

Inbound Framingham/Worcester Line EMU times per Alon Levy, infill stations omitted, full high platforms at all stations

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	current P512	savings
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	infill	infill
58.7	Grafton	276	72	506	541.42	10	13	3
51.5	Westborough	166	75	747	799.29	14	17	3
44.2	Southborough	172	68	987	1056.09	18	26	8
39.0	Ashland	144	65	1196	1279.72	22	30	8
34.3	Framingham	131	67	1394	1491.58	25	41	16
32.1	West Natick	57	68	1519	1625.33	28	46	18
28.5	Natick Center	93	68	1680	1797.6	30	51	21
23.8	Wellesley Square	121	63	1864	1994.48	34	56	22
21.8	Wellesley Hills	66	58	1988	2127.16	36	60	24
20.3	Wellesley Farms	49	64	2101	2248.07	38	63	25
16.9	Auburndale	88	67	2256	2413.92	41	68	27
15.2	West Newton	47	65	2368	2533.76	43	71	28
13.3	Newtonville	53	65	2486	2660.02	45	74	29
7.5	Boston Landing	175	55	2716	2906.12	49	79	30
6.2	West Station	47	55	2818	3015.26	51	infill	infill
4.0	Yawkey	80	55	2953	3159.71	53	84	31
2.1	Back Bay	99	55	3107	3324.49	56	89	33
0	South Station	98	0	3205	3429.35	58	94	36
		25s dwell at each stop; remaining time is acceleration penalty if I understand Alon correctly						

Simulated 90th %ile passenger loading, 8/8/4 tph, zone express, based on 2012 CTPS boardings

	X300	X308	X315	X323	X330	X338	X345	X353	X360	X368	X375	X383	X390	X398	X405	X413	X420	X425	X435	X440	X450	X455	X465
<b>Depart WUS</b>		4:10		4:25		4:40		4:55		5:10		5:25		5:40		5:55		6:15		6:30		6:45	
<b>Depart FRA</b>	4:27		4:42	4:50	4:57	5:05	5:12		5:27		5:42		5:57		6:12		6:27		6:42		6:57		7:12
<b>Worcester Union</b>		0		0		0		0		0		8		11		12		60		62		53	
<b>Grafton</b>		0		0		0		0		0		11		16		16		85		88		76	
<b>Westborough</b>		0		0		0		0		0		15		22		23		122		126		105	
<b>Southborough</b>		0		0		0		0		0		19		28		29		156		162		130	
<b>Ashland</b>		0		0		0		0		0		22		32		33		192		200		160	
<b>Framingham</b>	0	0	0	0	0	0	0	0	0	0	0	23	8	37	7	39	8	224	21	234	21	194	21
<b>West Natick</b>	0	0	0	0	0	0	0	0	0	0	0	25	16	43	17	46	15	260	43	274	42	233	43
<b>Natick Center</b>	0	0	0	0	0	0	0	0	0	0	0	25	20	46	20	49	22		49		54		92
<b>Wellesley Square</b>	0	0	0	0	0	0	0	0	0	0	0	26	23	49	23	50	26		53		69		153
<b>Wellesley Hills</b>	0	0	0	0	0	0	0	0	0	0	0	27	24	51	25	51	29		57		74		182
<b>Wellesley Farms</b>	0	0	0	0	0	0	0	0	0	0	0	27	25	52	26	52	32		59		80		208
<b>Auburndale</b>	0	0	0	0	0	0	0	0	0	0	0	27	27	53	28	53	34		61		84		230
<b>West Newton</b>	0	0	0	0	0	0	0	0	0	0	0	27	28	53	28	54	35		62		87		250
<b>Newtonville</b>	0	0	0	0	0	0	0	0	0	0	0	28	30	56	31	56	41		68		96		277
<b>Yawkey</b>	0	0	0	0	0	0	0	0	0	0	0	28	30	56	31	56	41	260	68	274	96	233	277
<b>Back Bay</b>	0	0	0	0	0	0	0	0	0	0	0	28	30	56	31	56	41	260	68	274	96	233	277
<b>Arrive</b>	5:00	5:08	5:15	5:23	5:30	5:38	5:45	5:53	6:00	6:08	6:15	6:23	6:30	6:38	6:45	6:53	7:00	7:05	7:15	7:20	7:30	7:35	7:45
<b>Units required</b>	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	2	1	2	2

	X470	X480	X485	X495	X500	X510	X515	X525	X530	X540	X545	X555	X560	X570	X585	X600	X615	X630	X645	X660	X675	X690	X705
<b>Depart WUS</b>	7:00		7:15		7:30		7:45		8:00		8:15		8:30		8:47		9:17		9:47		10:17		10:47
<b>Depart FRA</b>		7:27		7:42		7:57		8:12		8:27		8:42		8:57		9:27		9:57		10:27		10:57	
<b>Worcester Union</b>	34		76		77		76		75		46		70		52		24		24		25		58
<b>Grafton</b>	50		107		121		121		121		64		95		69		31		31		32		65
<b>Westborough</b>	65		143		181		180		180		89		134		91		35		35		36		75
<b>Southborough</b>	79		184		229		225		224		113		168		112		42		41		42		85
<b>Ashland</b>	99		240		284		281		278		133		195		127		45		44		46		88
<b>Framingham</b>	132	21	310	46	338	30	332	31	339	36	153	11	209	32	152	7	50	8	50	7	51	8	111
<b>West Natick</b>	175	43	372	84	377	48	367	51	402	75	172	18	221	55	172	15	56	15	56	15	57	14	138
<b>Natick Center</b>		108		146		99		129		132		38		70	183	18	59	18	60	19	60	18	161
<b>Wellesley Square</b>		159		180		132		193		184		61		87	197	21	61	20	62	21	61	20	179
<b>Wellesley Hills</b>		182		198		149		221		203		67		94	202	21	61	20	62	21	61	20	180
<b>Wellesley Farms</b>		209		225		177		257		235		88		106	211	21	62	21	63	22	63	22	185
<b>Auburndale</b>		226		237		190		271		250		104		110	211	22	63	22	64	22	64	22	187
<b>West Newton</b>		243		247		200		287		271		126		115	213	25	65	24	65	24	65	25	192
<b>Newtonville</b>		265		262		213		307		298		154		122	216	27	67	27	68	27	68	27	196
<b>Yawkey</b>	175	265	372	262	377	213	367	307	402	298	172	154	221	122	216	27	67	27	68	27	68	27	196
<b>Back Bay</b>	175	265	372	262	377	213	367	307	402	298	172	154	221	122	216	27	67	27	68	27	68	27	196
<b>Arrive</b>	7:50	8:00	8:05	8:15	8:20	8:30	8:35	8:45	8:50	9:00	9:05	9:15	9:20	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45
<b>Units required</b>	1	2	2	2	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1

Simulated 90th %ile passenger loading, 8/8/4 tph, zone express, based on 2018 CTPS boardings

Train ID	X300	X308	X315	X323	X330	X338	X345	X353	X360	X368	X375	X383	X390	X398	X405	X413	X420	X425	X435	X440	X450	X455	X465	X470	X480	X485	X495	X500	X510
depart WUS		4:10		4:25		4:40		4:55		5:10		5:25		5:40		5:55		6:15		6:30		6:45		7:00		7:15		7:30	
depart FRA	4:27		4:42		4:57		5:12		5:27		5:42		5:57		6:12		6:27		6:37		6:57		7:12		7:27		7:42		7:57
Worcester Union		0		0		0		0		14		28		34		28		50		54		57		58		66		97	
Grafton		0		0		0		0		20		40		47		39		91		95		99		101		115		159	
Westborough		0		0		0		0		23		51		62		51		124		131		148		162		187		279	
Southborough		0		0		0		0		29		62		78		63		152		161		187		209		236		351	
Ashland		0		0		0		0		34		80		112		89		200		212		236		258		295		460	
Framingham	0	0	0	0	0	0	0	0	0	34	9	87	10	120	12	99	10	228	22	245	18	263	19	287	19	365	45	536	44
West Natick	0	0	0	0	0	0	0	0	0	35	26	101	35	141	38	111	16	277	54	305	33	285	39	322	38	399	79	618	86
Natick Center	0	0	0	0	0	0	0	0	0	35	29	104	46	152	52	118	23		62		67		74		93		145		193
Wellesley Square	0	0	0	0	0	0	0	0	0	35	30	106	47	153	53	122	37		76		98		102		131		193		259
Wellesley Hills	0	0	0	0	0	0	0	0	0	35	32	107	49	155	56	126	48		86		112		117		150		218		297
Wellesley Farms	0	0	0	0	0	0	0	0	0	35	32	107	49	155	56	131	59		99		140		148		178		244		337
Auburndale	0	0	0	0	0	0	0	0	0	35	33	108	50	155	57	132	63		102		160		168		198		261		355
West Newton	0	0	0	0	0	0	0	0	0	35	33	108	50	155	57	132	67		106		177		185		223		292		382
Newtonville	0	0	0	0	0	0	0	0	0	35	35	110	54	157	59	137	76		116		199		210		261		345		429
Boston Landing	0	0	0	0	0	0	0	0	0	35	35	110	54	157	59	140	79	284	119	311	205	297	217	335	266	416	356	637	439
Yawkey	0	0	0	0	0	0	0	0	0	35	35	110	54	157	59	140	79	284	119	311	205	297	217	335	266	416	356	637	439
Back Bay	0	0	0	0	0	0	0	0	0	35	35	110	54	157	59	140	79	284	119	311	205	297	217	335	266	416	356	637	439
Arrive South Sta.	5:00	5:08	5:15	5:23	5:30	5:38	5:45	5:53	6:00	6:08	6:15	6:23	6:30	6:38	6:45	6:53	7:00	7:05	7:10	7:20	7:30	7:35	7:45	7:50	8:00	8:05	8:15	8:20	8:30
Units required	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	2	2	2	3	2

Train ID	X515	X525	X530	X540	X545	X555	X560	X570	X585	X600	X615	X630	X645	X660	X675	X690	X705	X720	X735	X750	X765	X780	X795	X810	X825	X840	X855	X870	X885
depart WUS	7:45		8:00		8:15		8:30		8:47		9:17		9:47		10:17		10:47		11:17		11:47		12:17		12:47		13:17		13:47
depart FRA		8:12		8:27		8:42		8:57		9:27		9:57		10:27		10:57		11:27		11:57		12:27		12:57		13:27		13:57	
Worcester Union	98		83		60		96		113		48		27		27		25		22		22		24		24		15		0
Grafton	159		106		76		123		146		61		34		34		31		25		26		28		27		18		0
Westborough	280		154		99		162		191		79		44		44		38		27		28		31		32		20		0
Southborough	355		175		107		174		206		86		52		51		43		30		30		33		34		22		0
Ashland	461		247		177		270		267		107		60		59		50		32		33		35		38		23		0
Framingham	555	65	295	14	197	14	292	32	289	25	121	8	65	8	65	8	55	5	35	4	36	4	39	7	44	8	29	2	0
West Natick	626	94	324	26	220	26	312	59	310	46	132	13	69	12	70	13	60	8	37	7	37	6	40	10	46	11	32	3	0
Natick Center		220		53		52		79	324	62	141	17	72	16	74	17	63	10	38	8	38	8	41	12	48	13	34	3	0
Wellesley Square		295		73		72		100	347	86	154	21	76	21	77	22	67	14	41	11	41	11	44	14	50	16	37	4	0
Wellesley Hills		338		80		80		109	355	94	160	23	78	23	79	24	69	16	44	14	44	14	47	16	51	17	37	4	0
Wellesley Farms		382		88		87		115	359	99	162	25	79	25	80	25	70	17	44	14	44	14	47	16	51	17	37	4	0
Auburndale		399		106		105		124	363	102	164	26	81	26	82	27	72	17	44	14	44	15	48	16	52	17	38	4	0
West Newton		421		128		128		137	370	110	168	26	81	27	83	28	72	18	45	15	45	15	48	17	52	17	38	4	0
Newtonville		458		164		164		158	378	117	174	29	85	30	85	30	76	19	45	15	45	15	48	18	54	19	40	5	0
Boston Landing	679	507	365	171	231	169	324	172	387	127	179	31	86	32	86	30	76	19	45	15	45	15	48	18	54	19	40	5	0
Yawkey	679	507	365	171	231	169	324	172	387	127	179	31	86	32	86	30	76	19	45	15	45	15	48	18	54	19	40	5	0
Back Bay	679	507	365	171	231	169	324	172	387	127	179	31	86	32	86	30	76	19	45	15	45	15	48	18	54	19	40	5	0
Arrive South Sta.	8:35	8:45	8:50	9:00	9:05	9:15	9:20	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30	14:45
Units required	3	2	2	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Simulated 90th %ile passenger loading, 6/6/4 tph, zone express, based on 2018 CTPS boardings

	X300	X310	X320	X330	X340	X350	X360	X370	X380	X390	X400	X410	X420	X428	X440	X448	X460	X468	X480	X488	X500	X508	X520	X528
<b>depart WUS</b>		4:12		4:32		4:52		5:12		5:32		5:52		6:18		6:38		6:58		7:18		7:38		7:58
<b>depart FRA</b>	4:27		4:47		5:07		5:27		5:47		6:07		6:27		6:47		7:07		7:27		7:47		8:07	
<b>Worcester Union</b>		0		0		0		22		44		42		68		72		76		106		127		105
<b>Grafton</b>		0		0		0		32		60		60		125		128		132		176		208		144
<b>Westborough</b>		0		0		0		39		79		78		173		185		213		297		365		206
<b>Southborough</b>		0		0		0		49		98		97		211		231		277		382		464		239
<b>Ashland</b>		0		0		0		58		139		138		274		297		340		486		604		343
<b>Framingham</b>	0	0	0	0	0	0	0	62	11	149	13	151	17	314	32	331	28	376	36	574	68	694	97	420
<b>West Natick</b>	0	0	0	0	0	0	0	72	33	176	46	172	34	385	83	360	55	419	64	631	135	791	147	460
<b>Natick Center</b>	0	0	0	0	0	0	0	74	38	191	63	184	42		110		101		137		223		314	
<b>Wellesley Square</b>	0	0	0	0	0	0	0	75	40	193	66	189	60		138		139		190		285		423	
<b>Wellesley Hills</b>	0	0	0	0	0	0	0	76	42	197	69	194	73		154		161		220		320		483	
<b>Wellesley Farms</b>	0	0	0	0	0	0	0	76	42	197	69	197	88		183		200		259		356		548	
<b>Auburndale</b>	0	0	0	0	0	0	0	77	43	197	69	199	93		197		226		284		379		570	
<b>West Newton</b>	0	0	0	0	0	0	0	77	43	197	70	200	98		210		249		317		419		600	
<b>Newtonville</b>	0	0	0	0	0	0	0	78	46	199	73	205	109		232		282		371		485		649	
<b>Boston Landing</b>	0	0	0	0	0	0	0	78	46	199	73	207	116	393	237	375	292	433	384	655	502	819	718	515
<b>Yawkey</b>	0	0	0	0	0	0	0	78	46	199	73	207	116	393	237	375	292	433	384	655	502	819	718	515
<b>Back Bay</b>	0	0	0	0	0	0	0	78	46	199	73	207	116	393	237	375	292	433	384	655	502	819	718	515
<b>Arrive South Sta.</b>	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:08	7:20	7:28	7:40	7:48	8:00	8:08	8:20	8:28	8:40	8:48
<b>290-pax EMUs</b>	0	0	0	0	0	0	0	1	1	1	1	1	1	2	1	2	2	2	2	3	2	3	3	2

	X540	X548	X560	X575	X590	X605	X620	X635	X650	X665	X680	X695	X710	X725	X740	X755	X770	X785	X800	X815	X830	X845	X860	X875
<b>depart WUS</b>		8:18		8:37		9:07		9:37		10:07		10:37		11:07		11:37		12:07		12:37		13:07		13:37
<b>depart FRA</b>	8:27		8:47		9:17		9:47		10:17		10:47		11:17		11:47		12:17		12:47		13:17		13:47	
<b>Worcester Union</b>		101		111		77		27		27		28		22		22		23		24		22		0
<b>Grafton</b>		130		142		97		35		35		35		25		26		26		28		26		0
<b>Westborough</b>		171		189		126		44		44		44		27		29		28		33		30		0
<b>Southborough</b>		185		205		138		50		51		51		30		31		31		35		32		0
<b>Ashland</b>		308		274		178		59		59		58		32		33		34		37		34		0
<b>Framingham</b>	21	334	37	297	24	199	11	64	8	65	8	64	8	35	4	36	4	36	5	44	8	40	7	0
<b>West Natick</b>	40	362	72	318	46	219	17	69	12	70	13	68	12	37	7	38	7	37	7	46	11	43	10	0
<b>Natick Center</b>	75		97	333	61	233	22	73	16	72	17	71	16	38	8	39	8	38	9	48	13	45	11	0
<b>Wellesley Square</b>	101		117	357	85	257	30	76	21	76	21	75	20	41	11	42	11	41	12	51	16	48	14	0
<b>Wellesley Hills</b>	113		124	365	94	266	33	78	23	79	24	78	22	44	14	45	14	44	15	51	17	48	15	0
<b>Wellesley Farms</b>	121		131	369	99	270	35	80	24	80	25	80	23	44	14	45	14	44	15	52	17	48	15	0
<b>Auburndale</b>	144		150	373	102	273	36	81	26	81	26	81	25	45	15	45	14	45	16	52	17	49	15	0
<b>West Newton</b>	173		171	383	111	281	37	82	26	82	27	81	25	45	16	46	15	46	16	52	17	49	15	0
<b>Newtonville</b>	222		206	393	120	289	41	84	29	84	30	84	28	45	16	46	15	46	16	55	19	51	17	0
<b>Boston Landing</b>	232	375	225	402	129	298	43	86	31	87	30	84	28	45	16	46	15	46	16	55	19	51	17	0
<b>Yawkey</b>	232	375	225	402	129	298	43	86	31	87	30	84	28	45	16	46	15	46	16	55	19	51	17	0
<b>Back Bay</b>	232	375	225	402	129	298	43	86	31	87	30	84	28	45	16	46	15	46	16	55	19	51	17	0
<b>Arrive South Sta.</b>	9:00	9:08	9:20	9:35	9:50	10:05	10:20	10:35	10:50	11:05	11:20	11:35	11:50	12:05	12:20	12:35	12:50	13:05	13:20	13:35	13:50	14:05	14:20	14:35
<b>290-pax EMUs</b>	1	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Equipment required for zone express service with 8 tph peak and 4 tph off-peak (based on 2012 figures)

Train	from	plt	departs	to	plt	arrives	layover	becomes	units	equipment	notes
X300	FRA		4:27	BOS	1	5:00	12m	Y312	1	F001	stored overnight at Fountain St.
Y312	BOS	1	5:12	FRA		5:45	12m	X390	1	F001	
X315	FRA		4:42	BOS	1	5:15	12m	Y327	1	F002	stored overnight at Fountain St.
Y320	BOS	2	5:20	WUS		6:18	12m	X440	2	S001+S002	stored overnight at Southampton St.
Y327	BOS	1	5:27	FRA		6:00	12m	X405	1	F002	
X330	FRA		4:57	BOS	1	5:30	12m	Y342	1	F003	stored overnight at Fountain St.
Y335	BOS	2	5:35	WUS		6:33	12m	X455	2	S003+S004	stored overnight at Southampton St.
Y342	BOS	1	5:42	FRA		6:15	12m	X420	1	F003	
X345	FRA		5:12	BOS	1	5:45	12m	Y357	1	F004	stored overnight at Fountain St.
X353	WUS		4:55	BOS	2	5:53	12m	Y365	2	W001+W002	stored overnight at Worcester
Y357	BOS	1	5:57	FRA		6:30	12m	X435	1	F004	
X360	FRA		5:27	BOS	1	6:00	12m	Y372	1	F005	stored overnight at Fountain St.
Y365	BOS	2	6:05	WUS		7:03	12m	X485	2	W001+W002	
Y372	BOS	1	6:12	FRA		6:45	12m	X450	1	F005	
X375	FRA		5:42	BOS	1	6:15	12m	Y387	1	F006	stored overnight at Fountain St.
Y380	BOS	2	6:20	WUS		7:18	12m	X500	2	S005+S006	
X383	WUS		5:25	BOS	2	6:23	12m	Y395	2	W003+W004	stored overnight at Worcester
Y387	BOS	1	6:27	FRA		7:00	17m	X465	1	F006	
X390	FRA		5:57	BOS	1	6:30	12m	Y402	1	F001	
Y395	BOS	2	6:35	WUS		7:33	12m	X515	2	W003+W004	
X398	WUS		5:40	BOS	2	6:38	12m	Y410	2	W005+W006	stored overnight at Worcester
Y402	BOS	1	6:42	FRA		7:15	12m	X480	1	F001	
X405	FRA		6:12	BOS	1	6:45	12m	Y417	1	F002	
Y410	BOS	2	6:50	WUS		7:48	12m	X530	2	W005+W006	
X413	WUS		5:55	BOS	2	6:53	10m	Y423	2	W007+W008	stored overnight at Worcester; <b>NB SHORT TURNAROUND TIME</b>
Y417	BOS	1	6:57	FRA		7:30	12m	X495	1	F002	
X420	FRA		6:27	BOS	1	7:00	12m	Y432	1	F003	
Y423	BOS	2	7:03	WUS		8:01	14m	X545	2	W007+W008	
X425	WUS		6:15	BOS	2	7:05	12m	Y437	2	W009+W010	stored overnight at Worcester
Y432	BOS	1	7:12	FRA		7:45	12m	X510	1	F003	
X435	FRA		6:42	BOS	1	7:15	12m	Y447	1	F004	
Y437	BOS	2	7:17	WUS		8:15	15m	X560	2	W009+W010	
X440	WUS		6:30	BOS	2	7:20	12m	Y452	2	S001+S002	
Y447	BOS	1	7:27	FRA		8:00	12m	X525	1	F004	possibly swap for 2-unit consist for extra seats on X525 (out of service after a single round trip), would be F011+F012 if done
X450	FRA		6:57	BOS	1	7:30	12m	Y462	1	F005	
Y452	BOS	2	7:32	WUS		8:30	17m	X585	2	S001+S002	
X455	WUS		6:45	BOS	2	7:35	12m	Y467	2	S003+S004	
Y462	BOS	1	7:42	FRA		8:15	12m	X540	1	F005	possibly couple to F006 for extra seats on X540
X465	FRA		7:17	BOS	1	7:45	12m	Y477	1	F006	
Y467	BOS	2	7:47	WUS		8:45		OOS	2	S003+S004	need to identify storage location, maybe deadhead to Fountain St.; by preference we'd like to have 4 tph peak service westbound to serve Worcester commuters so short-turning this train is undesirable
X470	WUS		7:00	BOS	2	7:50	12m	Y482	2	W011+W012	stored overnight at Worcester
Y477	BOS	1	7:57	FRA		8:30	12m	X555	1	F006	
X480	FRA		7:27	BOS	1	8:00	12m	Y492	1	F001	
Y482	BOS	2	8:02	WUS		9:00	17m	X615	2	W011+W012	



Train	from	plt	departs	to	plt	arrives	layover	becomes	units	equipment	notes
X485	WUS		7:15	BOS	2	8:05	12m	Y497	2	W001+W002	
Y492	BOS	1	8:12	FRA		8:45	12m	X570	1	F001	
X495	FRA		7:42	BOS	1	8:15	12m	Y507	1	F002	
Y497	BOS	2	8:17	FRA		8:50		OOS	2	W001+W002	stored midday at Fountain St.
X500	WUS		7:30	BOS	2	8:20	12m	Y512	2	S005+S006	
Y507	BOS	1	8:27	FRA		9:00		OOS	1	F002	stored midday at Fountain St.
X510	FRA		7:57	BOS	1	8:30	12m	Y522	1	F003	
Y512	BOS	2	8:32	WUS		9:30	17m	X645	2	S005+S006	
X515	WUS		7:45	BOS	2	8:35		OOS	2	W003+W004	stored midday at Southampton St. (available for maintenance & inspection)
Y522	BOS	1	8:42	FRA		9:15	12m	X600	1	F003	
X525	FRA		8:12	BOS	1	8:45	12m	Y537	1	F004	
X530	WUS		8:00	BOS	2	8:50	12m	Y542	2	W005+W006	
Y537	BOS	1	8:57	FRA		9:30		OOS	1	F004	stored midday at Fountain St.
X540	FRA		8:27	BOS	1	9:00	12m	Y552	1	F005	
Y542	BOS	2	9:02	WUS		10:00	17m	X675	2	W005+W006	
X545	WUS		8:15	BOS	2	9:05	12m	Y557	2	W007+W008	
Y552	BOS	1	9:12	FRA		9:45	12m	X630	1	F005	
X555	FRA		8:42	BOS	1	9:15	12m	Y567	1	F006	
Y557	BOS	2	9:17	FRA		9:50		OOS	2	W007+W008	stored midday at Fountain St.
X560	WUS		8:30	BOS	2	9:20	12m	Y572	2	W009+W010	
Y567	BOS	1	9:27	FRA		10:00		OOS	1	F006	stored midday at Fountain St.
X570	FRA		8:57	BOS	1	9:30	12m	Y582	1	F001	
Y572	BOS	2	9:32	WUS		10:30	17m	X705	2	W009+W010	
Y582	BOS	1	9:42	FRA		10:15	12m	X660	1	F001	
X585	WUS		8:47	BOS	2	9:45	12m	Y597	2	S001+S002	
Y597	BOS	2	9:57	WUS		10:55	22m	X735	2	S001+S002	
X600	FRA		9:27	BOS	1	10:00	12m	Y612	1	F003	
Y612	BOS	1	10:12	FRA		10:50	7m	X690	1	F003	<b>NB short 7 minute turnaround</b>
X615	WUS		9:17	BOS	2	10:15	12m	Y627	2	W011+W012	
Y627	BOS	2	10:27	WUS		11:25	22m	X765	2	W011+W012	
X630	FRA		9:57	BOS	1	10:30	12m	Y642	1	F005	
Y642	BOS	1	10:42	FRA		11:15	12m	X720	1	F005	
X645	WUS		9:47	BOS	2	10:45	12m	Y657	2	S005+S006	
Y657	BOS	2	10:57	WUS		11:55	22m	X795	2	S005+S006	
X660	FRA		10:27	BOS	1	11:00	12m	Y672	1	F001	
Y672	BOS	1	11:12	FRA		11:45	12m	X750	1	F001	
X675	WUS		10:17	BOS	2	11:15	12m	Y687	2	W005+W006	
Y687	BOS	2	11:27	WUS		12:25	22m	X825	2	W005+W006	
X690	FRA		10:57	BOS	1	11:30	12m	Y702	1	F003	
Y702	BOS	1	11:42	FRA		12:15	12m	X780	1	F003	
X705	WUS		10:47	BOS	2	11:45	12m	Y717	2	W009+W010	
Y717	BOS	2	11:57	WUS		12:55	22m	X855	2	W009+W010	
X720	FRA		11:27	BOS	1	12:00	12m	Y732	1	F005	
Y732	BOS	1	12:12	FRA		12:45	12m	X810	1	F005	
X735	WUS		11:17	BOS	2	12:15	12m	Y747	2	S001+S002	
Y747	BOS	2	12:27	WUS		13:25		X885	2	S001+S002	
X750	FRA		11:57	BOS	1	12:30	12m	Y762	1	F001	

Train	from	plt	departs	to	plt	arrives	layover	becomes	units	equipment	notes
Y762	BOS	1	12:42	FRA		13:15		X840	1	F001	
X765	WUS		11:47	BOS	2	12:45	12m	Y777	2	W011+W012	
Y777	BOS	2	12:57	WUS		13:55		X915	2	W011+W012	
X780	FRA		12:27	BOS	1	13:00	12m	Y792	1	F003	
Y792	BOS	1	13:12	FRA		13:45		X780	1	F003	
X795	WUS		12:17	BOS	2	13:15	12m	Y807	2	S005+S006	
Y807	BOS	2	13:27	WUS		14:25		X945	2	S005+S006	
X810	FRA		12:57	BOS	1	13:30	12m	Y822	1	F005	
Y822	BOS	1	13:42	FRA		14:15		X900	1	F005	
X825	WUS		12:47	BOS	2	13:45	12m	Y837	2	W005+W006	
Y837	BOS	2	13:57	WUS		14:55		X960	2	W005+W006	
X840	FRA		13:27	BOS	1	14:00		Y852	1	F001	
X855	WUS		13:17	BOS	2	14:15		Y867	2	W009+W010	
	pattern continues until around 15:45 when stored trains are restarted to initiate PM rush service										total unit requirement: 24
	midday units in operation: 13 (only 8 are required to meet service target, remaining 5 are coupled										overnight storage requirement: 6 at SHSY, 12 at Worcester layover, 6 at Fountain St. layover (units coded by overnight storage location)
	base-to-peak ratio: 54%										midday storage requirement: 2 at Worcester (or Fountain St.), 7 at Fountain St., 2 at Southampton St. (available for inspection & light maintenance)
											platform requirements: 2 at South Station (peak only), 2 at Worcester (1 existing)

Equipment required for zone express service with 6 tph peak and 4 tph off-peak (based on 2018 loading and 290-seat EMUs)

Train	from	plt	departs	transit	to	plt	arrives	layover	becomes	units	equipment	notes
												<b><u>Equipment used in Framingham-Boston service</u></b>
<b>X300</b>	FRA		4:27	33m	BOS	1	5:00	12m	Y312	2	M001+M002	Stored overnight at Nevins
<b>Y312</b>	BOS	1	5:12	33m	FRA		5:45	22m	X400	2	M001+M002	
<b>X320</b>	FRA		4:47	33m	BOS	1	5:20	12m	Y332	3	M003+M004+M005	Stored overnight at Nevins
<b>Y332</b>	BOS	1	5:32	33m	FRA		6:05	22m	X420	3	M003+M004+M005	
<b>X340</b>	FRA		5:07	33m	BOS	1	5:40	12m	Y352	1	M006	Stored overnight at Nevins
<b>Y352</b>	BOS	1	5:52	33m	FRA		6:25	22m	X440	1	M006	
<b>X360</b>	FRA		5:27	33m	BOS	1	6:00	12m	Y372	2	M007+M008	Stored overnight at Nevins
<b>Y372</b>	BOS	1	6:12	33m	FRA		6:45	22m	X460	2	M007+M008	
<b>X380</b>	FRA		5:47	33m	BOS	1	6:20	12m	Y392	2	M009+M010	Stored overnight at Nevins
<b>Y392</b>	BOS	1	6:32	33m	FRA		7:05	22m	X480	2	M009+M010	
<b>X400</b>	FRA		6:07	33m	BOS	1	6:40	12m	Y412	2	M001+M002	
<b>Y412</b>	BOS	1	6:52	33m	FRA		7:25	22m	X500	2	M001+M002	
<b>X420</b>	FRA		6:27	33m	BOS	1	7:00	12m	Y432	3	M003+M004+M005	
<b>Y432</b>	BOS	1	7:12	33m	FRA		7:45	22m	X520	3	M003+M004+M005	
<b>X440</b>	FRA		6:47	33m	BOS	1	7:20	12m	Y452	1	M006	
<b>Y452</b>	BOS	1	7:32	33m	FRA		8:05	22m	X540	1	M006	
<b>X460</b>	FRA		7:07	33m	BOS	1	7:40	12m	Y472	2	M007+M008	
<b>Y472</b>	BOS	1	7:52	33m	FRA		8:25	22m	X560	2	M007+M008	
<b>X480</b>	FRA		7:27	33m	BOS	1	8:00	12m	Y492	2	M009+M010	Stored midday at Southampton
<b>Y492</b>	BOS	1	8:12	33m	FRA		8:45		OOS	2	M009+M010	Riders served by Y482, Y502 Worcester locals
<b>X500</b>	FRA		7:47	33m	BOS	1	8:20	12m	Y512	2	M001+M002	
<b>Y512</b>	BOS	1	8:32	33m	FRA		9:05	12m	X590	2	M001+M002	
<b>X520</b>	FRA		8:07	33m	BOS	1	8:40	12m	Y532	3	M003+M004+M005	Break on platform; M004+M005 stored midday at Southampton

Train	from	plt	departs	transit	to	plt	arrives	layover	becomes	units	equipment	notes
<b>Y532</b>	BOS	1	8:52	33m	FRA		9:25	22m	X620	1	M003	
<b>X540</b>	FRA		8:27	33m	BOS	1	9:00	12m	OOS	1	M006	Stored midday at Southampton
<b>Y552</b>	BOS	4	9:12	33m	FRA		9:45		OOS	4	M006	Riders served by Y542, Y562 Worcester locals
<b>X560</b>	FRA		8:47	33m	BOS	1	9:20	12m	Y572	2	M007+M008	Break on platform; M008 stored midday at Southampton
<b>Y572</b>	BOS	1	9:32	33m	FRA		10:05	12m	X650	1	M007	
<b>X590</b>	FRA		9:17	33m	BOS	1	9:50	12m	Y602	2	M001+M002	Break on platform; M002 stored midday at Southampton or on platform
<b>Y602</b>	BOS	1	10:02	33m	FRA		10:35	12m	X680	1	M001	
<b>X620</b>	FRA		9:47	33m	BOS	1	10:20	12m	Y622	1	M003	
<b>Y622</b>	BOS	1	10:32	33m	FRA		11:05	12m	X710	1	M003	
<b>X650</b>	FRA		10:17	33m	BOS	1	10:50	12m	Y662	1	M007	
<b>Y662</b>	BOS	1	11:02	33m	FRA		11:35	12m	X740	1	M007	
<b>X680</b>	FRA		10:47	33m	BOS	1	11:20	12m	Y692	1	M001	
<b>Y692</b>	BOS	1	11:32	33m	FRA		12:05	12m	X770	1	M001	
<b>X710</b>	FRA		11:17	33m	BOS	1	11:50	12m	Y722	1	M003	
<b>Y722</b>	BOS	1	12:02	33m	FRA		12:35	12m	X800	1	M003	
<b>X740</b>	FRA		11:47	33m	BOS	1	12:20	12m	Y752	1	M007	
<b>Y752</b>	BOS	1	12:32	33m	FRA		13:05	12m	X830	1	M007	
<b>X770</b>	FRA		12:17	33m	BOS	1	12:50	12m	Y782	1	M001	
<b>Y782</b>	BOS	1	13:02	33m	FRA		13:35	12m	X860	1	M001	
<b>X800</b>	FRA		12:47	33m	BOS	1	13:20	12m	Y812	1	M003	
<b>Y812</b>	BOS	1	13:32	33m	FRA		14:05		evening	1	M003	
<b>X830</b>	FRA		13:17	33m	BOS	1	13:50	12m	Y842	1	M007	
<b>Y842</b>	BOS	1	14:02	33m	FRA		14:35		evening	1	M007	
<b>X860</b>	FRA		13:47	33m	BOS	1	14:20	12m	Y872	1	M001	
<b>Y872</b>	BOS	1	14:32	33m	FRA		15:05		evening	1	M001	
												10 units required to operate service

Train	from	plt	departs	transit	to	plt	arrives	layover	becomes	units	equipment	notes
												10 units stored overnight at Nevins, 7 units stored midday at Southampton
												<b><u>Equipment used in Worcester-Boston service</u></b>
<b>X310</b>	WUS		4:12	58m	BOS	2	5:10	12m	Y324	2	M011+M012	Run skipped to reduce storage requirements at Worcester
<b>Y324</b>	BOS	2	5:22	58m	WUS		6:20	18m	X448	2	M011+M012	Stored overnight at Readville
<b>X330</b>	WUS		4:32	58m	BOS	2	5:30	12m	Y344	2	M013+M014	Run skipped to reduce storage requirements at Worcester
<b>Y344</b>	BOS	2	5:42	58m	WUS		6:40	18m	X468	2	M013+M014	Stored overnight at Readville
<b>X350</b>	WUS		4:52	58m	BOS	2	5:50	12m	Y364	3	M015+M016+M017	Run skipped to reduce storage requirements at Worcester
<b>Y364</b>	BOS	2	6:02	58m	WUS		7:00	18m	X488	3	M015+M016+M017	Stored overnight at Readville
<b>X370</b>	WUS		5:12	58m	BOS	2	6:10	12m	Y384	3	M018+M019+M020	Stored overnight at Worcester
<b>Y384</b>	BOS	2	6:22	58m	WUS		7:20	18m	X508	3	M018+M019+M020	
<b>X390</b>	WUS		5:32	58m	BOS	2	6:30	12m	Y404	2	M021+M022	Stored overnight at Worcester
<b>Y404</b>	BOS	2	6:42	58m	WUS		7:40	18m	X528	2	M021+M022	
<b>X410</b>	WUS		5:52	58m	BOS	2	6:50	12m	Y424	2	M023+M024	Stored overnight at Worcester
<b>Y424</b>	BOS	2	7:02	58m	WUS		8:00	18m	X548	2	M023+M024	
<b>X428</b>	WUS		6:18	50m	BOS	2	7:08	12m	Y442	2	M025+M026	Stored overnight at Worcester
<b>Y442</b>	BOS	2	7:20	58m	WUS		8:18	19m	X575	2	M025+M026	
<b>X448</b>	WUS		6:38	50m	BOS	2	7:28	12m	Y462	2	M011+M012	
<b>Y462</b>	BOS	2	7:40	58m	WUS		8:38	29m	X605	2	M011+M012	
<b>X468</b>	WUS		6:58	50m	BOS	2	7:48	12m	Y482	2	M013+M014	
<b>Y482</b>	BOS	2	8:00	58m	WUS		8:58		OOS	2	M013+M014	Stored midday at Worcester or deadhead to Nevins
<b>X488</b>	WUS		7:18	50m	BOS	2	8:08	12m	Y502	3	M015+M016+M017	Break on platform; M016+M017 to Southampton
<b>Y502</b>	BOS	2	8:20	58m	WUS		9:18	19m	X635	3	M015+M016+M017	
<b>X508</b>	WUS		7:38	50m	BOS	2	8:28	12m	Y522	3	M018+M019+M020	
<b>Y522</b>	BOS	2	8:40	58m	WUS		9:38	29m	X665	3	M018+M019+M020	

Train	from	plt	departs	transit	to	plt	arrives	layover	becomes	units	equipment	notes
<b>X528</b>	WUS		7:58	50m	BOS	2	8:48	12m	Y542	2	M021+M022	
<b>Y542</b>	BOS	2	9:00	58m	WUS		9:58		OOS	2	M021+M022	Stored midday at Worcester or deadhead to Nevins
<b>X548</b>	WUS		8:18	50m	BOS	2	9:08	12m	Y562	2	M023+M024	
<b>Y562</b>	BOS	2	9:20	58m	WUS		10:18	19m	X695	2	M023+M024	
<b>X575</b>	WUS		8:37	58m	BOS	2	9:35	12m	Y589	2	M025+M026	Break on platform; M026 to Southampton
<b>Y589</b>	BOS	2	9:47	58m	WUS		10:45	22m	X725	1	M025	
<b>X605</b>	WUS		9:07	58m	BOS	2	10:05	12m	Y619	2	M011+M012	Break on platform; M012 to Southampton
<b>Y619</b>	BOS	2	10:17	58m	WUS		11:15	22m	X755	1	M011	
<b>X635</b>	WUS		9:37	58m	BOS	2	10:35	12m	Y649	3	M015+M016+M017	Break on platform; M16+M017 to Southampton
<b>Y649</b>	BOS	2	10:47	58m	WUS		11:45	22m	X785	1	M015	
<b>X665</b>	WUS		10:07	58m	BOS	2	11:05	12m	Y679	3	M018+M019+M020	Break on platform; M019+M020 to Southampton
<b>Y679</b>	BOS	2	11:17	58m	WUS		12:15	22m	X815	1	M018	
<b>X695</b>	WUS		10:37	58m	BOS	2	11:35	12m	Y709	2	M023+M024	Break on platform; M024 to Southampton or stored on platform
<b>Y709</b>	BOS	2	11:47	58m	WUS		12:45	22m	X845	1	M023	
<b>X725</b>	WUS		11:07	58m	BOS	2	12:05	12m	Y739	1	M025	
<b>Y739</b>	BOS	2	12:17	58m	WUS		13:15	22m	X875	1	M025	
<b>X755</b>	WUS		11:37	58m	BOS	2	12:35	12m	Y769	1	M011	
<b>Y769</b>	BOS	2	12:47	58m	WUS		13:45		evening	1	M011	
<b>X785</b>	WUS		12:07	58m	BOS	2	13:05	12m	Y799	1	M015	
<b>Y799</b>	BOS	2	13:17	58m	WUS		14:15		evening	1	M015	
<b>X815</b>	WUS		12:37	58m	BOS	2	13:35	12m	Y829	1	M018	
<b>Y829</b>	BOS	2	13:47	58m	WUS		14:45		evening	1	M018	
<b>X845</b>	WUS		13:07	58m	BOS	2	14:05	12m	Y859	1	M023	
<b>Y859</b>	BOS	2	14:17	58m	WUS		15:15		evening	1	M023	
<b>X875</b>	WUS		13:37	58m	BOS	2	14:35	12m	Y889	1	M025	
<b>Y889</b>	BOS	2	14:47	58m	WUS		15:45		evening	1	M025	
												16 units required

Train	from	plt	departs	transit	to	plt	arrives	layover	becomes	units	equipment	notes
												7 units stored overnight at Readville; 9 units (2400 feet) overnight at Worcester
												4 units stored midday at Worcester or Nevins; 9 units midday at Southampton/Readville/Allston (or left in service)

Full schedule, "peak-only zone express" 8/8/4 tph scenario, inbound trips only

	X300	X308	X315	X323	X330	X338	X345	X353	X360	X368	X375	X383	X390	X398	X405	X413	X420	X425	X435	X440	X450	X455	X465
<b>Worcester Union</b>		4:10		4:25		4:40		4:55		5:10		5:25		5:40		5:55		6:15		6:30		6:45	
<b>Biotech Park</b>		4:13		4:28		4:43		4:58		5:13		5:28		5:43		5:58		6:18		6:33		6:48	
<b>Grafton</b>		4:20		4:35		4:50		5:05		5:20		5:35		5:50		6:05		6:25		6:40		6:55	
<b>Westborough</b>		4:24		4:39		4:54		5:09		5:24		5:39		5:54		6:09		6:29		6:44		6:59	
<b>Southborough</b>		4:28		4:43		4:58		5:13		5:28		5:43		5:58		6:13		6:33		6:48		7:03	
<b>Ashland</b>		4:32		4:47		5:02		5:17		5:32		5:47		6:02		6:17		6:37		6:52		7:07	
<b>Framingham</b>	4:27	4:35	4:42	4:50	4:57	5:05	5:12	5:20	5:27	5:35	5:42	5:50	5:57	6:05	6:12	6:20	6:27	6:40	6:42	6:55	6:57	7:10	7:12
<b>West Natick</b>	4:30	4:38	4:45	4:53	5:00	5:08	5:15	5:23	5:30	5:38	5:45	5:53	6:00	6:08	6:15	6:23	6:30	6:43	6:45	6:58	7:00	7:13	7:15
<b>Natick Center</b>	4:33	4:40	4:48	4:55	5:03	5:10	5:18	5:25	5:33	5:40	5:48	5:55	6:03	6:10	6:18	6:25	6:33		6:48		7:03		7:18
<b>Wellesley Square</b>	4:36	4:44	4:51	4:59	5:06	5:14	5:21	5:29	5:36	5:44	5:51	5:59	6:06	6:14	6:21	6:29	6:36		6:51		7:06		7:21
<b>Wellesley Hills</b>	4:38	4:46	4:53	5:01	5:08	5:16	5:23	5:31	5:38	5:46	5:53	6:01	6:08	6:16	6:23	6:31	6:38		6:53		7:08		7:23
<b>Wellesley Farms</b>	4:40	4:48	4:55	5:03	5:10	5:18	5:25	5:33	5:40	5:48	5:55	6:03	6:10	6:18	6:25	6:33	6:40		6:55		7:10		7:25
<b>Auburndale</b>	4:43	4:51	4:58	5:06	5:13	5:21	5:28	5:36	5:43	5:51	5:58	6:06	6:13	6:21	6:28	6:36	6:43		6:58		7:13		7:28
<b>West Newton</b>	4:45	4:53	5:00	5:08	5:15	5:23	5:30	5:38	5:45	5:53	6:00	6:08	6:15	6:23	6:30	6:38	6:45		7:00		7:15		7:30
<b>Newtonville</b>	4:47	4:55	5:02	5:10	5:17	5:25	5:32	5:40	5:47	5:55	6:02	6:10	6:17	6:25	6:32	6:40	6:47		7:02		7:17		7:32
<b>Boston Landing</b>	4:51	4:59	5:06	5:14	5:21	5:29	5:36	5:44	5:51	5:59	6:06	6:14	6:21	6:29	6:36	6:44	6:51	6:56	7:06	7:11	7:21	7:26	7:36
<b>West Station</b>	4:53	5:01	5:08	5:16	5:23	5:31	5:38	5:46	5:53	6:01	6:08	6:16	6:23	6:31	6:38	6:46	6:53	6:58	7:08	7:13	7:23	7:28	7:38
<b>Yawkey</b>	4:55	5:03	5:10	5:18	5:25	5:33	5:40	5:48	5:55	6:03	6:10	6:18	6:25	6:33	6:40	6:48	6:55	7:00	7:10	7:15	7:25	7:30	7:40
<b>Back Bay</b>	4:58	5:06	5:13	5:21	5:28	5:36	5:43	5:51	5:58	6:06	6:13	6:21	6:28	6:36	6:43	6:51	6:58	7:03	7:13	7:18	7:28	7:33	7:43
<b>South Station</b>	5:00	5:08	5:15	5:23	5:30	5:38	5:45	5:53	6:00	6:08	6:15	6:23	6:30	6:38	6:45	6:53	7:00	7:05	7:15	7:20	7:30	7:35	7:45
	Trips continue every 30 minutes from Framingham and Worcester through 4 PM making all local stops																						



	X470	X480	X485	X495	X500	X510	X515	X525	X530	X540	X545	X555	X560	X570	X585	X600	X615	X630	X645	X660	X675	X690	X705
<b>Worcester Union</b>	7:00		7:15		7:30		7:45		8:00		8:15		8:30		8:47		9:17		9:47		10:17		10:47
<b>Biotech Park</b>	7:03		7:18		7:33		7:48		8:03		8:18		8:33		8:50		9:20		9:50		10:20		10:50
<b>Grafton</b>	7:10		7:25		7:40		7:55		8:10		8:25		8:40		8:57		9:27		9:57		10:27		10:57
<b>Westborough</b>	7:14		7:29		7:44		7:59		8:14		8:29		8:44		9:01		9:31		10:01		10:31		11:01
<b>Southborough</b>	7:18		7:33		7:48		8:03		8:18		8:33		8:48		9:05		9:35		10:05		10:35		11:05
<b>Ashland</b>	7:22		7:37		7:52		8:07		8:22		8:37		8:52		9:09		9:39		10:09		10:39		11:09
<b>Framingham</b>	7:25	7:27	7:40	7:42	7:55	7:57	8:10	8:12	8:25	8:27	8:40	8:42	8:55	8:57	9:12	9:27	9:42	9:57	10:12	10:27	10:42	10:57	11:12
<b>West Natick</b>	7:28	7:30	7:43	7:45	7:58	8:00	8:13	8:15	8:28	8:30	8:43	8:45	8:58	9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15
<b>Natick Center</b>		7:33		7:48		8:03		8:18		8:33		8:48		9:03	9:17	9:33	9:47	10:03	10:17	10:33	10:47	11:03	11:17
<b>Wellesley Square</b>		7:36		7:51		8:06		8:21		8:36		8:51		9:06	9:21	9:36	9:51	10:06	10:21	10:36	10:51	11:06	11:21
<b>Wellesley Hills</b>		7:38		7:53		8:08		8:23		8:38		8:53		9:08	9:23	9:38	9:53	10:08	10:23	10:38	10:53	11:08	11:23
<b>Wellesley Farms</b>		7:40		7:55		8:10		8:25		8:40		8:55		9:10	9:25	9:40	9:55	10:10	10:25	10:40	10:55	11:10	11:25
<b>Auburndale</b>		7:43		7:58		8:13		8:28		8:43		8:58		9:13	9:28	9:43	9:58	10:13	10:28	10:43	10:58	11:13	11:28
<b>West Newton</b>		7:45		8:00		8:15		8:30		8:45		9:00		9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30
<b>Newtonville</b>		7:47		8:02		8:17		8:32		8:47		9:02		9:17	9:32	9:47	10:02	10:17	10:32	10:47	11:02	11:17	11:32
<b>Boston Landing</b>	7:41	7:51	7:56	8:06	8:11	8:21	8:26	8:36	8:41	8:51	8:56	9:06	9:11	9:21	9:36	9:51	10:06	10:21	10:36	10:51	11:06	11:21	11:36
<b>West Station</b>	7:43	7:53	7:58	8:08	8:13	8:23	8:28	8:38	8:43	8:53	8:58	9:08	9:13	9:23	9:38	9:53	10:08	10:23	10:38	10:53	11:08	11:23	11:38
<b>Yawkey</b>	7:45	7:55	8:00	8:10	8:15	8:25	8:30	8:40	8:45	8:55	9:00	9:10	9:15	9:25	9:40	9:55	10:10	10:25	10:40	10:55	11:10	11:25	11:40
<b>Back Bay</b>	7:48	7:58	8:03	8:13	8:18	8:28	8:33	8:43	8:48	8:58	9:03	9:13	9:18	9:28	9:43	9:58	10:13	10:28	10:43	10:58	11:13	11:28	11:43
<b>South Station</b>	7:50	8:00	8:05	8:15	8:20	8:30	8:35	8:45	8:50	9:00	9:05	9:15	9:20	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45

Full schedule, “peak-only zone express” 6/6/4 tph scenario, inbound trips only

	X300	X310	X320	X330	X340	X350	X360	X370	X380	X390	X400	X410	X420	X428	X440	X448	X460	X468	X480
<b>Worcester Union</b>		4:12		4:32		4:52		5:12		5:32		5:52		6:18		6:38		6:58	
<b>Biotech Park</b>		4:15		4:35		4:55		5:15		5:35		5:55		6:21		6:41		7:01	
<b>Grafton</b>		4:22		4:42		5:02		5:22		5:42		6:02		6:28		6:48		7:08	
<b>Westborough</b>		4:26		4:46		5:06		5:26		5:46		6:06		6:32		6:52		7:12	
<b>Southborough</b>		4:30		4:50		5:10		5:30		5:50		6:10		6:36		6:56		7:16	
<b>Ashland</b>		4:34		4:54		5:14		5:34		5:54		6:14		6:40		7:00		7:20	
<b>Framingham</b>	4:27	4:37	4:47	4:57	5:07	5:17	5:27	5:37	5:47	5:57	6:07	6:17	6:27	6:43	6:47	7:03	7:07	7:23	7:27
<b>West Natick</b>	4:30	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:46	6:50	7:06	7:10	7:26	7:30
<b>Natick Center</b>	4:33	4:42	4:53	5:02	5:13	5:22	5:33	5:42	5:53	6:02	6:13	6:22	6:33		6:53		7:13		7:33
<b>Wellesley Square</b>	4:36	4:46	4:56	5:06	5:16	5:26	5:36	5:46	5:56	6:06	6:16	6:26	6:36		6:56		7:16		7:36
<b>Wellesley Hills</b>	4:38	4:48	4:58	5:08	5:18	5:28	5:38	5:48	5:58	6:08	6:18	6:28	6:38		6:58		7:18		7:38
<b>Wellesley Farms</b>	4:40	4:50	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40		7:00		7:20		7:40
<b>Auburndale</b>	4:43	4:53	5:03	5:13	5:23	5:33	5:43	5:53	6:03	6:13	6:23	6:33	6:43		7:03		7:23		7:43
<b>West Newton</b>	4:45	4:55	5:05	5:15	5:25	5:35	5:45	5:55	6:05	6:15	6:25	6:35	6:45		7:05		7:25		7:45
<b>Newtonville</b>	4:47	4:57	5:07	5:17	5:27	5:37	5:47	5:57	6:07	6:17	6:27	6:37	6:47		7:07		7:27		7:47
<b>Boston Landing</b>	4:51	5:01	5:11	5:21	5:31	5:41	5:51	6:01	6:11	6:21	6:31	6:41	6:51	6:59	7:11	7:19	7:31	7:39	7:51
<b>West Station</b>	4:53	5:03	5:13	5:23	5:33	5:43	5:53	6:03	6:13	6:23	6:33	6:43	6:53	7:01	7:13	7:21	7:33	7:41	7:53
<b>Yawkey</b>	4:55	5:05	5:15	5:25	5:35	5:45	5:55	6:05	6:15	6:25	6:35	6:45	6:55	7:03	7:15	7:23	7:35	7:43	7:55
<b>Back Bay</b>	4:58	5:08	5:18	5:28	5:38	5:48	5:58	6:08	6:18	6:28	6:38	6:48	6:58	7:06	7:18	7:26	7:38	7:46	7:58
<b>South Station</b>	5:00	5:10	5:20	5:30	5:40	5:50	6:00	6:10	6:20	6:30	6:40	6:50	7:00	7:08	7:20	7:28	7:40	7:48	8:00

	X488	X500	X508	X520	X528	X540	X548	X560	X575	X590	X605	X620	X635	X650	X665	X680	X695	X710
<b>Worcester Union</b>	7:18		7:38		7:58		8:18		8:37		9:07		9:37		10:07		10:37	
<b>Biotech Park</b>	7:21		7:41		8:01		8:21		8:40		9:10		9:40		10:10		10:40	
<b>Grafton</b>	7:28		7:48		8:08		8:28		8:47		9:17		9:47		10:17		10:47	
<b>Westborough</b>	7:32		7:52		8:12		8:32		8:51		9:21		9:51		10:21		10:51	
<b>Southborough</b>	7:36		7:56		8:16		8:36		8:55		9:25		9:55		10:25		10:55	
<b>Ashland</b>	7:40		8:00		8:20		8:40		8:59		9:29		9:59		10:29		10:59	
<b>Framingham</b>	7:43	7:47	8:03	8:07	8:23	8:27	8:43	8:47	9:02	9:17	9:32	9:47	10:02	10:17	10:32	10:47	11:02	11:17
<b>West Natick</b>	7:46	7:50	8:06	8:10	8:26	8:30	8:46	8:50	9:05	9:20	9:35	9:50	10:05	10:20	10:35	10:50	11:05	11:20
<b>Natick Center</b>		7:53		8:13		8:33		8:53	9:07	9:23	9:37	9:53	10:07	10:23	10:37	10:53	11:07	11:23
<b>Wellesley Square</b>		7:56		8:16		8:36		8:56	9:11	9:26	9:41	9:56	10:11	10:26	10:41	10:56	11:11	11:26
<b>Wellesley Hills</b>		7:58		8:18		8:38		8:58	9:13	9:28	9:43	9:58	10:13	10:28	10:43	10:58	11:13	11:28
<b>Wellesley Farms</b>		8:00		8:20		8:40		9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30
<b>Auburndale</b>		8:03		8:23		8:43		9:03	9:18	9:33	9:48	10:03	10:18	10:33	10:48	11:03	11:18	11:33
<b>West Newton</b>		8:05		8:25		8:45		9:05	9:20	9:35	9:50	10:05	10:20	10:35	10:50	11:05	11:20	11:35
<b>Newtonville</b>		8:07		8:27		8:47		9:07	9:22	9:37	9:52	10:07	10:22	10:37	10:52	11:07	11:22	11:37
<b>Boston Landing</b>	7:59	8:11	8:19	8:31	8:39	8:51	8:59	9:11	9:26	9:41	9:56	10:11	10:26	10:41	10:56	11:11	11:26	11:41
<b>West Station</b>	8:01	8:13	8:21	8:33	8:41	8:53	9:01	9:13	9:28	9:43	9:58	10:13	10:28	10:43	10:58	11:13	11:28	11:43
<b>Yawkey</b>	8:03	8:15	8:23	8:35	8:43	8:55	9:03	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45
<b>Back Bay</b>	8:06	8:18	8:26	8:38	8:46	8:58	9:06	9:18	9:33	9:48	10:03	10:18	10:33	10:48	11:03	11:18	11:33	11:48
<b>South Station</b>	8:08	8:20	8:28	8:40	8:48	9:00	9:08	9:20	9:35	9:50	10:05	10:20	10:35	10:50	11:05	11:20	11:35	11:50

	X725	X740	X755	X770	X785	X800	X815	X830	X845	X860	X875
<b>Worcester Union</b>	11:07		11:37		12:07		12:37		13:07		13:37
<b>Biotech Park</b>	11:10		11:40		12:10		12:40		13:10		13:40
<b>Grafton</b>	11:17		11:47		12:17		12:47		13:17		13:47
<b>Westborough</b>	11:21		11:51		12:21		12:51		13:21		13:51
<b>Southborough</b>	11:25		11:55		12:25		12:55		13:25		13:55
<b>Ashland</b>	11:29		11:59		12:29		12:59		13:29		13:59
<b>Framingham</b>	11:32	11:47	12:02	12:17	12:32	12:47	13:02	13:17	13:32	13:47	14:02
<b>West Natick</b>	11:35	11:50	12:05	12:20	12:35	12:50	13:05	13:20	13:35	13:50	14:05
<b>Natick Center</b>	11:37	11:53	12:07	12:23	12:37	12:53	13:07	13:23	13:37	13:53	14:07
<b>Wellesley Square</b>	11:41	11:56	12:11	12:26	12:41	12:56	13:11	13:26	13:41	13:56	14:11
<b>Wellesley Hills</b>	11:43	11:58	12:13	12:28	12:43	12:58	13:13	13:28	13:43	13:58	14:13
<b>Wellesley Farms</b>	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15
<b>Auburndale</b>	11:48	12:03	12:18	12:33	12:48	13:03	13:18	13:33	13:48	14:03	14:18
<b>West Newton</b>	11:50	12:05	12:20	12:35	12:50	13:05	13:20	13:35	13:50	14:05	14:20
<b>Newtonville</b>	11:52	12:07	12:22	12:37	12:52	13:07	13:22	13:37	13:52	14:07	14:22
<b>Boston Landing</b>	11:56	12:11	12:26	12:41	12:56	13:11	13:26	13:41	13:56	14:11	14:26
<b>West Station</b>	11:58	12:13	12:28	12:43	12:58	13:13	13:28	13:43	13:58	14:13	14:28
<b>Yawkey</b>	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30
<b>Back Bay</b>	12:03	12:18	12:33	12:48	13:03	13:18	13:33	13:48	14:03	14:18	14:33
<b>South Station</b>	12:05	12:20	12:35	12:50	13:05	13:20	13:35	13:50	14:05	14:20	14:35

Summary schedule, “zone express” scenario, outbound trips only

	Y312	Y320	Y327	Y335	Y342	Y357	Y365	Y372	Y380	Y387	Y395	Y402	Y410	Y417	Y423	Y432	Y437	Y447	Y452	Y462	Y467	Y477	Y482
<b>South Station</b>	5:12	5:20	5:27	5:35	5:42	5:57	6:05	6:12	6:20	6:27	6:35	6:42	6:50	6:57	7:03	7:12	7:17	7:27	7:32	7:42	7:47	7:57	8:02
***																							
<b>Framingham</b>	5:45	5:53	6:00	6:08	6:15	6:30	6:38	6:45	6:53	7:00	7:08	7:15	7:23	7:30	7:36	7:45	7:50	8:00	8:05	8:15	8:20	8:30	8:35
***																							
<b>Worcester</b>		6:18		6:33			7:03		7:18		7:33		7:48		8:01		8:15		8:30		8:45		9:00
																					OOS		

	Y492	Y497	Y507	Y512	Y522	Y537	Y542	Y552	Y557	Y567	Y572	Y582	Y597	Y612	Y627	Y642	Y657	Y672	Y687	Y702	Y717
<b>South Station</b>	8:12	8:17	8:27	8:32	8:42	8:57	9:02	9:12	9:17	9:27	9:32	9:42	9:57	10:12	10:27	10:42	10:57	11:12	11:27	11:42	11:57
***																					
<b>Framingham</b>	8:45	8:50	9:00	9:05	9:15	9:30	9:35	9:45	9:50	10:00	10:05	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30
***		OOS	OOS			OOS			OOS	OOS											
<b>Worcester</b>				9:30			10:00				10:30		10:55		11:25		11:55		12:25		12:55

Inbound Framingham/Worcester Line EMU times per Alon Levy, express service from West Natick to Boston Landing

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	time ahead	current P504
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	0	infill
58.7	Grafton	276	72	506	541.42	10	0	13
51.5	Westborough	166	75	747	799.29	14	0	17
44.2	Southborough	172	68	987	1056.09	18	0	26
39.0	Ashland	144	65	1196	1279.72	22	0	30
34.3	Framingham	131	67	1394	1491.58	25	0	40
32.1	West Natick	57	68	1519	1625.33	28	0	46
28.5	Natick Center	93	0	1612	1724.84	29	2	
23.8	Wellesley Square	121	0	1733	1854.31	31	3	
21.8	Wellesley Hills	66	0	1799	1924.93	33	4	
20.3	Wellesley Farms	49	0	1848	1977.36	33	5	
16.9	Auburndale	88	0	1936	2071.52	35	6	
15.2	West Newton	47	0	1983	2121.81	36	7	
13.3	Newtonville	53	0	2036	2178.52	37	9	
7.5	Boston Landing	175	55	2266	2424.62	41	9	
6.2	West Station	47	55	2368	2533.76	43	9	
4.0	Yawkey	80	55	2503	2678.21	45	9	69
2.1	Back Bay	99	55	2657	2842.99	48	9	74
0	South Station	98	0	2755	2947.85	50	9	80
			assumes 25s dwell at each stop; remaining time is acceleration					

Inbound Framingham/Worcester Line EMU times per Alon Levy, superexpress service from Worcester to Boston Landing

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	time ahead	current P552
71.3	Worcester Union			0				
68.8	Biotech Park	103	55	158	169.06	3	0	infill
58.7	Grafton	276	0	434	464.38	8	2	
51.5	Westborough	166	0	600	642	11	3	
44.2	Southborough	172	0	772	826.04	14	4	
39.0	Ashland	144	0	916	980.12	17	5	
34.3	Framingham	131	67	1114	1191.98	20	5	
32.1	West Natick	57	0	1171	1252.97	21	7	
28.5	Natick Center	93	0	1264	1352.48	23	8	
23.8	Wellesley Square	121	0	1385	1481.95	25	9	
21.8	Wellesley Hills	66	0	1451	1552.57	26	10	
20.3	Wellesley Farms	49	0	1500	1605	27	11	
16.9	Auburndale	88	0	1588	1699.16	29	12	
15.2	West Newton	47	0	1635	1749.45	30	14	
13.3	Newtonville	53	0	1688	1806.16	31	15	
7.5	Boston Landing	175	55	1918	2052.26	35	15	
6.2	West Station	47	55	2020	2161.4	37	15	infill
4.0	Yawkey	80	55	2155	2305.85	39	15	55
2.1	Back Bay	99	55	2309	2470.63	42	15	60
0	South Station	98	0	2407	2575.49	43	15	66
			assumes 25s dwell at each stop; remaining time is acceleration					



Inbound Framingham/Worcester Line EMU times per Alon Levy, infill stations omitted, Framingham short-turn

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute	current P512	savings			
71.3	Worcester Union										
68.8	Biotech Park										
58.7	Grafton										
51.5	Westborough										
44.2	Southborough										
39.0	Ashland										
34.3	Framingham	0	0	0	0	0	41	41			
32.1	West Natick	57	68	125	133.75	3	46	43			
28.5	Natick Center	93	68	286	306.02	6	51	45			
23.8	Wellesley Square	121	63	470	502.9	9	56	47			
21.8	Wellesley Hills	66	58	594	635.58	11	60	49			
20.3	Wellesley Farms	49	64	707	756.49	13	63	50			
16.9	Auburndale	88	67	862	922.34	16	68	52			
15.2	West Newton	47	65	974	1042.18	18	71	53			
13.3	Newtonville	53	65	1092	1168.44	20	74	54			
7.5	Boston Landing	175	55	1322	1414.54	24	79	55			
6.2	West Station	47	55	1424	1523.68	26	infill	infill			
4.0	Yawkey	80	55	1559	1668.13	28	84	56			
2.1	Back Bay	99	55	1713	1832.91	31	89	58			
0	South Station	98	0	1811	1937.77	33	94	61			
		25s dwell at each stop; remaining time is acceleration penalty if I understand Alon correctly									

Inbound Framingham/Northborough service, via Ag Branch, simulated 59 mi/h speed limit and EMUs

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute
60	Northboro/290			0		
57.9	Northboro Center		25	101	108.07	2
52.3	Marlboro/495		25	297	317.79	6
45.1	Southborough		25	541	578.87	10
41.2	Tech Park		25	692	740.44	13
37.3	Framingham Center		25	840	898.8	15
34.3	South Framingham	126	25	991	1060.37	18
32.1	West Natick	57	68	1116	1194.12	20
28.5	Natick Center	93	68	1277	1366.39	23
23.8	Wellesley Square	121	63	1461	1563.27	27
21.8	Wellesley Hills	66	58	1585	1695.95	29
20.3	Wellesley Farms	49	64	1698	1816.86	31
16.9	Auburndale	88	67	1853	1982.71	34
15.2	West Newton	47	65	1965	2102.55	36
13.3	Newtonville	53	65	2083	2228.81	38
7.5	Boston Landing	175	55	2313	2474.91	42
6.2	West Station	47	55	2415	2584.05	44
4.0	Yawkey	80	55	2550	2728.5	46
2.1	Back Bay	99	55	2704	2893.28	49
0	South Station	98	0	2802	2998.14	50
			blend of Alon's and my models, which compute stop times differently			

Inbound Framingham/Worcester Line EMU times per Alon Levy, infill stations omitted, Riverside Jct. short-turn

km	station	time from prev (s)	station time (s)	total time (s)	time with 7% pad	minute					
71.3	Worcester Union										
68.8	Biotech Park										
58.7	Grafton										
51.5	Westborough										
44.2	Southborough										
39.0	Ashland										
34.3	Framingham										
32.1	West Natick										
28.5	Natick Center										
23.8	Wellesley Square										
21.8	Wellesley Hills										
20.3	Wellesley Farms										
16.9	Auburndale	0	0	0	0	0					
15.2	West Newton	47	65	112	119.84	2					
13.3	Newtonville	53	65	230	246.1	5					
7.5	Boston Landing	175	55	460	492.2	9					
6.2	West Station	47	55	562	601.34	11					
4.0	Yawkey	80	55	697	745.79	13					
2.1	Back Bay	99	55	851	910.57	16					
0	South Station	98	0	949	1015.43	17					
		25s dwell at each stop; remaining time is acceleration penalty if I understand Alon correctly									

2018 CTPS F/W inbound net boardings, by arrival time at South Station

km	departing station	6:18	6:35	6:58	7:10	7:33	7:45	8:10	8:20	8:44	8:55	9:06	9:39	10:24	12:06
71.3	Worcester Union	23	68		108		118		203		56	262		74	54
58.7	Grafton	11	28		94		94		139		89			24	9
51.5	Westborough	8	32		81		136		266		133			29	6
44.2	Southborough	12	34		66		107		169		44			22	7
39.0	Ashland	10	76		110		109		242		196		93	27	8
34.3	Framingham	15	24	17	77	32	73	76	176	127	92		62	34	15
32.1	West Natick	33	68	12	135	19	88	35	189	61	93		58	29	11
28.5	Natick Center	8	36	16		82		146		143	71		43	23	8
23.8	Wellesley Square	9		30		68		101		92	54		66	25	15
21.8	Wellesley Hills	11		23		37		57		56	24		26	14	16
20.3	Wellesley Farms	-4		27		74		58		59	19		14	8	1
16.9	Auburndale	2		8		47		40		63			8	11	2
15.2	West Newton	1		8		43		68		79			25	3	4
13.3	Newtonville	12		22		59		114		128			23	20	0
7.5	Boston Landing			23		46		70		110	49		28	6	
4.0	Yawkey	-15	-48	-21	-90	-70	-72	-91	-121	-80	-65	-33	-46	-93	-18
2.1	Back Bay	-99	-118	-83	-183	-180	-221	-219	-463	-297	-224	-80	-154	-113	-49