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MEMORANDUM

TO: Scott Hamwey, MassDOT
Tegin Bennet, City of Cambridge

FROM: Joanne Haracz, Sandra Clarey

SUBJECT: Kendall Square Mobility Task Force:
CT2 Stop Relocation Analysis

DATE: September 30, 2016

This memorandum has been prepared to review alternative stop locations along Broadway and Main Street for MBTA Bus Route CT2, if the CT2 was re-routed away from Kendall Square (via Broadway and Main Street) to operate more directly via Ames Street. This would result in the removal of the Kendall Station stop on Main Street.

A bus stop on Main Street would be the preferred location and the most proximate to Kendall Station. A stop on Ames Street could be equally as close (and established as a floating bus island); however, we understand that the City of Cambridge's preference is not to establish a new stop on Ames Street. A stop on Broadway would be slightly further from Kendall Station and right around the lower end of the MBTA bus stop spacing guidelines for a limited stop service.

Table 3.2: Bus Stop Spacing Guidelines

Bus Operating Environment	Average # of Stops per Mile	Average Distance Between Stops
Central Business District (CBD)	4-5	1,000-1,300 feet
Urban outside CBD and Key Bus Routes	4-7	750-1,300 feet
Suburban	4-5	1,000-1,300 feet
Bus Rapid Transit/Limited Stop Service	2-4	1,300-2,600 feet

Source: MBTA Bus Stop Design Guidelines (2016)

The proposed inbound stop is recommended on Main Street, farside of Ames Street. It would require the removal of three (3) metered parking spaces so that the bus could make a right turn from Ames Street onto Main Street, and after servicing the stop, access the left turn lane onto Vassar Street. The

proposed outbound stop is recommended on Main Street, midblock. In order to access Ames Street, the bus stop must be sufficiently set back from the intersection to allow the bus to enter the travel lane, line up perpendicular to the intersection and set up for the left turn movement. Between five (5) and six (6) metered parking spaces would be impacted by the addition of this stop. Both stops would be approximately 700' from Kendall Station. The graphic attached illustrates the new routing and existing and proposed bus stop locations.

Some additional observations and concerns are noted below for further consideration:

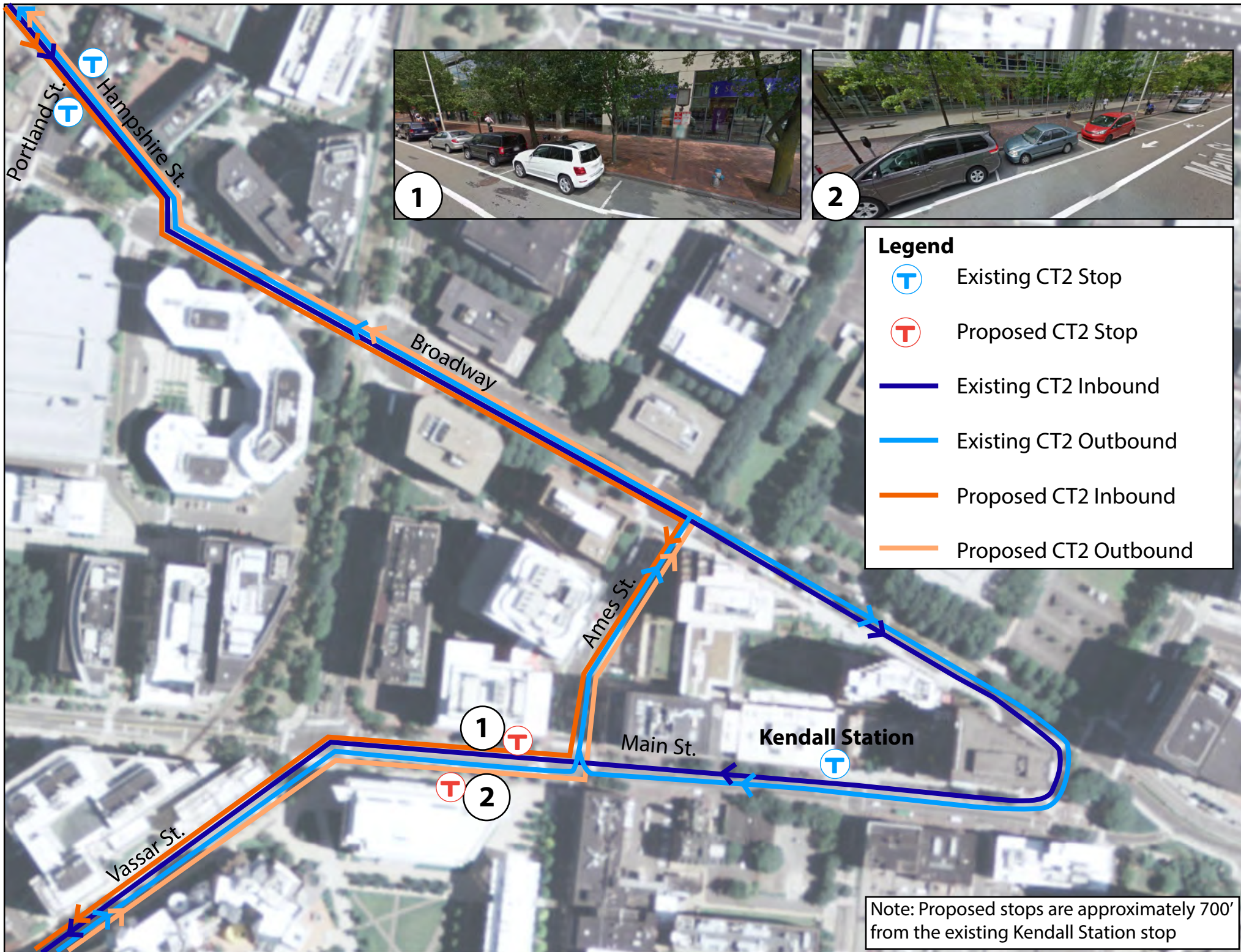
Given the stop locations on Main Street proximate to Galileo Galilei Way, and the short length of the Ames Street to Galileo Galilei Way block (400'), it seems that bus riders may be better served via a more direct route via Galileo Galilei Way. Approximately 1,000' of route miles would be saved in each direction, and there would be two less turn movements, when compared to Ames Street. For stop locations, farside of Main Street in both directions is recommended, and ideally in conjunction with shared bus-right turn lanes on both approaches.

Removing the existing Kendall Station stop on Main Street however, may not provide sufficient savings for onboard riders to offset the impact to the number of riders currently utilizing the stop. Based on a review of the MBTA's Fall 2014 APC data, it was found that:

- Kendall Station stop represents about 15% of the total CT2 ridership.
- 20% of the inbound ridership that boards between Sullivan and Kendall, alights at Kendall.
- Based on the outbound alightings at Kendall Station, riders are coming from the Park Drive at Beacon Street stop, or further back from the Fenway/LMA

Based on the data, the Kendall Station stop is an important stop for riders. More recent 2015 data that became available after this analysis was conducted showed that the route ridership is down a little, but the patterns and percentages noted above are roughly the same. Both 2014 and 2015 ridership is summarized and presented in the attached tables and charts.

The CTPS MBTA Rider Survey 2008-9 shows a Rapid Transit Line connection to CT2 for 7-9% of CT2 riders. Since this is a make-up of Green, Red and Orange Line connections that could be made across the CT2 route, analysis of ODX (Charlie Card Origin-Destination transfer) data or a rider survey would be needed tell us more about whether riders are transferring to the Red Line, MBTA Route 68, EZRide shuttle, or walking/biking to/from somewhere in Kendall Square or beyond. If the Red Line is a high ridership connection, or origins/destinations are northeast or southeast of Kendall Station, then maintenance of the direct connection and current stop would become a higher priority. CTPS MBTA Rider Survey data is attached.



Route CT2 (747)

Sullivan Station
Ruggles Station

Span	Wkdy	5:55 AM - 7:37 PM	Frequency	30 mins all day
Winter 2016	Sat	none	Winter 2016	
	Sun	none		

Ridership

Fall 2014

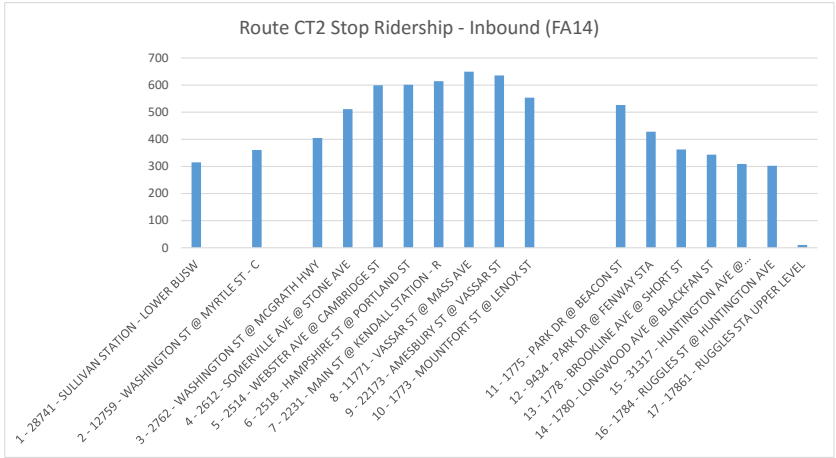
Route	Day of the Week	Direction	Total Ons	Total Offs	Total Trips	Total Ons
	747 WKDY	IB	1,377.0	1,373.6	30	
	747 WKDY	OB	1,297.0	1,297.4	32	2,674.0

Fall 2015

Route	Day of the Week	Direction	Total Ons	Total Offs	Total Trips	FA15	Percent of Trips	SP16	Percent of Trips	SP15	Percent of Trips	WI16	Percent of Trips	FA14	Percent of Trips	SU15	Percent of Trips	Other	Percent of Trips
Route CT2	WKDY	IB	1,260.1	1,259.1	30	29	97%	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%
Route CT2	WKDY	OB	1,171.4	1,173.8	32	31	97%	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%

Route CT2 (747) Ridership (Fall 2014)

Inbound				
Seq - StopID - Stop Name	On	Off	Total Ridership	Daily Load
1 - 28741 - SULLIVAN STATION - LOWER BUSW	308	0	308	315
2 - 12759 - WASHINGTON ST @ MYRTLE ST - C	79	31	110	361
3 - 2762 - WASHINGTON ST @ MCGRATH HWY	73	29	102	405
4 - 2612 - SOMERVILLE AVE @ STONE AVE	191	86	276	512
5 - 2514 - WEBSTER AVE @ CAMBRIDGE ST	118	31	148	599
6 - 2518 - HAMPSHIRE ST @ PORTLAND ST	91	89	179	601
7 - 2231 - MAIN ST @ KENDALL STATION - R	180	166	346	615
8 - 11771 - VASSAR ST @ MASS AVE	68	33	101	650
9 - 22173 - AMESBURY ST @ VASSAR ST	38	52	89	636
10 - 1773 - MOUNTFORT ST @ LENOX ST	15	97	111	554
11 - 1775 - PARK DR @ BEACON ST	20	47	67	527
12 - 9434 - PARK DR @ FENWAY STA	9	107	116	428
13 - 1778 - BROOKLINE AVE @ SHORT ST	41	107	147	362
14 - 1780 - LONGWOOD AVE @ BLACKFAN ST	130	148	278	343
15 - 31317 - HUNTINGTON AVE @ LONGWOOD AVE	15	50	65	309
16 - 1784 - RUGGLES ST @ HUNTINGTON AVE	5	12	17	302
17 - 17861 - RUGGLES STA UPPER LEVEL	0	292	292	10
Total	1377	1374	2751	



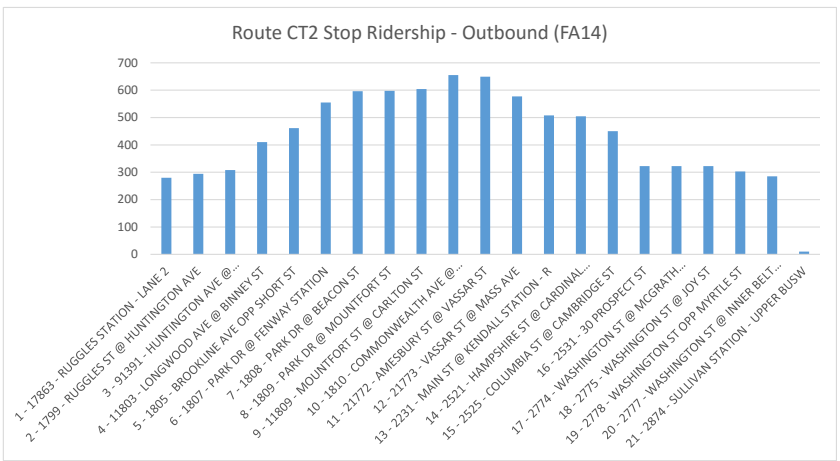
peak load point

DATA ANALYSIS

859 Total Ons before Kendall IB
19% % of ons before kendall, alighting at kendall
209 Total ons before Kendall OB equiv to offs @ Kendall (to Park @ Beacon)

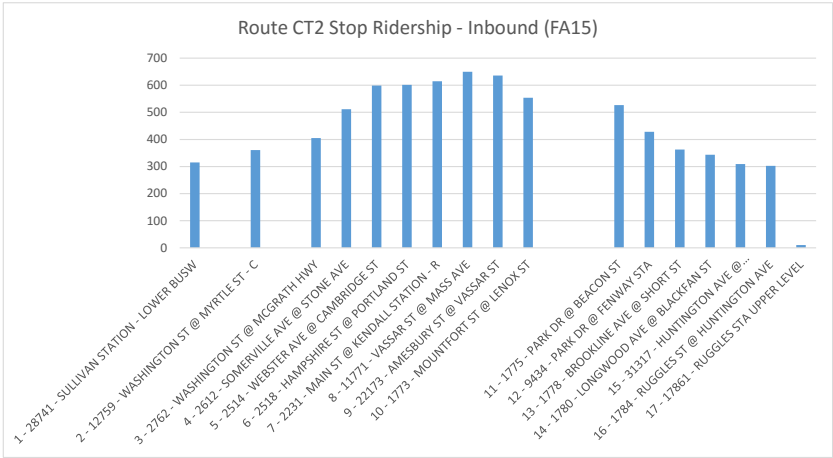
13% Kendall ons/offs / total route IB
14% Kendall ons/offs / total route IB

Outbound				
Seq - StopID - Stop Name	On	Off	Total Ridership	Daily Load
1 - 17863 - RUGGLES STATION - LANE 2	268	0	268	280
2 - 1799 - RUGGLES ST @ HUNTINGTON AVE	13	2	14	294
3 - 91391 - HUNTINGTON AVE @ LONGWOOD AVE	51	38	89	308
4 - 11803 - LONGWOOD AVE @ BINNEY ST	196	93	290	410
5 - 1805 - BROOKLINE AVE OPP SHORT ST	79	24	102	461
6 - 1807 - PARK DR @ FENWAY STATION	119	26	145	555
7 - 1808 - PARK DR @ BEACON ST	49	8	56	596
8 - 1809 - PARK DR @ MOUNTFORT ST	7	6	12	598
9 - 11809 - MOUNTFORT ST @ CARLTON ST	14	8	22	604
10 - 1810 - COMMONWEALTH AVE @ UNIVERSITY	80	28	108	656
11 - 21772 - AMESBURY ST @ VASSAR ST	31	37	68	649
12 - 21773 - VASSAR ST @ MASS AVE	28	100	129	578
13 - 2231 - MAIN ST @ KENDALL STATION - R	152	222	374	508
14 - 2521 - HAMPSHIRE ST @ CARDINAL MEDEI	79	82	161	505
15 - 2525 - COLUMBIA ST @ CAMBRIDGE ST	34	89	124	450
16 - 2531 - 30 PROSPECT ST	36	163	199	322
17 - 2774 - WASHINGTON ST @ MCGRATH HWY	38	38	76	322
18 - 2775 - WASHINGTON ST @ JOY ST	1	1	1	322
19 - 2778 - WASHINGTON ST OPP MYRTLE ST	19	39	58	303
20 - 2777 - WASHINGTON ST @ INNER BELT RD	4	21	25	285
21 - 2874 - SULLIVAN STATION - UPPER BUSW	0	275	275	10
Total	1298	1299	2598	



Route CT2 (747) Ridership (Fall 2015)

Inbound				
Seq - StopID - Stop Name	On	Off	Total Ridership	Daily Load
1 - 28741 - SULLIVAN STATION - LOWER BUSW	281	0	281	315
2 - 12759 - WASHINGTON ST @ MYRTLE ST - C	60	23	82	361
3 - 2762 - WASHINGTON ST @ MCGRATH HWY	68	30	98	405
4 - 2612 - SOMERVILLE AVE @ STONE AVE	172	70	242	512
5 - 2514 - WEBSTER AVE @ CAMBRIDGE ST	105	50	155	599
6 - 2518 - HAMPSHIRE ST @ PORTLAND ST	76	55	131	601
7 - 2231 - MAIN ST @ KENDALL STATION - R	153	130	283	615
8 - 11771 - VASSAR ST @ MASS AVE	51	33	84	650
9 - 22173 - AMESBURY ST @ VASSAR ST	35	52	88	636
10 - 1773 - MOUNTFORT ST @ LENOX ST	15	74	89	554
11 - 1775 - PARK DR @ BEACON ST	10	41	51	527
12 - 9434 - PARK DR @ FENWAY STA	14	97	111	428
13 - 1778 - BROOKLINE AVE @ SHORT ST	16	104	121	362
14 - 1780 - LONGWOOD AVE @ BLACKFAN ST	181	140	321	343
15 - 31317 - HUNTINGTON AVE @ LONGWOOD AVE	18	36	54	309
16 - 1784 - RUGGLES ST @ HUNTINGTON AVE	5	10	15	302
17 - 17861 - RUGGLES STA UPPER LEVEL	0	314	314	10
Total	1260	1259	2519	



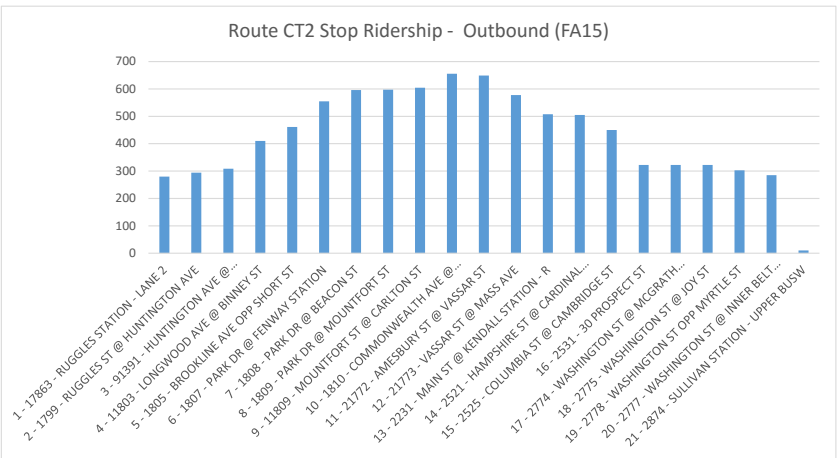
peak load point

DATA ANALYSIS

762 Total Ons before Kendall IB
17% % of ons before kendall, alighting at kendall
213 Total ons before Kendall OB equiv to offs @ Kendall (to Park @ Beacon)

11% Kendall ons/offs / total route IB
13% Kendall ons/offs / total route IB

Outbound				
Seq - StopID - Stop Name	On	Off	Total Ridership	Daily Load
1 - 17863 - RUGGLES STATION - LANE 2	283	0	283	280
2 - 1799 - RUGGLES ST @ HUNTINGTON AVE	12	1	13	294
3 - 91391 - HUNTINGTON AVE @ LONGWOOD AVE	58	23	81	308
4 - 11803 - LONGWOOD AVE @ BINNEY ST	158	120	278	410
5 - 1805 - BROOKLINE AVE OPP SHORT ST	59	38	96	461
6 - 1807 - PARK DR @ FENWAY STATION	100	17	117	555
7 - 1808 - PARK DR @ BEACON ST	44	4	48	596
8 - 1809 - PARK DR @ MOUNTFORT ST	8	4	12	598
9 - 11809 - MOUNTFORT ST @ CARLTON ST	13	4	17	604
10 - 1810 - COMMONWEALTH AVE @ UNIVERSITY	76	22	98	656
11 - 21772 - AMESBURY ST @ VASSAR ST	42	48	90	649
12 - 21773 - VASSAR ST @ MASS AVE	30	83	113	578
13 - 2231 - MAIN ST @ KENDALL STATION - R	106	195	302	508
14 - 2521 - HAMPSHIRE ST @ CARDINAL MEDEI	57	57	115	505
15 - 2525 - COLUMBIA ST @ CAMBRIDGE ST	31	87	118	450
16 - 2531 - 30 PROSPECT ST	35	133	168	322
17 - 2774 - WASHINGTON ST @ MCGRATH HWY	36	39	76	322
18 - 2775 - WASHINGTON ST @ JOY ST	0	1	2	322
19 - 2778 - WASHINGTON ST OPP MYRTLE ST	18	33	51	303
20 - 2777 - WASHINGTON ST @ INNER BELT RD	5	9	14	285
21 - 2874 - SULLIVAN STATION - UPPER BUSW	0	255	255	10
Total	1171	1174	2345	





MBTA Surveys: 2008-09

Bus Survey

Access to the Bus

Expanded Results

Route: CT2

Sullivan Station - Ruggles via Kendall/MIT

Both Directions

For Passengers Transferring from Other Transit:

Access Mode to this Bus:

	Number of Riders	Percent of Riders
Walk Access	1,081	77.0%
Drive/Park Access	33	2.4%
Drop-off Access	11	0.8%
Taxi Access	0	0.0%
Shuttle/Van Access	11	0.8%
Bicycle Access	0	0.0%
Other Access	11	0.8%
Total Private Trans.	1,148	81.8%
MBTA Bus	133	9.5%
Other Bus	11	0.8%
Rapid Transit	101	7.2%
Commuter Rail	11	0.8%
Boat	0	0.0%
Other	0	0.0%
Total Public Trans.	256	18.2%
TOTAL	1,404	100.0%
No Answer	0	

Access Mode to the Transit System:

	Number of Riders	Percent of Riders
Walk	190	13.5%
Drive/Park	33	2.4%
Drop-off	33	2.4%
Other	0	0.0%
TOTAL	256	18.2%
No Answer	0	

Initial Transit Mode Used on Trip:

	Number of Riders	Percent of Riders
MBTA Bus	156	11.1%
Other Bus	0	0.0%
Rapid Transit	67	4.8%
Commuter Rail	33	2.4%
Boat	0	0.0%
Other	0	0.0%
TOTAL	256	18.2%

Bus Transfers from Connecting Routes:

	Number of Riders	Percent of Riders
28	34	23.8%
85	22	15.1%
39	11	7.9%
1	11	7.9%
EZ	11	7.5%
Other	54	37.7%
TOTAL	144	100.0%

Bus Transfers from Nonconnecting Routes:

	Number of Riders	Percent of Riders
36	11	50.0%
31	11	50.0%
TOTAL	23	100.0%

Trip time from trip origin to stop by private transportation:

	WALK		DRIVE/PARK		DROP-OFF		OTHER		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0-5 minutes	631	60.8%	0	0.0%	0	0.0%	0	0.0%	631	57.7%
6-10	363	34.9%	22	100.0%	0	0.0%	11	48.7%	395	36.1%
11-15	34	3.2%	0	0.0%	11	100.0%	0	0.0%	45	4.1%
16-20	11	1.0%	0	0.0%	0	0.0%	0	0.0%	11	1.0%
21-30	0	0.0%	0	0.0%	0	0.0%	11	51.3%	11	1.0%
31-45	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Over 45	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
TOTAL	1,038	100.0%	22	100.0%	11	100.0%	22	100.0%	1,093	100.0%
No Answer	43		11		0		0		55	
Avg. Time (min)	6.0		8.5		15.0		19.3		6.4	



MBTA Surveys: 2008-09

Bus Survey

Egress from the Bus

Expanded Results

Route: CT2

Sullivan Station - Ruggles via Kendall/MIT

Both Directions

For Passengers Transferring to Other Transit:

Egress Mode from this Bus:

	Number of Riders	Percent of Riders
Walk Egress	1,159	83.9%
Drive/Park Egress	22	1.6%
Pick-up Egress	0	0.0%
Taxi Egress	0	0.0%
Shuttle/Van Egress	11	0.8%
Bicycle Egress	0	0.0%
Other Egress	11	0.8%
Total Private Trans.	1,204	87.1%
MBTA Bus	44	3.2%
Other Bus	0	0.0%
Rapid Transit	133	9.7%
Commuter Rail	0	0.0%
Boat	0	0.0%
Other	0	0.0%
Total Public Trans.	178	12.9%
TOTAL	1,382	100.0%
No Answer	22	

Egress Mode from the Transit System:

	Number of Riders	Percent of Riders
Walk	178	12.9%
Drive	0	0.0%
Pick-up	0	0.0%
Other	0	0.0%
TOTAL	178	12.9%
No Answer	0	

Final Transit Mode Used on Trip:

	Number of Riders	Percent of Riders
MBTA Bus	44	3.2%
Other Bus	0	0.0%
Rapid Transit	122	8.8%
Commuter Rail	11	0.8%
Boat	0	0.0%
Other	0	0.0%
TOTAL	178	12.9%

Bus Transfers to Connecting Routes:

	Number of Riders	Percent of Riders
101	23	51.3%
64	11	24.4%
1	11	24.4%
TOTAL	44	100.0%

Bus Transfers to Nonconnecting Routes:

	Number of Riders	Percent of Riders
TOTAL	0	0.0%

Trip time from stop to trip destination by private transportation:

	WALK		DRIVE/PARK		PICK-UP		OTHER		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0-5 minutes	749	68.6%	11	100.0%			11	50.0%	772	68.5%
6-10	276	25.3%	0	0.0%			0	0.0%	276	24.5%
11-15	45	4.1%	0	0.0%	(No responses)		0	0.0%	45	4.0%
16-20	22	2.0%	0	0.0%			0	0.0%	22	2.0%
21-30	0	0.0%	0	0.0%			11	50.0%	11	1.0%
31-45	0	0.0%	0	0.0%			0	0.0%	0	0.0%
Over 45	0	0.0%	0	0.0%			0	0.0%	0	0.0%
TOTAL	1,092	100.0%	11	100.0%			23	100.0%	1,126	100.0%
No Answer	67		11				0		78	
Avg. Time (min)	5.4		2.0				17.5		5.6	