

Appendix 4.1-J
Grade Crossing Analysis



Project SCR 10111
 Calculated by A. Soupharath April 14, 2009
 Checked by MPR
 Location Various

Based on XX% growth rate, 765' train (1 engine, 8 coaches) & 30 second advanced gate closure

		Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)		
<u>Stoughton</u>																
Brock Street MP 4.30	NB	Daily	1875	1.09	2,045											
		AM	212	1.09	231	3600	0.06	35	51	765	15	150	4	5.6	80.6	150
		PM	218	1.09	238	3600	0.07	35	51	765	15	150	4	5.9	80.9	150
	SB	Daily	1418	1.09	1,547											
		AM	92	1.09	101	3600	0.03	35	51	765	15	150	4	0.2	75.2	25
		PM	160	1.09	174	3600	0.05	35	51	765	15	150	4	3.3	78.3	100
<u>Plain Street MP 4.60</u>																
Plain Street MP 4.60	EB	Daily	3457	1.10	3,804											
		AM	337	1.10	371	3600	0.10	45	66	765	12	60	-	6.2	36.2	175
		PM	314	1.10	345	3600	0.10	45	66	765	12	60	-	5.8	35.8	150
	WB	Daily	3815	1.10	4,199											
		AM	228	1.10	251	3600	0.07	45	66	765	12	60	-	4.2	34.2	125
		PM	463	1.10	509	3600	0.14	45	66	765	12	60	-	8.5	38.5	225
<u>Morton Street MP 5.20</u>																
Morton Street MP 5.20	Daily	1522	1.06	1,616												
	AM	120	1.06	127	3600	0.04	60	88	765	9	60	-	2.1	32.1	75	
	PM	170	1.06	181	3600	0.05	60	88	765	9	60	-	3.0	33.0	100	
<u>Easton</u>																
Elm Street MP 7.60	nb	Daily	2092	1.07	2,248											
		AM	174	1.07	174	3600	0.05	45	66	765	12	60	-	2.9	32.9	75
		PM	154	1.07	122	3600	0.03	45	66	765	12	60	-	2.0	32.0	75
	sb	Daily	2484	1.07	2,669											
		AM	168	1.07	98	3600	0.03	45	66	765	12	60	-	1.6	31.6	50
		PM	239	1.07	293	3600	0.08	45	66	765	12	60	-	4.9	34.9	125



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		Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)
Oliver Street	Daily	978	1,039											
MP 7.80	AM	76	81	3600	0.02	45	66	765	12	150	4	(0.6)	74.4	(25)
	PM	96	102	3600	0.03	45	66	765	12	150	4	0.2	75.2	25
Easton DPW	No volumes available, crossing closed/gated...address qualitative													
MP 8.65	AM	0	-	3600	0.00	45	66	765	12	60	-	-	30.0	-
	PM	0	-	3600	0.00	45	66	765	12	60	-	-	30.0	-
Gary Lane	No volumes available, crossing closed/gated...address qualitative													
MP 9.15	AM	0	-	3600	0.00	45	66	765	12	60	-	-	30.0	-
	PM	0	-	3600	0.00	45	66	765	12	60	-	-	30.0	-
Short Street	NB Daily	2152	2,347											
MP 9.55	AM	136	148	3600	0.04	45	66	765	12	60	-	2.5	32.5	75
	PM	218	238	3600	0.07	45	66	765	12	60	-	4.0	34.0	100
	SB Daily	2179	2,377											
	AM	201	219	3600	0.06	45	66	765	12	60	-	3.7	33.7	100
	PM	165	180	3600	0.05	45	66	765	12	60	-	3.0	33.0	75
Depot Street/123	EB Daily	9603	10,319											
MP 10.00	AM	1011	1,086	3600	0.30	45	66	765	12	60	-	18.1	48.1	475
	PM	617	663	3600	0.18	45	66	765	12	60	-	11.1	41.1	300
	WB Daily	8723	9,373											
	AM	446	479	3600	0.13	45	66	765	12	60	-	8.0	38.0	200
	PM	824	886	3600	0.25	45	66	765	12	60	-	14.8	44.8	375
Purchase Street	NB Daily	1103	1,193											
MP 10.20	AM	92	100	3600	0.03	45	66	765	12	60	-	1.7	31.7	50
	PM	101	109	3600	0.03	45	66	765	12	60	-	1.8	31.8	50
	SB Daily	1158	1,251											
	AM	98	106	3600	0.03	45	66	765	12	60	-	1.8	31.8	50
	PM	128	138	3600	0.04	45	66	765	12	60	-	2.3	32.3	75



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			Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)	
Prospect Street																
MP 10.90	NB	Daily	951	1.08	1,031							-	-			
		AM	82	1.08	88	3600	0.02	45	66	765	12	60	-	1.5	31.5	50
		PM	74	1.08	81	3600	0.02	45	66	765	12	60	-	1.3	31.3	50
	SB	Daily	1049	1.08	1,137								-	-		
		AM	65	1.08	71	3600	0.02	45	66	765	12	60	-	1.2	31.2	50
		PM	112	1.08	121	3600	0.03	45	66	765	12	60	-	2.0	32.0	75
Foundry Street (R)																
MP 11.80	EB	Daily	5984	1.08	6,468							-	-			
		AM	489	1.08	522	3600	0.14	45	66	765	12	60	-	8.7	38.7	225
		PM	543	1.08	415	3600	0.12	45	66	765	12	60	-	6.9	36.9	175
	WB	Daily	5859	1.08	6,333								-	-		
		AM	359	1.08	571	3600	0.16	45	66	765	12	60	-	9.5	39.5	250
		PM	580	1.08	633	3600	0.18	45	66	765	12	60	-	10.5	40.5	275
Raynham																
Elm Street																
MP 15.40	EB	Daily			1,343							-	-			
		AM	0	1.04	98	3600	0.03	45	66	765	12	60	-	1.6	31.6	50
		PM	0	1.04	65	3600	0.02	45	66	765	12	60	-	1.1	31.1	50
	WB	Daily			553								-	-		
		AM	0	1.04	40	3600	0.01	45	66	765	12	60	-	0.7	30.7	25
		PM	0	1.04	65	3600	0.02	45	66	765	12	60	-	1.1	31.1	50
Carver Street																
MP 15.80	EB	Daily			4,583							-	-			
		AM	0	1.04	333	3600	0.09	45	66	765	12	60	-	5.6	35.6	150
		PM	0	1.04	366	3600	0.10	45	66	765	12	60	-	6.1	36.1	175
	WB	Daily			2,213								-	-		
		AM	0	1.04	161	3600	0.04	45	66	765	12	60	-	2.7	32.7	75
		PM	0	1.04	387	3600	0.11	45	66	765	12	60	-	6.5	36.5	175



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			Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)	
Route 138																
MP xxxx				19,440												
	NB	Daily														
		AM	0	1.04	1,414	3600	0.39	50	73	765	10	70	-	27.5	62.5	700
		PM	0	1.04	930	3600	0.26	50	73	765	10	70	-	18.1	53.1	475
													-	-		
	SB	Daily		7,981												
		AM	0	1.04	580	3600	0.16	50	73	765	10	70	-	11.3	46.3	300
		PM	0	1.04	1,425	3600	0.40	50	73	765	10	70	-	27.7	62.7	700
Britton Street																
MP 16.50				395												
	EB	Daily														
		AM	0	1.04	29	3600	0.01	50	73	765	10	60	-	0.5	30.5	25
		PM	0	1.04	59	3600	0.02	50	73	765	10	60	-	1.0	31.0	25
													-	-		
	WB	Daily		869												
		AM	0	1.04	63	3600	0.02	50	73	765	10	60	-	1.1	31.1	50
		PM	0	1.04	65	3600	0.02	50	73	765	10	60	-	1.1	31.1	50
King Phillip Street																
MP 17.10				3793												
	Daily		3793	1.07	4,068											
		AM	276	1.07	296	3600	0.08	70	103	765	7	60	-	4.9	34.9	125
		PM	328	1.07	352	3600	0.10	70	103	765	7	60	-	5.9	35.9	150
East Britannia																
MP				4368												
	Daily		4368	1.07	4,684											
		AM	310	1.07	333	3600	0.09	60	88	765	9	60	-	5.5	35.5	150
		PM	387	1.07	415	3600	0.12	60	88	765	9	60	-	6.9	36.9	175
Taunton																
MP 12.5				5885												
	EB	Daily	5885	1.06	6,267											
		AM	555	1.06	462	3600	0.13	25	37	765	21	60	-	7.7	37.7	200
		PM	474	1.06	326	3600	0.09	25	37	765	21	60	-	5.4	35.4	150
													-	-		
	WB	Daily	6236	1.06	6,641											
		AM	440	1.06	275	3600	0.08	25	37	765	21	60	-	4.6	34.6	125
		PM	579	1.06	432	3600	0.12	25	37	765	21	60	-	7.2	37.2	200



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			Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)
Winter Street / Longmeadow															
MP 18.90	NB	Daily	6648	1.05	6,992							-	-		
		AM	456	1.05	511	3600	0.14	25	37	765	21	60	-	8.5	38.5
		PM	568	1.05	637	3600	0.18	25	37	765	21	60	-	10.6	40.6
	SB	Daily	6016	1.05	6,327							-	-		
		AM	467	1.05	396	3600	0.11	25	37	765	21	60	-	6.6	36.6
		PM	537	1.05	411	3600	0.11	25	37	765	21	60	-	6.8	36.8
Dean Street															
MP 19.40	EB	Daily	14951	1.06	15,855							-	-		
		AM	1236	1.06	912	3600	0.25	25	37	765	21	150	4	34.0	109.0
		PM	1100	1.06	858	3600	0.24	25	37	765	21	150	4	31.7	106.7
	WB	Daily	16626	1.06	17,632							-	-		
		AM	1033	1.06	846	3600	0.24	25	37	765	21	150	4	31.3	106.3
		PM	1405	1.06	879	3600	0.24	25	37	765	21	150	4	32.6	107.6
Whittenton Street															
MP xxxx	EB	Daily			1,946							-	-		
		AM	0	1.03	121	3600	0.03	25	37	765	21	60	-	2.0	32.0
		PM	0	1.03	179	3600	0.05	25	37	765	21	60	-	3.0	33.0
	WB	Daily			1,327							-	-		
		AM	0	1.03	82	3600	0.02	25	37	765	21	60	-	1.4	31.4
		PM	0	1.03	226	3600	0.06	25	37	765	21	60	-	3.8	33.8
Ingell Street															
MP xxxx	NB	Daily	3385	1.06	3,604							-	-		
		AM	407	1.06	433	3600	0.12	25	37	765	21	60	-	7.2	37.2
		PM	432	1.06	460	3600	0.13	25	37	765	21	60	-	7.7	37.7
	SB	Daily	3714	1.06	3,956							-	-		
		AM	407	1.06	433	3600	0.12	25	37	765	21	60	-	7.2	37.2
		PM	432	1.06	460	3600	0.13	25	37	765	21	60	-	7.7	37.7



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Warren Street	No volumes available, crossing closed/gated...address qualitative													
MP xxxx	AM	0	1.03	-	3600	0.00	25	37	765	21	60	-	30.0	-
	PM	0	1.03	-	3600	0.00	25	37	765	21	60	-	30.0	-
<u>Berkley</u>														
Mill Street	No volumes available, crossing closed/gated...address qualitative													
MP 0.20	AM	0	1.13	-	3600	0.00	25	37	765	21	60	-	30.0	-
	PM	0	1.13	-	3600	0.00	25	37	765	21	60	-	30.0	-
Adams Lane	No volumes available, crossing closed/gated...address qualitative													
MP 0.60	AM	0	1.13	-	3600	0.00	25	37	765	21	60	-	30.0	-
	PM	0	1.13	-	3600	0.00	25	37	765	21	60	-	30.0	-
<u>Freetown</u>														
Forge Road-North EB	Daily	426	1.25	532										
MP 2.4	AM	16	1.25	20	3600	0.01	25	37	765	21	60	-	0.3	25
	PM	57	1.25	72	3600	0.02	25	37	765	21	60	-	1.2	50
	WB Daily	500	1.25	625										
	AM	64	1.25	80	3600	0.02	25	37	765	21	60	-	1.3	50
	PM	63	1.25	78	3600	0.02	25	37	765	21	60	-	1.3	50
Richmond Road-S NB	Daily	1894	1.25	2,365										
MP 2.4	AM	170	1.25	213	3600	0.06	25	37	765	21	60	-	3.5	100
	PM	161	1.25	202	3600	0.06	25	37	765	21	60	-	3.4	100
	SB Daily	1910	1.25	2,385										
	AM	170	1.25	213	3600	0.06	25	37	765	21	60	-	3.5	100
	PM	146	1.25	182	3600	0.05	25	37	765	21	60	-	3.0	100
Forge Road-South NB	Daily	1250	1.25	1,561										
MP 2.7	AM	69	1.25	86	3600	0.02	25	37	765	21	60	-	1.4	50
	PM	141	1.25	176	3600	0.05	25	37	765	21	60	-	2.9	75
				3,335										
	SB Daily	1420	1.25	1,774										
	AM	165	1.25	206	3600	0.06	25	37	765	21	60	-	3.4	100
	PM	94	1.25	117	3600	0.03	25	37	765	21	60	-	2.0	50



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			Growth Factor	Design 2030 Volume	Seconds /Hour	Veh /Sec	Train Speed (MPH)	Train Speed (FPS)	Train Length	seconds to cross	Gate Closed (seconds)	clearing Vehicles	Vehicles Queued	Average Delay	Queue Length (ft)	
<u>New Bedford</u>																
Tarkiln Hill Road MP 28.5	EB	Daily	17094	1.05	18,010							-	-			
		AM	1272	1.05	611	3600	0.17	25	37	765	21	60	-	10.2	40.2	275
		PM	1359	1.05	1,283	3600	0.36	25	37	765	21	60	-	21.4	51.4	550
	WB	Daily	15150	1.05	15,961								-	-		
		AM	972	1.05	817	3600	0.23	25	37	765	21	60	-	13.6	43.6	350
		PM	1179	1.05	848	3600	0.24	25	37	765	21	60	-	14.1	44.1	375
Nash Road MP 29.5	EB	Daily	7094	1.06	7,488							-	-			
		AM	433	1.06	400	3600	0.11	25	37	765	21	60	-	6.7	36.7	175
		PM	625	1.06	663	3600	0.18	25	37	765	21	60	-	11.1	41.1	300
	WB	Daily	7006	1.06	7,394								-	-		
		AM	506	1.06	511	3600	0.14	25	37	765	21	60	-	8.5	38.5	225
		PM	620	1.06	745	3600	0.21	25	37	765	21	60	-	12.4	42.4	325

Grade Crossing Delay Calculations

Project: South Coast Rail
 Calculated by:
 Checked by:
 Location: Attleboro Alignment

Project#:
 Date: May 1, 2009

Based on 1% growth rate, 765' train (1 engine, 8 coaches) & 30 second advanced gate closure

		EB or NB Volume	WB or SB Volume	Largest Volume	PHF	Base Year	Future Year	Years	growth rate	Growth Factor	2030 Volume	Veh /Sec	Gate Closed (seconds)	Vehicles Queued	Average Delay	Queue Length (ft)	
Richardson Ave.	AM	96	307	307	0.92	334	2006	2030	24	1.0041	1.103	368	0.10	60	6.1	36.1	175
	PM	262	120	262	0.92	285	2006	2030	24	1.0041	1.103	314	0.09	60	5.2	35.2	150
Pleasant St.	AM	556	504	556	0.92	604	2005	2030	25	1.0041	1.108	669	0.19	60	11.2	41.2	300
	PM	595	582	595	0.92	647	2005	2030	25	1.0041	1.108	716	0.20	60	11.9	41.9	300
Union St. MP 26.31	AM	63	63	63	0.92	68	2001	2030	29	1.0041	1.126	77	0.02	60	1.3	31.3	50
	PM	82	103	103	0.92	112	2001	2030	29	1.0041	1.126	126	0.04	60	2.1	32.1	75
John Scott Blvd. MP 26.87	AM	396	199	396	0.92	430	2001	2030	29	1.0041	1.126	485	0.13	60	8.1	38.1	225
	PM	205	389	389	0.92	423	2001	2030	29	1.0041	1.126	476	0.13	60	7.9	37.9	200
S. Worcester Street MP 27.75	AM	86	213	213	0.92	232	2001	2030	29	1.0041	1.126	261	0.07	60	4.3	34.3	125
	PM	209	127	209	0.92	227	2001	2030	29	1.0041	1.126	256	0.07	60	4.3	34.3	125
Woodward St. MP 29.34	AM	50	53	53	0.92	58	2001	2030	29	1.0041	1.126	65	0.02	60	1.1	31.1	50
	PM	47	48	48	0.92	52	2001	2030	29	1.0041	1.126	59	0.02	60	1.0	31.0	25
Harvey St. MP 30.62	AM	242	662	662	0.91	727	2004	2030	26	1.0021	1.056	768	0.21	60	12.8	42.8	325
	PM	663	278	663	0.95	698	2004	2030	26	1.0021	1.056	737	0.20	60	12.3	42.3	325
Crane St. MP 31.28	AM	184	87	184	0.91	202	2000	2030	30	1.0021	1.065	215	0.06	60	3.6	33.6	100
	PM	97	185	185	0.95	195	2000	2030	30	1.0021	1.065	207	0.06	60	3.5	33.5	100
Fremont St. MP 32.19	AM	112	68	112	0.91	123	2000	2030	30	1.0021	1.065	131	0.04	60	2.2	32.2	75
	PM	72	96	96	0.95	101	2000	2030	30	1.0021	1.065	108	0.03	60	1.8	31.8	50
West Britannia St. MP 33.00	AM	149	246	246	0.91	270	2000	2030	30	1.0021	1.065	288	0.08	60	4.8	34.8	125
	PM	276	211	276	0.95	291	2000	2030	30	1.0021	1.065	309	0.09	60	5.2	35.2	150
Danforth St. MP 33.64	AM	182	123	182	0.91	200	2000	2030	30	1.0021	1.065	213	0.06	60	3.5	33.5	100
	PM	156	243	243	0.95	256	2000	2030	30	1.0021	1.065	272	0.08	60	4.5	34.5	125
Tremont St. MP 34.06	AM	569	520	569	0.91	625	2000	2030	30	1.0021	1.065	666	0.18	60	11.1	41.1	300
	PM	712	710	712	0.95	749	2000	2030	30	1.0021	1.065	798	0.22	60	13.3	43.3	350
Oak St.¹ MP 34.23	AM	652	343	652	0.91	716	2000	2030	30	1.0021	1.065	763	0.21	150	31.8	106.8	800
	PM	489	546	489	0.95	515	2000	2030	30	1.0021	1.065	548	0.15	150	22.8	97.8	575
Porter St. MP 34.47	AM	127	89	127	0.91	140	2000	2030	30	1.0021	1.065	149	0.04	60	2.5	32.5	75
	PM	176	123	176	0.95	185	2000	2030	30	1.0021	1.065	197	0.05	60	3.3	33.3	100
Cohannet St. MP 34.54	AM	118	118	118	0.91	130	2000	2030	30	1.0021	1.065	138	0.04	60	2.3	32.3	75
	PM	200	200	200	0.95	211	2000	2030	30	1.0021	1.065	224	0.06	60	3.7	33.7	100
Winthrop St. MP 34.60	AM	539	684	684	0.91	752	2000	2030	30	1.0021	1.065	800	0.22	60	13.3	43.3	350
	PM	724	648	724	0.95	762	2000	2030	30	1.0021	1.065	812	0.23	60	13.5	43.5	350
Harrison Ave. MP 34.74	AM	139	72	139	0.91	153	2000	2030	30	1.0021	1.065	163	0.05	60	2.7	32.7	75
	PM	111	79	111	0.95	117	2000	2030	30	1.0021	1.065	124	0.03	60	2.1	32.1	75
Somerset Ave. MP 34.92	AM	371	207	371	0.91	408	2000	2030	30	1.0021	1.065	434	0.12	60	7.2	37.2	200
	PM	327	431	431	0.95	454	2000	2030	30	1.0021	1.065	483	0.13	60	8.1	38.1	225
Weir St. MP 35.00	AM	525	465	525	0.91	577	2001	2030	29	1.0021	1.063	613	0.17	70	11.9	46.9	300
	PM	426	613	613	0.95	645	2001	2030	29	1.0021	1.063	686	0.19	70	13.3	48.3	350

1 The existing pre-signals at Oak Street do not allow for vehicles to cross the tracks while the train dwells in the station. Therefore, no 4 vehicle queue reduction credit has been taken.