Reconsider the Curb

MAITE Conference
Curb Space is Limited & in High Demand
Ride Hailing (Uber/Lyft)  
Transit Delivery  
Bicycle Access  

Curb Space is Limited & in High Demand
Reconsider the Curb: 1 City Block

- Parking: 60 people
- Drop-Offs: 1,800 people
- Transit: 32,000 people
- Bicycles: 60,000 people
- Walking: 72,000 people

Source: Based on NACTO "Urban Spaces Realities" graphic hourly rates for 8 hours
Reconsider the Curb: 1 City Block

- Parking: 60
- Drop-Offs: 1,800
Reconsider the Curb: 1 City Block

What Does a Curb Space Represent?

- 1 car = ~1.1 people / hr.
- OR
- 30 drop-offs = 33+ people / hr.

2 minutes per drop-off / pick-up (avg.)

Uber, Lyft, Taxi, Micro-Transit, Robot Taxis
Reconsider the Curb

Chicago, IL
Reconsider the Curb

Huntington, NY

McKinney, TX
New York, NY (NACTO)
Reconsider the Curb: 1 City Block

- **Drop-Offs**: 60
- **Transit**: 1,800
- **Bicycles**: 32,000
- **Walking**: 72,000

500x more people!

**Source**: Based on NACTCO “Urban Spaces Realities” graphic hourly rates for 8 hours
BostonBRT & Local Bus Pilots 2018

Julia Wallerce, Boston Program Manager
Institute for Transportation and Development Policy (ITDP)
September 26th, 2019
ITDP’s Mission:
To promote sustainable and equitable transport to create inclusive, people-oriented cities
Our Focus on BRT....

Bus Rapid Transit:
• High capacity
• High speed
• Customer oriented

Not an old bus running in a bus lane!
Defining BRT

Dedicated bus lanes at least 1.9 miles long

The BRT Standard online
5 BRT Basics

Dedicated Right-of-Way
Bus-only lanes fully segregated from mixed traffic

Busway Alignment
Bus-only lanes aligned to the middle, not the curb, of a road

Off-Board Fare Collection
Turnstile-controlled or proof-of-payment fare collection system

Intersection Treatments
Mixed-traffic is prohibited from making turns across the busway

Platform-Level Boarding
Station platforms level with bus floors when boarding and alighting
Busway Alignment:
*Bus lanes separated from traffic with a median alignment*

Eugene, Oregon: Emerald Express (EmX)
Off-board Fare Collection

Mexico City, Mexico: Metrobus
Platform Level Boarding

Ahmedabad, India: Janmarg
High-quality stations: Wide, weather protected, safe, well-lit
Buses with multiple, very wide doors

Bogota, Colombia: TransMilenio
BRT in the US:
11 cities, 12 corridors
Steady growth over 4 decades

12 corridors
73 miles
1977 - 1997: 2 cities added 3 corridors
1998 - 2018: 8 new cities & 9 new corridors
Bus Lane Fever in Boston

Positive outcomes are indicated on the following map with orange. 

- Washington Street
- Broadway
- Massachusetts Ave.
- Mt. Auburn Street
- Hennepin Avenue
- Bancroft West
- Main Street
- Rhode Island Avenue
- Streets for People
Where BRT Meets Boston

• Initiative of the Barr Foundation’s Climate program
• Silver Line All-Door Boarding Demo (2017)
• “Beauty and the Bus” Contest (2017)
• RFP for grants (up to $100,000 each) to municipalities to demonstrate elements of BRT along high ridership corridors (awarded late 2017)
• #YearoftheBus begins (2018)
Dedicated Lanes
Signal Priority
Level Boarding
Queue Jump Lanes
A better bus experience.

In collaboration with the MBTA, Everett will enhance its new dedicated bus lane it implemented on the south side of Broadway, the city's main transit corridor, by adding upgrades to further demonstrate elements of Gold Standard BRT.

The pilot includes "platform level" boarding facilities (which allow of ease of boarding for riders in wheelchairs, strollers, or carts) at two bus stops in Everett Square, and TSP at three locations along Broadway that give southbound buses priority during peak-hours.
Level Boarding
Red Carpet
Dedicated Lane
Next Stop: BRT in Everett in 3-5 years
Thank you!

Julia Wallerce, ITDP US (Boston)
Julia.wallerce@itdp.org
Itdp.org
Twitter: @itdpus, @juliawallerce
Massachusetts Avenue
Bus Priority Lane:
Pilot Program

Matthew
Duranleau
VHB

September 26, 2019
Getting to BRT in Arlington

- Desire to address local sustainability goals
- Striving to catch up with demand from regional growth
- Focusing on transit ridership in Arlington and along entire route

**Emphasis on how bus service suffers from significant delays and reliability challenges**

- In 2018, Town received $100,000 grant from Barr Foundation
- Pilot program to test Bus Rapid Transit
Study Area

Pilot Scope

• One month duration
• Only during morning commute
• Eastbound direction only
• No permanent construction
Process and Methodology

- Review of entire Mass Ave corridor
  - Data Collection
  - Observations
  - Field Assessment

- Conceptual Design
  - Potential Alternatives
  - Range of opportunities

- Public Review and Input Throughout Process

- One-Month Pilot Program

- Pre-, During, and Post-Pilot Assessment
Arlington BRT Project Timeline

April-June: Field Work and Data Collection/Neighborhood Meetings
May 16: BRT Educational Forum
June-August: Corridor Scenario Development
May-October: East Arlington Neighborhood Meetings
August 15: Alternatives Scenarios Forum
August-September: Implementation
October 9-November 9: Bus Priority Pilot
November: Final Forum
November-January: Pilot Evaluation
February-March: Final Recommendations/ Select Board approval
Arlington Pilot Goals

1. Improve Traffic Flow
2. Reduce Travel Time
3. Increase Reliability

Challenges

• Making the pitch for a pilot
• Business community and public concern about on-street parking impacts
• Coordination of and consistent communication among multiple parties/ stakeholders
Design Challenges

- Operational
  - On-Street Parking Needs
  - Traffic Flow
  - Queuing
  - Temporary Nature of Solutions
- Physical
  - Available Curb-to-Curb Width
  - Curb Extensions
  - Bicycle Accommodations
Design Approach

Break Study Area Into Three Manageable Areas
Design Elements

Focus on Four Design Elements

- Exclusive Bus Lane
- Transit Signal Priority
- Bus Stop Relocation
- Queue Jump Lanes
Design Options

Provide Multiple Options for Each Sub-Area

Impact Designation

- Positive
- Slightly Positive
- Neutral
- Slightly Negative
- Negative
Final Design
Mass Ave at Lake Street

Relocate Bus Stop to Far Side of Intersection/Add TSP

Location: Massachusetts Avenue from Lake Street to Alewife Brook Parkway
Duration: One Month Only
Timeframe: Weekday Morning Peak Period Only (6-9 AM)
Direction: Eastbound Direction Only

Alternative: With Transit Signal Priority
Final Design
Mass Ave Running Way

Provide Curbside Bus Lane from Varnum Street to Alewife Brook Parkway

19 Parking Spaces Temporarily Displaced

Remove curb extension

Location: Massachusetts Avenue from Lake Street to Alewife Brook Parkway
Duration: One Month Only
Timeframe: Weekday Morning Peak Period Only (6-9 AM)
Direction: Eastbound Direction Only
Final Design
Mass Ave at Alewife Brook Parkway

Split Phase on EB Approach with Shared Left-Through Movement
Mass Ave at Lake Street
Mass Ave between Varnum Street and Alewife Brook Parkway
Mass Ave at Alewife Brook Parkway
Pilot Challenges & Surprises

**Challenges**
- Coordination of and communication among multiple parties/ stakeholders
- Business community and public concern about on-street parking impacts (real & perceived)
- Bus stop relocation (messaging about move and amenities at new stop)

**Surprises**
- Minimal conflict between buses and bicyclists
- Significant bus time savings from short pilot duration
- Reported increased bus utilization even for short time
- Dedicated bus lane may need to be extended to increase overall benefit
Measuring Success!
**Key Program Objectives**
Reduce travel times on corridor; incorporate TSP

**Action Strategy**
Develop and prioritize improvements

**Pilot Duration**
October 9 – November 9, 2018

**Pilot Extent**
Massachusetts Avenue – Pleasant Street to Alewife Brook Parkway

**Pilot Elements**
- Dedicated bus lane *(inbound only)*
- Two queue jumps
- Bus stop relocation
- Retimed traffic signals/TSP

**MBTA Routes**
77, 79, 350
## Data Collection

Data for analysis was collected from the MBTA across 3 time frames: pre-pilot, pilot, and post pilot.

<table>
<thead>
<tr>
<th>Pre-Pilot</th>
<th>Pilot</th>
<th>Post-pilot*</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 9 – October 8</td>
<td>October 9 – November 9</td>
<td>November 10 – December 14</td>
</tr>
</tbody>
</table>

Route performance and BRT impacts were measured using MBTA data.

AVL – Automatic Vehicle Location
• For overall route

APC – Automated Passenger Count
• For specific areas

*Some of the bus-priority pilot treatments remained permanent (see slide #)
Pilot Performance in Arlington

Route 77 - peak of the peak

Your worst day during the pilot is still better than your best day without it.

Travel Time
Average Day

Before BRT Pilot 10.9
During BRT Pilot 5.1

Typical Bad Day

Before BRT Pilot 17.1
During BRT Pilot 7.3

54% faster
Pilot Performance: Travel Time

Route 77

Current Travel Times
These compare an average day (50th percentile of travel times) to a typical 'bad day' (90th percentile) and cover pilot corridors only.

Pilot Travel Times
The same metrics taken during pilot conditions.

Notable Patterns
Every 50th percentile travel time improved between current and pilot conditions, as did every 90th percentile. In many cases, even the 'new bad day' is better than the 'old normal.'
Pilot Performance: Travel Time Variability

Route 77

**Current Bad-Day ‘Risk’**

The gap between an average day and a bad day is the amount of time a rider might lose from their normal schedule if it turns out to be a bad day.

**Pilot Bad-Day ‘Risk’**

This has been kept constant or reduced in every pilot case, with particularly strong reductions in the peak of the peak. In addition to time saved during travel on the bus, this is time saved from the regular day – not spent mitigating the risk of a bad day service.
Pilot Performance: Travel Time
Routes 79/350

Shoulder Peak

Inbound, 7 AM

- **Worst Day (90th Percentile):** 21.2 minutes
- **Average Day (50th Percentile):** 13.4 minutes
- **Pilot Average Day:** 14.0 minutes

28% reduction

- **Worst Day (90th Percentile):** 21.2 minutes
- **Average Day (50th Percentile):** 13.4 minutes
- **Pilot Average Day:** 9.7 minutes

4.3 minutes
Pilot Performance: Travel Time
Routes 79/350

Peak of the Peak

Inbound, 8 AM

- Worst Day (90th Percentile): 23.9 minutes
- Average Day (50th Percentile): 16.3 minutes
- Pilot Average Day (50th Percentile): 9.6 minutes
- Pilot Worst Day (90th Percentile): 13.2 minutes

19% reduction
47% reduction

Inbound, 8 AM

- Worst Day (90th Percentile): 23.9 minutes
- Average Day (50th Percentile): 16.3 minutes
- Pilot Average Day (50th Percentile): 9.6 minutes
- Pilot Worst Day (90th Percentile): 13.2 minutes

7.6 minutes
3.6 minutes
Final Design
Mass Ave at Lake Street

Relocate Bus Stop to Far Side of Intersection/Add TSP

**Location:** Massachusetts Avenue from Lake Street to Alewife Brook Parkway
**Duration:** One Month Only
**Timeframe:** Weekday Morning Peak Period Only (6-9 AM)
**Direction:** Eastbound Direction Only

- 3 Parking Spaces Temporarily Displaced
- Relocate bus stop to far side of intersection

*Alternative:* With Transit Signal Priority
Run Time at Lake Street

In general, median travel times in the Lake St Corridor declined after the stop was moved to the curb after the traffic signal...especially during the peak morning commute hours.

Source: Massachusetts Bay Transportation Authority, APC Data—MBTA, September 9 – December 14, 2018

Travel Time Along Massachusetts Avenue in Lake St Corridor, Before and After BRT Pilot and Lake St Stop Move

55 seconds saved at 8 a.m.
Pilots & the Results

Graphic shows the comparison of the average inbound travel time before pilot and during the pilot, throughout Pre-Peak (6:00), Shoulder-Peak (7:00), and Peak of the Peak (8:00). There is a significant drop in the travel time during the pilots. **On average, in the pilot area, people saved about half of their time on the way.**

**Without Pilots** | **During Pilots**
---|---
**ARLINGTON**
6:00 am: 3.2 | 6:00 am: 3.2
7:00 am: 8.3 | 7:00 am: 4.9
8:00 am: 10.9 | 8:00 am: 5.1

**CAMBRIDGE**
6:00 am: 3.3 | 7:00 am: 3.5
7:00 am: 6.3 | 8:00 am: 4.9

Save 5 min everyday, you save one day every year.
Final Design
Mass Ave Running Way

Provide Curbside Bus Lane from Varnum to Alewife Brook Parkway

Location: Massachusetts Avenue from Lake Street to Alewife Brook Parkway
Duration: One Month Only
Timeframe: Weekday Morning Peak Period Only (6-9 AM)
Direction: Eastbound Direction Only

19 Parking Spaces Temporarily Displaced

Remove curb extension
Making it Permanent
Bus Priority Lane on Mass Ave
Making it Permanent
Bus Priority Lane on Mass Ave

Local & National Examples

Cambridge, MA
Baltimore
Washington, DC
Making it Permanent
Bus Priority Lane on Mass Ave

MUTCD Example Text
Los Angeles
Austin, Texas
Calgary, Canada
Washington, DC
Making it Permanent
Bus Priority Lane on Mass Ave

New York City

Arlington BRT Pilot

Los Angeles
**DESIGN GUIDANCE**

**CRITICAL**

As on other streets with shared bicycle lanes, bicycle operation must be permitted across the entire road surface. Jurisdictions with “as far right as practicable” rules for bikes must explicitly permit flexible operation on streets with bus-bike lanes.

1. Pavement markings must indicate that the lane is dedicated to transit, including a solid white line and BIKE BUS ONLY or similar marking.

**RECOMMENDED**

The width of a full-time bus-bike lane is 10–11 feet for offset lanes, and up to 12 feet for curbside lanes.

Lanes 13–15 feet wide should be avoided in most cases to limit unsafe passing movements. If 15–16 feet of width is available, consider providing a marked conventional bike lane on the left or right side of the bus lane, marked and signed as a green-colored bicycle lane to enhance visibility (see the Urban Bikeway

3. Bicycle shared lane markings (MUTCD 69C-9) should be placed in the center or left side of the lane. At stops, place markings at the left side of the lane.

The typical width of a part-time bus-bike lane that permits parking during non-peak times, creating an off-peak bike lane, is 12–13 feet. If more space is available, mark a left-side buffer to guide bikers away from parked vehicles. 

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**Final Design**

**Mass Ave Running Way**
**Section 1:**
- Trapezoidal area: 174sf
- Dashed bike lane: 4.7"W x 20'L
  (5 dashes, each 4.7"W x 2"L (47sf)
- Bike lane: 4.7"W x 106.5'L (500.55sf)
- Solid dividing line: 1.5"W x 146.7'L (220.05sf)
- Parking gap 1: 8"W x 27'L (216sf)
- Parking gap 2: 8"W x 4.8'L (38.4sf)
- Parking gap 3: 8"W x 6'L (48sf)

**Paint area:**
- Red: 1,244sf

**Signs:**
- Sign A: refer to sign spec sheet
- Sign B: refer to sign spec sheet

**Section 2:**
- 5' skip striping with 1:1 skip to stripe ratio
- Wide stripes: 4 lines, 15'L x 5"W
- White edge line:
  - 8 lines, 5.5'L x 6"W
- Lettering: 6' tall letters,
  1'-6" gap between lines

**Paint area:**
- Red: 300 sf
- White: 20 sf

**Section 3:**
- Dividing line: 1.5"W x 109'L (1)
- Bike lane: 4.7"W x 146.2'L
- Parking gap 4: 8"W x 4.8'L (38sf)
- Parking gap 5: 8"W x 52.4'L (41sf)
- Bus stop: 263.62sf
- Parking gap 6: 9.5"W x 23'L (21)

**Paint area**
- Red: 1,790.36sf
Bus Priority Lane Returns to East Arlington Week of October 7

Public Information Session about the permanent bus lane design scheduled for October 2

(Arlington, MA) – The bus priority lane piloted in fall 2018 in East Arlington will be permanently installed on Massachusetts Avenue during the week of October 7. The bus lane will be installed in the parking lane on the eastbound section of the road between Varnum Street and Alewife Brook Parkway and will serve MBTA routes 77, 79, and 350. It will operate Monday through Friday, 6:00 a.m. to 9:00 a.m., and will be designated by pavement markings and signage. No stopping, standing, or parking will be allowed in the parking lane while the bus lane is in operation.

"Last year’s pilot was very well received by the community. Analysis showed that the new bus priority lane reduced morning commute times of MBTA buses and improved reliability," said Diane Mahon, Arlington Select Board Chair. “The Board was happy to approve making the bus lane permanent and would like to thank the MBTA and Barr Foundation for their financial support and the Department of Planning and Community Development for shepherding the project along.”
An AM peak-hour shared bus-bike lane demarcated with cones, including Transit Signal Priority and other signal adjustments, intersection treatments, queue jump lanes, signage, and bus stop relocation.

(1) PROJECT IMPETUS
The town has known of significant delays in bus service on Massachusetts Avenue since 2005, specifically in East Arlington. After years of thinking through first-last mile connections to the MBTA Alewife Station, and after a recent streetscape reconstruction didn’t alleviate the issues, the town wanted to take advantage of the BostonBRT funding program to take another look at ways to improve traffic flow, reduce bus travel times, and improve reliability on the corridor. The project garnered support from town officials and the town manager, which the town's Director of Planning and Community Development (interviewee) considered a major reason the test was an option in the first place.

(2) WHY THE QUICK-BUILD METHODOLOGY
The interviewee said that the town was excited at the prospect of testing something, an otherwise rare opportunity for municipalities. The idea that it was a test made town officials, and the public, more comfortable that the town wasn’t going to waste resources. She said they were hopeful that they could try out multiple BRT elements as a part of one project, something that may not have been possible if not for the Quick-Build approach.

(3) PROJECT TIMELINE: 7 months
The interviewee said that staff turnover had an impact early on in getting the project up and running.

(4) PROJECT TEAM + ROLES
- Town of Arlington
- Consultants
- City of Cambridge
- MA Department of Conservation + Recreation
- MBTA

Arlington, Cambridge, DCR, and the MBTA formed a team that conversed regularly about the project. The Metropolitan Area Planning Council conducted a parking utilization study. The town brought on a consultant for the analysis, design alternatives, and final test design/elements. Within the town, the project touched multiple departments, and coordinated with the City of Cambridge and the state’s Department of Conservation and Recreation about the signal changes at Alewife Brook Parkway. The consultant also helped the town with implementation during the final month of their contract (September 2018).

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