

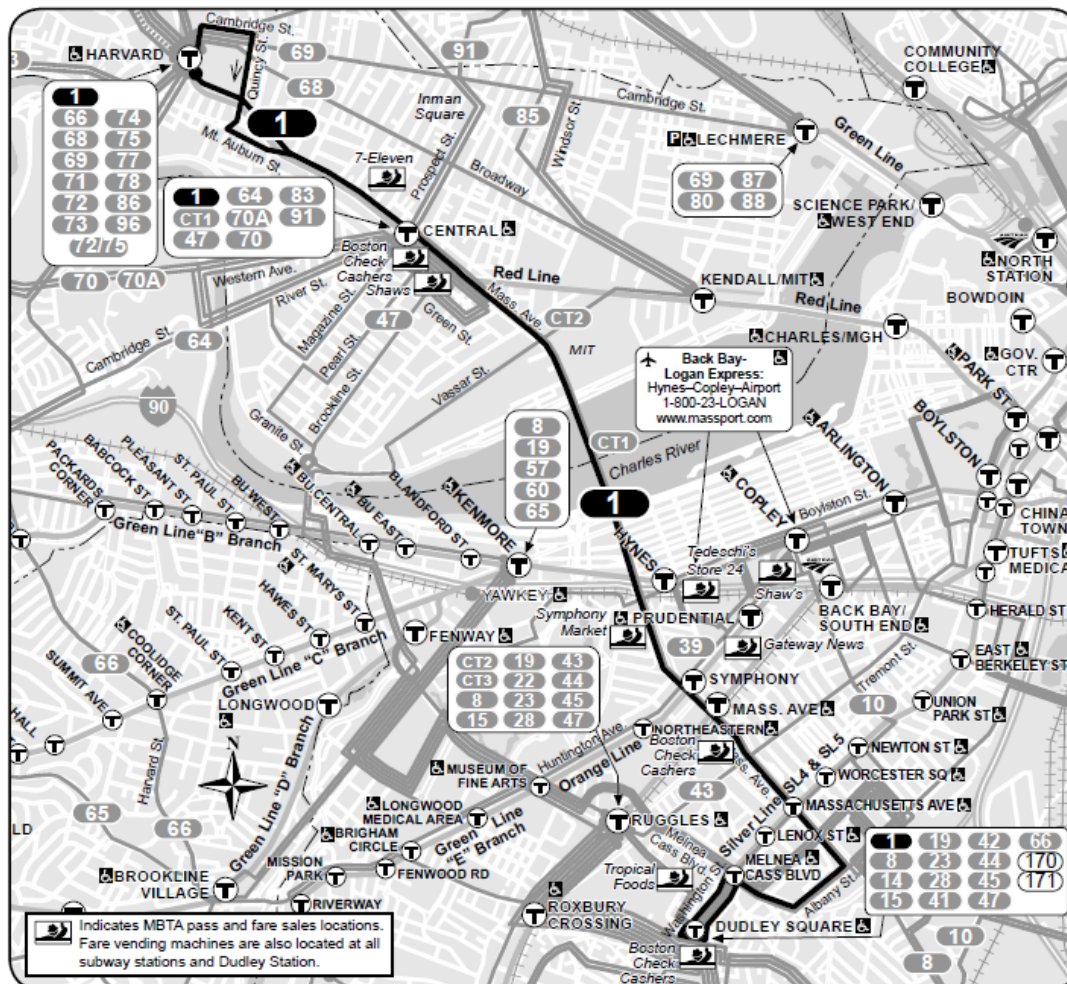
# Route 1

## Harvard – Dudley Station

### Route Overview

Route 1 Harvard- Dudley Station is a Key Bus route that provides crosstown service between Harvard Station and Dudley Station. It operates largely along Massachusetts Avenue via Central Square, MIT, Back Bay, South End, and the BU Medical Campus. Route 1 also has a limited stop counterpart, Route CT1 Central Square, Cambridge - BU Medical Campus/BMC. Route CT1 operates along the same alignment as Route 1 between Central Square and Massachusetts Avenue at Albany Street, where it then terminates in a loop around the BU Medical Campus rather than continuing south to Dudley Square. The two routes duplicate each other much more than they complement each other.

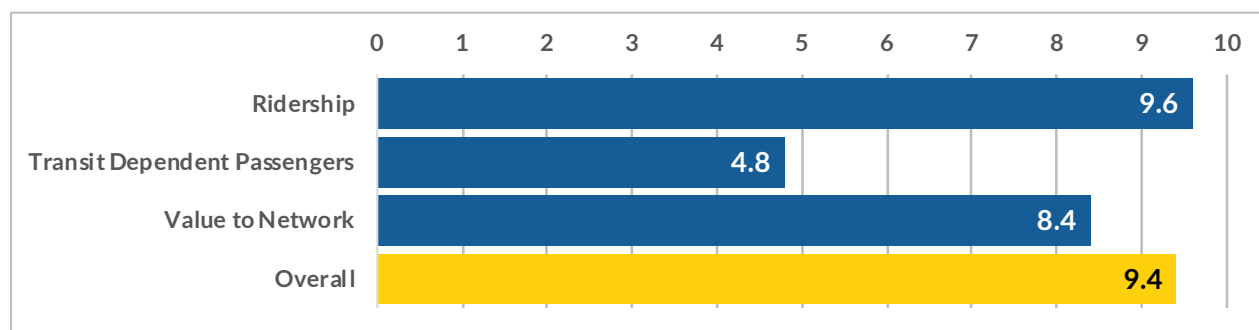
Figure 1 | Service Map



## Network Importance

Route 1 is one of the most important routes in the MBTA system (see Figure 2). On a relative scale of 0 to 10, the route rates 9.6 in terms of ridership, 4.8 in terms of transit dependent ridership, and 8.4 in terms of its value to the network (which reflects the number of people who are uniquely served, the number of jobs and other important destinations, and the number of transferring passengers). Its overall score, which gives a 70% weight to overall ridership and a 15% weight to both other measures, is 9.4.

Figure 2 | Relative Importance within MBTA Bus Network (on a scale of 0 to 10)



## Service Overview

### Schedule

Except during the Sunrise service span, Route 1 provides frequent service on weekdays and Saturdays until the end of service (see Table 1). On weekdays, it operates from 4:37 AM to 1:32 PM, with trips every 10 minutes or better during the AM and PM peaks.

Table 1 | Schedule Statistics

SERVICE DAY	SPAN OF SERVICE	FREQUENCY (RANGE)	FREQUENCY (AVERAGE)	DAILY TRIPS (INBOUND/OUTBOUND)
<b>Monday-Friday</b>	<b>4:37 AM to 1:27 AM</b>			<b>109/114</b>
Sunrise	4:37 AM to 5:59 AM	16 - 20	19	3/5
Early AM	6:00 AM to 6:59 AM	9 - 16	12	5/8
AM Peak	7:00 AM to 8:59 AM	9 - 10	9	13/12
Midday Base	9:00 AM to 1:29 PM	10 - 15	13	20/20
Midday School	1:30 PM to 3:59 PM	8 - 15	12	13/14
PM Peak	4:00 PM to 6:29 PM	8	8	18/19
Evening	6:30 PM to 9:59 PM	7 - 13	10	22/22
Late Evening	10:00 PM to 11:59 PM	13	13	9/10
Night	12:00 AM to 1:27 AM	13 - 14	13	6/4
<b>Saturday</b>	<b>4:40 AM to 1:40 AM</b>	<b>9 - 25</b>	<b>12</b>	<b>100/104</b>
<b>Sunday</b>	<b>6:00 AM to 1:32 AM</b>	<b>15 - 20</b>	<b>18</b>	<b>67/67</b>

Note: Span of service reflects the time the first bus begins service until the time the last bus finishes service.

On Saturdays, Route 1 provides a similar span of service, and operates trips every 10 minutes through the midday and evening hours. On Sundays, Route 1 provides moderately frequent service, operating every 16 to 20 minutes. Schedules on all days are generally very regular.

Route 1 operates for longer than the minimum span of service standards on all days. It meets the frequency standards except for Saturday service after 11:30 PM, when service operates every 25 minutes versus the standard of every 20 minutes.

Finally, as described above, Route CT1 operates along much of the same alignment as Route 1 and most riders can ride either route. However, because the two routes operate with different frequencies, schedules are not coordinated (see Table 2).

**Table 2 | Route 1 and CT1 Frequencies**

SERVICE DAY	ROUTE 1 TYPICAL FREQUENCY	ROUTE CT1 TYPICAL FREQUENCY
<b>Monday-Friday</b>		
Sunrise	20	No service
Early AM	8 - 16	20
AM Peak	10	20
Midday Base	15	20
Midday School	11	12
PM Peak	8	20
Evening	8 - 11	20 - 24
Late Evening	13	No service
Night	12 - 13	No service
<b>Saturday</b>	<b>10 - 15</b>	<b>No service</b>
<b>Sunday</b>	<b>16 - 20</b>	<b>No service</b>

### Service Patterns

Route 1 operates along the same service pattern from Harvard Station to Dudley Station on all trips on all days (see Table 3).

**Table 3 | Service Patterns**

PATTERN	ORIGIN	DESTINATION	UNIQUE FEATURE	TRIPS PER WKD	TRIPS PER SAT	TRIPS PER SUN
<b>INBOUND</b>				<b>109</b>	<b>100</b>	<b>67</b>
1.0	Harvard Station	Dudley Station	Primary Pattern	109	100	67
<b>OUTBOUND</b>				<b>114</b>	<b>104</b>	<b>67</b>
1.0	Dudley Station	Harvard Station	Primary Pattern	114	104	67

## Ridership

Route 1 is one of the MBTA's highest ridership bus routes, carrying about 12,000 daily riders on weekdays, 9,600 riders on Saturdays, and 6,700 riders on Sundays.

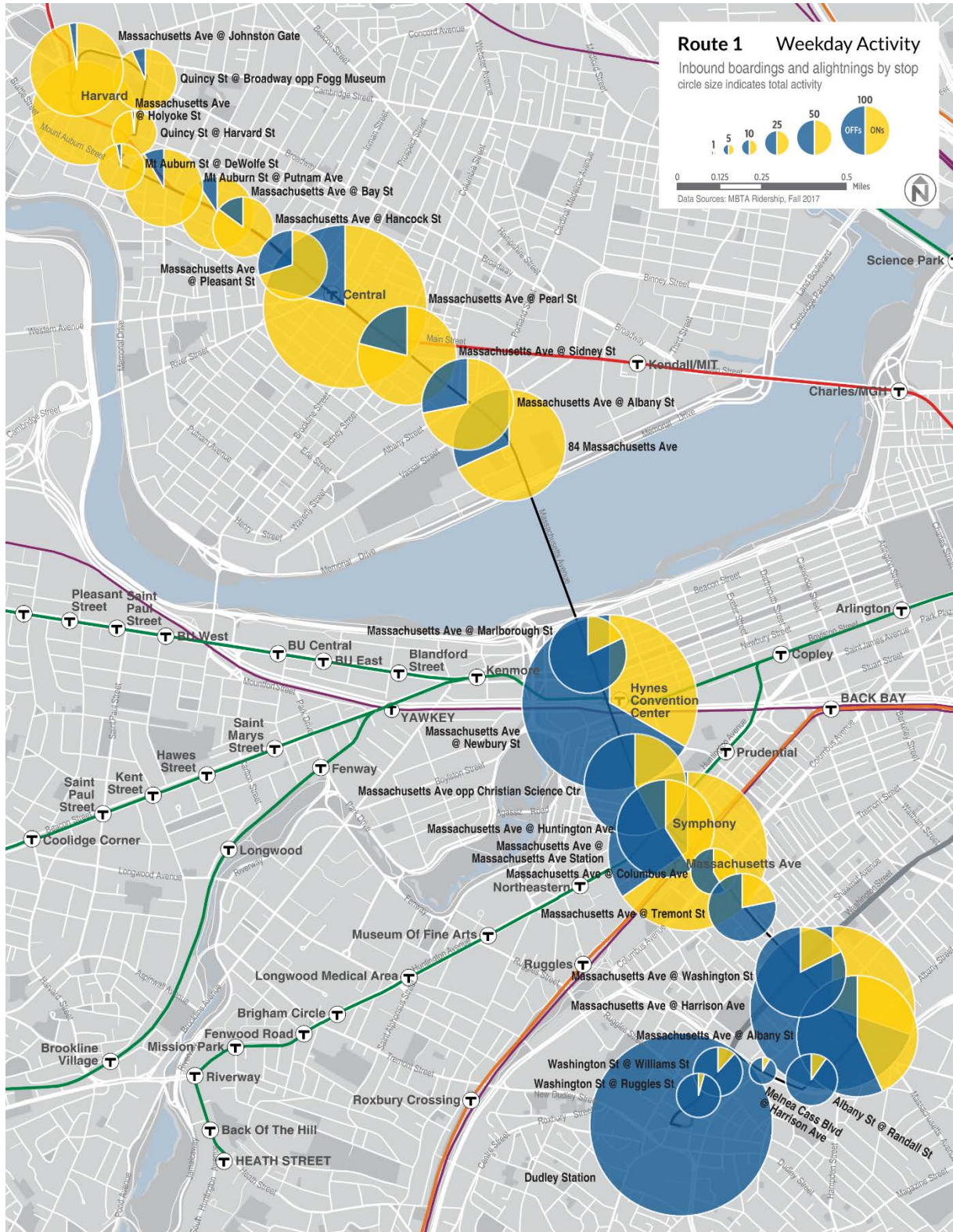
### Ridership by Stop

Route 1 has high ridership along most of the route, with the highest ridership at connections with rapid transit and at Dudley Station. On weekdays, inbound from Harvard Station (see Figure 3):

- 940 passengers board at the first three stops in Harvard Square: 440 at Massachusetts Avenue at Holyoke Street, 345 at Massachusetts Avenue at Johnston Gate, and 150 at Quincy Street at Broadway.
- Ridership is high at all stops through Central Square, with most stops serving more than 100 boardings but far fewer alightings.
- The stop in Central Square that serves Central Station is the second highest ridership stop on the route, with 860 boardings and 230 alightings.
- Stops between Central Station and the Charles River also have high activity, especially the three stops that serve MIT, which have a total of 920 boardings and 340 alightings.
- South of the Charles River, ridership is high at nearly all stops, and particularly at stops where connections can be made with rapid transit and the Silver Line:
  - Green Line Hynes Convention Center Station (B, C, and D branches): 430 boardings and 840 alightings
  - Green Line Symphony Station (E branch): 16 boardings and 230 alightings
  - Orange Line Massachusetts Avenue Station: 670 boardings and 360 alightings
  - Silver Line Massachusetts Avenue Station: 59 boardings and 280 alightings
- The two stops on Massachusetts Avenue that serve Boston Medical Center (at Harrison Street and at Albany Street) serve very high ridership, with a total of 511 boardings and 1,120 alightings.
- Dudley Station is the single highest ridership stop on the route, with 1,370 alightings per weekday.

Weekend ridership patterns between Harvard Square and Hynes Convention Center are similar to those on weekdays, with similarly distributed boardings and alightings and a similar number of passengers served. Weekend ridership patterns on the southern half of the route between Hynes Convention Center and Dudley Square are similar to weekdays but with significantly lower ridership volumes.

Figure 3 | Weekday Inbound Ridership by Stop Map



## Ridership by Trip

On all days, ridership per trip is very high except on early morning and late night trips and in both directions. On weekdays (see Figure 4 and Figure 5):

- During AM and PM peak trips, most trips carry more than 60 total passengers, and some carry over 90 passengers. However, there is a large amount of ridership turnover along the route, and maximum loads are significantly lower; on average, maximum loads are less than 140% of seated capacity, which is the MBTA's load standard.
- Midday service operates only one-third as frequently as peak period service, and total ridership per trip is only slightly lower than peak period ridership per trip. In both directions, midday trips carry 50 to 80 passengers. Maximum loads are generally 40 passengers or fewer.
- In the evening, inbound ridership declines from over 40 passengers per trip to 30 passengers per trip around 10:00 PM, and then to 10 passengers after midnight. Outbound evening ridership is significantly lower, at 10 to 20 passengers for most of the evening.

Due to high ridership turnover along the route, no trips exceed the MBTA's peak period maximum load standard. However, average maximum loads on many trips come close, and so when there are service issues, which as described below occur frequently, trips become overcrowded.

On Saturdays, ridership in both directions is low before 6:00 AM (see Figure 6 and Figure 7), with fewer than 15 riders per trip. It then increases from approximately 20 passengers per trip around 6:00 AM to 35 passengers at 8:00 AM. Inbound ridership peaks between 2:00 PM and 3:00 PM, with some trips serving more than 80 passengers. Ridership remains high through midnight, when it begins to drop off. Outbound ridership follows very similar patterns. In both directions, many trips are at or above the MBTA's maximum load standard, and crowding is worse when there are service disruptions. Both indicate that more frequent Saturday service is needed.

Sunday service follows similar patterns as on Saturdays, with higher ridership per trip and overcrowding on more trips (see Figure 8 and Figure 9). This is because, compared to Saturdays, reductions in service are greater than reductions in ridership, and indicates that more frequent service is needed on Sundays.

Figure 4 | Weekday Ridership by Trip: Inbound

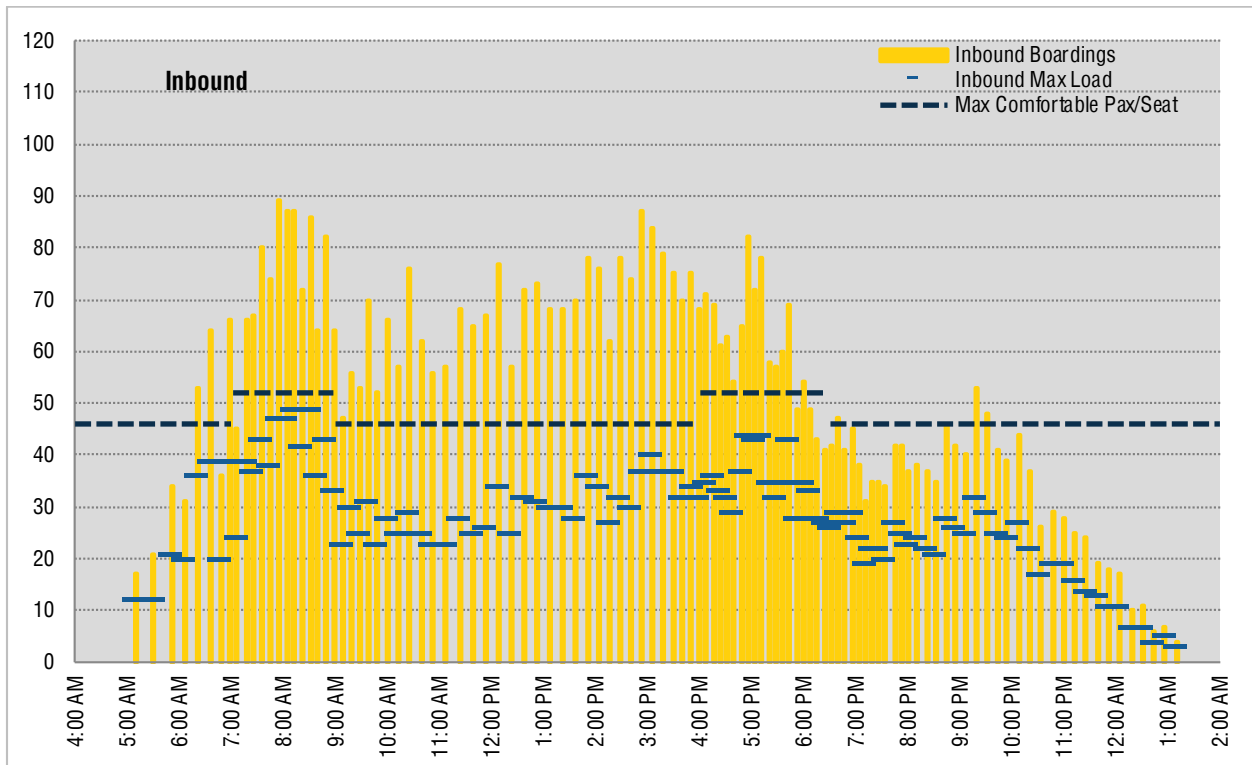


Figure 5 | Weekday Ridership by Trip: Outbound

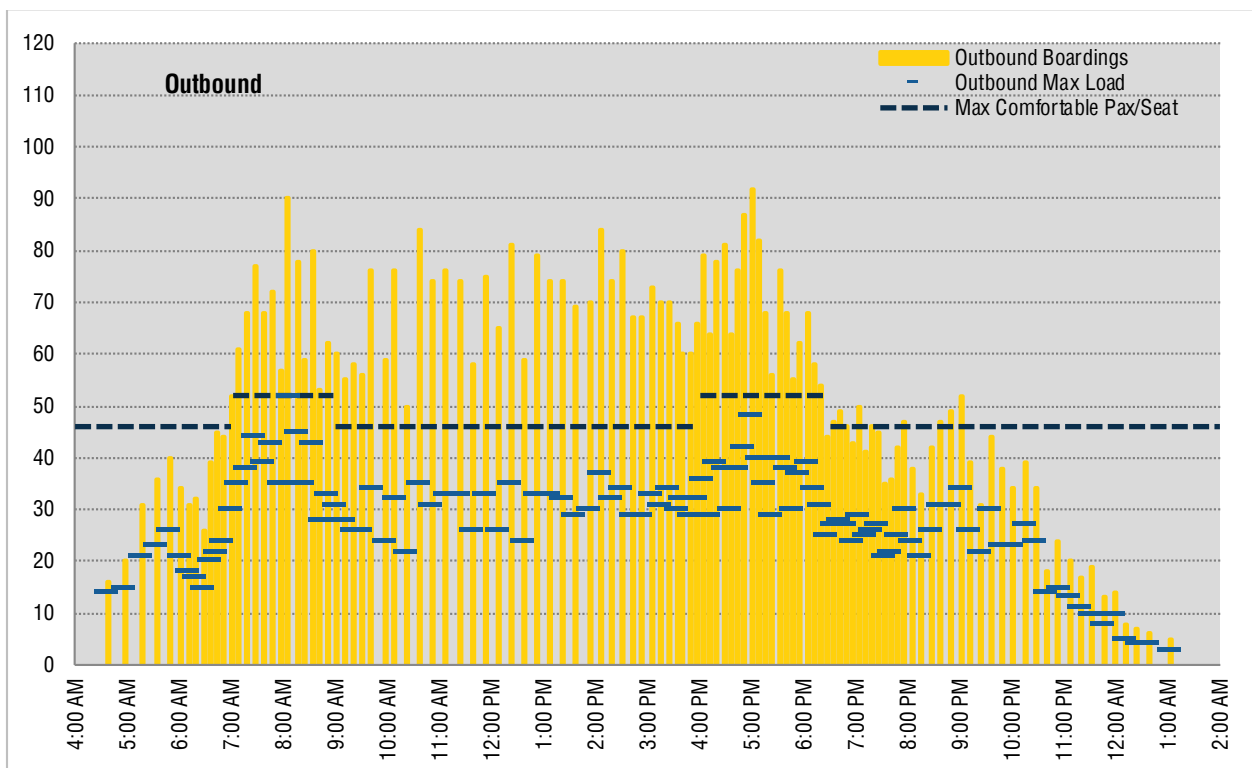


Figure 6 | Saturday Ridership by Trip: Inbound

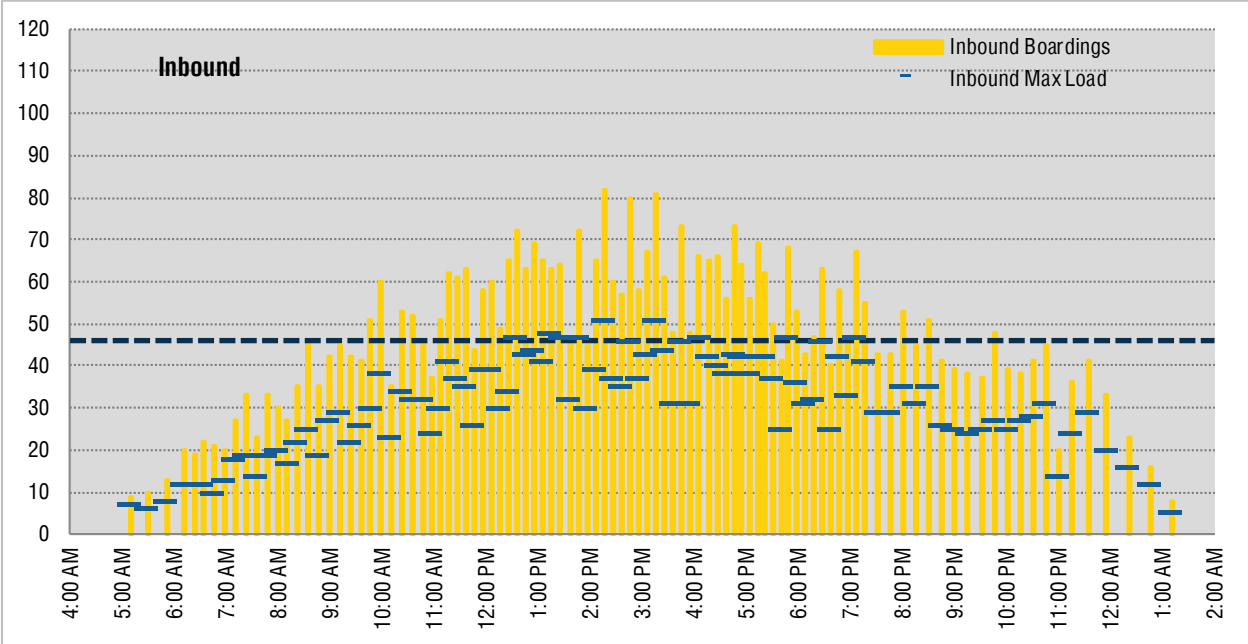


Figure 7 | Saturday Ridership by Trip: Outbound

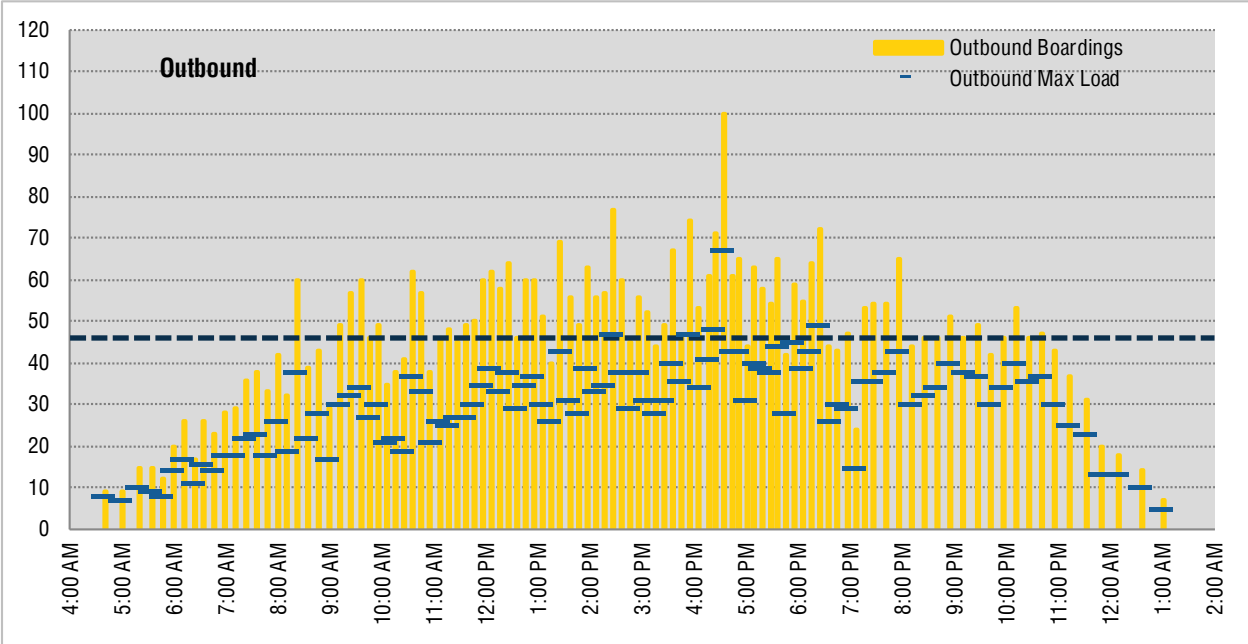




Figure 8 | Sunday Ridership by Trip: Inbound

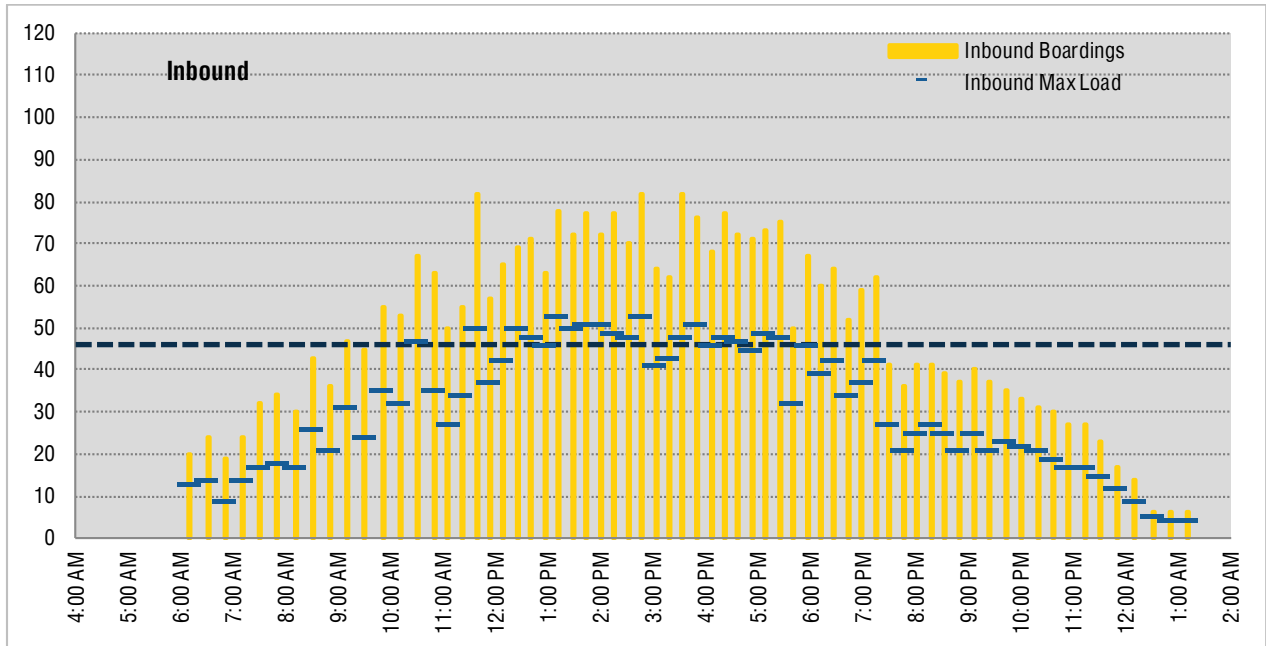
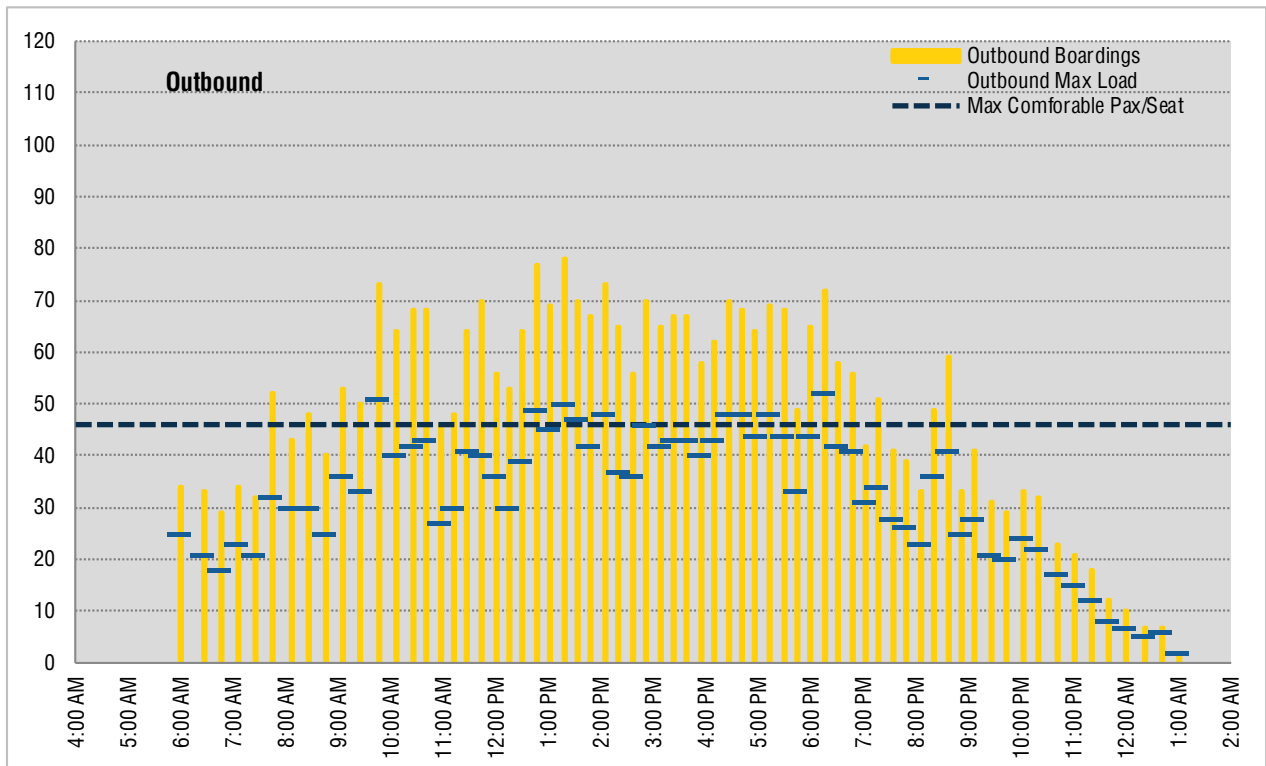


Figure 9 | Sunday Ridership by Trip: Outbound



## Passenger Comfort

The MBTA desires that passengers travel in relatively comfortable conditions. At the same time, the MBTA's definition of comfort reflects the very high volume environment in which the MBTA operates, and that some passengers may have to stand for a portion of their trip. Comfortable conditions are considered to be 140% or less of seated capacity during high volume periods and 125% or less during other periods.

On weekdays, 90.3% of passenger minutes on Route 1 are in comfortable conditions, which is below the minimum standard (see Table 4). Weekend comfort levels are significantly lower, with 79.6% on Saturdays and 75.2% on Sundays. Route 1 ranks the lowest of all routes for comfort on Saturdays and Sundays by a significant margin.

Table 4 | Passenger Time Spent Traveling in Comfortable Conditions

	WEEKDAYS	SATURDAYS	SUNDAYS
<b>Minimum Standard</b>	92.0%	92.0%	92.0%
<b>Target</b>	96.0%	96.0%	96.0%
<b>Actual</b>	90.3%	79.6%	75.2%

As described below, reliability is within the standard on weekdays and close to the standard on weekends, but even so, many trips are late. Missed trips are also a significant problem, with over 2.3% of trips missed in Fall 2017. As such, in addition to too little service being scheduled on weekends, reliability issues also contribute to substandard passenger comfort levels.

## Reliability and Speed

### Reliability

On weekdays, Route 1 falls below the minimum reliability standard of 75% for Key Bus routes on all service days (see Table 5). Dropped trips are also a significant issue, with approximately 2.3% of trips not operated in Fall 2017. In addition, and although not indicated by the data presented in Table 5, it is known that bunching due to off-schedule performance is a significant problem on Route 1 (see Figure 10).

Table 5 | Reliability

SERVICE DAY	ORIGIN/MID-ROUTE ON-TIME PERFORMANCE	DESTINATION ON-TIME PERFORMANCE	OVERALL RELIABILITY	DROPPED TRIPS
<b>Monday-Friday</b>	71%	74%	71%	2.3%
<b>Saturday</b>	69%	68%	68%	-
<b>Sunday</b>	62%	75%	63%	-

Figure 10 | Route 1 Bus Bunching



Route 1 trips regularly exceed their scheduled running times, especially during midday school and PM peak service (see Figure 11). As the scheduled running time increases for midday service, Route 1 runs faster than that scheduled time. Inbound PM peak trips typically run about five to eight minutes behind schedule. Outbound trips exceed their scheduled running times through most of the day, running up to 10 minutes behind schedule from the AM peak through the PM peak. Actual evening running times are more closely aligned with scheduled running times. The MBTA adjusted schedules in Spring 2018 to make scheduled travel times better reflect actual travel times.

Figure 11 | Scheduled & Median Travel Time by Trip: Route 1 Inbound

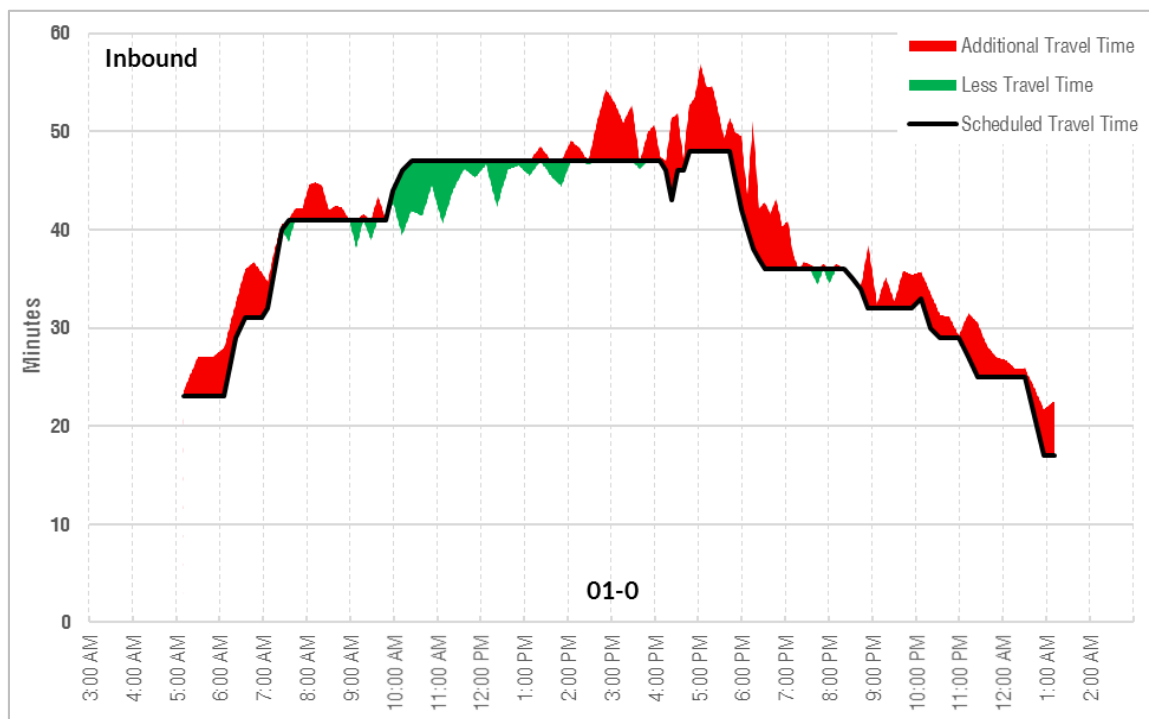
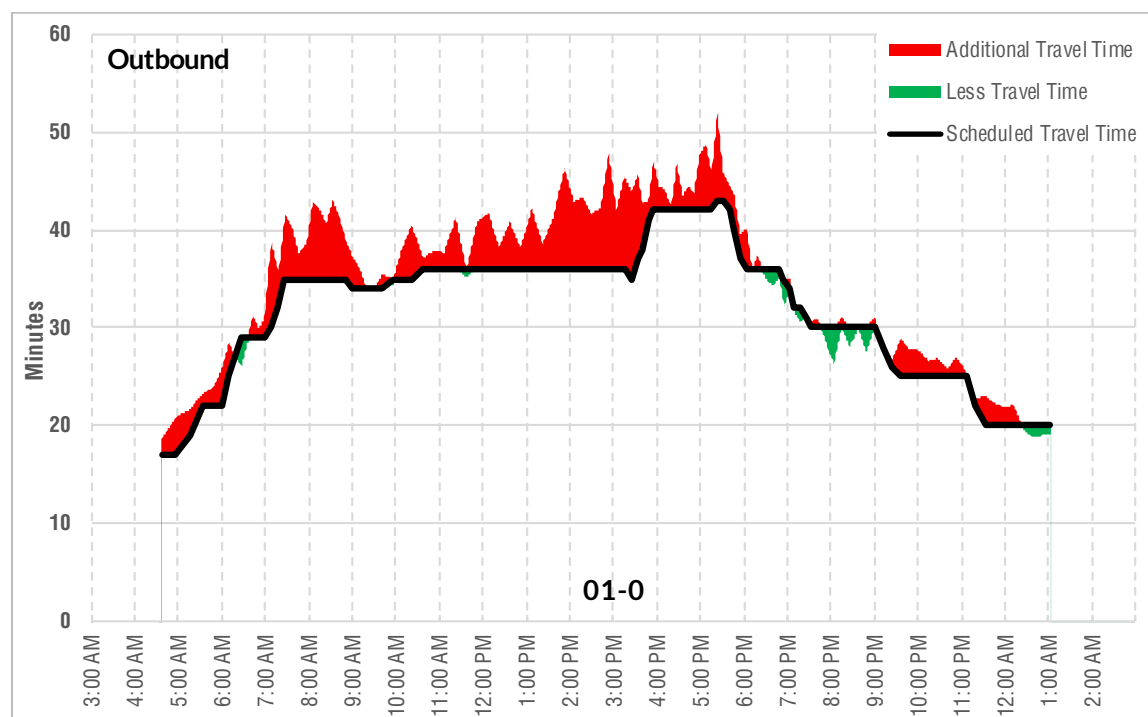


Figure 12 | Scheduled & Median Travel Time by Trip: Route 1 Outbound



## Stop Spacing

Route 1 has appropriate stop spacing along most of the route in both directions. The route has approximately six stops per mile, which falls within the four to seven stops per mile recommended for urban areas under MBTA guidelines. Customers can walk between stops with this spacing in about three to four minutes. As people will typically walk at least five minutes to access a local bus route, this spacing is close, but acceptable.

However, certain parts of the route have stops within a tenth of a mile of each other, which is unnecessarily close, and makes service slower and less reliable. These areas include between Bow Street and Inman Street in Cambridge, between Huntington Avenue and Tremont Street in Boston, and between Albany Street and Dudley Station in Boston.

## Summary

Route 1 provides frequent service on the high demand Massachusetts Avenue corridor in Cambridge and Boston, carrying among the highest ridership of any bus route in the MBTA network. However, service is unreliable and overcrowded.