Chapter 6—Future-Year Alternative Analysis: Massachusetts Turnpike Ramps

6.1 INTRODUCTION

This chapter describes the analysis of the future-year transportation conditions for the Massachusetts Turnpike Ramps 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; then applied the volumes to I-90, selected arterials, and selected intersections to determine their performance under each scenario. The performance measures analyzed included speed, density (passenger cars/mile/lane), and level of service (LOS). Staff used two software packages to evaluate each of 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

Noise analysis also was conducted 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 detaining the noise analysis is provided in Appendix B to this report.

6.2 I-90 MAINLINE RESULTS

As shown in Table 6-1, there was no significant change in the I-90 performance measures among the scenarios in either the AM or PM peak hours. The only slight change was that in the westbound direction between the Prudential Tunnel and Exit 20 (Allston), LOS changed from C to B under Alternative 3; however, this reflects a decrease in density of only one car/mile/lane, showing that the LOS C measure in the other alternatives was close to the B-C threshold.

6.3 I-90 RAMP RESULTS

How traffic merges and diverges at on- and off-ramps also was analyzed, as shown in Tables 6-2 and 6-3. The most significant change at the ramps occurs in the westbound direction at Exit 25, I-93, where LOS improves from F in the 2035 No Build AM peak hour to LOS C in Alternatives 1 and 2. There are a few other minor shifts during the

AM peak hour at the South Boston on-ramp between Exits 24 and 25 in the westbound direction, and at Exit 20 for Allston-Brighton in the westbound direction. There were virtually no changes noted during the PM peak hour.

6.4 I-90 ARTERIAL RESULTS

Tables 6-4 and 6-5 show results for the study arterials under the various 2035 scenarios. During the AM period, the only two segments that change are eastbound on the Longfellow Bridge (Route 3) and westbound Storrow Drive between Longfellow Bridge and Leverett Circle. The Longfellow Bridge segment is rated LOS B under the 2035 No Build conditions but improves to LOS A in each of the other alternatives. The Storrow Drive segment is rated LOS E under the 2035 No Build conditions but improves to LOS D in each of the other alternatives.

During the PM period, the only two segments that change are southbound on the BU Bridge and northbound on the Harvard/Mass Ave Bridge. The BU Bridge is rated LOS C under the 2035 No Build conditions but improves to LOS B in each of the other alternatives. The Harvard/Mass Ave Bridge is LOS B under the 2035 No Build conditions but improves to LOS A in each of the other alternatives.

TABLE 6-1
Level of Service I-90: Mainline Results for 2035 No Build and Alternatives

Location	Direction	2035 No Build			2035 Alternative 1			2035 Alternative 2			2035 Alternative 3			2035 Alternative 4		
		Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS
AM PEAK PERIOD																
I-90 EB between Prudential Tunnel and Allston Toll (Int 20)	EB	62.1	29.8	D	62.7	28.8	D	62.7	28.8	D	62.7	28.8	D	63	28.1	D
I-90 WB between Prudential Tunnel and Allston Toll (Int 20)	WB	65.0	19.3	C	65.0	19	C	65.0	18.9	C	65.0	17.9	B	65.0	19.2	C
I-90 EB between Prudential Tunnel and I-93 Exit (Int 24)	EB	63.5	27.2	D	63.8	26.5	D	63.8	26.5	D	63.8	26.4	D	63.3	27.7	D
I-90 WB between Prudential Tunnel and I-93 Exit (Int 24)	WB	65.0	19.5	C	65.0	22.4	C	64.9	22.5	C	65.0	21.2	C	65.0	19.5	C
I-90 EB in Ted Williams Tunnel	EB	55.0	16.1	B	55.0	16.1	B	55.0	16	B	55.0	16	B	55.0	16.3	B
I-90 WB in Ted Williams Tunnel	WB	55.0	26.4	D	55.0	26.8	D	55.0	26.9	D	55.0	26.5	D	55.0	26.1	D
PM PEAK PERIOD																
I-90 EB between Prudential Tunnel and Allston Toll (Int 20)	EB	65	21.2	C	65	21.1	C	65	21	C	65	21.1	C	65	20.6	C
I-90 WB between Prudential Tunnel and Allston Toll (Int 20)	WB	64.6	24.4	C	64.8	23.2	C	65.0	22.3	C	64.2	25.6	C	64.7	23.8	C
I-90 EB between Prudential Tunnel and I-93 Exit (Int 24)	EB	65	21	C	65	20.9	C	65	20.9	C	65	20.9	C	65	22	C
I-90 WB between Prudential Tunnel and I-93 Exit (Int 24)	WB	65.0	22.1	C	64.6	24.3	C	64.6	24.3	C	64.8	23.3	C	65.0	21.6	C
I-90 EB in Ted Williams Tunnel	EB	55.0	32.2	D	55.0	31.8	D	55.0	31.8	D	55.0	31.9	D	55.0	31.9	D
I-90 WB in Ted Williams Tunnel	WB	55.0	23.4	C	55.0	23.9	C	55.0	23.9	C	55.0	23.9	C	55.0	23.8	C

TABLE 6-2
Level of Service I-90: Ramp Results for 2035 No Build and Alternatives

Location	Direction	Merge or Diverge	2035 No Build			2035 Alternative 1			2035 Alternative 2			2035 Alternative 3			2035 Alternative 4		
			Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS
AM PEAK PERIOD																	
I-90 EB Int 20 Allston-Brighton	EB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
Alternative 4: I-90 EB Bowker Overpass On-ramp	EB	Merge													56.0	29.2	D
I-90 EB Int 22 Prudential-Copley Off-ramp	EB	Diverge	46.9	21.4	C	46.9	20.5	C	47.0	20.4	C	46.9	20.5	C	46.9	21.5	C
I-90 EB Int24 I-93/South Station Off-ramp	EB	Diverge	48.7	29.1	D	48.9	28.1	D	48.9	28.1	D	48.9	28.0	C	48.7	29.4	D
I-90 EB Exit 25 South Boston Off-ramp	EB	Diverge	48.2	16.7	B	48.2	16.8	B	48.2	16.8	B	48.2	16.8	B	48.2	17.4	B
I-90 EB I-93 NB On-ramp	EB	Merge	51.0	12.8	B	51.0	12.9	B	51.0	12.9	B	51.0	12.9	B	51.0	13.2	B
I-90 EB South Boston On-ramp	EB	Merge	51.0	16.6	B	51.0	16.6	B	51.0	16.6	B	51.0	16.6	B	51.0	16.9	B
I-90 EB HOV from I-93 On-ramp	EB	Merge	51.0	16.1	B	51.0	16.1	B	51.0	16.0	B	51.0	16.0	B	51.0	16.2	B
I-90 WB Exit 25 I-93/South Boston Off-ramp	WB	Diverge	47.0	25.6	F	47.1	26.0	C	47.1	26.1	C	47.1	25.8	F	47.0	25.3	F
I-90 WB South Boston On-ramp	WB	Merge	51.0	9.4	A	51.0	11.1	B	51.0	11.1	B	51.0	10.4	B	51.0	9.3	A
I-90 WB Int 24 I-93 NB On-ramp	WB	Merge	50.0	24.6	C	50.0	26.7	C	50.0	26.8	C	50.0	26.0	C	50.0	24.6	C
I-90 WB Int 24 I-93 SB On-ramp	WB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
I-90 WB Int 23 Arlington Street On-ramp	WB	Merge	57.0	23.9	C	Closed in this Alternative			Closed in this Alternative			56.0	25.7	C	57.0	23.9	C
Alternative 1: I-90 WB Berkeley Street Off-ramp	WB	Diverge				48.9	24.9	C									
Alternative 2: I-90 WB Stuart Street/Trinity Place Off-ramp	WB	Diverge							48.8	25.1	C						
I-90 WB Clarendon Street On-ramp	WB	Merge	23.4	C	57.0	22.4	C	23.4	Closed in this Alternative			57.0	25.2	C	57.0	23.4	C
I-90 WB Int 22 Prudential-Copley On-ramp	WB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
I-90 WB Int 21 Massachusetts Avenue On-ramp	WB	Merge	57.0	22.2	C	57.0	22.1	C	58.0	13.6	B	57.0	23.8	C	57.0	22.2	C
Alternative 3: I-90 WB Brookline Avenue Off-ramp	WB	Diverge										48.5	24.2	C			
I-90 WB Int 20 Allston-Brighton	WB	Diverge	51.5	10.2	B	51.5	9.8	A	51.5	9.6	A	51.4	10.0	A	51.5	10.1	B

TABLE 6-3
Level of Service I-90: Ramp Results for 2035 No Build and Alternatives

Location	Direction	Merge or Diverge	2035 No Build			2035 Alternative 1			2035 Alternative 2			2035 Alternative 3			2035 Alternative 4		
			Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS
PM PEAK PERIOD																	
I-90 EB Int 20 Allston-Brighton	EB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
Alternative 4: I-90 EB Bowker Overpass On-ramp	EB	Merge													57.0	24.1	C
I-90 EB Int 22 Prudential-Copley Off-ramp	EB	Diverge	47.8	12.1	B	47.8	11.8	B	47.8	11.8	B	47.8	12.0	B	47.7	13.1	B
I-90 EB Int 24 I-93/South Station Off-ramp	EB	Diverge	50.0	19.2	B	50.0	19.2	B	50.0	19.2	B	50.0	19.2	B	49.9	20.6	C
I-90 EB Exit 25 South Boston Off-ramp	EB	Diverge	48.7	16.9	B	48.7	16.7	B	48.7	16.7	B	48.7	16.7	B	48.7	17.6	B
I-90 EB I-93 NB On-ramp	EB	Merge	51.0	20.9	C	51.0	20.6	C	51.0	20.6	C	51.0	20.7	C	51.0	21.0	C
I-90 EB South Boston On-ramp	EB	Merge	50.0	29.3	D	50.0	28.9	D	50.0	28.9	D	50.0	29.0	D	50.0	29.2	D
I-90 EB HOV from I-93 On-ramp	EB	Merge	50.0	29.9	D	50.0	29.5	D	50.0	29.5	D	50.0	29.6	D	50.0	29.6	D
I-90 WB Exit 25 I-93/South Boston Off-ramp	WB	Diverge	47.4	22.8	C	47.5	23.2	C	47.5	23.2	C	47.5	23.2	C	47.4	23.1	C
I-90 WB South Boston On-ramp	WB	Merge	51.0	12.3	B	51.0	13.7	B	51.0	13.8	B	51.0	13.5	B	51.0	12.5	B
I-90 WB Int 24 I-93 NB On-ramp	WB	Merge	50.0	25.4	C	50.0	27.4	C	50.0	27.4	C	50.0	26.7	C	50.0	25.6	C
I-90 WB Int 24 I-93 SB On-ramp	WB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
I-90 WB Int 23 Arlington Street On-ramp	WB	Merge	56.0	28.5	D	Closed in this Alternative			Closed in this Alternative			56.0	29.2	D	56.0	27.8	C
Alternative 1: I-90 WB Berkeley Street Off-ramp	WB	Diverge				48.8	26.5	C									
Alternative 2: I-90 WB Stuart Street/Trinity Place Off-ramp	WB	Diverge							48.9	26.4	C						
I-90 WB Clarendon Street On-ramp	WB	Merge	56.0	28.3	D	56.0	26.9	C	Closed in this Alternative			56.0	29.1	D	56.0	28.1	D
I-90 WB Int. 22 Prudential-Copley On-ramp	WB	Merge	Merge has acceptable operations because of geometry, LOS not used.														
I-90 WB Int 21 Massachusetts Avenue On-ramp	WB	Merge	56.0	26.5	C	56.0	25.6	C	57.0	24.9	C	56.0	27.5	C	56.0	26.0	C
Alternative 3: I-90 WB Brookline Avenue Off-ramp	WB	Diverge										49.4	24.7	C			
I-90 WB Int 20 Allston-Brighton	WB	Diverge	51.2	14.6	B	51.3	13.3	B	51.3	13.0	B	51.4	14.3	B	51.2	14.0	B

TABLE 6-4
Level of Service I-90: Arterial Results for 2035 No Build and Alternatives

Location	Direction	2035 No Build			2035 Alternative 1			2035 Alternative 2			2035 Alternative 3			2035 Alternative 4		
		Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS
AM PEAK PERIOD																
Boston University Bridge (Route 2)	NB	45.0	20.3	C	45.0	19.5	C	45.0	19.4	C	45.0	19.6	C	45.0	19.6	C
Boston University Bridge (Route 2)	SB	45.0	13.3	B	45.0	13.1	B	45.0	13.1	B	45.0	12.9	B	45.0	13.1	B
Harvard Bridge (Route 2A)	NB	45.0	15.9	B	45.0	15.1	B	45.0	15.1	B	45.0	15.0	B	45.0	14.7	B
Harvard Bridge (Route 2A)	SB	45.0	9.1	A	45.0	8.6	A	45.0	8.5	A	45.0	8.3	A	45.0	8.8	A
Longfellow Bridge (Route 3)	EB	45.0	11.1	B	45.0	10.4	A	45.0	10.4	A	45.0	10.5	A	45.0	10.4	A
Longfellow Bridge (Route 3)	WB	45.0	12.0	B	45.0	12.2	B	45.0	12.2	B	45.0	12.2	B	45.0	12.2	B
Memorial Drive (Route 3) between BU Bridge and Harvard Bridge	EB	45.0	25.0	C	45.0	24.6	C	45.0	23.7	C	45.0	23.8	C	45.0	24.1	C
Memorial Drive (Route 3) between BU Bridge and Harvard Bridge	WB	45.0	13.2	B	45.0	12.6	B	45.0	12.6	B	45.0	12.8	B	45.0	13	B
Memorial Drive (Route 3) between Harvard Bridge and Longfellow Bridge	EB	45.0	25.0	C	45.0	23.3	C	45.0	24.5	C	45.0	23.3	C	45.0	23.4	C
Memorial Drive (Route 3) between Harvard Bridge and Longfellow Bridge	WB	45.0	13.3	B	45.0	12.6	B	45.0	12.8	B	45.0	12.5	B	45.0	13	B
Storrow Drive between Harvard Bridge and Berkeley Street	EB	45.0	29.2	D	45.0	27.6	D	45.0	27.5	D	45.0	27.6	D	45.0	27.3	D
Storrow Drive between Harvard Bridge and Berkeley Street	WB	45.0	25.4	C	45.0	25.8	C	45.0	25.8	C	45.0	25.1	C	45.0	25.6	C
Storrow Drive between Berkeley Street and Longfellow Bridge (Route 28)	EB	45.0	30.0	D	45.0	28.4	D	45.0	28.4	D	45.0	28.4	D	45.0	28.4	D
Storrow Drive between Berkeley Street and Longfellow Bridge (Route 28)	WB	44.9	32.4	D	44.9	31.9	D	44.9	31.9	D	45.0	31.6	D	44.9	32.1	D
Storrow Drive between Longfellow Bridge and Leverett Circle (Route 28)	EB	45.0	19.2	C	45.0	18.8	C	45.0	18.9	C	45.0	18.9	C	45.0	18.8	C
Storrow Drive between Longfellow Bridge and Leverett Circle (Route 28)	WB	44.4	35.0	E	44.5	34.3	D	44.6	34.2	D	45.0	34.7	D	45.0	34.9	D
Callahan Tunnel	NB	45.0	20.4	C	45.0	20.4	C	45.0	20.5	C	45.0	20.4	C	45.0	20.3	C
Sumner Tunnel	SB	45.0	10	A	45.0	9.4	A	45.0	9.3	A	45.0	9.5	A	45.0	9.8	A

TABLE 6-5
Level of Service I-90: Arterial Results for 2035 No Build and Alternatives

Location	Direction	2035 No Build			2035 Alternative 1			2035 Alternative 2			2035 Alternative 3			2035 Alternative 4		
		Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS	Computed Speeds (MPH)	Passenger Cars/ Mile/Lane	LOS
PM PEAK PERIOD																
Boston University Bridge (Route 2)	NB	45.0	14.8	B	45.0	14	B	45.0	14	B	45.0	14	B	45.0	14	B
Boston University Bridge (Route 2)	SB	45.0	18.2	C	45.0	18	B	45.0	18	B	45.0	17.8	B	45.0	18.1	B
Harvard Bridge (Route 2A)	NB	45.0	12.0	B	45.0	10.8	A	45.0	10.8	A	45.0	10.8	A	45.0	10.4	A
Harvard Bridge (Route 2A)	SB	45.0	11.6	B	45.0	11.6	B	45.0	11.6	B	45.0	11.3	B	45.0	11.7	B
Longfellow Bridge (Route 3)	EB	45.0	16.3	B	45.0	16.6	B	45.0	16.6	B	45.0	16.5	B	45.0	16.6	B
Longfellow Bridge (Route 3)	WB	45.0	8.5	A	45.0	7.9	A	45.0	7.9	A	45.0	7.8	A	45.0	7.8	A
Memorial Drive (Route 3) between BU Bridge and Harvard Bridge	EB	45.0	12.1	B	45.0	12.2	B	45.0	12.2	B	45.0	12.2	B	45.0	12.4	B
Memorial Drive (Route 3) between BU Bridge and Harvard Bridge	WB	45.0	14.6	B	45.0	14.4	B	45.0	14.4	B	45.0	14.3	B	45.0	14.4	B
Memorial Drive (Route 3) between Harvard Bridge and Longfellow Bridge	EB	45.0	13.4	B	45.0	12.4	B	45.0	12.5	B	45.0	12.5	B	45.0	12.5	B
Memorial Drive (Route 3) between Harvard Bridge and Longfellow Bridge	WB	45.0	13.7	B	45.0	13.4	B	45.0	13.4	B	45.0	13.2	B	45.0	13.5	B
Storrow Drive between Harvard Bridge and Berkeley Street	EB	45.0	22.5	C	45.0	21.6	C	45.0	21.6	C	45.0	21.7	C	45.0	21.3	C
Storrow Drive between Harvard Bridge and Berkeley Street	WB	45.0	29.3	D	45.0	30	D	45.0	30	D	45.0	29.5	D	45.0	29.5	D
Storrow Drive between Berkeley Street and Longfellow Bridge (Route 28)	EB	45.0	24.8	C	45.0	23.4	C	45.0	24.8	C	45.0	24.8	C	45.0	23.2	C
Storrow Drive between Berkeley Street and Longfellow Bridge (Route 28)	WB	44.7	33.3	D	44.8	33.0	D	44.7	33.3	D	44.7	33.3	D	44.7	33.2	D
Storrow Drive between Longfellow Bridge and Leverett Circle (Route 28)	EB	45.0	19.8	C	45.0	19.1	C	45.0	19.1	C	45.0	19.1	C	45.0	19.0	C
Storrow Drive between Longfellow Bridge and Leverett Circle (Route 28)	WB	45.0	30.1	D	45.0	29.7	D	45.0	29.5	D	45.0	30.0	D	45.0	30.2	D
Callahan Tunnel	NB	45.0	20.7	C	45.0	20.2	C	45.0	20.3	C	45.0	20.2	C	45.0	20.2	C
Sumner Tunnel	SB	45.0	18.2	C	45.0	18	C	45.0	18	C	45.0	18.2	C	45.0	18.4	C

6.5 BACK BAY RAMP INTERSECTION RESULTS

The intersection analysis for the Back Bay Ramp alternatives was analyzed using Synchro for the AM and PM peak hours for selected intersections in the Boston area. Intersections selected are major intersections that surround Back Bay and help feed traffic into and out of the neighborhood. The following intersections were evaluated:

- Park Drive at Brookline Avenue/Boylston Street
- Kenmore Square
- Massachusetts Avenue at Beacon Street
- Massachusetts Avenue at Boylston Street
- Dartmouth Street at Saint James Avenue
- Berkeley Street at Columbus Avenue
- Arlington Street at Stuart Street/Columbus Avenue
- Berkeley Street at Saint James Avenue
- Berkeley Street at Beacon Street
- Arlington Street/Mugar Way at Beacon Street

The following additional intersections were analyzed based on the Back Bay Ramp alternative:

- New Ramp intersection: Stuart Street at Trinity Place
- New Ramp intersection: Off-Ramp at Brookline Avenue
- Bowker Overpass at Boylston Street
- Charlesgate at Bolyston Street and Fenway

As the results in Figures 6-1 through 6-8 show, the AM and PM peak period LOS and queuing does not change significantly at any of the key intersections. There are some improvements at intersections located near the proposed ramps. A summary table of all intersections analyzed is provided in Appendix C.

AM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street

2035 No-Build/2035 Alternative 1

- 2035 No-Build Queues
- Back Bay Ramps Alternative 1 Queues
- Existing MBTA Bus Route

FIGURE 6-1
Back Bay Ramps Alternative 1
New Westbound Off-Ramp to Berkeley Street: AM LOS

Back Bay Ramps Alternative 1
PM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street

2035 No-Build/2035 Alternative 1

2035 No-Build Queues
Back Bay Ramps Alternative 1 Queues
Existing MBTA Bus Route

FIGURE 6-2
Back Bay Ramps Alternative 1
New Westbound Off-Ramp to Berkeley Street: PM LOS

massDOT
Massachusetts Department of Transportation

Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

AM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street

*11. **New Ramp Intersection:** Stuart Street at Trinity Place

2035 No-Build/2035 Alternative 2

2035 No-Build Queues
Back Bay Ramps Alternative 2 Queues
Existing MBTA Bus Route

FIGURE 6-3
Back Bay Ramps Alternative 2
New Westbound Off-Ramp to Trinity Place/Stuart Street: AM LOS

massDOT
Massachusetts Department of Transportation

Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

Back Bay Ramps Alternative 2
PM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street
*11. **New Ramp Intersection:** Stuart Street at Trinity Place

2035 No-Build/2035 Alternative 2

2035 No-Build Queues
Back Bay Ramps Alternative 2 Queues
Existing MBTA Bus Route

FIGURE 6-4
Back Bay Ramps Alternative 2
New Westbound Off-Ramp to Trinity Place/Stuart Street: PM LOS

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Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

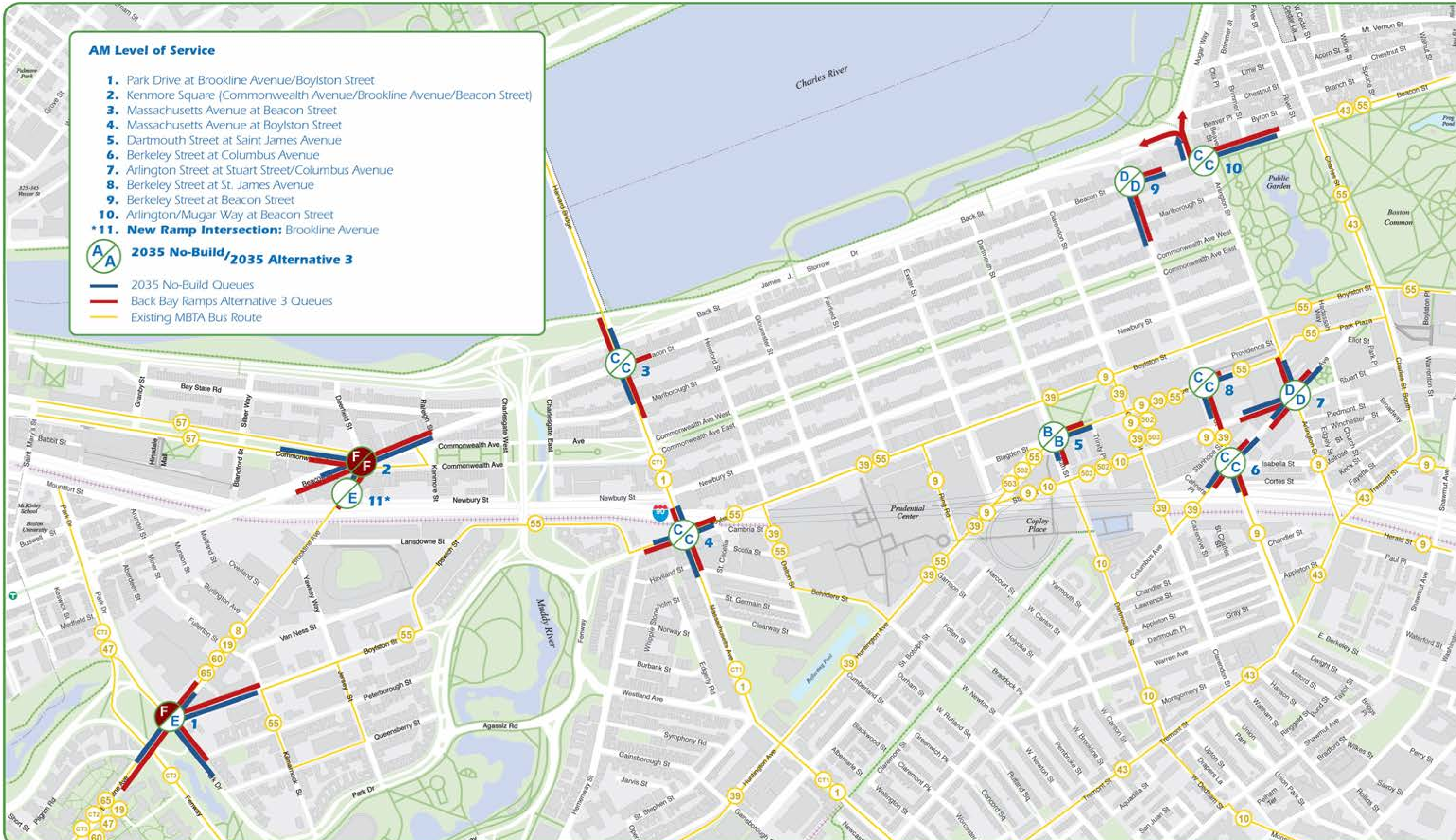

FIGURE 6-5
Back Bay Ramps Alternative 3
New Westbound Off-Ramp to Brookline Avenue: AM LOS

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Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

Back Bay Ramps Alternative 3
PM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street
*11. **New Ramp Intersection:** Brookline Avenue

2035 No-Build/2035 Alternative 3

2035 No-Build Queues
Back Bay Ramps Alternative 3 Queues
Existing MBTA Bus Route

FIGURE 6-6
Back Bay Ramps Alternative 3
New Westbound Off-Ramp to Brookline Avenue: PM LOS

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Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

AM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street
11. Bowker Overpass at Boylston Street
12. Charlesgate at Boylston Street and Fenway

2035 No-Build/2035 Alternative 4

- 2035 No-Build Queues
- Back Bay Ramps Alternative 4 Queues
- Existing MBTA Bus Route

FIGURE 6-7
Back Bay Ramps Alternative 4
New Eastbound On-Ramp from the Bowker Overpass: AM LOS

massDOT
Massachusetts Department of Transportation

Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

Back Bay Ramps Alternative 4
PM Level of Service

1. Park Drive at Brookline Avenue/Boylston Street
2. Kenmore Square (Commonwealth Avenue/Brookline Avenue/Beacon Street)
3. Massachusetts Avenue at Beacon Street
4. Massachusetts Avenue at Boylston Street
5. Dartmouth Street at Saint James Avenue
6. Berkeley Street at Columbus Avenue
7. Arlington Street at Stuart Street/Columbus Avenue
8. Berkeley Street at St. James Avenue
9. Berkeley Street at Beacon Street
10. Arlington/Mugar Way at Beacon Street
11. Bowker Overpass at Boylston Street
12. Charlesgate at Boylston Street and Fenway

2035 No-Build/2035 Alternative 4

2035 No-Build Queues
Back Bay Ramps Alternative 4 Queues
Existing MBTA Bus Route

FIGURE 6-8
Back Bay Ramps Alternative 4
New Eastbound On-Ramp from the Bowker Overpass: PM LOS

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Massachusetts Turnpike Boston Ramps and Bowker Overpass Study

6.6 BACK BAY RAMPS NOISE EVALUATION

This exercise provides a planning-level noise evaluation of the Back Bay Ramp Alternatives. The noise evaluation calculated the potential sound levels associated with the change in roadway alignments and vehicular traffic using the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM) Version 2.5.1. An abbreviated approach was used in developing the terrain for the project area noise model.

The FHWA has established noise abatement criteria (NAC) to help protect the public from excessive traffic noise, which MassDOT has endorsed. Recognizing that different areas are sensitive to noise in different ways, the NAC varies according to land use. The NAC for residential land use is 67 dB(A). MassDOT endorses the FHWA's procedures and considers noise impacts to occur when existing or future sound levels approach (within 1 dB(A)) or exceeds the NAC, or when future sound levels exceed the existing sound levels by 10 dB(A) or more. For each of the alternatives, the TNM model was used to calculate the distance or noise contour line from the primary roadways to where the sound level of 66 dB(A) would occur. The number of impacted receptor locations was determined by counting the residential receptor locations that were within the 66 dB(A) noise contour line.

The FHWA's TNM model was used to calculate sound levels associated with each of the Back Bay Alternatives for the Existing and Build conditions. The results of the noise analysis demonstrated that there is no significant change in the sound levels between the Existing and Build conditions for most of the alternatives and the number of residential units impacted also did not change.

However, based upon this planning-level evaluation, the alternatives can be ranked based upon the total number of impacted residential receptor locations. Table 6-6 provides information about the number of residential units impacted. As shown in the table, the number of impacted residential units does not increase from the 2010 existing conditions to the 2035 build conditions. But based on a ranking system that examines the total number of impacted residential units by the alternatives, then Back Bay Alternative 2 is the highest ranked (least number of impacted residential units) and Back Bay Alternative 4 is the lowest ranked alternative (greatest number of impacted residential units) as summarized in Table 6-7.

TABLE 6-6
Back Bay Alternative Impacts

	2010 Existing Conditions		2035 Build Conditions	
	Impact Distance (FT)	Impacted Residential Units (#)	Impact Distance (Ft)	Impacted Residential Units (#)
Alternative 1				
Cortes Street	75	116	75	116
Fayette Street	75	2	75	2
Total		118		118
Alternative 2				
Cahners Place	75	17	75	27
Total		27		27
Alternative 3				
Newbury Street	50	98	50	98
Total		98		98
Alternative 4				
Newbury Street	175	122	175	122
Ipswich Street	100	91	100	91
Total		213		213

TABLE 6-7
Back Bay Alternative Rankings

1.	Alternative #2 with 27 Residential Receptors impacted
2.	Alternative #3 with 98 Residential Receptors impacted
3.	Alternative #1 with 118 Residential Receptors impacted
4.	Alternative #4 with 213 Residential Receptors impacted