# Chapter 7—Future-Year Alternative Analysis: Bowker Overpass

## 7.1 INTRODUCTION

This chapter describes the analysis of the future-year transportation conditions for the Bowker Overpass during a typical workday, emphasizing the peak commuting hours. Staff used the Boston regional model to forecast AM and PM peak-hour volumes in 2035 for each of the four study alternatives. Staff then applied the volumes to I-90 and selected intersections to determine their performance under each scenario. Performance was measured in terms of speed, density (passenger cars/miles/lane), and level of service (LOS). Staff used two software tools to evaluate the alternatives' operations:

- Highway Capacity Software (HCS) 2010—a traffic-analysis software based on the Highway Capacity Manual—to evaluate performance
- Synchro—a traffic-capacity and simulation program developed and distributed by Trafficware Ltd.—to perform capacity analysis for an individual intersection or a series of intersections in a roadway network

Staff also conducted a noise analysis to evaluate the potential sound levels associated with changes in roadway alignments and vehicular traffic using the Federal Highway Administration's Traffic Noise Model Version 2.5. A memorandum detailing the noise analysis is provided in Appendix B of this report.

## 7.2 I-90 RAMP RESULTS

The merges and diverges that take place at on- and off-ramps also were analyzed, as shown in Table 7-1. There were no significant impacts in I-90 performance within Alternatives 3 and 4 in either the AM or PM peak hours. Operations are expected to perform at LOS C and D during both peak hours, for both alternatives.

## TABLE 7-1
## Level of Service I-90: Ramp Results for 2035 Alternatives 3 and 4

| Location | Merge or Diverge | Ramp Volume | Freeway Volume | Computed Speeds (MPH) | Density (Passenger Cars/ Mile/Lane) | LOS | Ramp Volume | Freeway Volume | Computed Speeds (MPH) | Density (Passenger Cars/ Mile/Lane) | LOS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AM PEAK PERIOD | | | | | | | | | | | |
| I-90 EB Bowker Off-ramp | Diverge | 595 | 8127 | 48.7 | 33.4 | D | 641 | 8160 | 48.7 | 33.8 | D |
| I-90 EB Bowker On-ramp | Merge | 494 | 8026 | 54.0 | 33.1 | D | 522 | 8042 | 54.0 | 33.4 | D |
| I-90 WB Bowker Off-ramp | Diverge | 707 | 5882 | 48.6 | 25.5 | C | 811 | 5896 | 48.5 | 26.0 | C |
| I-90 WB Bowker On-ramp | Merge | 340 | 5174 | 57.0 | 23.0 | C | 386 | 5084 | 57.0 | 23.1 | C |
| PM PEAK PERIOD | | | | | | | | | | | |
| I-90 EB Bowker Off-ramp | Diverge | 430 | 6718 | 48.9 | 27.3 | C | 501 | 6792 | 48.8 | 27.9 | C |
| I-90 EB Bowker On-ramp | Merge | 490 | 6777 | 56.0 | 29.2 | D | 546 | 6836 | 57.0 | 20.0 | B |
| I-90 WB Bowker Off-ramp | Diverge | 637 | 5987 | 48.7 | 25.5 | C | 677 | 6050 | 48.6 | 25.9 | C |
| I-90 WB Bowker On-ramp | Merge | 587 | 5356 | 57.0 | 25.4 | C | 622 | 5378 | 56.0 | 25.7 | C |

## 7.3 BOWKER OVERPASS: INTERSECTION RESULTS

Staff used Synchro to analyze selected intersections for the Bowker Overpass alternatives for the AM and PM peak hours in the Boston area. The selected intersections cited below were determined to be key intersections for evaluating traffic operations for the alternatives.

- Beacon Street at Charlesgate East
- Beacon Street at Charlesgate West
- Commonwealth Avenue East at Charlesgate East
- Commonwealth Avenue East at Charlesgate West
- Commonwealth Avenue West at Charlesgate East
- Commonwealth Avenue West at Charlesgate West
- Bowker Overpass at Boylston Street
- Charlesgate at Bolyston Street and Fenway

Staff analyzed the following additional intersections based on the Bowker Overpass alternative:

- New Ramp intersection: Bowker Overpass at Massachusetts Turnpike Eastbound Ramps
- New Ramp intersection: Bowker Overpass at Massachusetts Turnpike Westbound Ramps
- New Ramp intersection: Storrow Drive Eastbound at Massachusetts Avenue
- New Ramp intersection: Storrow Drive Westbound at Massachusetts Avenue

Figures 7-1 through 7-8 present the LOS and queuing results for the AM and PM peak hours at the key intersections. The LOS and queuing results for Alternative 1 show that removing the Bowker Overpass would result in a decrease in LOS operations with several intersections having a LOS of F. Significant increases in potential queuing occur, with expected queues spilling back through previous intersections.

The expected operations for Alternative 2, with a new at-grade roadway, indicate that four intersections would be LOS F in the AM peak hour. There is also the potential for gridlock because of the expected queues. Alternative 3, with the new Massachusetts Turnpike interchange, will operate at acceptable LOS, except at the Beacon Street at Charlesgate West intersection. With the overpass removed, Beacon Street and Kenmore Square are expected to see significant increases in traffic volumes. As with Alternative 3, Alternative 4 also would see acceptable LOS in the study area, with one exception. The new interchange intersections with Storrow Drive and Massachusetts Avenue are expected to have an LOS of F. These intersections would provide Storrow Drive access to the Fenway and Longwood Medical areas; which previously was accessed by the Storrow Drive ramps to Beacon Street.

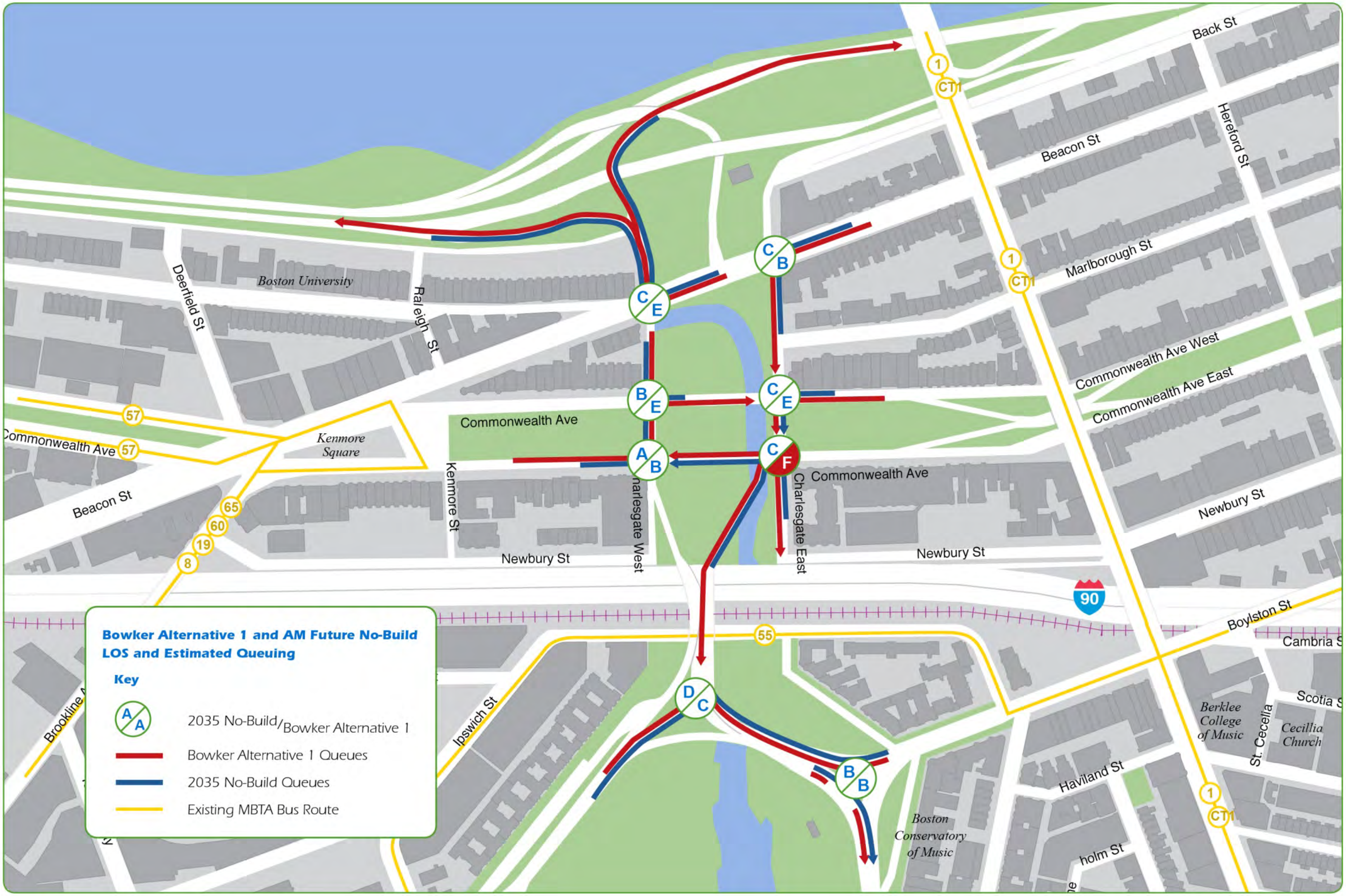


**FIGURE 7-1**
**Bowker Alternative 1: AM**
**Bowker Overpass Removed**

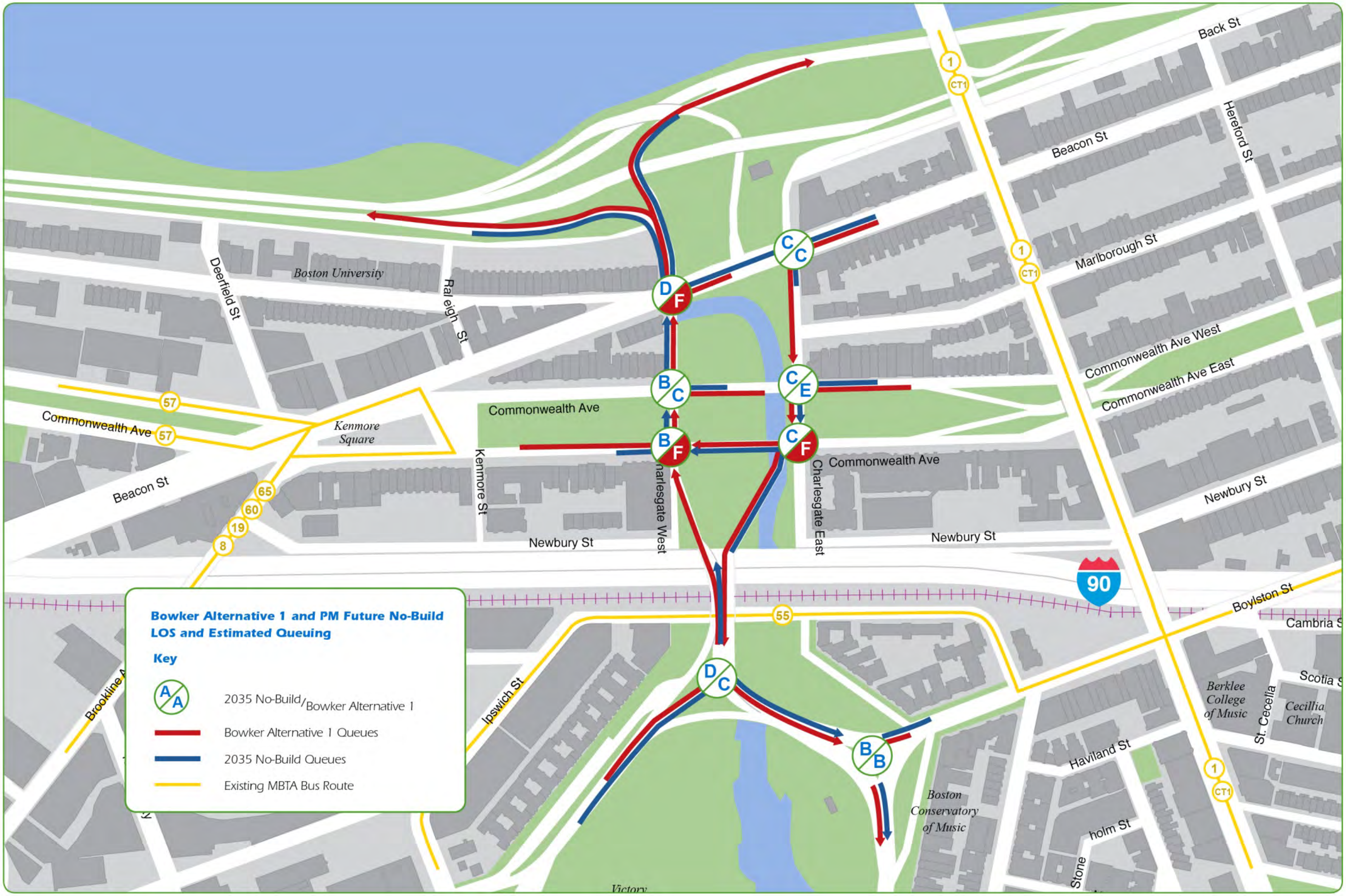


**FIGURE 7-2**
**Bowker Alternative 1: PM**
**Bowker Overpass Removed**

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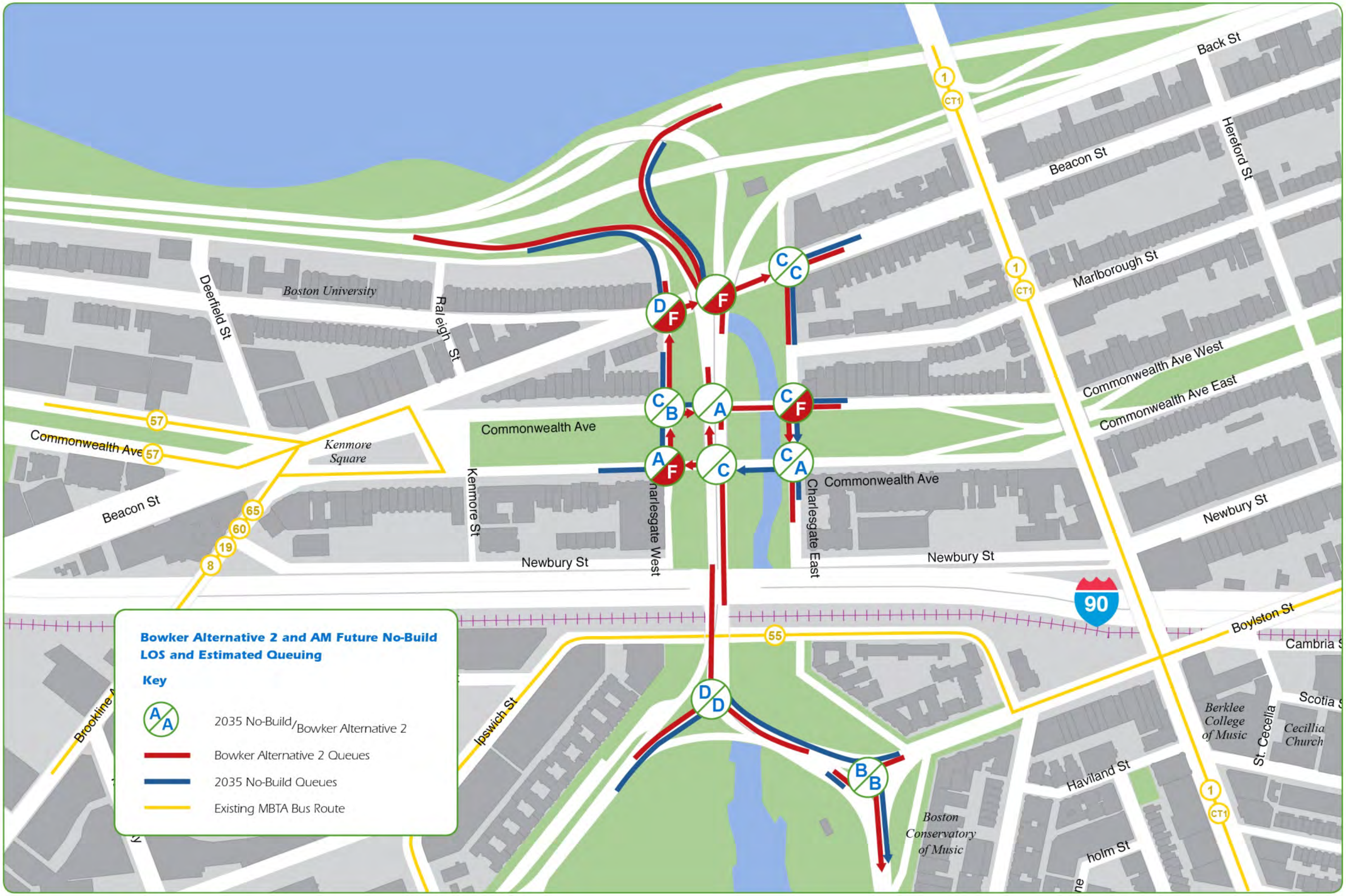


**FIGURE 7-3**
**Bowker Alternative 2: AM**
**Bowker Overpass At-grade**

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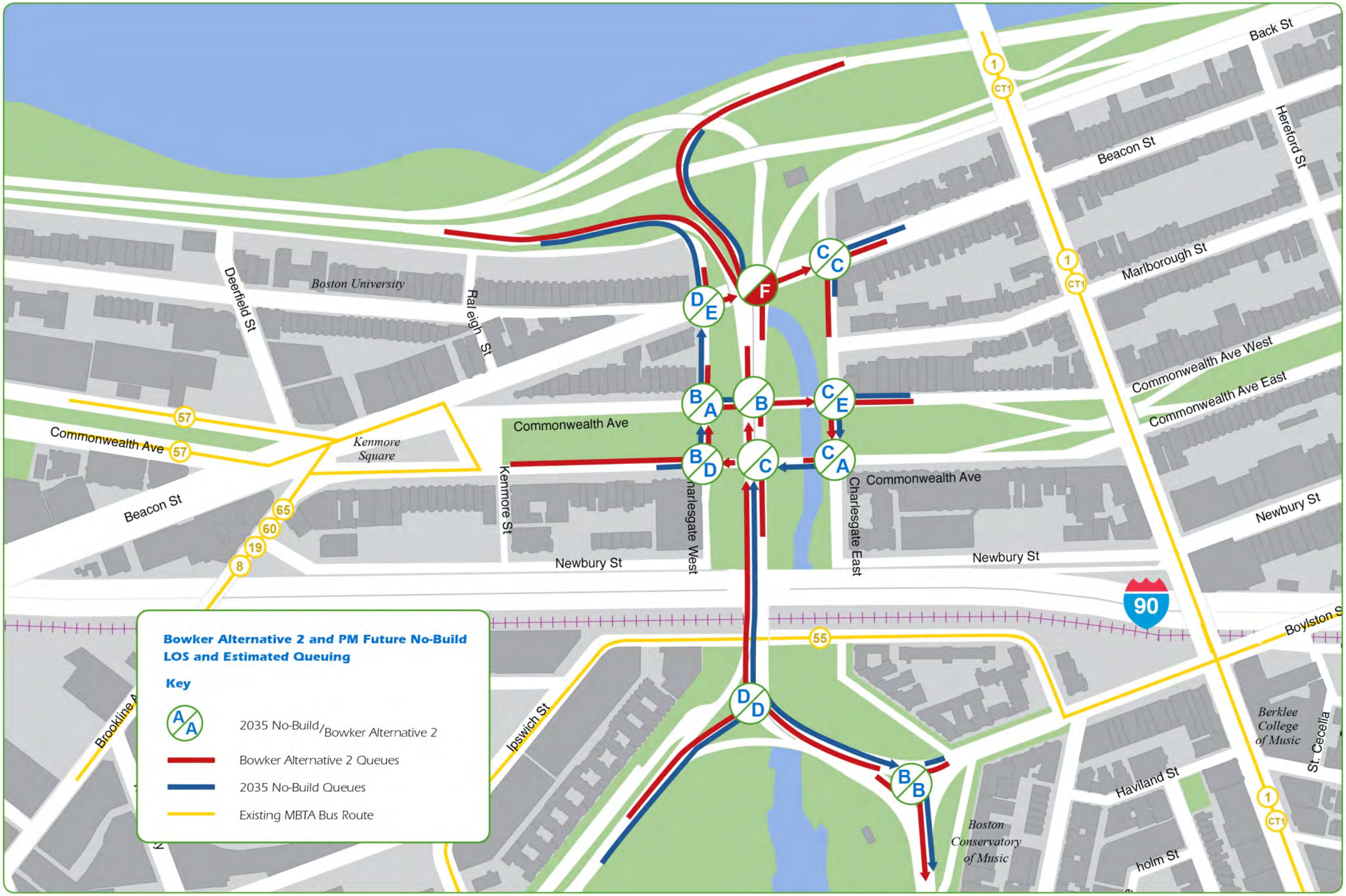


# FIGURE 7-4
# Bowker Alternative 2: PM
# Bowker Overpass At-grade

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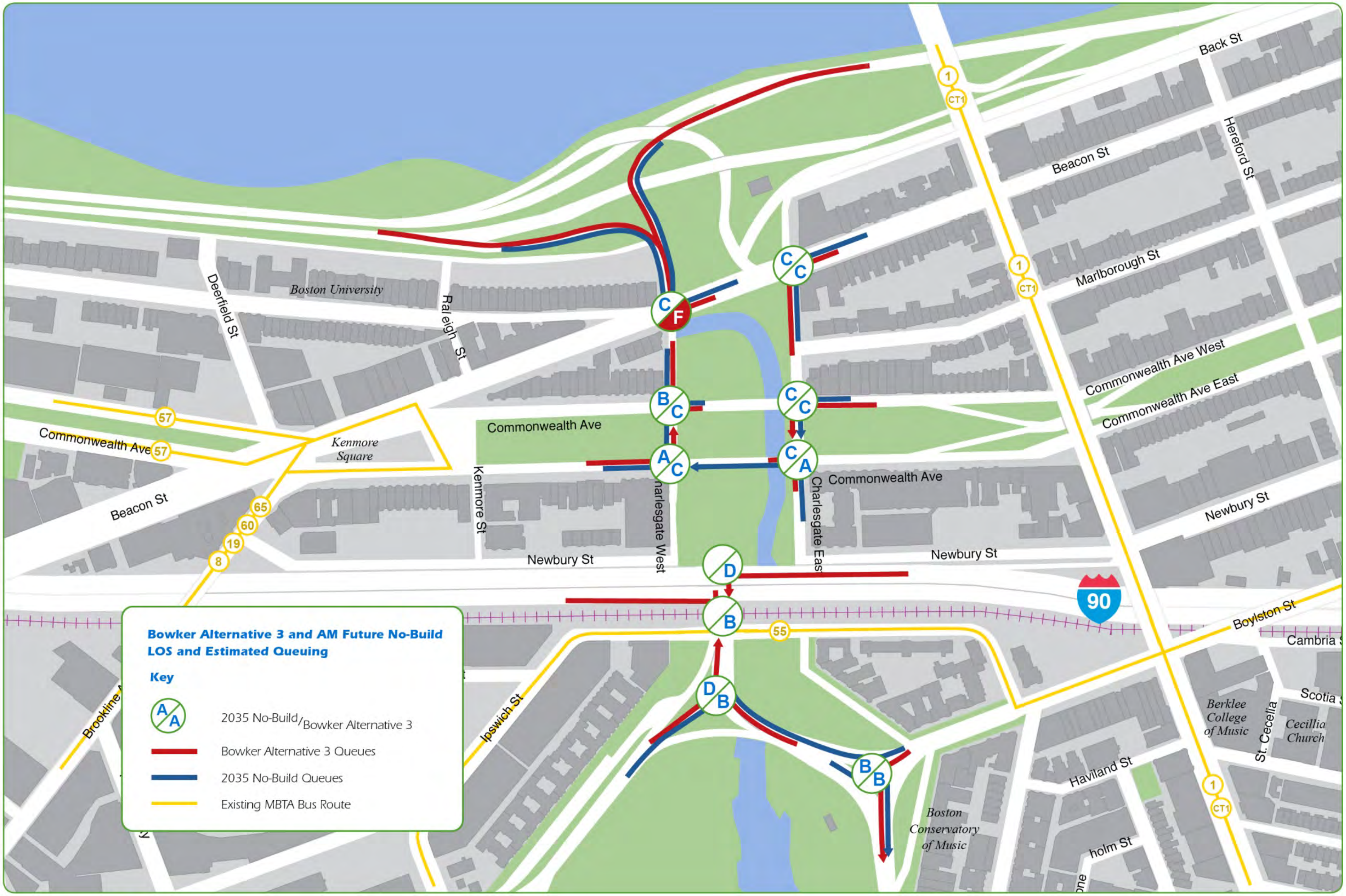


# FIGURE 7-5
## Bowker Alternative 3: AM
## New Regional Access

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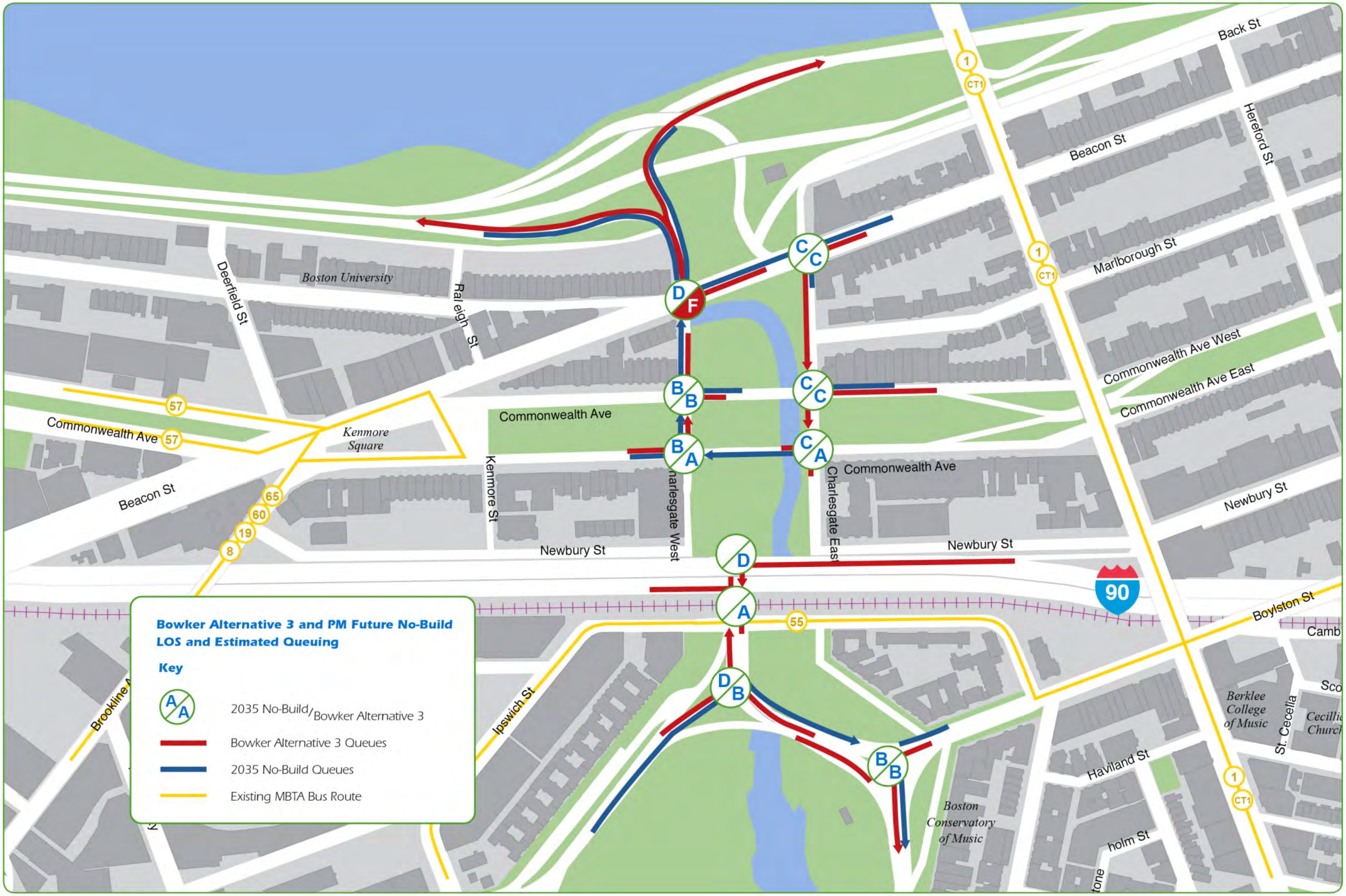


# FIGURE 7-6
# Bowker Alternative 3: PM
# New Regional Access

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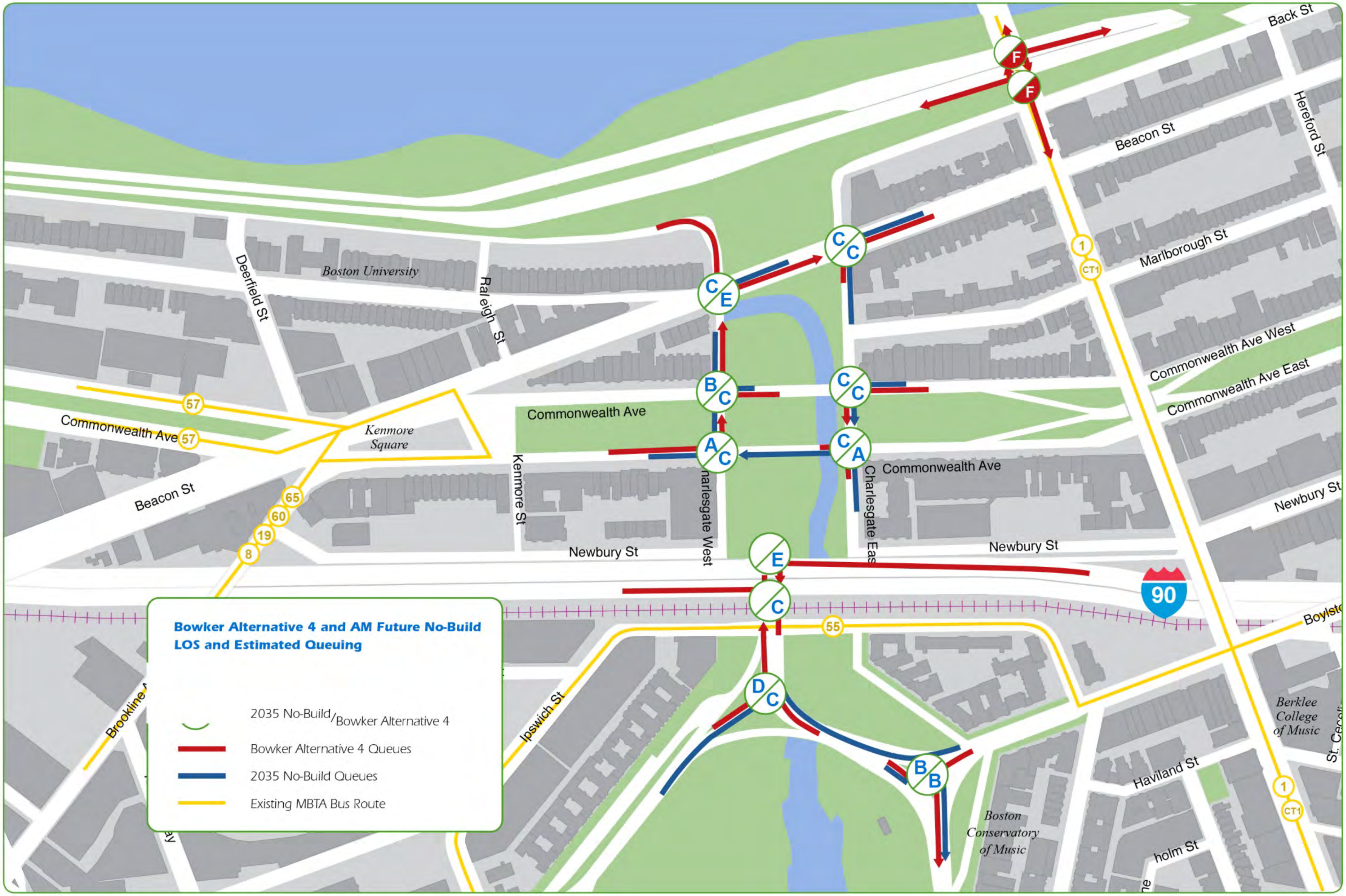


**FIGURE 7-7**
**Bowker Alternative 4: AM**
**New Regional and Local Access**

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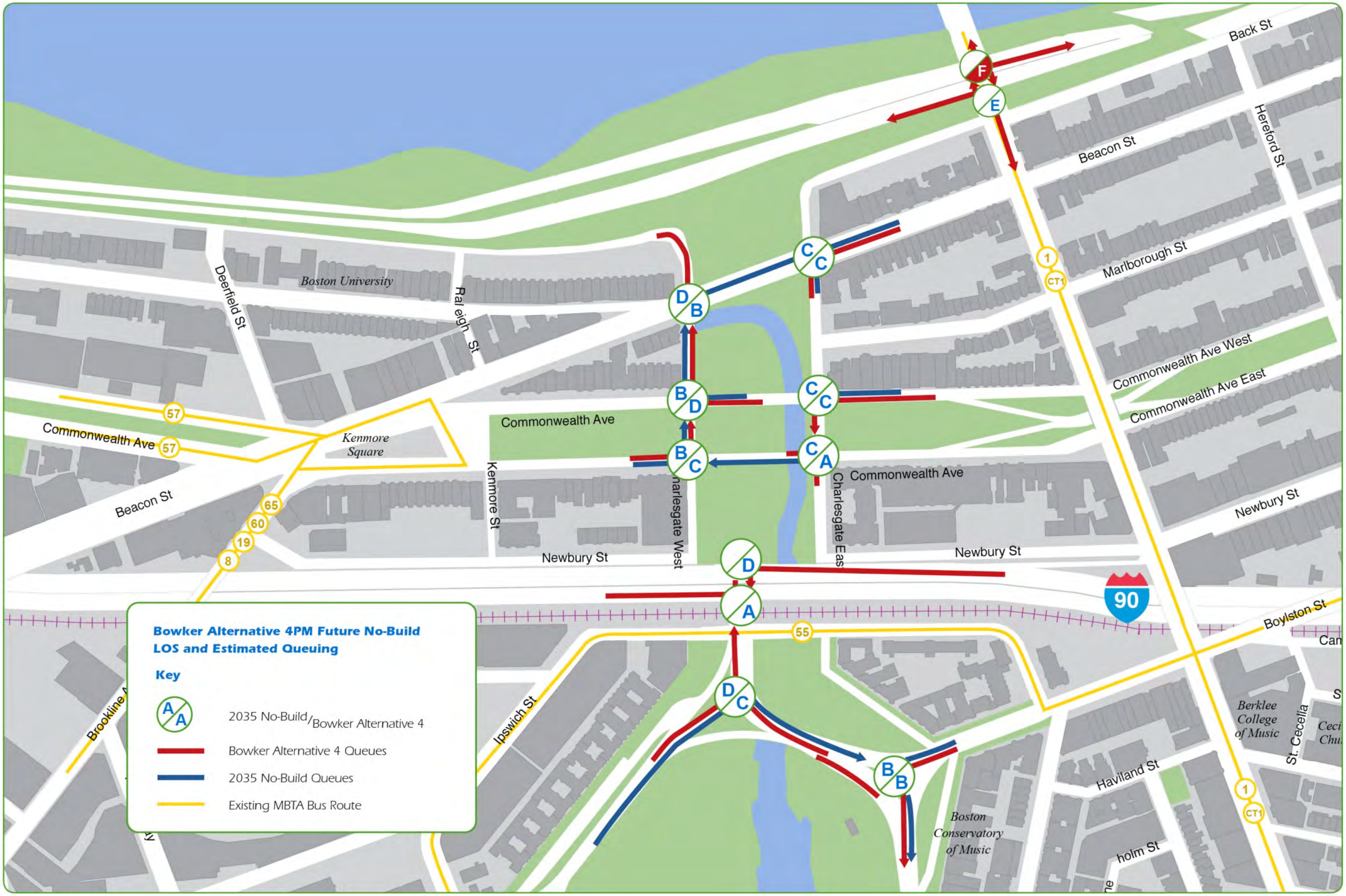


**FIGURE 7-8**
**Bowker Alternative 4: PM**
**New Regional and Local Access**

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## 7.4 BOWKER OVERPASS: NOISE EVALUATION

As with the Back Bay Ramps, staff conducted a noise evaluation for the Bowker Overpass alternatives using the same methods and procedures described in Chapter 6. The results of the analysis—which used the FHWA's Traffic Noise Model (TNM) model to calculate sound levels associated with each of the Bowker Overpass alternatives for the Existing and Build conditions—demonstrated no significant change in the sound levels between the Existing and Build conditions for most of the alternatives.

However, based on this planning-level evaluation, the alternatives can be ranked by the total number of impacted residential receptor locations. As table 7-2 shows, alternatives 2 and 4 impact fewer residential units than the No-Build condition. For Alternative 2, there are 183 less residential units impacted, and for Alternative 4 there are 357 fewer units impacted. Alternatives 1 and 2 show that the same number of units are impacted for both conditions. The ranking is shown in Table 7-3.

**TABLE 7-2**
**Bowker Overpass Alternative Impacts**

| | 2010 Existing Conditions | | 2035 Build Conditions | |
|---|---|---|---|---|
| | Impact Distance (Ft) | Impacted Residential Units (#) | Impact Distance (Ft) | Impacted Residential Units (#) |
| Alternative 1 | | | | |
| Charlesgate East | 25 | 183 | 25 | 183 |
| Charlesgate West | 25 | 174 | 25 | 174 |
| Total | | 357 | | 357 |
| Alternative 2 | | | | |
| Charlesgate East | 25 | 183 | 15 | 0 |
| Charlesgate West | 25 | 174 | 25 | 174 |
| Total | | 357 | | 174 |
| Alternative 3 | | | | |
| Charlesgate East | 25 | 183 | 25 | 183 |
| Charlesgate West | 25 | 174 | 25 | 174 |
| Newbury Street | 175 | 122 | 25 | 122 |
| Ipswich Street | 100 | 91 | 125 | 91 |
| Total | | 570 | | 570 |
| Alternative 4 | | | | |
| Charlesgate East | 25 | 183 | 0 | 0 |
| Charlesgate West | 25 | 174 | 0 | 0 |
| Newbury Street | 175 | 122 | 25 | 122 |
| Ipswich Street | 100 | 91 | 125 | 91 |
| Total | | 270 | | 213 |

**TABLE 7-3**
**Bowker Overpass Alternative Rankings**

| | |
|---|---|
| 1. | Alternative #2 with 174 Residential Receptors impacted |
| 2. | Alternative #4 with 213 Residential Receptors impacted |
| 3. | Alternative #1 with 357 Residential Receptors impacted |
| 4. | Alternative #3 with 570 Residential Receptors impacted |

## 7.5 BOWKER OVERPASS: BICYCLE AND PEDESTRIAN LOS

As with vehicle LOS, there are measures to estimate bikeability and walkability. Several methods have been proposed, but for this study staff chose a calculator developed by the League of Illinois Bicyclists (http://www.bikelib.org/roads/blos/losform.htm). This particular calculator is nationally recognized and takes into account traffic volumes, which can be major stressors for bicyclists and pedestrians. Like vehicle LOS, the calculator assigns a letter grade of A through F, with A reflecting best conditions and F reflecting worst. The bicycle LOS and pedestrian LOS utilize the following inputs:

- Number of through lanes per direction
- Width of outside/right-most lane
- Width of paved shoulder, bike lane, or on-street parking lane
- Average Daily Traffic (ADT)
- Posted speed limit
- Percentage of heavy vehicles
- Pavement condition rating
- Percentage of road segment with occupied on-street parking
- Percentage of segment with sidewalks
- Sidewalk width
- Sidewalk buffer width
- Average tree spacing within sidewalk buffer

Table 7-4 below suggests how bicycle and pedestrian LOS might change under the four Bowker Overpass alternatives. These estimates are based only on changes to vehicle traffic volumes, not design. For bicyclists, conditions would improve on the Bowker Overpass (only the segment over the Mass Pike) in all scenarios because the north-south vehicle traffic using the overpass decreases. Conditions would deteriorate somewhat for both bicyclists and pedestrians under both Alternatives 1 and 3 because of increased at-grade traffic along Charlesgate. Alternatives 2 and 4 show slight improvements in both bicycle and pedestrian LOS because of improved vehicle traffic flow.

**TABLE 7-4**
**Bicycle and Pedestrian LOS for Bowker Alternatives**

| | Direction | Existing Conditions | 2035 Alt 1 | 2035 Alt 2 | 2035 Alt 3 | 2035 Alt 4 |
|---|---|---|---|---|---|---|
| **BICYCLE LOS** | | | | | | |
| Commonwealth Avenue | EB | D | D | D | D | D |
| | WB | D | D | D | D | D |
| Charlesgate | NB | D | E | D | E | D |
| | SB | D | E | D | D | C |
| Beacon Street | WB | B | B | B | B | B |
| Bowker Overpass over Mass Turnpike | NB | F | C | C | C | C |
| | SB | F | C | C | C | C |
| **PEDESTRIAN LOS** | | | | | | |
| Commonwealth Avenue | EB | C | C | D | D | C |
| | WB | C | C | C | C | C |
| Charlesgate | NB | C | F | C | D | B |
| | SB | C | F | C | D | B |
| Beacon Street | WB | B | B | B | B | B |
| Bowker Overpass over Mass Turnpike | NB | C | C | C | C | C |
| | SB | C | C | C | C | C |