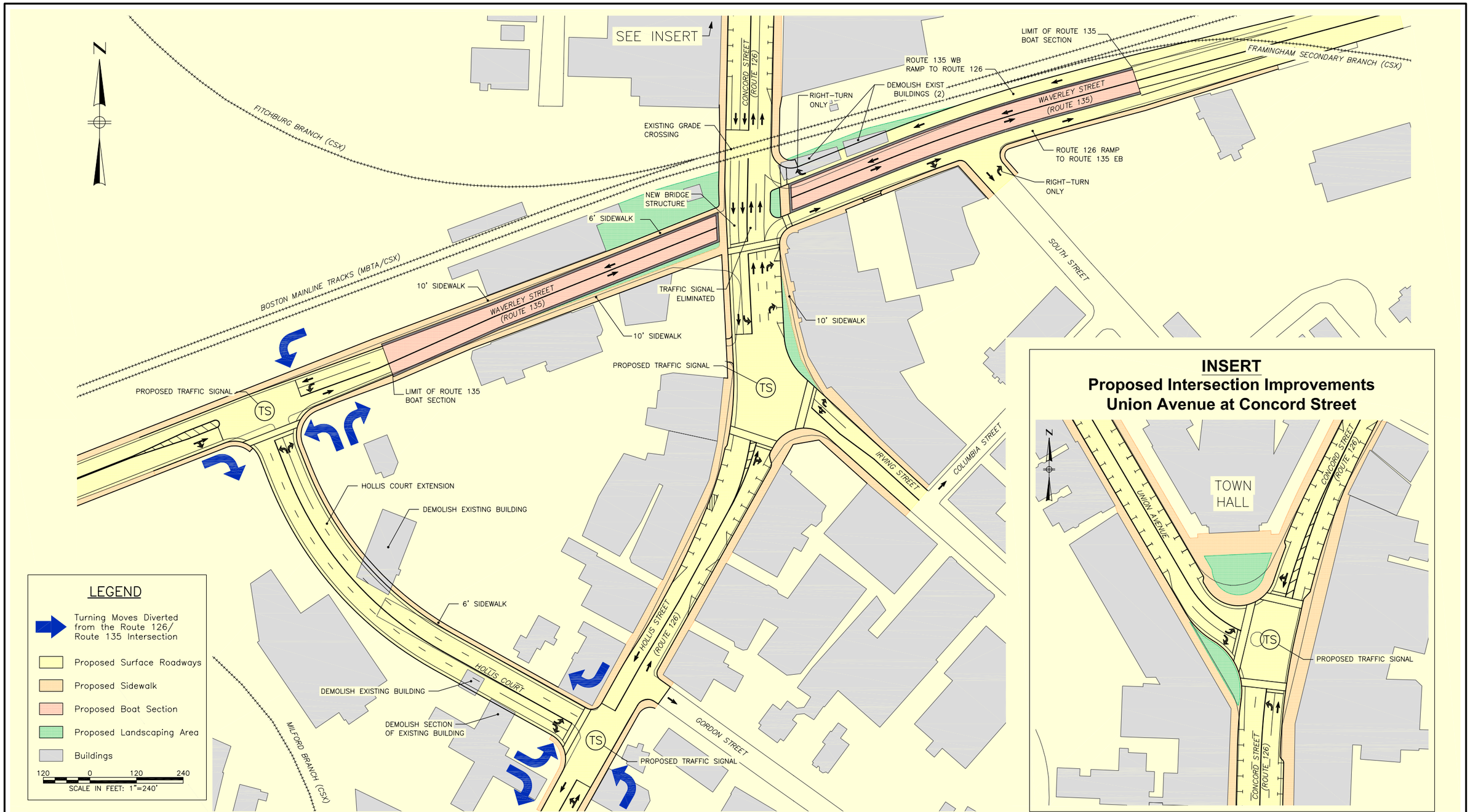

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Figure 2-2
Alternative 2
Route 135 Under Route 126

extend past South Street creating a right in/right out restriction at South Street. Side streets beyond the immediate vicinity of the intersection would be used to provide connections from eastbound Route 135 to Route 126 and from Route 126 to westbound Route 135. This would include the extension of Hollis Court, as discussed above in **Section 2.2.1.1 - Hollis Court Extension**. New signals would likely be required at the Route 126/Hollis Court and Route 135/Hollis Court Extension intersections.

Other proposed improvements along Route 126 beyond the intersection are:

- Geometric improvements and new traffic signal at Route 126 and Irving Street
- Maintain existing traffic signals at Route 126 and Howard Street
- Geometric improvements and new traffic signal at Route 126 and Union Avenue.

A summary of key issues associated with the Route 135 Underpass alternative include:

- A grade separation would facilitate through traffic on Route 135.
- Pedestrian connections between Downtown sections, north and south of Route 135, would be enhanced.
- The existing at-grade crossing of the Boston Mainline track would remain on Route 126.
- A Hollis Court Extension would be required for connections from eastbound Route 135 to Route 126 and from Route 126 to westbound Route 135.
- Land acquisitions would be required to accommodate Hollis Court Extension. These would likely include acquisition and demolition of the existing auto parts store and acquisition and possible partial demolition of the existing gas station/garage.
- Land acquisitions would be required to accommodate ramps along Route 135 east of Route 126. These would likely include acquisition and demolition of the existing buildings located between Route 135 and the Boston Mainline tracks.
- Existing utilities on Route 135, including water and sewer, would need to be addressed.
- Storm water issues at the low-point in the underpass would need to be addressed.

The alternative of depressing Route 135 under Route 126 is feasible from a physical and geometric aspect. It will provide the benefit of uninterrupted traffic flow on Route 135, while enhancing pedestrian connections across the intersection. Direct ramp connections can be accommodated on the east side of the intersection.

Based on the physical feasibility of this alternative and the potential benefits to traffic flow and safety, this alternative warrants further development.

2.2.3 Alternative 3: East Bypass – Loring Drive Alignment

This would be a bypass alignment intended to allow through traffic on Route 126 to bypass the congested area in Downtown Framingham, without compromising access for local traffic to the Downtown. This alternative is shown in **Figure 2-3**.

From the west, the alignment would begin on Hollis Street (Route 126), in the vicinity of its intersection with the access drive to the CSX Automobile Facility adjacent to the CP rail yard. It would then head east crossing the yard tracks. The alignment would then enter a partially wooded area, crossing a stream and adjacent wetland, west of the General Motors (GM) parcel. It would then continue through the westerly end of the GM parcel parking lot and pass just north of an existing building. The alignment would then intersect Loring Drive, approximately opposite the drive to the MCI Framingham parking lot. The alignment would continue northerly on the existing Loring Drive alignment to Irving Street. From Irving Street it would run on Blandin Avenue to the Beaver Street intersection, where it would then cross Route 135 at an existing signalized intersection. The bypass would continue across the existing at-grade crossing of the Boston Mainline tracks to Bishop Street, turn left onto Everit Avenue, and connect to Route 126. The total distance of the East Bypass alignment would be approximately 10,500 feet, nearly 2,700 feet longer than the existing path along Route 126 alignment.

Three potential points on Hollis Street were considered to begin the bypass alignment, an extension of Bates Road, the CSX Automobile Facility, and an extension of Andrews Street. Both Bates Road and Andrews Street are residential roads. The CSX facility has a controlled access drive. A new roadway through the CSX facility would bisect the existing parking lot and would complicate controlled access, although the CSX facility is currently inactive.

A new alignment from Hollis Street would need to cross the existing CP Yard tracks. It is expected that a grade separated crossing would be required, either passing under the tracks or over the tracks.

The area between the rail yard and the General Motors property would likely involve crossing an existing stream and associated resource areas. The extent of the impacts to resource areas would need to be evaluated to determine the level of permitting required.

Acquisition of a portion of the GM parcel parking lot would be required to develop the bypass route up to its intersection with Loring Drive. Loring Drive, Irving Street, Blandin Avenue and Beaver Street are two-way, two-lane roads. Land use along this part of the bypass alignment is generally a mix of commercial and industrial land uses. There are existing traffic signals at the intersections of Irving Street/Blandin Avenue and Route 135/Beaver Street, and an existing at-grade crossing of the Framingham Secondary on Blandin Avenue. Geometrically, the alignment of Loring Drive, Irving Street, Blandin Avenue and Beaver Street could support a two-lane bypass. Improvements would likely be required at the intersection of Blandin Avenue/Beaver Street to accommodate increased northbound left turns and at the intersection of Irving Street/Blandin Avenue to accommodate increased southbound left turns.

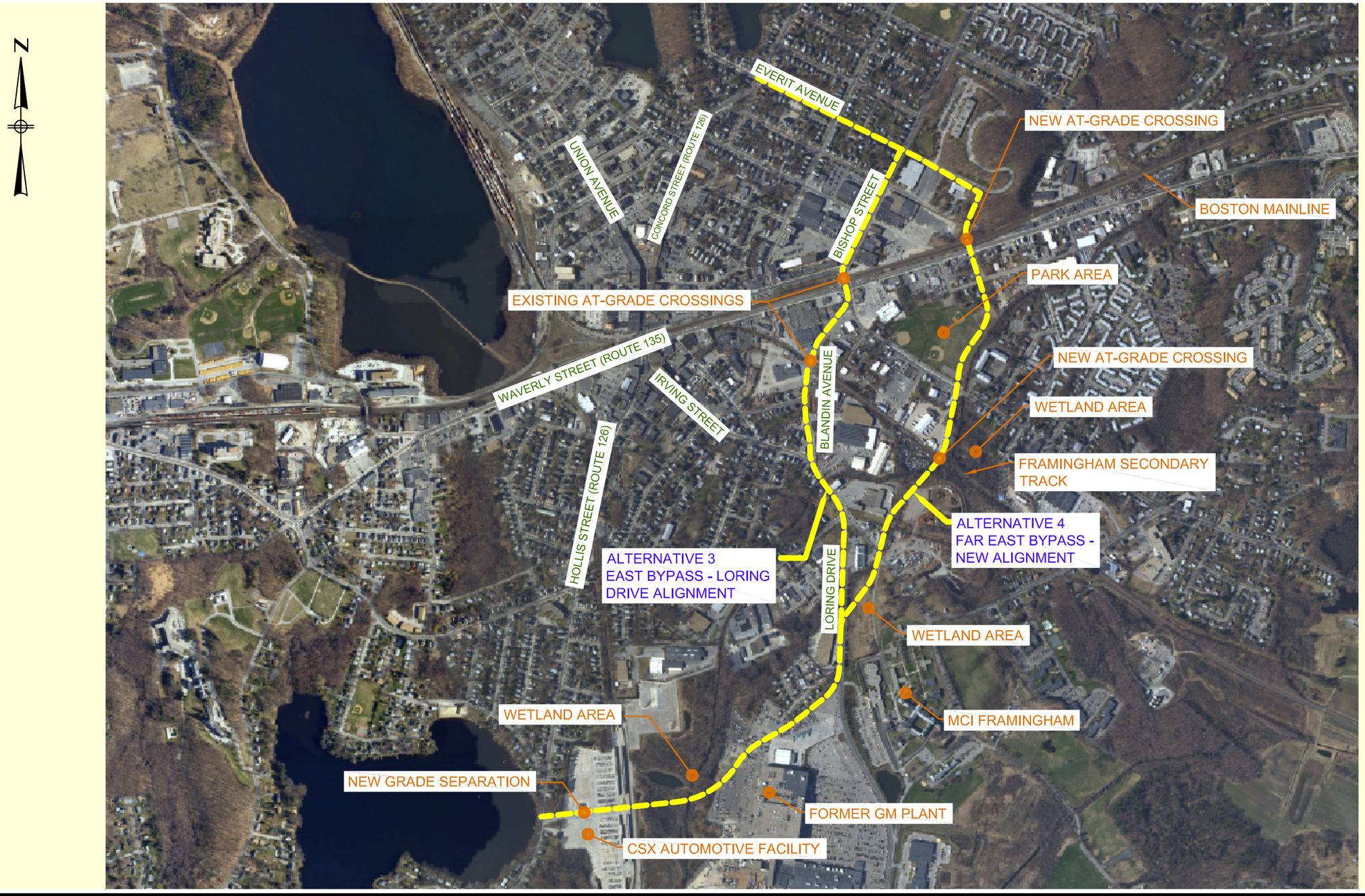

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Figure 2-3
Alternatives 3 and 4
East and Far East Bypasses

North of Route 135, Bishop Street is a two-lane, two-way road with a surrounding land use that is generally commercial/industrial. Everit Avenue is a residential street from its intersection with Bishop Street to Concord Street. There is a posted truck exclusion on both Bishop Street and Everit Avenue. The corner radii for traffic turning right from Everit Avenue to Concord Street may need to be improved to accommodate a WB-50 design vehicle. There appears to be sufficient right of way width to accomplish this.

A summary of the key issues associated with the Loring Drive Bypass alignment include:

- New signalized intersection at Hollis Street/Bypass Road.
- Impacts to existing neighborhood roadways (Bates Road or Andrews Road) or to the existing CSX Automobile Facility for a new alignment.
- Impacts/costs related to new grade-separated crossing of the CSX Automobile Facility tracks. Does not eliminate any at-grade crossings.
- Environmental resource area impacts along the alignment west of the GM parcel.
- Property acquisition for crossing through the GM parking lot and a new (signalized) intersection at Loring Drive.
- May need to modify Irving Street/Blandin Avenue intersection to accommodate increased southbound left turns.
- May need to modify Beaver Street/Blandin Avenue intersection to accommodate increased northbound left turns.
- May need to modify the existing grade crossing at the Framingham Secondary to include full gates/signals due to increased traffic volume.
- Complex intersection at Blandin Avenue/Beaver Street/Route 135/Howard Street/Bishop Street combined with at-grade crossing of the Boston Mainline tracks. Additionally Bishop Street has a posted truck exclusion.
- Connection to Concord Street (Route 126) via Everit Avenue would be through a residential neighborhood. Everit Avenue also has an existing truck exclusion.
- Additional traffic volume would be added to the existing Beaver Street/Blandin Avenue/Waverley Street/Howard Street/Bishop Street intersections, which could degrade already over capacity conditions.

The Loring Drive Bypass alignment would follow a partially new alignment, combined with, several existing streets. The alignment would be somewhat circuitous, requiring several turns to follow the bypass. In addition, it would have potential environmental impacts, such as, stream and wetland crossings; impacts to existing residential neighborhoods; land acquisitions; and would require a new grade separated crossing of the CSX Automobile Facility. The number of potentially negative impacts suggests that the Loring Drive Bypass alignment does not warrant further development.

2.2.4 Alternative 4: Far East Bypass – New Alignment

This would be bypass alignment intended to allow through traffic on Route 126 to bypass the congested area in Downtown Framingham without compromising access for local traffic. The bypass alternative generally follows a new alignment, south of Route 135 and connects with the existing roadway network north of Route 135. This alternative is also shown in **Figure 2-3**.

From the west, the alignment begins on Route 126 in the vicinity of its intersection with the access drive to the CSX Automobile Facility adjacent to the CP rail yard. It then heads east crossing the yard tracks. The alignment then enters a partially wooded area, crossing a stream and adjacent wetland west of the General Motors (GM) parcel. It then crosses through the westerly end of GM parcel parking lot and passes just north of an existing building and then intersects Loring Drive approximately opposite the drive to the MCI Framingham parking lot. To this point, this alternative runs on the same alignment as Alternative 3. The alignment then runs northerly on existing Loring Drive for approximately 700 feet, runs northeasterly on a new alignment for approximately 600 feet where it intersects Irving Street at approximately the location of the existing MCI Framingham access road. The bypass then crosses Irving Street and continues on a new alignment for approximately 1,800 feet crossing an existing stream and the Framingham Secondary tracks before intersecting Beaver Street. It continues on a new alignment across Beaver Street and through the southerly end of Dennison Park for approximately 1,100 feet to Morton Street, and then northerly on a new alignment for 250 feet to a new intersection at Route 135 and a new crossing of the Boston Mainline tracks. After crossing the tracks, the alignment would continue northerly on a new alignment for 500 feet to Clarks Hill, following the existing Clarks Hill alignment to Bishop Street and to Everit Avenue. It continues along the existing Everit Avenue alignment to Route 126. The total distance of the East Bypass alignment would be approximately 11,700 feet, nearly 3,900 feet longer than the existing Route 126 alignment.

This bypass alignment would follow the same route as the Loring Drive (Alternative 3) bypass alignment between Route 126 near the CSX Automobile Facility and Loring Drive. Accordingly, it would encounter the same issues regarding neighborhood impacts, and impacts to the CSX facility, as well as potential environmental issues associated with resource areas west of the GM parcel. As with the Loring Drive Bypass, acquisition of a portion of the GM parcel parking lot would be required to develop the bypass route to its intersection with Loring Drive.

Between Loring Drive and Waverley Street (Route 135) property acquisition would be required for approximately 3,700 feet of new roadway. Other potential impacts within this section include a stream crossing west of the Framingham Secondary track, a new crossing of the Framingham Secondary, acquisition of parkland in the Dennison Playground and potential impacts to businesses in the Morton Street area. The extent of the impacts to resource areas associated with the stream crossing would need to be evaluated to determine the level of permitting required. Coordination with the railroad would be required to determine whether a new at-grade crossing would be acceptable or whether a grade separated crossing would be required. The bypass alignment would

intersect Beaver Street near the southerly driveway for the Dennison Playground parking lot. The bypass would then cross Beaver Street and enter the playground. Acquisition of property within the Dennison Playground for a new street layout likely would involve Article 97 and possibly Section 4f parkland issues. Alternately, the alignment could follow Beaver Street northerly to Waverley Street (Route 135) and then follow the Loring Street Bypass alignment onto Bishop Street.

The crossing of Waverley Street (Route 135) and the two Boston Mainline tracks present a number of issues. An at-grade intersection would require a new traffic signal, as well as a new grade crossing of the Boston Mainline tracks. Given the existing, adjacent crossings at Concord Street (Route 126) and at Bishop Street, introducing a third at grade crossing would likely be problematic.

A grade separated crossing would also require additional right of way and could have significant grading impacts on the properties and businesses located between Waverley Street and Morton Street.

In addition to the Waverley Street crossing, new intersections would be created at Loring Drive, Irving Street and Beaver Street.

North of Waverley Street (Route 135) the bypass would connect with Clark Hills and turn westerly crossing Bishop Street onto Everit Avenue. As noted with Alternative 3, Everit Avenue is a residential Street with a posted truck exclusion.

A summary of the key issues associated with the New Alignment Bypass include:

- New signalized intersection at Hollis Road/ Bypass Road.
- Impacts to existing neighborhood roadways (Bates Road or Andrews Road) or to existing CSX Automobile Facility.
- Impacts/costs related to new grade separated crossing of the CSX Automobile Facility tracks.
- Environmental resource area impacts along the alignment west of the GM parcel.
- Property acquisition for crossing through the GM parking lot and a new (signalized) intersection at Loring Drive.
- Property acquisitions for the new alignment between Loring Drive and Irving Street, and a new intersection (signalized) at Irving Street and re-alignment of the MCI Framingham access road.
- Property acquisitions for the new alignment between Irving Street and Beaver Street, and a new (signalized) intersection at Beaver Street.
- A new stream crossing/resource area impacts on the new alignment between Irving Street and Beaver Street.
- A new crossing of the Framingham Secondary line. Does not eliminate any at-grade crossings.
- Property acquisitions for the new alignment through Dennison Park and extending to Waverly Street. Potential Article 97 and Section 4F park land issues.

- A new intersection at Waverley Street (Route 135) would likely require grade separation with associated right of way and grading impacts.
- Property acquisition for new alignment to Clarks Hill.
- Connection to Route 126 via Everit Avenue would be through a residential neighborhood. Everit Avenue also has an existing truck exclusion.

The New Alignment Bypass follows a new alignment connecting with Route 135 approximately 3,300 feet east of existing Route 126. The alignment has potential environmental impacts, parkland impacts, impacts to existing residential neighborhoods, and would require significant land acquisitions. In addition, new grade separated crossings would likely be required at the CSX Automobile Facility, the Route 135/Boston Mainline tracks and possibly at the Framingham Secondary tracks. The number of potentially negative impacts suggests that the New Alignment Bypass does not warrant further development.

2.3 Physical and Environmental Constraints Evaluation Summary

The alternatives included in this evaluation provide certain potential benefits to mitigating congestion within Downtown Framingham and, in particular, at the intersection of Route 135 and Route 126.

Additional considerations from an urban design perspective are:

- The location and length of depressed boat sections can have a significant impact on the urban design character, and the quality of the pedestrian environment along the traditional downtown commercial areas. These impacts need to be carefully assessed and evaluated as the planning for the future of the downtown continues.
- Change to the existing street alignments and frontages will affect the land use and urban design character of the adjacent properties.
- If land acquisition were contemplated as part of the process, the ability to compose new sites would affect the development potential of the resulting parcels.
- Alternative 1 would likely result in significant impacts to the urban design character and the quality of the pedestrian environment along Concord and Hollis Streets, due to the length of the proposed depressed boat section.
- Alternative 2 would minimize the negative impacts to the pedestrian-oriented retail uses and activities along Concord and Hollis Streets (particularly when compared to Alternative 1).
- The bypass alternatives, Alternatives 3 and 4, appear to have a number of issues related to negative environmental and neighborhood impacts that would preclude implementation of these alternatives.

2.3.1 Conclusion

Alternative 1 – The Grade Separation of Route 126 under Route 135 would facilitate north-south movements through the Downtown, but would

reduce local mobility within the Downtown. The required depressed boat sections would limit vehicular and pedestrian mobility on both sides of Route 135. The Downtown would be physically divided by the structure and would severely limit development opportunities, economic growth and chances to achieve an attractive Downtown atmosphere. **It is recommended that this alternative not be considered further.**

Alternatives 3 & 4 – The Bypass Alternatives present challenges related to physical constraints, property acquisition, environmental impacts and residential disruption, without improving traffic flow. Each of these routes would still require a signalized crossing of Route 135, either at the already-congested Dennison Crossing area, or at Clarks Hill to Everett Street, and an additional at-grade crossing of the CSX tracks. Further, each Bypass Alternative would connect north of Route 135 to a corridor with an existing truck exclusion. **Neither of these alternatives is recommended for further consideration.**

Alternative 2 – The Grade Separation of Route 135 under Route 126 would improve north-south movements through the Downtown, although not to the same degree as the Route 126 underpass because the at-grade rail crossing would still be in place. The Route 135 Underpass would, however, maintain local east-west mobility along Route 126 for vehicles and pedestrians. This alternative would also improve pedestrian connectivity between Downtown areas north and south of Route 135, while unlocking land parcels for development that could spur economic growth. Finally, right-of-way takings would be predominantly limited to non-residential areas. **This alternative is recommended for further transportation traffic evaluations.**

2.4 Tier Two Evaluations – Traffic Operations

Analysis of future traffic conditions first examined expected traffic flow conditions 20 years into the future without the transportation alternatives proposed by this Study. This is called the **No-Build Condition**. A level of traffic growth was accounted for in this analysis.

Another round of analysis was then done for the Future Condition, but with the proposed alternative included to represent the **Build Condition**.

The following thirteen intersections are included in the Study Area:

- Hollis Street at Irving Street (Route 126)
- Hollis/Concord Streets (Route 126) at Waverly Street (Route 135)
- Concord Street (Route 126) at Howard Street
- Concord Street (Route 126) at Union Avenue
- Concord Street (Route 126) at Lincoln Street
- Concord Street (Route 126) at Dennison Avenue/Everit Avenue
- Beaver Street at Blandin Avenue
- Bishop Street/Beaver Street at Waverly Street (Route 135)
- Bishop Street at Howard Street
- Bishop Street at Everit Avenue
- Waverly Street (Route 135) @ Cedar Street
- Hollis Street (Route 126) at Hollis Court
- Hollis Court Extension at Waverly Street (Route 135)

2.4.1 Traffic Volume Forecasts

The typical trend is for traffic volumes to grow over time. The two methods for forecasting future traffic volumes are: Background Traffic Growth, and New Land Use/Trip Generation.

2.4.1.1 Method 1 - Background Traffic Growth

A review of historic traffic volumes along Route 135 and Route 126 shows that traffic volumes have remained stable or even declined slightly at some locations in the Downtown over the past ten years. However, the potential exists (and the intent is) for development of vacant parcels or redevelopment of occupied parcels in the future within the study area. These land use changes will likely result in a greater number of vehicle trips in the future.

The Central Transportation Planning Staff (CTPS) has estimated a growth rate of **0.1%** per year in Downtown Framingham, to account for background growth and development. Accordingly, the background growth rate of **1%** was used for this method. This is viewed as a providing a conservative, planning level, estimate of background growth.

2.4.1.2 Method 2 - New Land Use/Trip Generation

Future traffic patterns within the Downtown area are dependant on the amount and nature of new developments, which may occur over the coming years. The potential development areas identified later in Section 3.4 - Identification of Key Properties, were used as the probable developments to occur within the Downtown. **Table 2-1** presents the developments and their associated land uses.

Table 2-1 - Land Use Data for Potential Developments

Development	Land Use		
	Residential (units)	Office (ft^2)	Commercial (ft^2)
Route 135 Triangle	178	53,000	27,000
CSX Triangle	0	240,000	0
North Yard	597	0	0
15 Blandin Avenue	84	0	0
121 Concord Street (The Arcade)	190	0	50,000
1 Grant Street (Dennison)	0	0	64,000
97 Franklin Street	29	0	0
TOTAL	**1,078**	**293,000**	**141,000**

Table 2-2 - Trip Generation Estimates for Potential Developments

Development	Land Use	AM Peak Hour Trips			PM Peak Hour Trips		
		Entering	Exiting	Total	Entering	Exiting	Total
Route 135 Triangle	Residential	14	68	82	64	32	96
	Office	99	14	113	23	115	138
	Commercial	43	28	71	130	135	265
	Total	156	110	266	217	282	499
CSX Triangle	Residential	0	0	0	0	0	0
	Office	333	45	378	59	289	348
	Commercial	0	0	0	0	0	0
	Total	333	45	378	59	289	348
North Yard	Residential	37	179	216	174	86	260
	Office	0	0	0	0	0	0
	Commercial	0	0	0	0	0	0
	Total	37	179	216	174	86	260
15 Blandin Avenue	Residential	8	37	45	35	17	52
	Office	0	0	0	0	0	0
	Commercial	0	0	0	0	0	0
	Total	8	37	45	35	17	52
121 Concord Street (The Arcade)	Residential	15	71	86	68	34	102
	Office	0	0	0	0	0	0
	Commercial	62	40	102	196	204	400
	Total	77	111	188	264	238	502
1 Grant Street (Dennison)	Residential	0	0	0	0	0	0
	Office	0	0	0	0	0	0
	Commercial	72	46	118	231	241	472
	Total	72	46	118	231	241	472
97 Franklin Street	Residential	3	16	19	15	7	22
	Office	0	0	0	0	0	0
	Commercial	0	0	0	0	0	0
	Total	3	16	19	15	7	22
TOTAL		**686**	**544**	**1,230**	**995**	**1,160**	**2,155**

2.4.1.3 Comparison of Traffic Volume Forecasting Methods

A cordon was drawn around the Downtown area to compare forecast results from the two methodologies. The number of trips entering and exiting the downtown cordon was estimated using the traffic volumes collected as a base for this study. Existing turning movement volumes are shown in **Figure 2-4** and the downtown cordon and the resulting volumes are shown in **Figure 2-5**.

Figure 2-4 shows that currently 4,312 trips enter and 4,407 trips exit the downtown area during the morning peak hour; and 5,364 trips enter and 5,809 trips exit the downtown area during the afternoon peak hour. These values are presented in **Table 2-3** and represent existing conditions. Using forecasting method one (1% per year, compounded annually for 20 years), gives the estimated number of total trips entering and exiting the cordon in the future. These values are also presented in **Table 2-3**. The future growth estimated by this method is 949 trips entering and 970 trips exiting during the morning peak hour, and 1,181 trips entering and 1,279 trips exiting during the afternoon peak hour. A summary of the estimated new trips determined by the two traffic forecasting methods is presented in **Table 2-4**.

Table 2-3 - Downtown Traffic Cordon Volumes

	Existing (2007)		Future* (2027)		Estimated Growth	
	AM	PM	AM	PM	AM	PM
Entering	4,312	5,364	5,261	6,545	949	1,181
Exiting	4,407	5,809	5,377	7,088	970	1,279

* Future volume based on Forecast Method 1 (1% per year for 20 years)

Table 2-4 - Summary of Traffic Forecasting Methods

	Total Trips Estimated				Percent Difference*	
	Background Traffic Growth Method		New Land-Use/Trip Generation Method			
	AM	PM	AM	PM	AM	PM
Entering	949	1,181	686	995	38%	19%
Exiting	970	1,279	544	1,160	78%	10%

* Background Traffic Growth Method vs. Land-Use/Trip Generation Method

The background traffic growth method has projected more trips entering and exiting the project study area during both peak periods. The Land-Use/Trip Generation method uses specific developments and specific trip generation rates as the basis for estimation. Other development opportunities in place of, or in addition to, these developments could also occur. For this reason, the more general and conservative background growth method was selected as the traffic forecasting method for this planning level study.

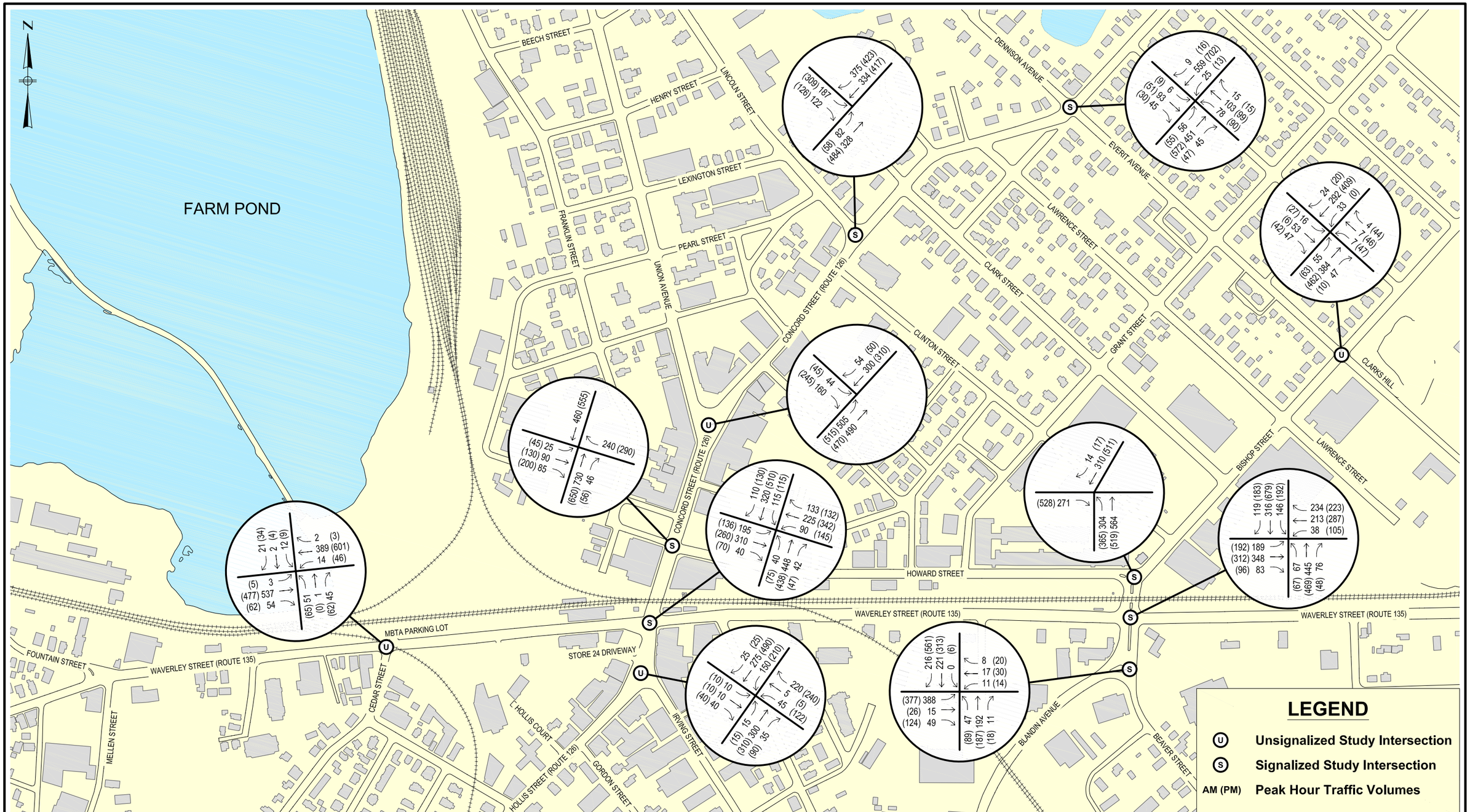

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Figure 2-4
Existing (2007)
Turning Movement Volumes

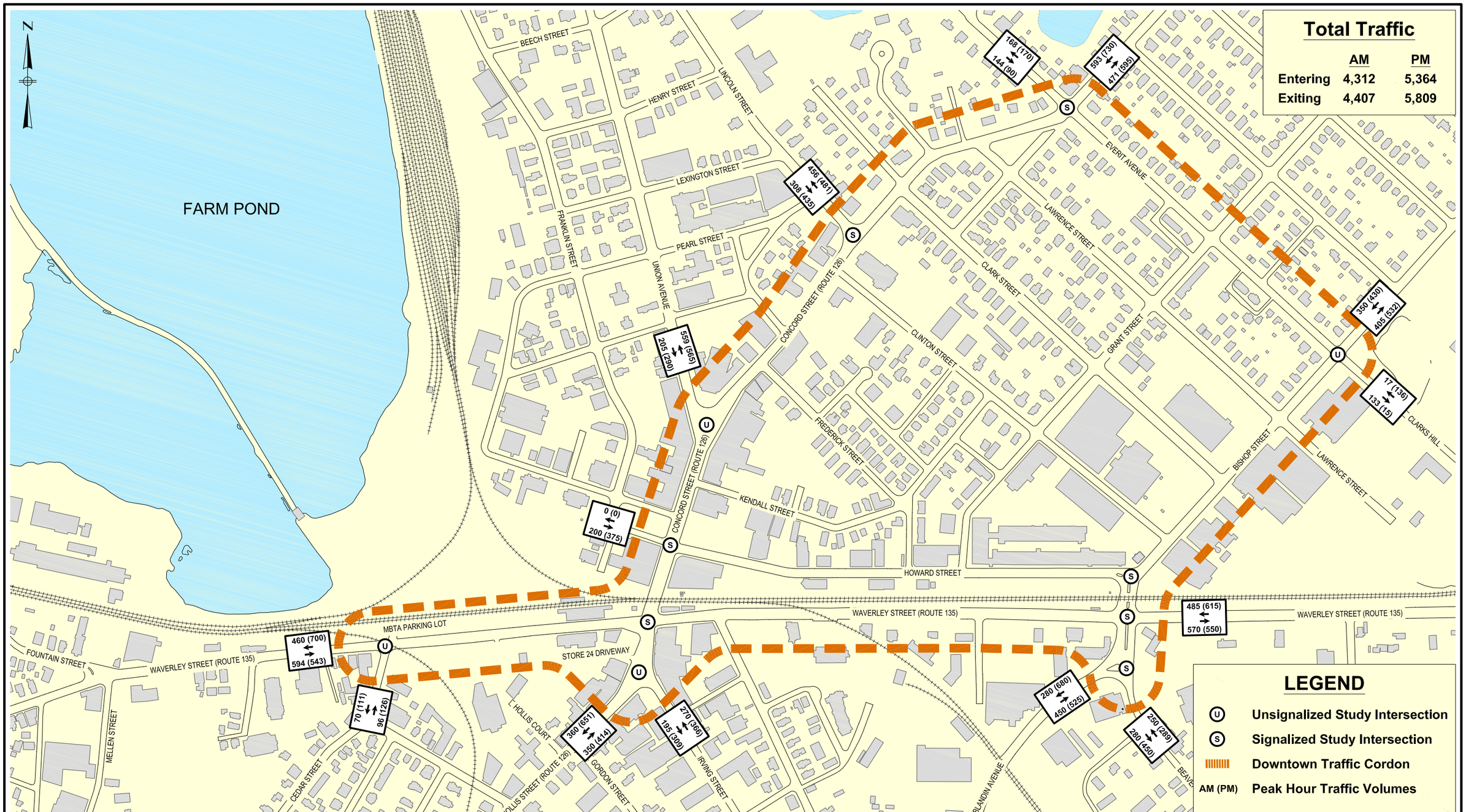

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Figure 2-5
Existing (2007)
Traffic Volume Cordon

2.4.2 Traffic Analysis Methodology

Intersection operations at the study intersections were evaluated using the SYNCHRO software package (Version 6, Build 614). This software package is based on methodologies contained in the 2000 Highway Capacity Manual. Traffic operations are defined by Level of Service (LOS), which is a qualitative measure that associates LOS with vehicle delays. The criteria for unsignalized intersections are different than for signalized intersections because drivers expect different performance levels from each type of intersection control. The relationship between LOS and delay is summarized in **Table 2-5**.

Table 2-5 - Vehicle Level of Service Criteria

LOS	Unsignalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	Signalized Intersection Criteria Average Total Delay (Seconds per Vehicle)
A	< 10.0	< 10.0
B	10.1 to 15.0	10.1 to 20.0
C	15.1 to 25.0	20.1 to 35.0
D	25.1 to 35.0	35.1 to 55.0
E	35.1 to 50.0	55.1 to 80.0
F	> 50.0	> 80.0

Source: Highway Capacity Manual, Transportation Research Board; Washington, DC; 2000

2.4.3 Downtown Train Crossings

The initial rounds of analysis for the **Build** and **No Build Conditions** were completed without taking into account the effects of gate closures for train crossings. The Downtown is heavily affected by the at-grade rail crossings at Concord Street and Bishop Street, as well as the active Framingham Secondary Branch crossing of Route 135, east of Concord Street.

The following intersections would continue to be impacted by train crossings in the future:

- Hollis Street (Route 126) at Irving Street
- Hollis/Concord Streets (Route 126) at Waverley Street (Route 135)
- Concord Street (Route 126) at Howard Street
- Concord Street (route 126) at Union Avenue
- Bishop Street at Howard Street
- Bishop/Beaver Streets at Waverley Street (Route 135)
- Beaver Street at Blandin Avenue.

A 20 hour observation of train crossings (from 5:00 a.m. to 1:00 a.m.) of Concord Street was performed in November of 2007. This observation was made on a typical weekday to quantify the effects of gate closures for

train crossings. During this period, the gates were closed a total of 62 times for 41 commuter rail trains, 18 freight trains, two Amtrak passenger trains and one closure with no train. The total cumulative time of closure over the course of the 20 hours was 2 hours, and 30 minutes; approximately 12% of the 20-hour period. The gate closures during the peak hours are summarized in **Table 2-6**.

Table 2-6 - Gate Closure Summary

	Existing Conditions		Future Conditions	
	Morning Peak Hour	Afternoon Peak Hour	Morning Peak Hour	Afternoon Peak Hour
Commuter Train Crossings	4	4	8	8
Typical Duration of Closure (mm:ss)	2:03	1:45	2:03	1:45
Freight Train Crossings	1	2	1	2
Typical Duration of Closure (mm:ss)	4:19	1:20	4:19	1:20
Total Duration of Closure (mm:ss)	12:30	9:40	20:41	17:00
Typical Duration of Closure (mm:ss)	2:30	1:37	2:18	1:42

(mm:ss) = Minutes:Seconds

The gates were closed five times during the morning peak hour to allow four commuter trains and one freight train to cross for a total time of 12 minutes and 30 seconds or a typical closure of 2 minutes and 30 seconds. The typical duration of a commuter train closure during the morning peak hour was 2 minutes and 3 seconds; the typical closure was 4 minutes and 19 seconds for a freight train. **The total gate closure time of 12 minutes and 30 seconds effectively reduces the morning peak hour intersection capacity by approximately 21 percent.**

The gates closed six times during the afternoon peak hour to allow four commuter trains and two freight trains to cross. The gates closed for a total of 9 minutes and 40 seconds for a typical closure of 1 minute and 37 seconds. The typical duration of a commuter train closure during the afternoon peak hour was 1 minute and 45 seconds; the typical closure was 1 minute and 20 seconds for the freight trains. **The total gate closure time of 9 minutes and 40 seconds effectively reduces the afternoon peak hour intersection capacity by approximately 16 percent.**

The MBTA has announced intentions to double the level of commuter rail service to Worcester, which pass through and services Framingham as well. The number of freight trains crossing Concord and Bishop Streets would remain the same, but the number of commuter trains crossing would double by the year 2027. It is projected that the total train delay would increase by 8 minutes and 11 seconds to 20 minutes and 41 seconds during the morning peak hour and by 7 minutes and 20 seconds to 17 minutes during the afternoon peak hour. The **typical delay** would actually decrease by 12 seconds to 2 minutes and 18 seconds per closure during the morning peak hour and would increase by 5 seconds to 1 minute and 42 seconds during the afternoon peak hour. The **typical**

delay during the morning peak hour would decrease because the duration of a commuter train crossing is much shorter than the freight crossing during the morning peak hour. The opposite is true during the afternoon peak hour; the commuter trains require slightly more time to cross during the afternoon peak hour than the freight trains. **The total gate closure time of 20 minutes and 41 seconds during the future morning peak hour, and 17 minutes during the future afternoon peak hour, would result in an effective reduction in intersection capacity of 34 percent and 28 percent, respectively.**

The typical duration of gate closure due to a train crossing was incorporated into the traffic analysis model as a railroad preemption phase, which would occur during every signal cycle. This methodology models what would happen during the traffic signal cycles when a typical gate closure occurs. For purposes of this report, this will be referred to as a "typical analysis condition".

The analysis scenarios with no gate closures and with typical gate closures are both conditions that actually occur in the Downtown. That is, sometimes traffic flows with no interruption due to a train crossing and sometimes the gates are activated and vehicles are delayed.

A third analysis condition, which represents an average cycle during the peak hour was used. This condition accounts for the traffic signal cycles with no train activity, those with train crossings, and those where traffic congestion is dissipating from a closure. While this does not represent an actual condition during a cycle, it does provide a picture of the overall delays experienced by the traffic using the intersection over the course of the peak hour.

2.4.4 Future No-Build Traffic Analysis

The traffic volumes presented above in **Figure 2-6** were used to evaluate traffic operations in the future without the transportation improvement alternatives presented by this report. This provides a No-Build Condition for comparison to the Build Condition.

The analysis was performed for three basic scenarios to remain consistent with the Existing Conditions Report. The three scenarios are: No Train Crossing, Typical Train Crossing, and Average Train Crossing. The results of the 2027 No-Build traffic analysis are presented in **Table 2-7** through **Table 2-9** for the signalized intersections, **Table 2-10** for the unsignalized intersections, and in **Figure 2-7** and **Figure 2-8** for all study intersections.

2.4.4.1 Analysis Results - No Train Crossing

Morning Peak Hour

Level of Service would degrade from existing conditions at four **signalized** intersections during the morning peak hour.

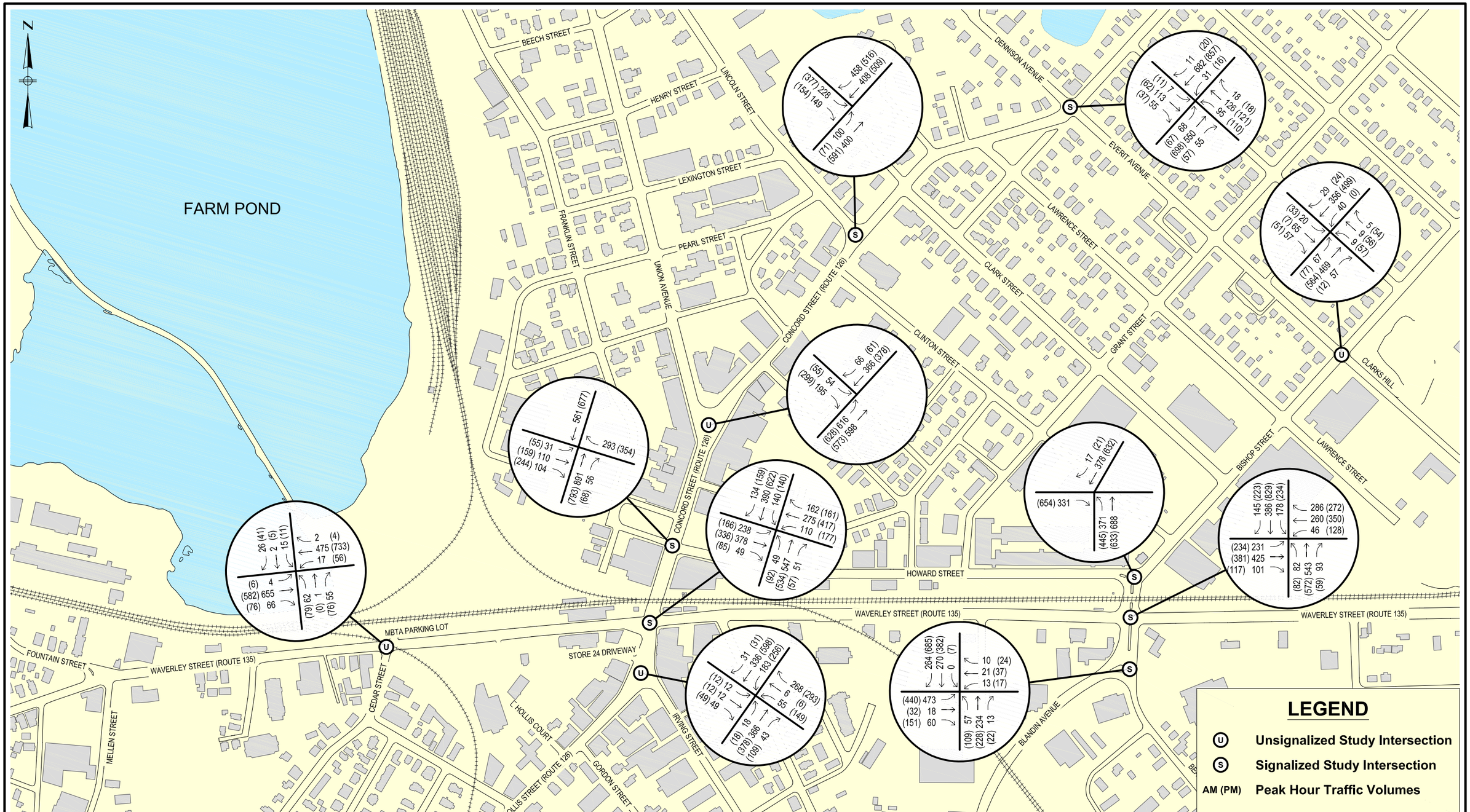

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Figure 2-6
Future No-Build (2027)
Turning Movement Volumes

Table 2-7 - Level of Service Analysis Results for Signalized Intersections (No Train Crossing)

	Morning Peak Hour						Afternoon Peak Hour					
	Existing		Future No-Build		Future Build		Existing		Future No-Build		Future Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1: Irving Street @ Hollis Street	-	-	-	-	B	18.9	-	-	-	-	C	24.8
2: Waverley Street @ Concord Street	D	42.0	F	87.0	-	-	D	51.0	F	114.1	-	-
3: Howard Street @ Concord Street	D	39.2	E	79.8	B	15.9	D	39.2	E	68.5	C	22.0
4: Union Avenue @ Concord Street	-	-	-	-	C	25.4	-	-	-	-	C	24.6
5: Lincoln Street @ Concord Street	B	15.6	B	17.7	B	17.7	C	21.8	C	30.6	C	30.6
6: Dennison Avenue @ Concord Street	D	39.9	F	95.7	F	95.7	D	36.2	F	81.2	F	81.2
7: Blandin Avenue @ Beaver Street	D	37.8	D	50.0	D	50.0	E	57.3	E	67.2	E	67.1
8: Waverley Street @ Bishop Street	C	34.1	D	36.6	D	36.5	D	41.8	D	49.0	D	49.0
9: Howard Street @ Bishop Street	C	22.7	C	20.1	C	20.1	C	28.0	C	28.5	C	28.5
12: Hollis Court @ Hollis Street	-	-	-	-	C	20.6	-	-	-	-	D	39.0
13: Waverley Street @ Hollis Court Extension	-	-	-	-	B	16.1	-	-	-	-	B	10.9

NOTES:

LOS - Level of Service
Delay - Average Vehicle Delay in Seconds

Table 2-8 - Level of Service Analysis Results for Signalized Intersections (Typical Train Crossing)

	Morning Peak Hour						Afternoon Peak Hour					
	Existing		Future No-Build		Future Build		Existing		Future No-Build		Future Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1: Irving Street @ Hollis Street	-	-	-	-	F	333.9	-	-	-	-	F	262.5
2: Waverley Street @ Concord Street	F	329.9	F	442.9	-	-	F	187.9	F	333.5	-	-
3: Howard Street @ Concord Street	F	310.6	F	440.3	E	77.1	F	120.0	F	223.8	C	27.2
4: Union Avenue @ Concord Street	-	-	-	-	F	125.5	-	-	-	-	F	107.3
7: Blandin Avenue @ Beaver Street	F	379.0	F	457.1	F	456.7	F	156.8	F	226.6	F	226.1
8: Waverley Street @ Bishop Street	F	148.1	F	164.2	F	164.3	F	92.3	F	145.2	F	145.3
9: Howard Street @ Bishop Street	F	131.9	F	157.0	F	157.0	F	253.1	F	344.5	F	344.5

NOTES:

LOS - Level of Service
Delay - Average Vehicle Delay in Seconds

Table 2-9 - Level of Service Analysis Results for Signalized Intersections (Average Train Crossing)

	Morning Peak Hour						Afternoon Peak Hour					
	Existing		Future No-Build		Future Build		Existing		Future No-Build		Future Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1: Irving Street @ Hollis Street	-	-	-	-	F	103.8	-	-	-	-	F	113.0
2: Waverley Street @ Concord Street	F	95.5	F	278.0	-	-	E	73.1	F	256.8	-	-
3: Howard Street @ Concord Street	F	87.1	F	257.5	C	28.8	D	54.5	F	170.2	B	19.1
4: Union Avenue @ Concord Street	-	-	-	-	D	46.4	-	-	-	-	D	46.4
7: Blandin Avenue @ Beaver Street	F	121.4	F	285.1	F	285.6	D	44.2	E	66.3	E	66.5
8: Waverley Street @ Bishop Street	D	42.8	F	85.5	F	85.7	E	76.8	E	76.1	E	76.1
9: Howard Street @ Bishop Street	C	29.6	D	46.8	D	46.8	C	28.0	C	33.8	C	33.8

NOTES:

LOS - Level of Service

Delay - Average Vehicle Delay in Seconds

Table 2-10 - Level of Service Analysis Results for Unsignalized Intersections

	Morning Peak Hour						Afternoon Peak Hour					
	Existing		Future No-Build		Future Build		Existing		Future No-Build		Future Build	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1: Irving Street @ Hollis Street												
2: Waverley Street @ Concord Street	C	20.1	E	44.5	-	-	D	26.1	F	56.0	-	-
3: Howard Street @ Concord Street	C	16.3	D	29.5	-	-	F	85.1	F	190.3	-	-
4: Union Avenue @ Concord Street	C	16.8	D	27.7	-	-	D	30.5	F	67.3	-	-
5: Lincoln Street @ Concord Street												
2: Waverley St & Concord St (Rte 126)												
Waverly Street Westbound Right	-	-	-	-	C	15.7	-	-	-	-	B	14.6
4: Union Avenue & Concord Street												
Concord Street Northbound	A	6.0	A	6.2	-	-	A	5.9	A	6.2	-	-
Concord Street Southbound	B	18.0	D	40.6	-	-	B	18.1	C	33.5	-	-
Union Avenue Southestbound	A	8.1	A	8.8	-	-	A	7.8	A	9.3	-	-
10: Everit Avenue & Bishop Street												
Bishop Street Northbound Left	A	1.5	A	1.8	A	1.8	A	1.7	A	2.1	A	2.1
Bishop Street Southbound Left	A	1.2	A	1.4	A	1.4	A	0.0	A	0.0	A	0.0
Everit Avenue Eastbound	D	34.0	F	105.1	F	105.1	E	36.9	F	192.3	F	192.3
Clarks Hill Westbound	D	29.9	F	65.9	F	65.9	F	79.5	F	345.6	F	345.6
11: Waverley Street & MBTA Driveway												
Cedar Street Northbound	E	36.9	F	148.0	F	102.6	F	233.8	F	1000+	F	837.7
MBTA Driveway Southbound	C	22.1	E	43.5	E	35.6	E	36.2	F	195.8	F	85.5
Waverley Street Eastbound Left	A	0.1	A	0.1	A	0.1	A	0.2	A	0.3	A	0.2
Waverley Street Westbound Left	A	0.5	A	0.6	A	0.6	A	1.3	A	1.8	A	1.8

NOTES:

LOS - Level of Service

Delay - Average Vehicle Delay in Seconds

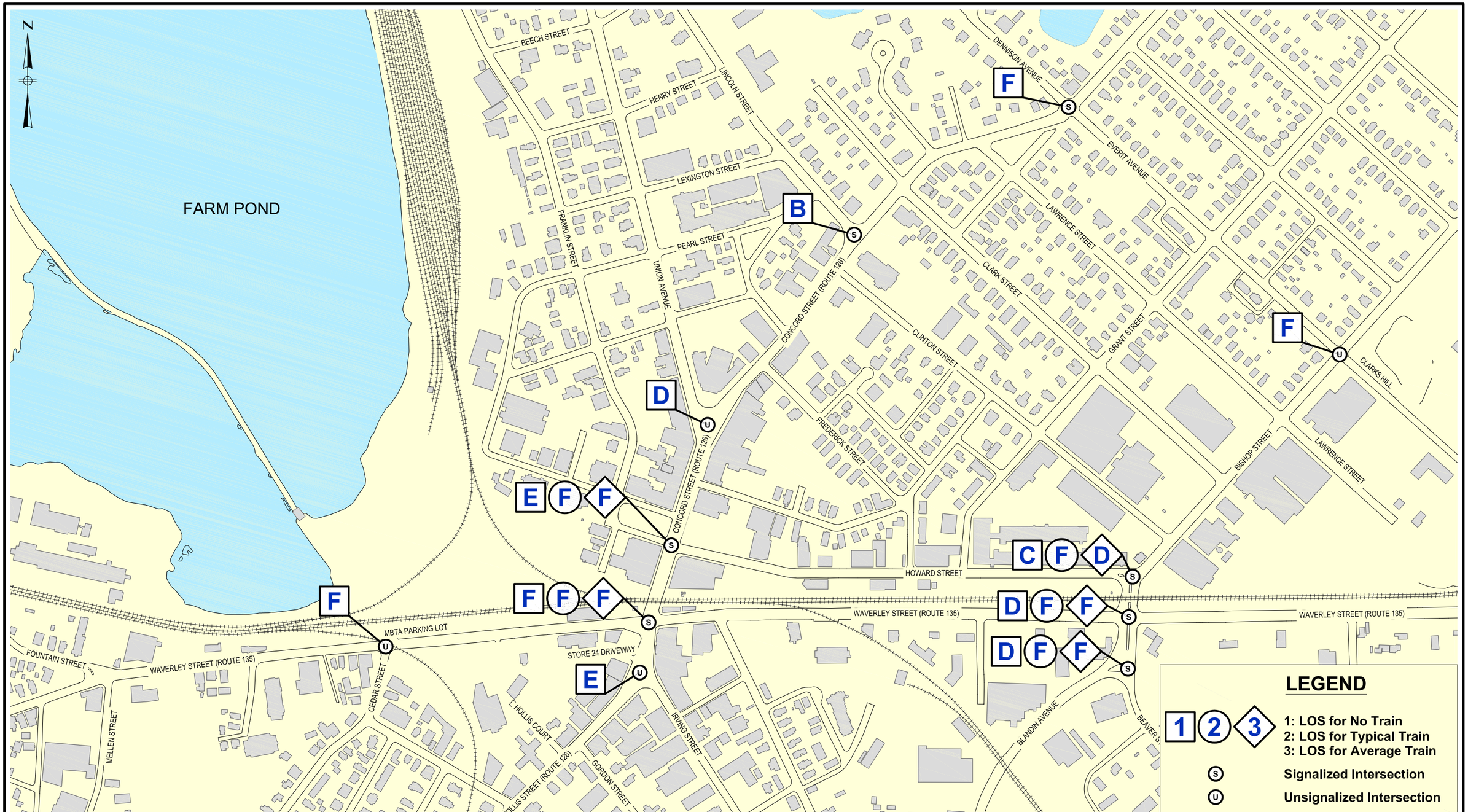

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Figure 2-7
Future No-Build (2027)
Morning Peak Hour
Level of Service Analysis Results

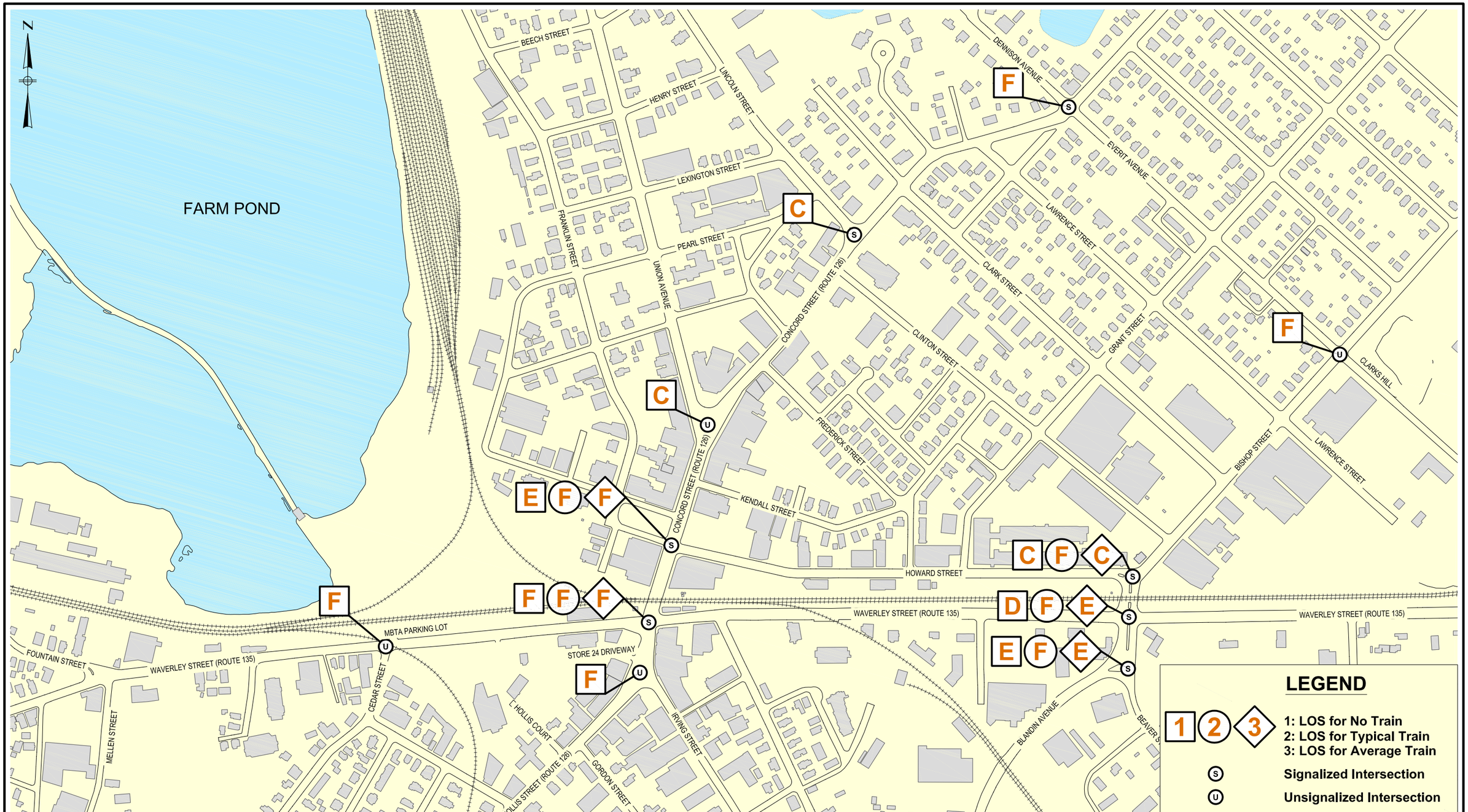

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Figure 2-8
Future No-Build (2027)
Afternoon Peak Hour
Level of Service Analysis Results

These intersections are:

- Waverley Street @ Concord Street (LOS D to LOS F)
- Howard Street @ Concord Street (LOS D to LOS E)
- Dennison Avenue @ Concord Street (LOS D to LOS F)
- Waverley Street @ Bishop Street (LOS C to LOS D)

Degradation at all four intersections is attributed to increased traffic volume from background growth. Average vehicle delay would increase at all other study area intersections, but the increases would not cause the Level of Service to change.

Level of service would degrade on left-turn and right-turn movements of all **unsignalized** intersections.

Afternoon Peak Hour

Three **signalized** intersections would see degradation in Level of Service from Existing Conditions during the afternoon peak hour. These intersections are:

- Waverley Street @ Concord Street (LOS D to LOS F)
- Howard Street @ Concord Street (LOS D to LOS E)
- Dennison Avenue @ Concord Street (LOS D to LOS F)

Degradation of Level of Service is again attributed to increased traffic volumes due to background growth. Average vehicle delay would increase at all other study area intersections, but the increases would not change Level of Service.

Traffic operations would degrade at all left-turn and right-turn movements at **unsignalized** intersections. If Level of Service is already at LOS F under Existing Conditions, these movements would remain at LOS F under Future No-Build Conditions, but delays would increase.

2.4.4.2 Analysis Results - Typical Train Crossings

Morning & Afternoon Peak Hour

As expected, the Level of Service of the intersections becomes significantly worse taking into account a typical train crossing. All study area intersections effected by train crossings would operate at LOS F under these conditions for both peak hours. It should be noted that during the railroad preemption phases some movements that do not conflict with the train are allowed to proceed. These movements typically experience an improvement in LOS due to this increased green time. The eastbound and westbound movements at the Howard Street intersection are examples of this.

2.4.4.3 Analysis Results - Average Train Crossings

Morning Peak Hour

Most intersections would operate at LOS F during the morning peak hour. The one exception is the Howard/Bishop Streets intersection, which would operate at LOS D. All intersections effected by train crossings would operate with less vehicle delay than under Typical Train Crossing conditions.

Afternoon Peak Hour

The two **signalized** intersections along Concord Street, which would be affected by train crossings, would operate at LOS F during the afternoon peak hour. The intersections of Blandin Avenue at Beaver Street and Waverley Street at Bishop Street would operate at LOS E, and the intersection of Howard Street at Bishop Street would operate at LOS C.

2.4.5 Future Build Traffic Analysis

The following section presents the traffic analysis results with Alternative 2: Grade Separation of Route 135 Under Route 126. This analysis used the future 2027 No-Build traffic volumes as a base. Turning movements to/from Route 135 at the Waverly Street at Concord Street intersection would be re-routed through the proposed network via the proposed Hollis Court Extension and its intersections with Route 135 and Route 126.

In addition to the Route 135 Underpass and Hollis Court Extension, the intersections of Hollis Street at Irving Street and Concord Street at Union Avenue have been analyzed as signalized intersections, as part of the Build Condition. The Hollis Court Extension intersections with Route 135 and Route 126 have also been analyzed as signalized intersections.

The Future Build turning movement volumes are presented below in **Figure 2-9**. Results for the Future Build analysis are contained above in **Table 2-7** through **Table 2-9** for signalized intersections and **Table 2-10** for unsignalized intersections. The results are also presented below in **Figures 2-10** and **2-11** for all intersections.

2.4.5.1 No Train Crossings

Morning & Afternoon Peak Hours

Only those intersections with significant geometric improvements as part of the Route 135 Underpass Alternative would experience changes in Level of Service and/or delay, including:

- Hollis Street at Irving Street (Route 126)
- Hollis/Concord Streets (Route 126) at Waverly Street (Route 135)
- Concord Street (Route 126) at Howard Street
- Concord Street (Route 126) at Union Avenue
- Hollis Street (Route 126) at Hollis Court
- Hollis Court Extension at Waverly Street (Route 135)

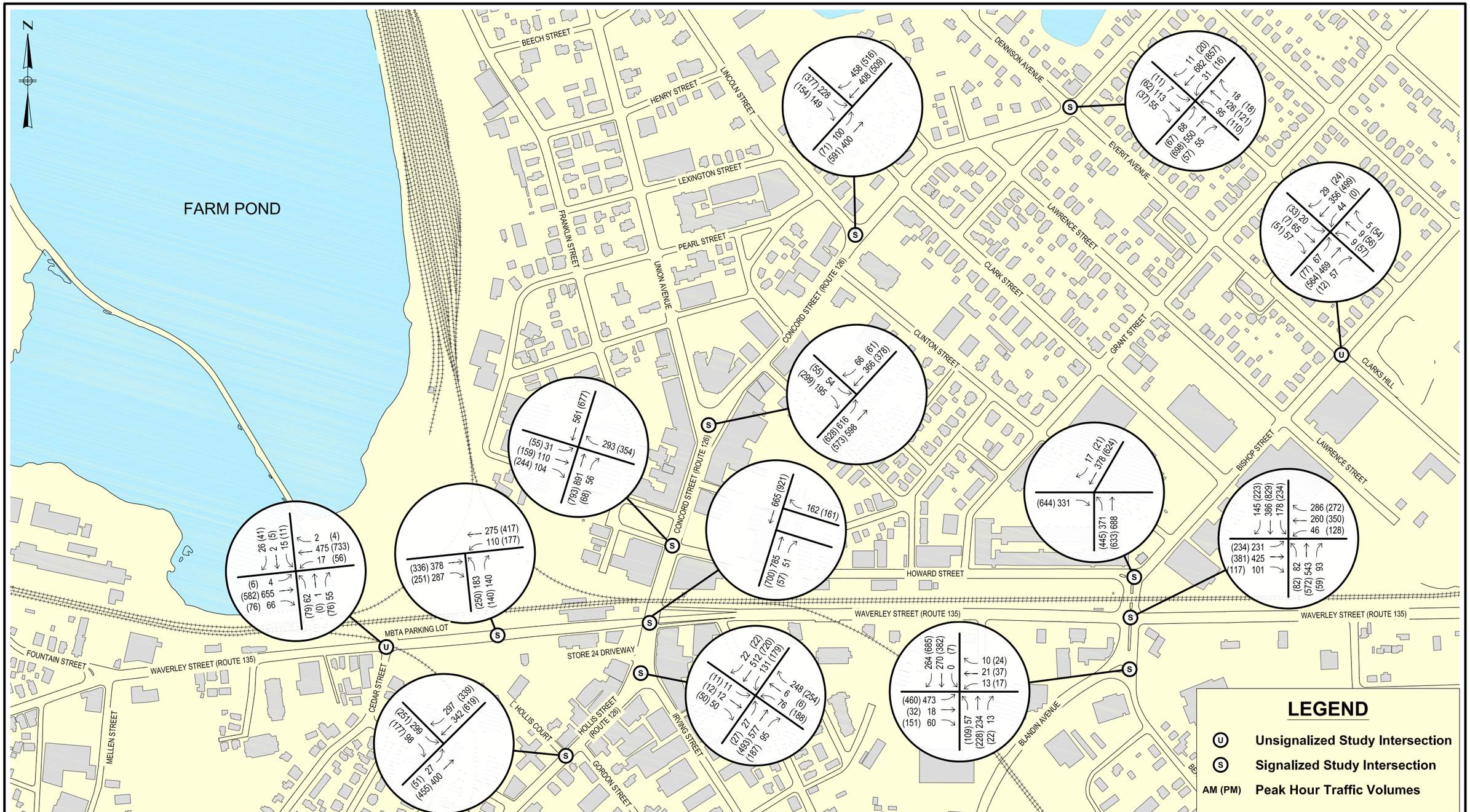

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Figure 2-9
Future Build (2027)
Turning Movement Volumes

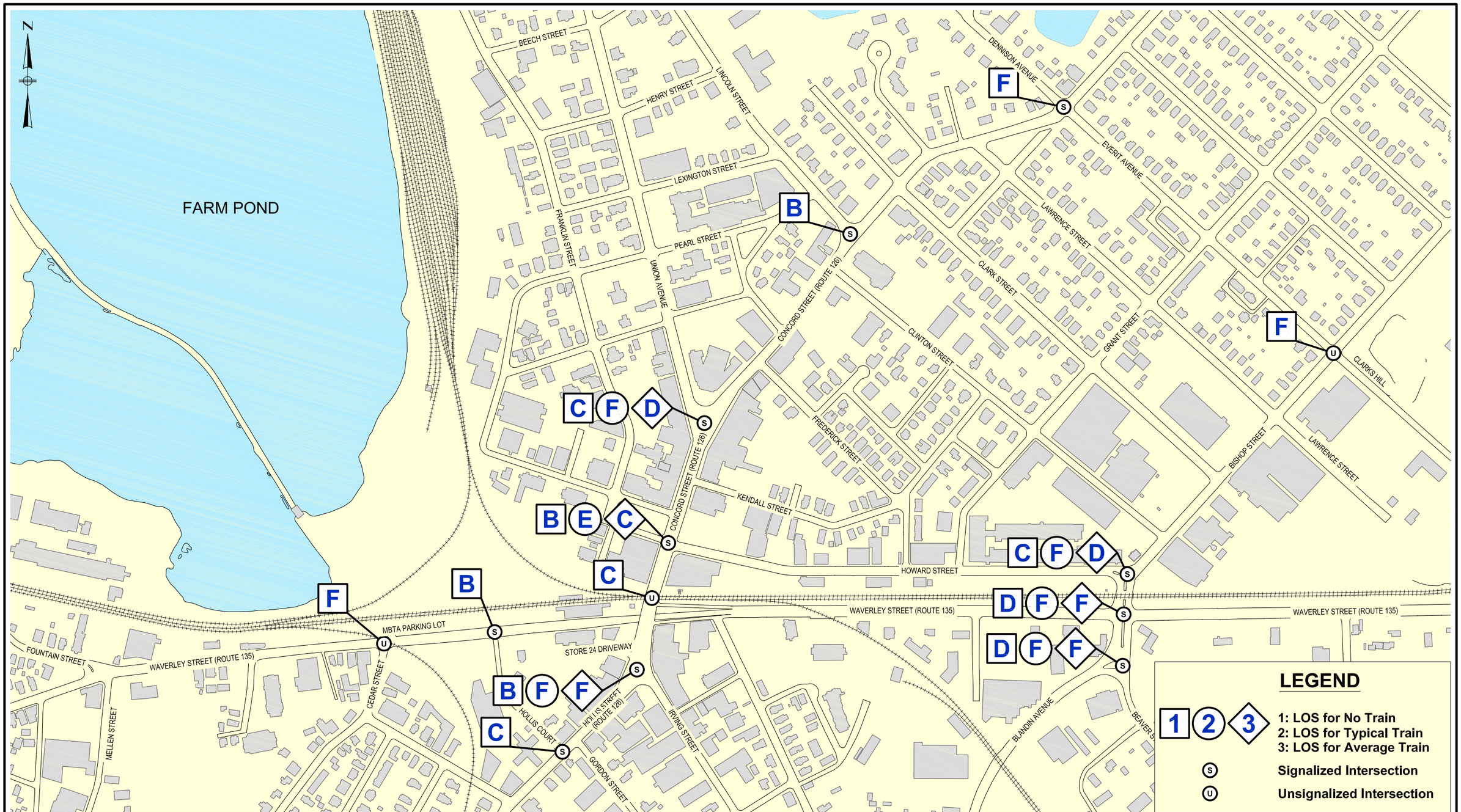

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Figure 2-10
Future Build (2027)
Morning Peak Hour
Level of Service Analysis Results

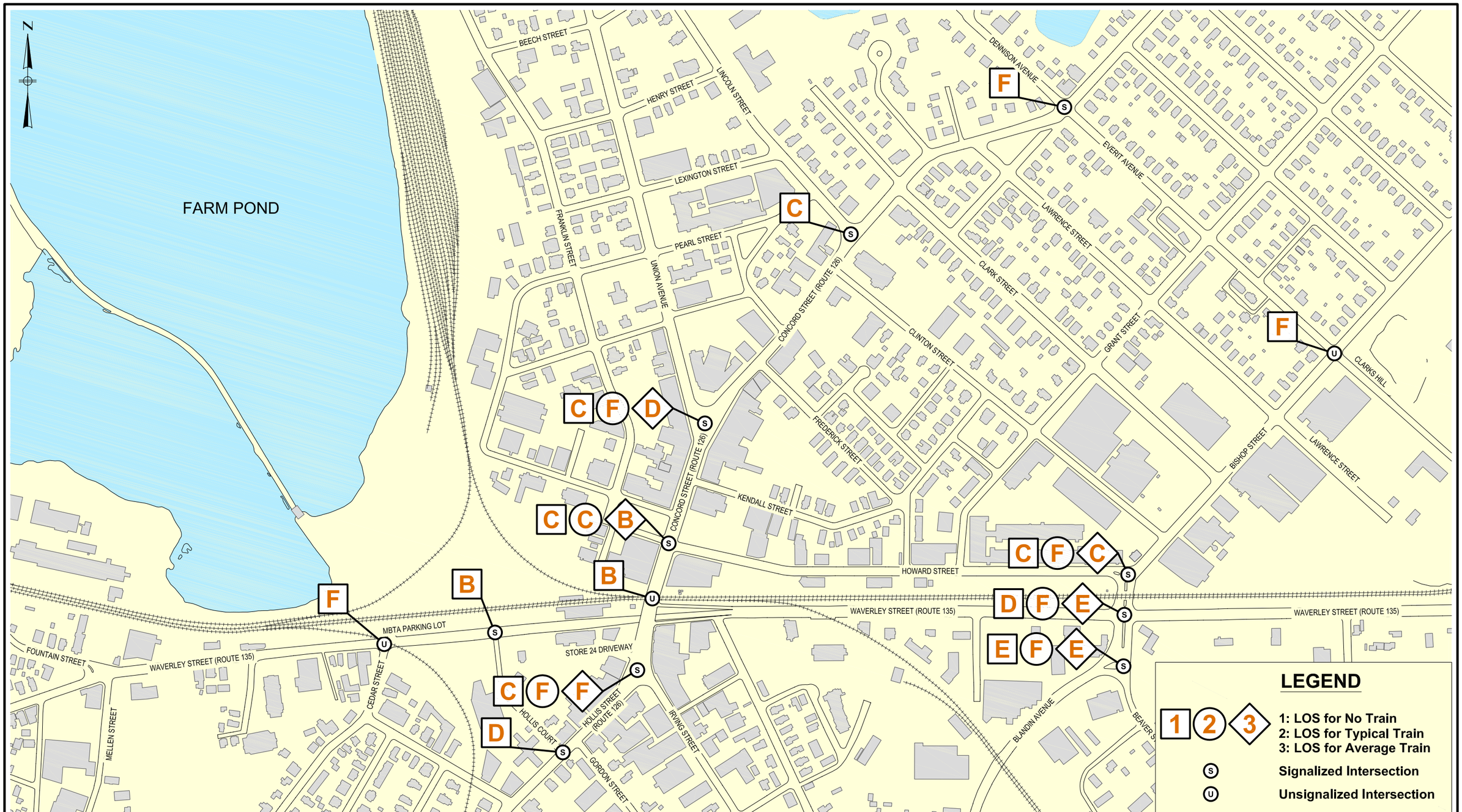

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Figure 2-11
Future Build (2027)
Afternoon Peak Hour
Level of Service Analysis Results

The proposed **signalized** intersection of Route 135 and Hollis Court Extension would operate at LOS B during peak hours. The proposed **signalized** intersection of Route 126 and Hollis Court would operate at LOS C and LOS D during the morning and afternoon peak hours, respectively.

The four **signalized** intersections within the immediate downtown area would all see significantly improved level of service from No-Build conditions during both peak hours. The newly signalized intersection of Hollis Street at Irving Street would operate at LOS B during the morning peak hour and LOS C during the afternoon peak hour.

The signalized intersection of Waverley Street at Concord Street would be eliminated by the Route 135 Underpass. The right-turn from the westbound Route 135 ramp to northbound Route 126 would remain under stop sign control. This right-turn movement would operate at LOS C during the morning peak hour and LOS B during the afternoon peak hour. Operations at the intersection of Howard and Concord Streets would improve from LOS E to LOS B during the morning peak hour and from LOS E to LOS C during the afternoon peak hour. The newly **signalized** intersection of Concord Street and Union Avenue would operate at LOS C during both peak hours.

2.4.5.2 Typical Train Crossings

Morning Peak Hour

Level of Service would remain unchanged from the No-Build Condition at most study area intersections during a typical train crossing in the morning peak hour. The intersection of Howard and Concord Streets would operate at an improved level of service during the morning peak hour (LOS F to LOS E). Overall, vehicle delay in the Build Condition would be reduced from the No-Build Condition along Concord Street during the morning peak hour because the Route 135/126 intersection would be removed.

Afternoon Peak Hour

Operations during the afternoon peak hour would generally be similar to the morning peak hour. The Level of Service, however, would improve further at the intersection of Howard and Concord Streets during the afternoon peak hour (LOS F to LOS C). Traffic operations along Concord and Waverley Streets would be greatly improved in the Build Condition because the delays caused by the signalized intersection of the two streets would be removed.

2.4.5.3 Average Train Crossings

Morning & Afternoon Peak Hours

The Level of Service would remain unchanged at the study area intersections outside of the immediate Downtown area during both peak hours. The intersection of Hollis and Irving Streets would operate at LOS F during the morning and afternoon peak hours (104 and 113 seconds of delay per vehicle, respectively). The intersection

of Howard and Concord Streets would improve from LOS F to LOS C during the morning peak hour and from LOS F to LOS B during the afternoon peak hour. The intersection of Concord Street and Union Avenue would operate at LOS D during both peak hours. Overall, traffic movement along Concord and Waverly Street would improve because the signalized intersection of these two streets would be removed by virtue of the grade separation.

2.4.6 Traffic Analysis Summary

The Route 135 Underpass Alternative creates significant improvements to traffic operations in the Downtown, with all of these intersections operating at LOS C or better without a train crossing. A summary of the traffic analysis results for the intersections in the Downtown is provided in **Table 2-11**.

Table 2-11 - Downtown Intersection Analysis Summary (No Train)

	Morning Peak Hour		Afternoon Peak Hour	
	Future No-Build LOS	Future Build LOS	Future No-Build LOS	Future Build LOS
1: Irving Street @ Hollis Street	D	B	F	C
2: Waverley Street @ Concord Street	F	C	F	B
3: Howard Street @ Concord Street	E	B	E	C
4: Union Avenue @ Concord Street	D	C	C	C

While not directly evident from the intersection analysis results, additional benefits will occur even with a train crossing. Under No-Build conditions, Route 126 would experience delays from two sources. The first would be from traffic operations at the intersection with Route 135. As Route 135 vehicles flow with a green traffic light, vehicles on Route 126 would have a red light, which would cause approaching traffic to experience delays and begin to queue. The second source of delay would be from traffic stoppage during train crossings. The combination of the two delays would result in serious congestion at the intersection.

The Route 135 Underpass would eliminate the intersection with Route 135, and therefore remove the first source of delay (from traffic operations), leaving only the second portion during train crossings. While train crossings would still result in delays, they would not be exacerbated by intersection congestion.

The Review of Traffic analysis of this study should be understood as a planning level assessment. A project of this scale must be assessed in a more rigorous environmental process and be vetted in the public process.

With a thorough understanding of the transportation conditions in Framingham comes the recognition that, while the Route 135 Underpass could bring significant benefits to the Downtown, more is needed. With nine at-grade rail crossings, the Town lacks sufficient uninterrupted north-

south connections. This condition results in serious delays across the Town for commuters, visitors and retail consumers. More important is the need for uninterrupted flow for emergency vehicles across the community.

2.5 Utility Evaluation

Most existing utilities within the Route 126 and Route 135 corridors through Downtown Framingham are located underground, including electric, gas, telephone, water, roadway storm drains, and sewer service. Some street lights through the downtown are powered by overhead power lines. This section will focus only on the underground utilities located along Route 126 between Hollis Court and Kendall Street and along Route 135 between Cedar Street and the Framingham Secondary track crossing, which is where excavation for the Route 126 or the Route 135 underpass would occur. **Figure 2-12** through **Figure 2-17** present the location of each utility.

Utility data have been compiled from multiple sources. Electric and gas line locations have been compiled from ground survey of manholes and value boxes, and from utility connection plans obtained from N-Star. Telephone connections have been compiled from ground survey of manhole locations. Information on water service, roadway storm drains, and sewer service was obtained from the Town of Framingham GIS database and ground survey information.

2.5.1 Utilities located along Route 126

Electric

An electric duct bank runs along the east side of Hollis Street south of Route 135. The duct bank then transitions to the west side of the roadway north of the Boston Mainline tracks. Numerous service connections are made to the buildings located along the street. Duct banks connect into the Route 126 line from Irving Street, Howard Street and Park Street.

Gas

A 6-inch gas line runs along the eastern side of Hollis Street to the intersection of Irving Street, where it connects to an 8-inch line running along Irving Street. This 8-inch line continues north along the east side of Concord Street through the Downtown. Connections of varying sizes are made to all intersecting side streets, and service connections are also made to buildings along Hollis and Concord Streets.

Telecommunications

Telecommunications duct banks are located along the west side of Hollis Street up to the intersection of Irving Street, where they connect to a duct bank traveling along the east side of Irving Street. The duct bank continues north along the east side of Concord Street through the Downtown.

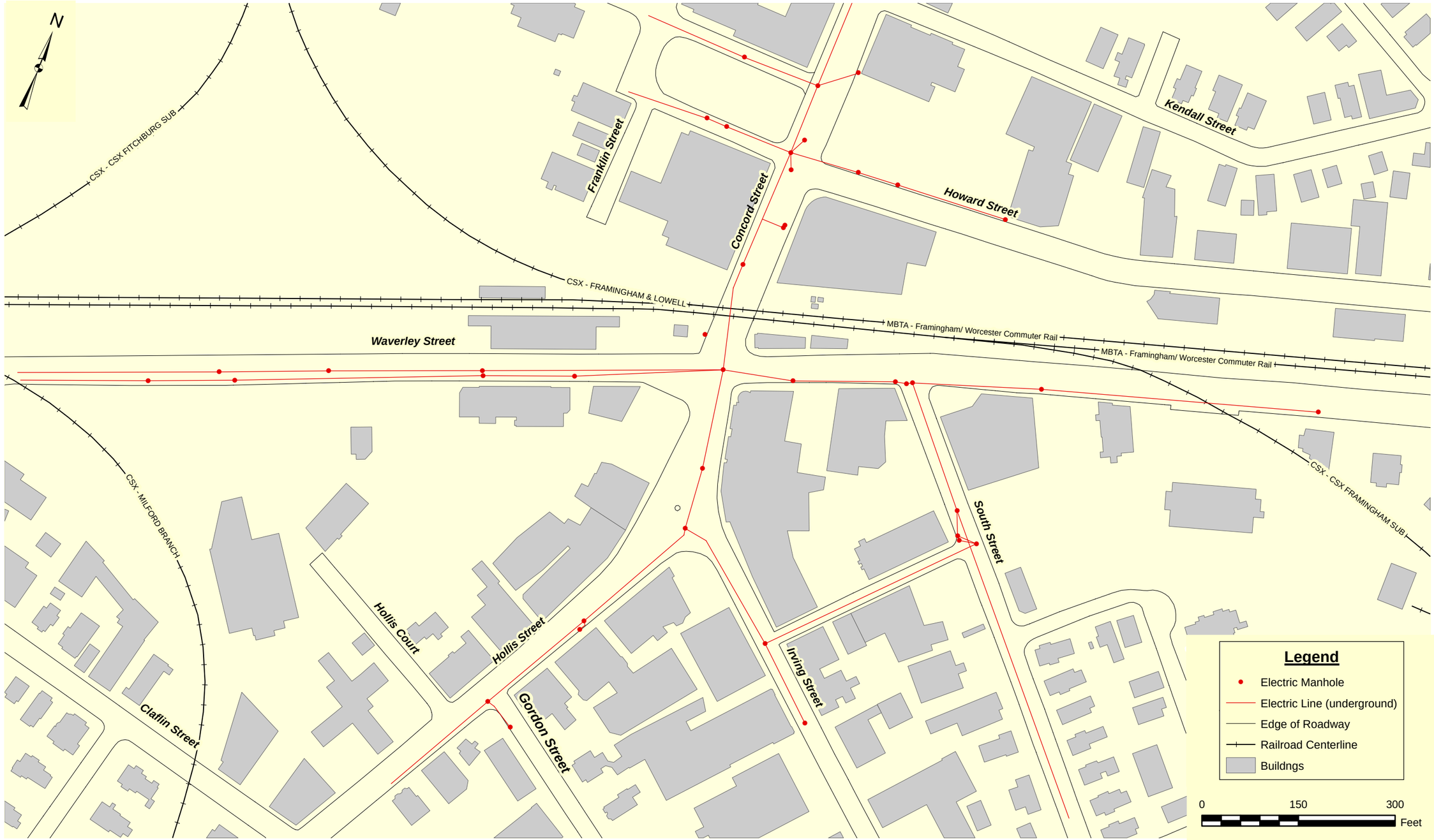

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Figure 2-12
Existing Underground Utilities
Electric

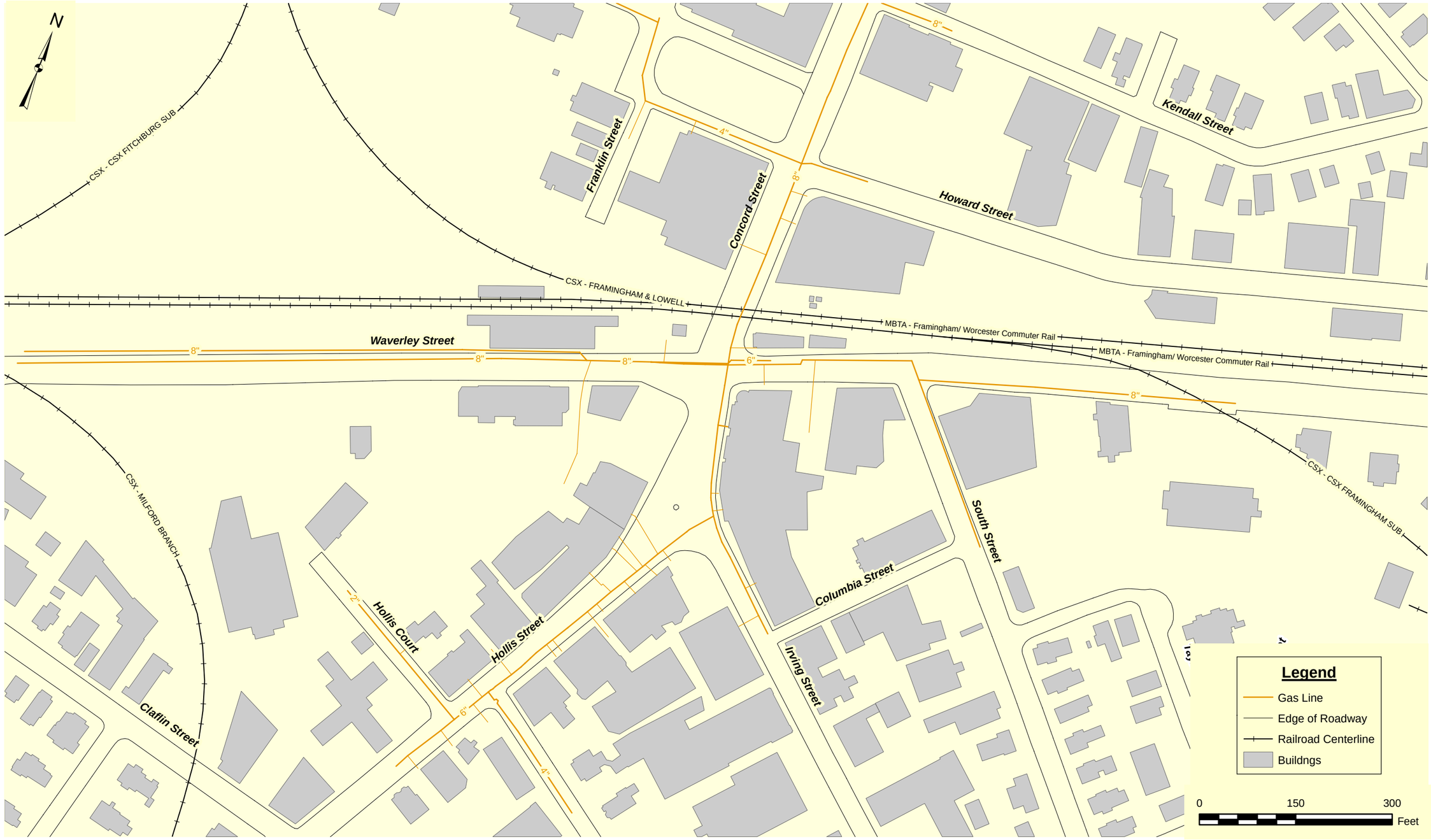

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Figure 2-13
Existing Underground Utilities
Gas

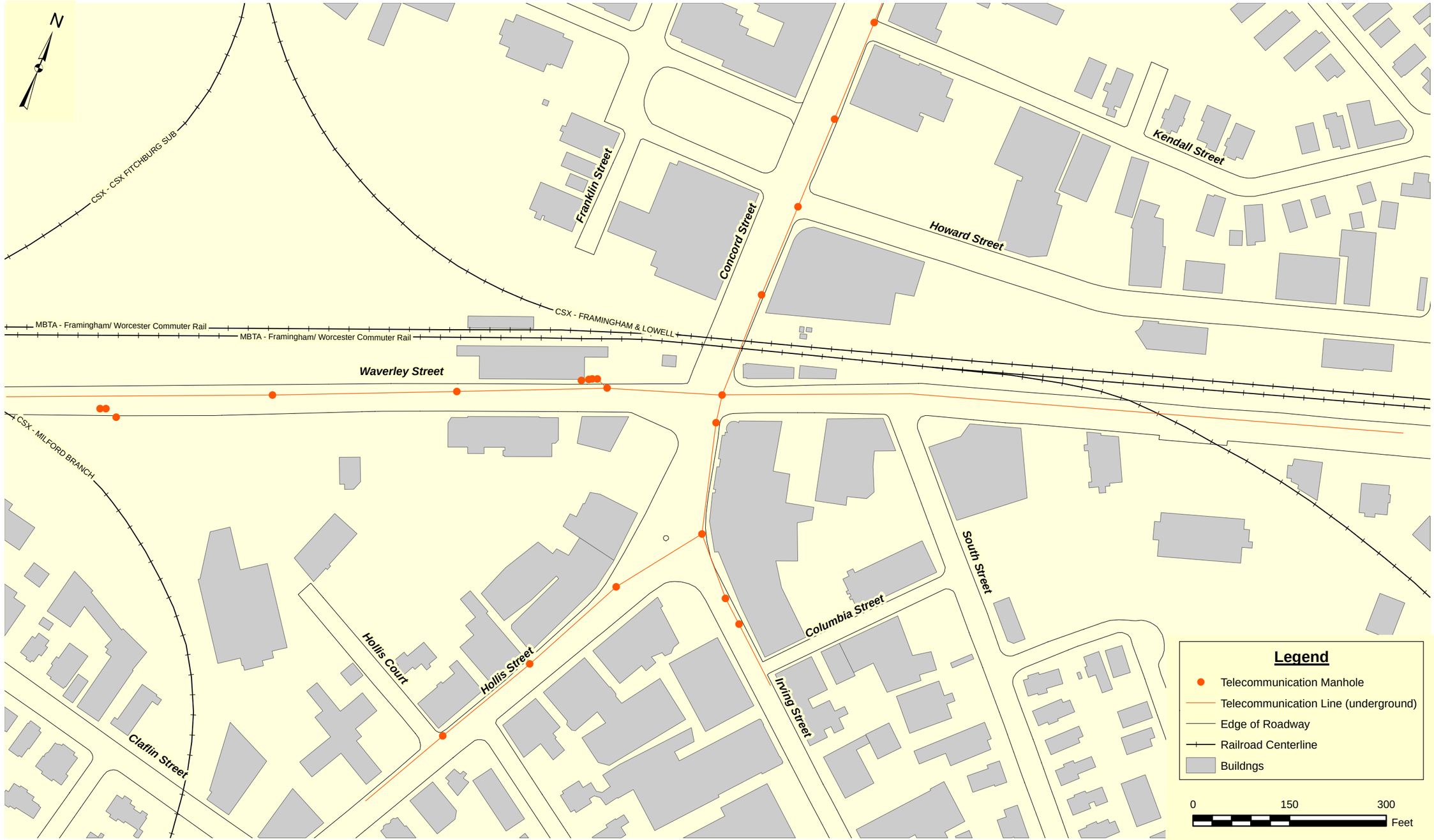

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Figure 2-14
Existing Underground Utilities
Telecommunication

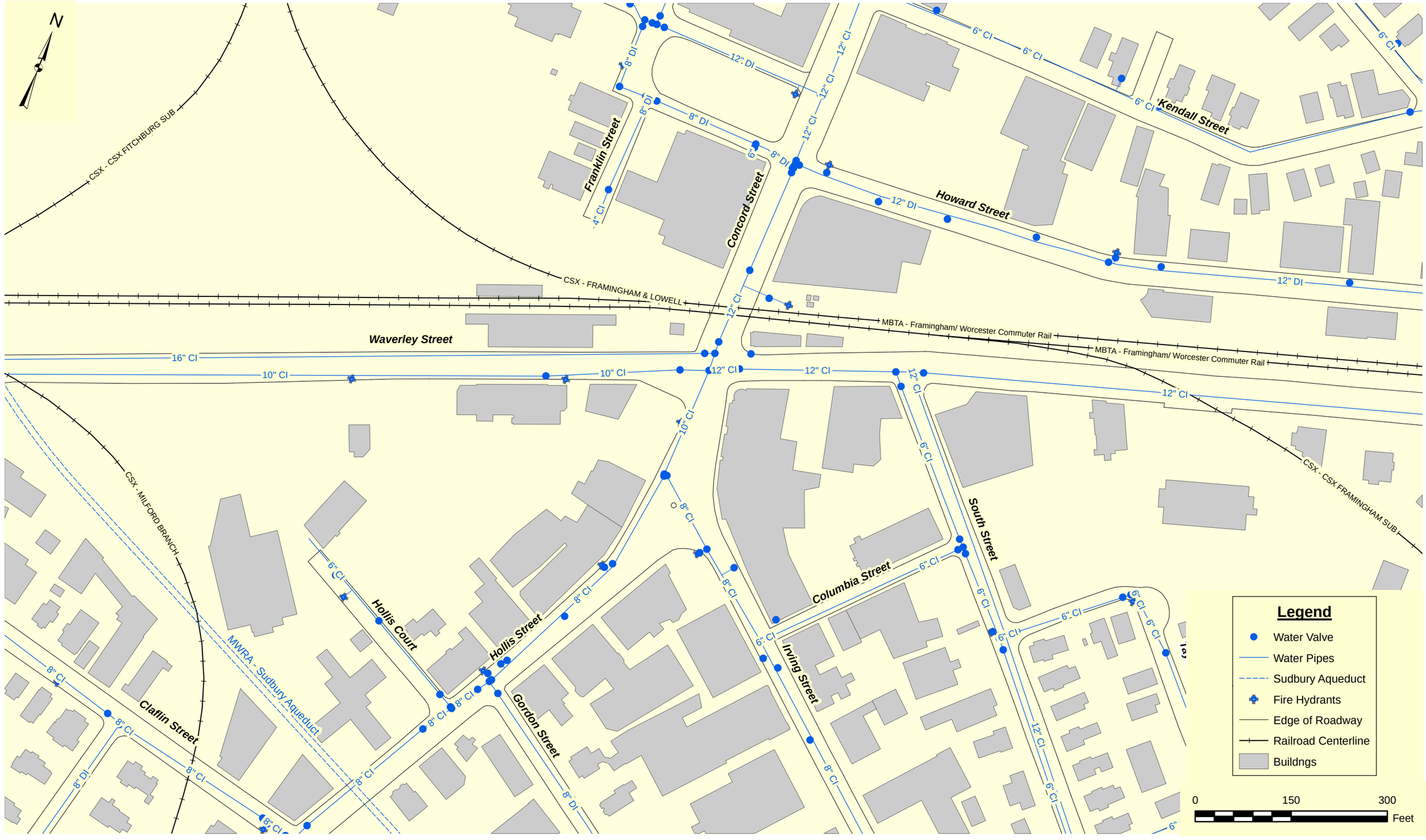

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Figure 2-15
Existing Underground Utilities
Water

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Figure 2-16
Existing Underground Utilities
Storm Drain

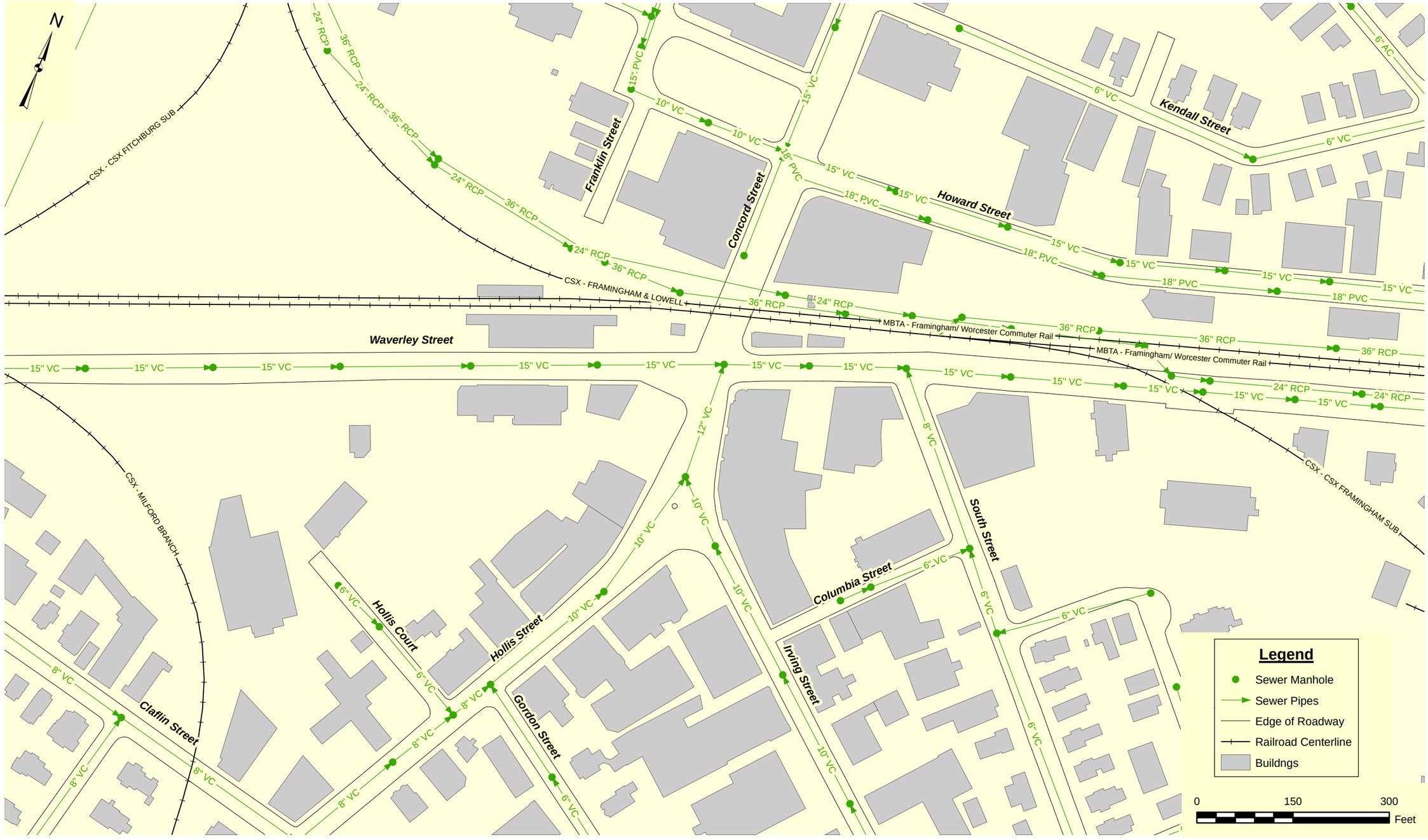

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Figure 2-17
Existing Underground Utilities
Sewer

Water

Water lines are located along the west side of Hollis Street and the center of Concord Street. Most lines in the area are cast iron, but the newer lines are ductile iron. An 8-inch line is provided between Hollis Court and Irving Street, a 10-inch line is provided between Irving and Waverley Streets, and a 12-inch pipe continues north along Concord Street. At Howard Street, an 8-inch line connects from the west, and a 12-inch line connects from the east. A 12-inch line runs west at Park Street, and a 6-inch line runs east at Kendall Street.

Storm Drain

The storm drain pipes located in the Route 126 corridor are for local drainage only, and no storm drain trunk lines pass through the area. Pipes range in size from 8 to 15 inches in diameter. Pipe runs are provided along each side of Route 126 north of Route 135. Storm water from the intersection of Route 126 and Route 135 is conveyed away to storm water systems located to the east of the intersection.

Sewer

Sewer service is located along the centerline of Hollis Street to the intersection with Route 135. Service for Irving Street connects into the Hollis Street service just south of Route 135. Pipes in this area are generally 8 to 12 inches in diameter and are constructed of vitrified clay. The sewer south of Route 135 flows north along Hollis and Irving Streets into a sewer trunk line which runs along the centerline of Route 135.

North of Route 135, local sewer service runs toward Howard Street and then east along Howard Street in one of two trunk lines (15-inch and 18-inch diameter) which cross Route 126. Pipe sizes range from 10 to 18 inches in diameter and are constructed of vitrified clay or PVC.

Two sewer interceptors (24-inch and 36-inch diameter) run from west to east across Route 126 just to the north of the Boston Mainline tracks. These pipes run parallel to the tracks in the area of the rail grade crossing. The 36-inch pipe continues to run parallel to the Boston Mainline tracks east of Route 126, while the 24-inch pipes skews south and continues along the north side of Route 135.

2.5.2 Utilities located along Route 135

Electric

Two parallel utility duct banks are located along the south side of Route 135. These duct banks merge at a utility vault located in the middle of the intersection of Route 135 and Route 126. A single duct bank continues east along the south side of Route 135. A connection is made from South Street, where an electric sub-station is located.

Gas

Two parallel 8-inch gas lines run along the north side of Route 135 west of Route 126, and connect to the 8-inch line on Route 126. East of Route 126 a single 8-inch line continues along the north side of Route 135 to the intersection with South Street, where it crosses to the south side of Route

135. A connection is made to South Street, and the line also continues east along the south side of Route 135.

Telecommunication

From the west, a telecommunication duct bank runs east along the north side of Route 135. Five telecommunication manholes are located at the southeast corner of the historic train station building. These appear to be access ways to a communications vault. The telecommunication line continues east along the north side of Route 135.

Water

From the west, a 16-inch supply line runs along the north side of Route 135 to the intersection with Route 126, where it intersects the 12-inch line running along Route 126. A 10-inch service line runs east along the south side of Route 135 to the intersection with Route 126. Local service connections and two fire hydrants are served from this line. A 12-inch service line runs along the south side of Route 135 east of Route 126. All pipes along Route 135 are cast iron.

Storm Drain

The storm drain pipes located in the Route 135 corridor are for local drainage only, and no storm drain trunk lines pass through the area. Pipes range in size from 8 to 18 inches in diameter. Pipe runs are provided along each side of Route 135 west of Route 126. Storm water from the intersection of Route 126 and Route 135 is conveyed away to storm water systems east of the intersection which discharges to Beaver Brook. Runoff from the section of Route 135 in front of the historic train station, including the historic train station parking area, flows west in runs along each side of Route 135 and connects to a drainage line that discharges to Farm Pond.

Sewer

A 15-inch trunk line is located along the centerline of Route 135. This trunk line accepts sewerage from sewer lines in the neighborhoods located to the south of Route 135, as well as local connections for the buildings on Route 135. The invert of this sewer line is located approximately 14 feet below the existing road surface.

2.6 Downtown Parking Analysis

A thorough understanding of the parking conditions in the Downtown Framingham Study Area can provide insight to how the area currently functions, as well as effective steps to affect change within the area. Ascertaining the available parking supply and utilization rates and analyzing these with the expected demand, as determined by the existing building square footage and uses, provides a unique understanding of the area's development capacity and appropriate strategies for a successful development scenario.

2.6.1 Calculation Methodology

Determining the existing parking supply in Downtown Framingham is integral to accurately understanding the area's true development potential and development limitations. Previous reports pertaining to this subject

were reviewed and independent research was conducted to determine the existing parking condition in the Downtown. In 1999, Rizzo Associates, Inc produced a detailed report, *Downtown Framingham Parking Evaluation*. Available GIS data, recent aerial photographs and site visits were used to confirm the conclusions reached in the Rizzo Report and to make determinations regarding parking availability in undocumented areas.

The independent research of this study was sensitive to the methodology and parameters of the Rizzo Report to ensure continuity between the two parking review efforts. Both on-street and off-street parking in the study area was surveyed.

The Rizzo Associates' parking evaluation study area does not exactly align with the area boundaries for this study. Accordingly, the analysis areas established in the Rizzo Associates' report were refined to align with the study area of this report and then new analysis areas were added to ensure that the parking conditions throughout entire study area were accounted for. **Figure 2-18** displays the eight updated analysis areas (A, B, C, D, E, F-1, F-2 and G) covering the entire study area. **Figure 2-18** also displays the total available parking spaces in each subarea.

From this analysis process, it has been determined that the total existing on-street and off-street parking spaces (public and private) available in the Downtown Study Area is **5,091. Figure 2-19** details the type of parking (on-street or off-street) that exists in each analysis area and records the adjustments and variations made to the Rizzo Report.

2.6.2 Calculations Implications: Industry Parking Ratios and Assessor's SF Data

In Downtown Framingham, like most environments, available parking is a limiting factor for building use and development. The downtown study area has 1,570,240 square feet of various non-residential uses based on data received from the Framingham Assessors' Office and 826 residential units based on information received from Claritas, Inc.

Determining the relationship between the existing parking supply and the existing uses is essential to determining the true development potential and limitations of the area. Using industry standard parking ratios from the Urban Land Institute and the Institute of Transportation Engineers, as well as past professional experience, it has been calculated that the square footage of uses and number of residential units in the downtown Study Area require approximately 5,111 parking spaces. This total includes a shared parking percentage of 10%. The parking ratio calculations are detailed in **Figure 2-20.**

The parking evaluation research reveals that there are 5,091 existing parking spaces in the downtown study area. Further examination of the Downtown parking inventory finds that of the 5,091 parking spaces, 609 parking spaces are dedicated for commuter uses. Therefore, the actual number of available parking spaces that support the Downtown Framingham Study Area uses is reduced to 4,482 or 629 fewer parking spaces than the volume of uses in the Downtown require.

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Figure 2-18
Downtown Sub-Areas with Parking Counts

Downtown Framingham Parking Existing Conditions

Rizzo Associates

Area	On-Street Spaces	Off-Street Private	Off-Street Public	Off-Street Town	Off-Street Total	Total Spaces
A	125	137	0	249	386	511
B	311	265	0	0	265	576
C	141	185	274	0	459	600
D	205	295	163	0	458	663
E	171	492	619	0	1111	1282
F-1	84	928	0	0	928	1012
F-2	0	372	0	0	372	372
G						
Totals	1037	2674	1056	249	3979	5016

Cecil Adjustments

Area	On-Street Spaces	Adjustment	Off-Street Private	Adjustment	Off-Street Public	Adjustment	Off-Street Town	Adjustment	Off-Street Total	Total Spaces Unadjusted	Total Spaces Adjusted
A	125	0	137	0	0	0	249	0	386	511	511
B	311	-79	265	-112	0	0	0	0	265	576	385
C	141	0	185	0	274	0	0	0	459	600	600
D	205	0	295	79	163	0	0	0	458	663	742
E	171	21	492	31	619	0	0	0	1111	1282	1334
F-1	84	-4	928	-536	0	0	0	0	928	1012	472
F-2	0	0	372	-170	0	0	0	0	372	372	202
G	0	44	0	801	0		0				845
Totals	1037	-18	2674	93	1056		249		3979	5016	**5091**
		1019		2767		1056		249			5091

Dedicated Commuter Rail Parking	609
	4482

Dedicated Commuter Parking Lots		Source
Pearl St Garage	289	Framingham Town Website*
Waverly St Town Admin Lot	65	Framingham Town Website*
Hollis Court	89	Framingham Town Website*
MBTA lots	166	Based on MBTA website
	609	

* file:///G:/Framingham%20Downtown%2026035/Parking%20Evaluation/parking%20-%20Town%20of%20Framingham.htm

ADJUSTMENTS

Area A
None

Area B
On-Street Spaces: minus 79 - on-street spaces documented by Rizzo Associates along Clark Street, Concord St north of Clinton and Grant Street north of Clinton

Off-Street Private: minus 112 - off-street private spaces document by Rizzo Associates for St. Stephen's Church and Hall and Assembly of God Church (now Baptist Church of Philadelphia)

Area C
None

Area D
On-Street Spaces: no on-street spaces documented for Waverly Ct or Casey Ct (any documented spaces in this area would have been removed)

Off-Street Private: no off-street spaces documented for Waverly Ct or Casey Ct (any documented spaces in this area would have been removed)

Off-Street Private: addition 79 - off-street private spaces located along Gordon and Hollis Street, documented through GIS, aerial views, and site visits

Area E

On-Street Spaces: addition 21: east and west sides of Franklin Street between Pearl and Lexington Street

Off-Street Private: addition 31: private spaces located along Franklin Street and north side of Pearl Street between 56 and 84 Pearl Street

Area F-1

On-Street Spaces: minus 4 - on-street spaces documented by Rizzo Associates along Clark Street, between Grant and Bishop Streets

On-Street Spaces: addition 21 - east and west sides of Franklin Street between Pearl and Lexington Street

Off-Street Private: minus 858 - off-street private spaces document by Rizzo Associates located on Lawrence, Clark, Bishop Streets

Area F-2

Off-Street Private: minus 170 - off-street private spaces document by Rizzo Associates located on Waverly east of Blandin Avenue

Area G

On-Street Spaces: addition 44: east and west sides of South St and south side of Taylor St

Off-Street Private: addition 801 - private lots located off of Waverly, bland in, south and Taylor Streets

Area G calculation are based on GIS information, aerial observations, site visits and Phase 1 Research

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Figure 2-19
Parking Count Calculations

USE TYPE	UNITS	SQUARE FOOT	PARKING RATIO	UNITS	PARKING REQUIREMENTS	PARKING DEMANDS
COMMERCIAL		348,863	348.863	SF	3.5	1221.02
RESIDENTIAL	826			UNITS	1.5	1239.00
HOTEL		14,252	14.252		1.65	23.52
SOCIAL SERVICES		123,714	123.714	SF	4	494.86
HEALTH SERVICES		13,601	13.601	SF	4	54.40
NURSING HOME		19,072	19.072	SF	1	19.07
RETAIL		435,560	435.56	SF	3.5	1524.46
GOVERNMENT		243,723	243.723	SF	3	731.17
CULTURAL		208,842	208.842	SF	1	208.84
INDUSTRIAL		149,213	149.213	SF	1	149.21
UTILITIES		13,400	13.4	SF	1	13.4
		1,570,240				5678.95
					SHARE USE %	0.10
					SHARED USE SPACES	567.90
					TOTAL DOWNTOWN PARKING DEMANDS	**5111.06**

METHODOLOGY

1. Use square footage is derived from data received from the Framingham Assessor's Office
2. Number of residential units was determined by Caritas information services
3. Parking ratios are based on the Cecil Group's assessment in coordination with ULI and ITE standard ratios
4. Shared parking percentage is based on the Cecil Group's assessment
5. All data use is exclusively in this project's Downtown Framingham study area

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Figure 2-20
Parking Demand Projections

2.6.3 Utilization Rates and Methodology

Based on a review of the parking ratio calculations and the existing parking evaluation, every parking space in the downtown Framingham study area should be occupied during peak times and an additional 629 vehicles should be seeking parking spaces. The utilization rates of the existing parking spaces in Downtown were measured to test this conclusion.

It was determined that the off-street parking utilization rate for the Downtown Framingham Study Area is approximately 49%. This determination was made based on a series of visual surveys of the 2008 orthoimage from MassGIS. The Downtown Framingham study area parking lots were categorized by size (large, medium and small) and five to eight lots of each category were selected for examination. Each parking lot selected was assigned a coefficient based on its relative size within its designated category and was then visually assessed to determine its utilization. The weighted average for each category was then calculated and then the average utilization for the entire sample was calculated. The parking utilization rate calculations are detailed in **Figure 2-21.**

A June, 2009 Town wide Parking Study conducted by BETA for the Town of Framingham focused on on-street parking. Portions of Union Street, Hollis Street/Hollis Court, Howard Street and Franklin Street were included in the study. While the sample size is limited, the utilization rates ranging from 46 percent to 82 percent are supported by visual observations.

The extremely low parking utilization rate for a parking supply that is less than what the existing building space should require, implies that significant portions of the Study Area buildings are either vacant or dramatically underutilized.

2.6.4 Analysis

The analysis of Downtown Framingham's existing available parking, utilization of the existing parking and the amount of parking required to support the existing building square footage provides critical insight into the needs of Downtown Framingham and guidance when formulating a development program and plan.

The analysis of these three elements indicates that the existing building square footage in Downtown Framingham is currently only 43% utilized. The Downtown area will require 12% additional parking (or 629 additional spaces) as building utilization approaches 100%. Increasing the parking resources for Downtown Framingham should be considered to prevent a severe parking shortage as utilization rates in Downtown Framingham rise. A comprehensive development strategy that includes revitalization of existing buildings, increased parking resources, as well as new development projects can be successful in Downtown Framingham, particularly given its unique transportation assets of Routes 135, 126 and MBTA commuter rail access.

Large lot				Medium Lot				Small Lot			
Approx Loc	**Util**	**CoE**	**Wutil**	**Approx Loc**	**Util**	**CoE**	**Wutil**	**Approx Loc**	**Util**	**CoE**	**Wutil**
57 Union Ave	100%	0.75	75%	55 Franklin St	95%	1	95%	228 Lincoln St	100%	0.85	85%
11 Hollis Ct	95%	0.8	76%	354 Waverley St	75%	0.85	64%	121 Lexington St	100%	1	100%
121 Concord	40%	1	40%	55 Concord St	67%	0.7	47%	Franklin & Pearl St	90%	0.65	59%
266 Waverly	30%	0.8	24%	205 Concord St	65%	0.85	55%	15 South St	80%	0.45	36%
15 Blandin	10%	1	10%	38 Park St	55%	0.9	50%	214 Concord St	65%	0.5	33%
				64 Franklin St	55%	0.95	52%	27 Gordon St	40%	0.65	26%
				97 Pearl St	30%	0.6	18%	2 Milton St	25%	0.9	23%
								264 Waverkt St	15%	0.7	11%
Avg Cat Util	45%				54%				46%		
Avg Overall Util	49%										

Methodology:

1. Categorize lots based on size (visual survey)
2. Pick 6-8 lots from each category as sample (1 largely utilized, 1 not very utilized, 1 largely under-utilized based on visual assessement)
3. Visually assess the utilization for each lot; lots are also assigned coefficient based on relative size within the category
4. Calculate the weighted average utilization for each category
5. Calculate the average utilization of the sample

NOTE:

Visual survey is based on the 2008 orthoimage from MassGIS, the image seems to be taken in during business hour
Adjacent parking lots are lump together if there is no visual separation between them.
Approximate location is the address of the parking lot or the group of parking lots

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Figure 2-21
Parking Utilization Analysis