



MAIN STREET









APPENDIX

PUBLIC TRANSPORATION TRIP-GENERATION CALCULATIONS QUEUE ANALYSIS CALCULATIONS PUBLIC TRANSPORATION





136	136/137 Weekday								136/137 Saturday										
		Inbound					Outboun	d				Inbound			1	C	Dutbound		
Leave Readin Depot	Lv/Arrive g Wakefield Square	Arrive Franklin Square	Arrive Oak Grove Station	Arrive Malden Station	Leave Malden Station	Lv/Arrive Oak Grove Station	Arrive Franklin Square	Arrive Wakefield Square	Arrive I Reading Depot	Leave Reading Depot	Lv/Arrive Wakefield Square	Arrive Franklin Square	Arrive Oak Grove Station	Arrive Malden Station	Leave Malden (Station	Arrive Dak Grove Station	Arrive Franklin Square	Arrive Wakefield Square	Arrive Reading Depot
6:15/ 6:30 6:50 7:05 7:25 7:40 7:58 8:15 8:35 8:50	5:30A 6:10 A 6:26 6:44 7:01 7:10 7:30 7:38 7:54 8:00 8:09 8:28 8:46 9:03	5:40A 6:20 6:36 6:54 7:12 7:21 7:21 7:21 7:21 7:21 7:21 7:21	5:52A 6:32 6:48 7:08 7:32 7:41 7:50 8:01 8:08 8:21 8:26 8:35 8:54 9:09 9:24	6:04A 6:04A 7:00 7:20 7:44 8:03 8:15 8:22 8:35 8:40 8:49 9:09 9:24 9:39	4:45A 5:25 6:00 6:15 6:35 6:50 7:25 7:25 7:40 7:55 8:10 8:25 9:20 9:20 10:05	4:59A 5:39 6:07 6:22 6:42 6:57 7:16 7:36 7:51 8:06 8:21 8:36 9:16 9:31 10:16	5:15A 5:555 6:17 6:32 6:52 7:06 7:25 7:45 8:00 8:15 8:30 8:45 9:25 9:40 10:25	5:26A 6:06 6:24 6:39 6:59 7:16 7:35 7:55 8:10 8:25 8:40 8:55 9:35 9:50 10:35	6:44A 6:59 7:17 7:34 7:53 8:13 8:28 8:43 8:58 9:13 9:53 10:08 10:53	6:00A 6:45 7:30 8:15 9:00 9:45 10:35 11:20 12:10P 1:00 1:50 2:40 3:30 4:20 5:10 6:00	6:10A 6:55 7:43 8:25 9:13 9:55 10:48 11:30 12:23P 1:14 2:03 2:54 3:43 4:34 5:21 6:11	6:17A 7:02 7:49 8:34 9:19 10:04 10:54 11:38 12:29P 1:22 2:12 3:02 3:52 4:42 5:28 6:17	6:25A 7:10 7:58 8:43 9:32 10:13 11:07 11:52 12:42P 1:36 2:23 3:16 4:03 4:56 5:39 6:27	6:34A 7:19 8:05 8:51 9:39 10:21 11:14 12:02P 12:49P 1:46 2:34 3:26 4:14 5:06 5:48 5:36	6:00A 6:45 7:30 8:15 9:00 9:45 10:30 11:20 12:10P 1:00 1:50 2:40 3:30 4:20 5:10 6:00	6:07A 6:52 7:37 8:22 9:08 9:54 10:38 11:28 12:18P 1:09 1:59 2:49 3:39 4:29 5:19 6:10	6:16A 7:00 7:46 8:32 9:18 10:05 10:51 10:51 11:42 12:31P 1:20 2:10 3:00 4:39 5:30 6:20	6:22A 7:07 7:53 8:40 9:26 10:14 11:00 11:52 12:40P 1:29 2:19 3:09 3:59 4:48 5:38 6:29	6:33A 7:19 8:05 8:55 9:40 10:28 11:15 12:05P 1:43 2:33 3:23 4:13 5:00 5:49 6:41
9:05 9:20 10:00	9:03 9:16 9:32 10:11	9:24 9:40 10:19	9:24 9:37 9:53 10:32	9:59 9:52 10:08 10:47	11:05 12:05P	11:16 12:16P	11:25 12:25P	10:35 11:35 12:35P	11:53 12:53P	6:00 6:45 7:45 	6:56 7:56 9:00	6:17 7:03 8:02 9:06	6:27 7:14 8:12 9:14	6:36 7:23 8:21 9:22	6:50 8:30	6:59 8:38	6:20 7:10 8:47	6:29 7:18 8:54	7:29
12:00 1:00 2:00 3:05 4:05 4:35 5:05 5:50 6:16 6:50 7:27 8:55 10:25	N 12:11P 1:12 2:12 5 2:45 3:13 3:47 4:20 4:48 5:20 6:04 6:04 6:04 6:04 7:02 7:37 9:06 10:35	12:19P 1:20 2:21 2:54 3:22 3:56 4:29 4:57 5:29 6:12 6:36 7:08 7:43 9:12 10:41	12:32P 1:33 2:35 3:08 3:36 4:10 4:43 5:11 5:43 6:23 6:47 7:19 7:54 9:23 10:52	12:46P 1:47 2:50 3:23 3:51 4:27 5:00 5:28 6:00 6:37 7:01 7:32 8:07 9:36 11:05	1:56 2:00 2:35 3:00 4:00 4:30 4:35 5:15 6:30 7:05 8:10 9:40	2:10 2:12 2:47 3:14 3:44 4:14 4:49 5:00 5:15 5:29 5:50 6:18 6:43 7:17 8:19 9:49	2:26 2:25 3:00 3:30 4:00 4:30 5:05 5:16 5:31 5:45 6:06 6:34 6:59 7:28 8:30 10:00	2:37 2:34 3:11 3:41 4:11 4:11 5:16 5:27 5:42 5:56 6:15 6:45 6:15 6:45 7:08 7:37 8:37 10:07	2:54 3:29 3:59 4:59 5:34 5:45 6:00 6:11 6:29 6:57 7:23 7:52 8:52 10:22	136 Leave Reading Depot 8:00A 9:30 11:00 12:30P 2:00 3:30 5:00 Saturd so that or 137 D so that	Arrive Wakefield Square 8:08A 9:38 11:09 12:40P 2:10 3:39 5:09 day and t a pass '. If nec	Inbound Arrive Franklir Square 8:14A 9:45 11:17 12:48P 2:18 3:46 5:16 Sunday enger c essary,	Arrive Oak Grove Station 8:26A 9:57 11:28 1:00P 2:28 3:56 5:26 trips are an always just stay o	Sur Arrive Malden 8:33A 10:05 11:38 1:11P 2:38 4:06 5:36	Leave Malden Station 8:45A 10:15 11:45 1:15P 2:45 4:15 in Wake her Rou us throu	Arrive Oak Grove Station 8:52A 10:23 11:53 1:24P 2:53 4:24 field, te 136 gh the	Outbound Arrive Franklin Square 9:01A 10:33 12:03P 1:33P 3:03 4:35 E All Fare Charlie Charlie Cash-c	Arrive Wakefield Square 9:09A 10:41 12:12P 1:42P 3:11 4:42 buses are eCard eTicket on-Board	Arrive Reading Depot 9:22A 10:55 12:25F 3:24 4:53 a access \$ access \$ 1.70 \$ 2.00 \$ 2.00
Route 137 indicated by shaded areas s - Does NOT run during school vacation Route 136/137 Reading Depot - Malden Center Station								Readi from a 9/ 11/26/2	ng end c a stop wh Fall 2 7/20: Sur 20, 12/25,	of the lin nich is o 2020 & V nday; 10/ /20, & 1/ ⁻	e if you n nly on Ro Vinter 2021 12/20 & 11/ I/21: Sun; 1,	eed to b oute 136 Holiday: 11/20: W /18/21 & :	ooard or or 137. s eekday 2/15/21: s	alight Sat	Senior. VALID PAS (530.00/m boat pass FREE FARE Access Che * Requi to stu are av www. ** Requi and p	ArrEventury Arrest Construction Arrest Constructi	\$2.00 \$0.85 \$0.00/mo.) TAP LinkPass and under ri rs ride free a arlieCard or participating to community thpass for de CharlieCard, abilities.		

sible to persons with disabilities

Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	\$1.70	\$1.70	\$2.40	\$2.40
CharlieTicket	\$2.00	\$2.00	\$2.90	\$4.90
Cash-on-Board	\$2.00	\$4.00	\$2.90	\$4.90
Student/Youth [,]	\$0.85	\$0.85	\$1.10	\$1.10
Senior/TAP**	\$0.85	\$0.85	\$1.10	\$1.10

b.); Local Bus (\$55/mo.); *Student/Youth LinkPass ss (\$30/mo.); and express bus, commuter rail, and

ride free when accompanied by an adult; Blind e and if using a guide, the guide rides free. r Youth CharlieCard. Student CharlieCards are available ng middle schools and high schools. Youth CharlieCards ty partners in the Boston metro area. Visit details. rd, available to Medicare cardholders, seniors 65+,

HAVERHILL LINE

Summer 2020 schedule, effective June 22, 2020

Monday to Friday

Inbound to Boston)(AM)					PM				
ZONE STATION	TRAIN #		200	7204	7206	288	7208	210	212	214	216	218	7292	7220	7222	224	226	228
Bikes Allowed			ණ්ත	56	56	676	56	56	5%	670	56	676	676	5%	56	56	676	676
7 Haverhill	1	в	5:05	6:00	6:51	-	7:50	9:05	10:49	12:05	2:00	3:25	-	4:47	6:03	7:45	9:10	10:50
7 Bradford	1	6	5:07	6:02	6:53	-	7:52	f 9:07	f 10:52	f 12:07	f 2:02	f 3:27	-	f 4:49	f 6:05	f 7:47	f 9:12	f 10:52
6 Lawrence	1	Ь	5:16	6:11	7:02	-	8:01	9:15	10:59	12:15	2:10	3:35	-	4:57	6:13	7:55	9:20	11:00
5 Andover	1	8	5:23	6:18	7:09	-	8:08	f 9:22	f 11:06	f 12:22	f 2:17	f 3:42	-	f 5:04	f 6:20	f 8:02	f 9:27	f 11:07
4 Ballardvale	1	6	5:29	6:24	7:15	-	8:14	f 9:27	f 11:11	f 12:27	f 2:22	f 3:47	-	f 5:09	f 6:25	f 8:07	f 9:32	f 11:12
3 North Wilming	ton		5:36	6:31	-	-	-	f 9:34	f 11:18	f 12:34	f 2:29	-	-	-	-	-	f 9:39	f 11:19
2 Reading	1	6	5:43	6:38	7:30	8:00	8:29	9:41	11:25	12:41	2:36	-	4:45	5:25	6:40	8:21	9:46	11:26
2 Wakefield			5:49	6:44	7:36	8:06	8:35	f 9:46	f 11:30	f 12:46	f 2:41	-	f 4:50	f 5:30	f 6:45	f 8:27	f 9:51	f 11:31
2 Greenwood			5:52	6:47	7:39	8:09	8:38	f 9:49	f 11:33	f 12:49	f 2:44	-	f 4:53	f 5:33	f 6:48	f 8:30	f 9:54	f 11:34
1 Melrose Highla	ands a	6	5:54	6:49	7:41	8:11	8:40	f 9:51	f 11:35	f 12:51	f 2:46	-	f 4:55	f 5:35	f 6:50	f 8:32	f 9:56	f 11:36
1 Melrose/Cedar	Park		5:56	6:51	7:43	8:13	8:42	f 9:53	f 11:37	f 12:53	f 2:48	-	f 4:56	f 5:36	f 6:51	f 8:34	f 9:58	f 11:38
1 Wyoming Hill			5:58	6:53	7:45	8:15	8:44	f 9:55	f 11:39	f 12:55	f 2:50	-	f 4:58	f 5:39	f 6:53	f 8:36	f 10:00	f 11:40
1A Malden Center	• 1	6	L 6:03	L 6:58	L 7:51	L 8:19	L 8:48	L 9:58	L 11:43	L 12:58	L 2:54	-	L 5:01	L 5:42	L 6:56	L 8:39	L 10:03	L 11:43
1A North Station	1	6	6:15	7:10	8:02	8:30	8:59	10:10	11:55	1:10	3:06	4:23	5:12	5:53	7:07	8:50	10:15	11:55
	Trains in purple box indicate peak period trains.																	

Monday to Friday

Outl	oound from Boston	\Box		A	M							PM						MA
ZON	STATION TRAIN	#	287	201	203	205	207	209	211	291	213	7215	7217	219	223	225	227	229
	Bikes Allowed		676	646	56	65	640	640	676	676	646	646	රේම	66	676	646	66	646
1A	North Station	\$	7:10	7:35	9:20	10:30	12:20	1:44	3:15	3:50	4:30	5:05	5:45	6:25	7:30	9:20	11:00	12:10
1A	Malden Center	\$	f 7:21	f 7:45	f 9:31	f 10:41	f 12:31	f 1:55	3:26	4:01	4:41	5:16	5:56	6:36	f 7:41	f 9:31	f 11:11	f 12:21
1	Wyoming Hill		f 7:24	f 7:49	f 9:34	f 10:44	f 12:34	f 1:58	3:30	4:05	4:45	5:20	6:00	6:40	f 7:44	f 9:34	f 11:14	f 12:24
1	Melrose/Cedar Park		f 7:26	f 7:51	f 9:36	f 10:46	f 12:36	f 2:00	3:32	4:07	4:47	5:22	6:02	6:42	f 7:46	f 9:36	f 11:16	f 12:26
1	Melrose Highlands	8	f 7:29	f 7:54	f 9:39	f 10:49	f 12:39	f 2:03	3:36	4:11	4:51	5:26	6:06	6:46	f 7:49	f 9:39	f 11:19	f 12:29
2	Greenwood		f 7:32	f 7:57	f 9:42	f 10:52	f 12:42	f 2:06	3:39	4:14	4:54	5:29	6:09	6:49	f 7:52	f 9:42	f 11:22	f 12:32
2	Wakefield		f 7:36	f 8:01	f 9:46	f 10:56	f 12:46	f 2:10	3:43	4:18	4:58	5:33	6:13	6:53	f 7:56	f 9:46	f 11:26	f 12:36
2	Reading	\$	7:42	8:07	9:52	11:02	12:52	2:16	3:49	4:24	5:04	5:39	6:19	6:59	8:02	9:52	11:32	12:42
3	North Wilmington		-	f 8:13	f 9:58	f 11:08	f 12:58	f 2:22	3:56	-	5:11	5:46	6:26	7:06	f 8:08	f 9:58	f 11:38	f 12:48
4	Ballardvale	\$	-	f 8:20	f 10:05	f 11:16	f 1:05	f 2:30	4:03	-	5:18	5:53	6:33	7:13	f 8:15	f 10:05	f 11:45	f 12:55
5	Andover	\$	-	f 8:25	f 10:10	f 11:21	f 1:10	f 2:35	4:09	-	5:24	5:59	6:39	7:19	f 8:20	f 10:10	f 11:50	f 1:00
6	Lawrence	8	-	8:32	10:17	11:28	1:17	2:42	4:16	-	5:31	6:06	6:46	7:26	8:28	10:17	11:57	1:07
7	Bradford	\$	-	L 8:41	L 10:26	L 11:38	L 1:27	L 2:54	L 4:26	-	L 5:42	L 6:17	L 6:57	L 7:37	L 8:39	L 10:26	L 12:06	L 1:16
7	Haverhill	\$	-	8:44	10:29	11:41	1:30	2:57	4:29	-	5:45	6:20	7:00	7:40	8:42	10:29	12:09	1:19
	Trains in purple box indicate peak period trains																	

Saturday & Sunday

Juiu	rady a sunday							Jan	iluay & Sulluay						
Inb	ound to Boston	A	N		P	м		Ou	tbound from Boston			м	PM		РМ
	SATURDAY TRAIN #	1200	1202	1204	1206	1208	1210		SATURDAY TRAIN #		1201	1203	1205	1207	1209
ZONE	STATION SUNDAY TRAIN #	2200	2202	2204	2206	2208	2210	ZONE	STATION SUNDAY TRAIN #		2201	2203	2205	2207	2209
	Bikes Allowed	රෑම	56	676	676	ණ	56		Bikes Allowed		රෑම	56	676	676	ණ
7	Haverhill	\$ 7:15	10:20	1:20	4:20	7:15	10:00	1A	North Station	\$	8:40	11:40	2:50	5:20	8:20
7	Bradford	\$ 7:18	10:23	1:23	4:23	7:18	10:03	1A	Malden Center	\$	8:50	11:50	3:00	5:30	8:30
6	Lawrence	\$ 7:27	10:32	1:32	4:32	7:27	10:12	1	Wyoming Hill		f 8:54	f 11:54	f 3:04	f 5:34	f 8:3
5	Andover	\$ 7:32	10:37	1:37	4:37	7:33	10:18	1	Melrose/Cedar Park		f 8:56	f 11:56	f 3:06	f 5:36	f 8:3
4	Ballardvale	\$ f 7:37	f 10:42	f 1:42	f 4:42	f 7:37	f 10:22	1	Melrose Highlands	\$	8:59	11:59	3:09	5:39	8:39
3	North Wilmington	f 7:44	f 10:49	f 1:49	f 4:49	f 7:44	f 10:29	2	Greenwood		f 9:02	f 12:02	f 3:12	f 5:42	f 8:4
2	Reading	\$ 7:50	10:56	1:56	4:55	7:50	10:35	2	Wakefield		9:05	12:05	3:15	5:45	8:45
2	Wakefield	7:55	11:01	2:01	5:00	7:55	10:40	2	Reading	\$	9:11	12:11	3:21	5:51	8:51
2	Greenwood	f 7:59	f 11:05	f 2:05	f 5:04	f 7:59	f 10:44	3	North Wilmington		f 9:17	f 12:17	f 3:27	f 5:57	f 8:5
1	Melrose Highlands	\$ 8:02	11:08	2:08	5:07	8:02	10:47	4	Ballardvale	\$	f 9:24	f 12:24	f 3:34	f 6:04	f 9:04
1	Melrose/Cedar Park	f 8:04	f 11:10	f 2:10	f 5:09	f 8:04	f 10:49	5	Andover	\$	9:29	12:29	3:39	6:09	9:09
1	Wyoming Hill	f 8:06	f 11:12	f 2:12	f 5:11	f 8:06	f 10:51	6	Lawrence	\$	9:36	12:36	3:46	6:16	9:16
1A	Malden Center	\$ L 8:10	L 11:16	L 2:16	L 5:15	L 8:10	L 10:55	7	Bradford	B	L 9:46	L 12:46	L 3:56	L 6:26	L 9:2
								_							

Keep in Mind:

This schedule will be effective from June 22, 2020 and will replace the schedule of October 21, 2019.

Presidents' Day and 4th of July operate on a Saturday service schedule.

New Year's Day, Memorial Day, Labor Day, Thanksgiving Day, and Christmas Day operate on a Sunday service schedule.

For all other holiday schedules, please check MBTA.com/holidays or call 617-222-3200.

For the latest information regarding weekend disruptions, visit MBTA.com/weekend.

Via Lowell Line: Operates via the Lowell Line between Wilmington and North Station. See the Lowell Line schedule for all stops.

Times in purple with "f" indicate a flag stop: Passengers must tell the conductor that they wish to leave. Passengers waiting to board must be visible on the platform for the train to stop.

Times in blue indicate an early departure (L stop): The train may leave ahead of schedule at these stops.

Bikes: Bicycles are allowed on trains with the bicycle symbol shown below the train number.

High level platform and bridge plate available. Visit mbta.com/accessibility for more information.

Saturday & Sunday

		AN	n	FM					
ZONE	SATURDAY TRAIN # STATION SUNDAY TRAIN #	1200 2200	1202 2202	1204 2204	1206 2206	1208 2208	1210 2210		
	Bikes Allowed	56	676	676	676	676	5%		
7	Haverhill	\$ 7:15	10:20	1:20	4:20	7:15	10:00		
7	Bradford	\$ 7:18	10:23	1:23	4:23	7:18	10:03		
6	Lawrence	\$ 7:27	10:32	1:32	4:32	7:27	10:12		
5	Andover	\$ 7:32	10:37	1:37	4:37	7:33	10:18		
4	Ballardvale	\$ f 7:37	f 10:42	f 1:42	f 4:42	f 7:37	f 10:22		
3	North Wilmington	f 7:44	f 10:49	f 1:49	f 4:49	f 7:44	f 10:29		
2	Reading	\$ 7:50	10:56	1:56	4:55	7:50	10:35		
2	Wakefield	7:55	11:01	2:01	5:00	7:55	10:40		
2	Greenwood	f 7:59	f 11:05	f 2:05	f 5:04	f 7:59	f 10:44		
1	Melrose Highlands	\$ 8:02	11:08	2:08	5:07	8:02	10:47		
1	Melrose/Cedar Park	f 8:04	f 11:10	f 2:10	f 5:09	f 8:04	f 10:49		
1	Wyoming Hill	f 8:06	f 11:12	f 2:12	f 5:11	f 8:06	f 10:51		
1A	Malden Center	\$ L 8:10	L 11:16	L 2:16	L 5:15	L 8:10	L 10:55		
1A	North Station	\$ 8:21	11:27	2:27	5:26	8:21	11:06		

ZONE	STATION SUNDAY TRAIN #		2201	2203	2205	2207	2209	2211
	Bikes Allowed		රෑම	ණ්	రార్	676	ණ්ත	රෑම
1A	North Station	b	8:40	11:40	2:50	5:20	8:20	11:30
1A	Malden Center	b	8:50	11:50	3:00	5:30	8:30	11:40
1	Wyoming Hill		f 8:54	f 11:54	f 3:04	f 5:34	f 8:34	f 11:44
1	Melrose/Cedar Park		f 8:56	f 11:56	f 3:06	f 5:36	f 8:36	f 11:46
1	Melrose Highlands	\$	8:59	11:59	3:09	5:39	8:39	11:49
2	Greenwood		f 9:02	f 12:02	f 3:12	f 5:42	f 8:42	f 11:52
2	Wakefield		9:05	12:05	3:15	5:45	8:45	11:55
2	Reading	b	9:11	12:11	3:21	5:51	8:51	12:01
3	North Wilmington		f 9:17	f 12:17	f 3:27	f 5:57	f 8:57	f 12:07
4	Ballardvale	\$	f 9:24	f 12:24	f 3:34	f 6:04	f 9:04	f 12:14
5	Andover	\$	9:29	12:29	3:39	6:09	9:09	12:19
6	Lawrence	\$	9:36	12:36	3:46	6:16	9:16	12:26
7	Bradford	b	L 9:46	L 12:46	L 3:56	L 6:26	L 9:26	L 12:36
7	Haverhill	b	9:49	12:49	3:59	6:29	9:29	12:39
						-		

Buy tickets with

0

mTicket

Wash hands before

Follow

@MBTA_CR









mbta.com/ridesafer



Face coverings

are required

Download the **Commuter Rail App**

and after riding

1211

TRIP-GENERATION CALCULATIONS

Institute of Transportation Engineers (ITE) *Trip Generation, 10*th Edition Land Use Code (LUC) 911 - Walk-In Bank

Average Vehicle Trips Ends vs:1,000 Square Feet Gross Floor AreaIndependent Variable (X):2.500									
AVERAGE WEEKDAY DAILYITE LUC 911 Weekday Daily Trip RateITE LUC 911 Weekday Evening Trip RateITE LUC 911 Weekday Evening Trip Rate									
$\frac{(Y)}{12.13} = \frac{100.030}{20.45} \qquad Y = 59.33$									
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$									
WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFICITE LUC 911 Weekday Morning Trip Rate=ITE LUC 912 Weekday Morning Trip RateITE LUC 911 Weekday Evening Trip Rate=ITE LUC 912 Weekday Evening Trip Rate									
$\frac{(Y)}{12.13} = \frac{9.5}{20.45} \qquad Y = 5.63$									
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$									
WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC									

T = 12.13 * (X)			
T = 12.13 *	2.500		
T = 30.33			
T = 30	vehicle trips		
with 44% (13 vph) entering and 56% (17	vph) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

ITE LUC 911 Saturday Midday Trip Rate	= ITE LUC 912 Saturday Midday Trip Rate
ITE LUC 911 Weekday Evening Trip Rate	ITE LUC 912 Weekday Evening Trip Rate
<u>(Y)</u> 12.13	$= \frac{26.35}{20.45} \qquad Y = 15.63$
T = Y * 2.500	
T = 39.07	
T = 39 vehicle tri	ps
with 51% (20 v	vph) entering and 49% (19 vph) exiting.

Drive-in Bank (912)

Vehicle Trip Ends vs: Drive-In Lanes On a: Weekday

Setting/Location: General Urban/Suburban

Number of Studies: 20 Avg. Num. of Drive-In Lanes: 5 Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
124.76	38.36 - 314.25	77.44



Drive-in Bank (912)								
Vehicle Trip Ends vs: On a:	Drive-In Lanes Weekday,							
	Peak Hour of Adjacent Street Traffic,							
	One Hour Between 7 and 9 a.m.							
Setting/Location:	General Urban/Suburban							
Number of Studies:	36							
Avg. Num. of Drive-In Lanes:	5							
Directional Distribution:	61% entering, 39% exiting							

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
8.83	0.55 - 45.00	5.55



Drive-in Bank (912)						
Vehicle Trip Ends vs: On a:	Drive-In Lanes Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 n m					
Setting/Location:	General Urban/Suburban					
Number of Studies:	108					
Avg. Num. of Drive-In Lanes:	3					
Directional Distribution:	49% entering, 51% exiting					

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
27.15	3.00 - 176.00	22.14



Drive-in Bank (912)

Vehicle Trip Ends vs: Drive-In Lanes On a: Saturday, Peak Hour of Generator

Setting/Location: General Urban/Suburban Number of Studies: 31

Avg. Num. of Drive-In Lanes: 3 Directional Distribution: 49% entering, 51% exiting

Vehicle Trip Generation per Drive-In Lane

Average Rate	Range of Rates	Standard Deviation
27.67	7.60 - 107.00	17.13



QUEUE ANALYSIS CALCUALTIONS

Bank Development - Wakefield, MA Vehicle Queue Calculations - Teller Lane Saturday Midday Peak Hour

Teller Lane Arrival Rate $(\lambda) =$ 14.0veh/hrService Rate =2.0min/veh

Maximum Service Flow Rate at 2.0 min/veh, (μ) = 30 veh/hr

$$\rho = \frac{\lambda}{\mu} = \frac{14.0}{30.0} = 0.47$$

50th Percentile Vehicle Queue 1 Vehicle

95th Percentile Vehicle Queue 2 to 3 Vehicles

Vehicle Queue	Teller Lane Vehicle Queue Prob	ability	Cumulative Probability
duodo		<u>ability</u>	
0	$p\{0\} = 1 - \rho =$	0.533	0.533
1	$p\{1\} = p\{0\} + \rho^2 =$	0.249	0.782
2	$p\{2\} = p\{0\} p =$	0.110	0.898
3 4	$p{3} = p{0} p{-}$ $p{4} = p{0} * p^{*} =$	0.034	0.953
5	$p{5} = p{0} * \rho^{5} =$	0.012	0.990
6	$p{6} = p{0} * \rho^{6} =$	0.006	0.995
7	$p{7} = p{0} * \rho^7 =$	0.003	0.998
8	p{8} = p{0} * ρ ⁸ =	0.001	0.999
9	p{9} = p{0} * ρ ⁹ =	0.001	1.000
10	p{10} = p{0} * ρ ¹⁰ =	0.000	1.000
11	p{11} = p{0} * ρ ¹¹ =	0.000	1.000
12	p{12} = p{0} * ρ ¹² =	0.000	1.000
13	p{13} = p{0} * ρ ¹³ =	0.000	1.000
14	p{14} = p{0} * ρ ¹⁴ =	0.000	1.000
15	p{15} = p{0} * ρ ¹⁵ =	0.000	1.000
16	p{16} = p{0} * ρ ¹⁶ =	0.000	1.000
17	$p{17} = p{0} * \rho^{17} =$	0.000	1.000
18	p{18} = p{0} * ρ ¹⁸ =	0.000	1.000
19	p{19} = p{0} * ρ ¹⁹ =	0.000	1.000
20	p{20} = p{0} * ρ ²⁰ =	0.000	1.000
21	p{21} = p{0} * ρ ²¹ =	0.000	1.000
22	$p{22} = p{0} * \rho^{22} =$	0.000	1.000
23	$p{23} = p{0} * \rho^{23} =$	0.000	1.000
24	p{24} = p{0} * ρ ²⁴ =	0.000	1.000
25	p{25} = p{0} * ρ ²⁵ =	0.000	1.000
26	p{26} = p{0} * p ²⁶ =	0.000	1.000
27	p{27} = p{0} * ρ ²⁷ =	0.000	1.000
28	p{28} = p{0} * ρ ²⁸ =	0.000	1.000
29	p{29} = p{0} * ρ ²⁹ =	0.000	1.000
30	p{30} = p{0} * ρ ³⁰ =	0.000	1.000
31	p{31} = p{0} * p ³¹ =	0.000	1.000
32	p{32} = p{0} * ρ ³² =	0.000	1.000
33	p{33} = p{0} * ρ ³³ =	0.000	1.000
34	p{34} = p{0} * ρ ³⁴ =	0.000	1.000
35	p{35} = p{0} * p ³⁵ =	0.000	1.000

Average Vehicle Queue for Teller Lane = <u>1 Vehicle</u>

95th Percentile Vehicle Queue for Teller Lane = <u>3 Vehicles</u>

MEMORANDUM

TO:	Mr. Robert Santonelli 1155 Main Street Lynnfield, MA 01940	FROM:	Scott W. Thornton, P.E. and Rana Eslamifard Vanasse & Associates, Inc. 35 New England Business Center Drive Suite 140 Andover, MA 01810-1066 (978) 474-8800
DATE:	January 19, 2021	RE:	VAI Job No. 8741
SUBJECT:	Proposed Bank Development – 500 Ma Wakefield, Massachusetts	in Street	

Vanasse & Associates, Inc. (VAI) has conducted a Traffic Assessment to identify the anticipated traffic levels associated with the proposed redevelopment of an existing commercial site located at 500 Main Street in Wakefield, Massachusetts. The project entails the redevelopment of the site to accommodate a proposed bank with a separate drive-through automated teller machine (ATM). This assessment evaluates the following specific areas as they relate to the Project: i) trip-generation calculations; ii) access/egress requirements; and iii) queue analyses.

PROJECT DESCRIPTION

The Project entails the redevelopment of an existing commercial site that currently houses a vacant building. As part of the development program the existing building would be razed and a new $2,500\pm$ sf bank with a drive-through ATM would be constructed. The bank would provide indoor teller service only, while the ATM would be the only drive-through service and would provide one lane for vehicles. Access to the project site will be provided via one (1) driveway located on the north side of Richardson Street approximately 65 feet east of Main Street intended as a one-way entrance and two (2) new driveways located on the east side of Main Street approximately 103 and 171 feet north of Richardson Street intended as one full access and one exit-only driveways, respectively. As part of the site redevelopment the existing driveway would be reconstructed to accommodate the Project.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions on the study area roadways was conducted in September 2020. The field investigation consisted of an inventory of existing roadway geometrics and operating characteristics as well as public transportation and land use information within the study area. The following summarizes the existing conditions within the study area.

Roadways

Main Street

Within the study area, Main Street is a two-lane urban principal arterial under Town jurisdiction that traverses the study area in a general north-south direction providing additional turning lane at the major intersections. Main Street provides two 10 to 22-foot wide travel lanes separated by a double-yellow centerline. On-street parking is provided on both sides of the street, and illumination is provided on Main Street within the study area. The posted speed limit is 20 and 30 miles per hour (mph) on Main Street within the study area and land use consists of the Project site and commercial properties. Sidewalks are provided on both sides of Main Street.

Richardson Street

Richardson Street is a two-lane local roadway that is under Town jurisdiction that traverses the study area in a general east-west direction. Richardson Street provides a 42-foot wide travel way with no pavement markings. There is no posted speed limit on Richardson Street and land use consists of the Project site and residential and commercial properties within the study area. Sidewalks are provided on both sides of the roadway in the vicinity of the Project site.

Pedestrian and Bicycle Accommodations

Sidewalks are generally provided on both sides of Main and Richardson Street within the Project site with painted crosswalks across Richardson Street. Bicycle facilities were not provided in the vicinity of the Project site; however, study area roadways provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travel-way configuration (i.e., motor vehicles and bicyclists sharing the roadway).¹

Public Transportation

Public transportation services are provided in the vicinity of the Project site by the Massachusetts Bay Transportation Authority (MBTA) (fixed-route bus and commuter rail services) on Main Street by way of MBTA bus Routes 136 (Reading Depot to Malden Center Station) and 137 (Reading Depot to Malden Center Station). In addition, Wakefield Station on the Haverhill Line of the MBTA commuter rail system is located approximately 0.4-mile distance (an approximate 8-minute walking distance) from the Project site.

The public transportation schedules and fare information are provided in the attachments. The service schedules may reflect reduced operations due to COVID-19 restrictions.

PROJECT-GENERATED TRAFFIC

The project includes the construction of an approximate $2,500\pm$ sf bank that will provide a separate drivethrough ATM. In order to develop the traffic characteristics of the proposed project, trip-generation statistics published by the Institute of Transportation Engineers (ITE)² for LUC 911, *Walk-In Bank* and LUC 912, *Drive-In Bank* were utilized. These land use codes represent the most appropriate categories for

¹A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared traveledway condition.

²Trip Generation Manual, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

the proposed development. The trip generation projections were adjusted to reflect the fact that a significant percentage of Project-related traffic will be comprised of pass-by trips that are new to the site but already traveling along the Main Street corridor. Based on a review of ITE data, approximately 29 to 38 percent of bank-related traffic activity is drawn from traffic already passing the site. To reflect this, the trip generation estimates were adjusted to include a 29 percent pass-by reduction on a daily basis for weekdays, weekday mornings, and Saturdays, with a 35 percent and 38 percent pass-by rate applied to the weekday evening and Saturday midday peak hours, respectively. The trip generation estimates are summarized in Table 1.

Time Period/Direction	Walk-In Bank Total Trips ^a	Pass-By Trips ^b	Net Trips	Drive-In Bank (One Drive-Up Lane) ^c	Total New Trips
Weekday Daily:	148	-44	104	126	230
Weekday Morning: Entering <u>Exiting</u> Total	7 <u>7</u> 14	-2 -2 -4	5 _ <u>5</u> 10	5 <u>4</u> 9	$\frac{10}{\frac{9}{19}}$
Weekday Evening: Entering <u>Exiting</u> Total	$\frac{13}{17}$	-6 <u>-6</u> -12	$\frac{7}{11}$ 18	13 <u>14</u> 27	20 <u>25</u> 45
Saturday Daily ^d :	148	-44	104	126	230
Saturday Midday: Entering <u>Exiting</u> Total	20 <u>19</u> 39	-8 <u>-8</u> -16	12 <u>11</u> 23	14 <u>14</u> 28	26 <u>25</u> 51

Table 1TRIP GENERATION SUMMARY

^aBased on ITE LUC 911, Walk-In Bank; 2,500 sf.

^bPass-by trips: weekday daily, weekday morning peak-hour and Saturday Daily = 29 percent; weekday evening peak-hour = 35 percent; and Saturday midday peak-hour = 38 percent

^cBased on ITE LUC 912, Drive-In Bank; one (1) Drive-up Lane.

^dNote: No Saturday daily data available from ITE; therefore estimates based on weekday daily totals.

Project-Generated Traffic Volume Summary

As can be seen in Table 1, after applying reductions to account for pass-by trips, the project is expected to generate approximately 230 new vehicle trips on an average weekday (115 entering and 115 exiting), with approximately 19 new vehicle trips (10 entering and 9 exiting) expected during the weekday morning peak hour and approximately 45 new vehicle trips (20 entering and 25 exiting) expected during the weekday evening peak hour. On a typical Saturday, the project is expected to generate approximately 230 new vehicle trips (115 entering and 115 exiting) with approximately 51 new vehicle trips (26 entering and 25 exiting) expected during the Saturday midday peak hour.

QUEUE ANALYSIS

As proposed, the Project will entail the construction of a bank with one ATM drive-through window that would be located along the east side of the building with an adjacent queue by-pass lane. This configuration is necessary to separate the drive-through facilities and the bypass and entrance lane. The following provides vehicle queue projections bank drive-through operations.

The bank component of the Project will include one (1) drive-through lane as described above. In order to assess the adequacy of the vehicle queue storage for the proposed drive-through facility, a statistical analysis of vehicle queuing was completed. This analysis was based on proprietary data collected by VAI at existing similar branch banks with drive-through window facilities similar to those of the proposed bank. The data that was collected consisted of observations of drive-through lane utilization and service times during both the weekday evening and Saturday midday peak hours.

Based on these observations it was determined that, average transaction times in the drive-through facility ranged from 1.5 to 3 minutes per vehicle, with the lower value (1.5 minutes) observed at the ATM or when a 2-transaction limit was imposed. For the purpose of this analysis, the higher observed 2-minute transaction time was applied to provide a conservative analysis.

As presented in Table 1, the largest number of vehicles expected to be entering the proposed bank will occur during the Saturday midday peak-hour (14 vehicles entering). Given that the ATM facility provides one (1) lane, assuming random arrivals and a service flow rate of 2 minutes per transaction during the hour results in a theoretical average vehicle queue of 1 vehicle and a 95th percentile (or maximum) vehicle queue of three (3) vehicles.³ The drive-through facility can accommodate 4 vehicles in the ATM lane without extending onto Richardson Street.

RECOMMENDATIONS

The following recommendations are offered with respect to the design and operation of the Project site access and internal circulations:

- The Project site driveways should be a minimum of 24-feet in width and designed to accommodate two-way travel and a minimum of 21-feet in width for one-way travel.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOPline provided.
- "One Way" and "Do Not Enter" signs should be provided to regulate the one-way flow for the drive-through lane.
- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).⁴
- Americans with Disabilities Act (ADA) compliant wheelchair ramps should be provided at all pedestrian crossings internal to the Project site and for crossing the Project site driveways.
- Signs and landscaping to be installed as a part of the Project within the intersection sight triangle areas of the Project site roadway should be designed and maintained so as not to restrict lines of sight.

³ Transportation Engineering and Planning-Probability, Queuing, and Simulation Models; C.S. Papacostas and P.D. Prevedouros. ⁴Manual on Uniform Traffic Control Devices (MUTCD); Federal Highway Administration; Washington, D.C.; 2009.

Snow windrows within sight triangle areas of the Project site roadway should be promptly removed where such accumulations would impede sight lines.

CONCLUSIONS

VAI has conducted a traffic assessment in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a $2,500\pm$ sf bank at 500 Main Street in Wakefield, Massachusetts. Access to the project site will be provided via one (1) existing driveway located on north side of Richardson Street approximately 65 feet east of Main Street to be served as a one-way entrance and two (2) new driveways located on east side of Main Street approximately 103 and 171 feet north of Richardson Street to be served as full access and exit-only driveways, respectively. Based on this assessment, we have concluded the following with respect to the Project:

- Using trip-generation statistics published by the ITE⁵, after applying reduction to account for passby trips, the project is expected to generate approximately 230 new vehicle trips on an average weekday (115 entering and 115 exiting), with approximately 19 new vehicle trips (10 entering and 9 exiting) expected during the weekday morning peak hour and approximately 45 new vehicle trips (20 entering and 25 exiting) expected during the weekday evening peak hour. On a typical Saturday, the project is expected to generate approximately 230 new vehicle trips (115 entering and 115 exiting) with approximately 51 new vehicle trips (26 entering and 25 exiting) expected during the Saturday midday peak hour.
- 2. When distributed over the peak-hour, the predicted trips generated by the Project would not result in a significant impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.
- 3. The drive-through design can accommodate the expected average and maximum queues without impeding access to parking or internal circulation or movements along Richardson Street.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the identified recommendations for the site.

⁵Ibid 2.

GENERAL	NOTES
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1. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ALL PERMITS REQUIRED FOR THIS PROJECT. 2. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR MEANS, METHODS,

TECHNIQUES, SEQUENCING, SCHEDULING AND SAFETY FOR THIS PROJECT.

3. ALL WORK SHALL BE PERFORMED IN CONFORMANCE TO THE MASSACHUSETTS STATE BUILDING CODE AND ALL OTHER APPLICABLE CODES AND LAWS.

4. THE CONTRACTOR SHALL VISIT THE SITE AND BE THOROUGHLY AQUATINTED WITH THE PROJECT PRIOR TO SUBMITTING A PRICE. ADDITIONAL MONEY WILL NOT BE GRANTED FOR WORK NOT CLARIFIED PRIOR TO BIDDING.

5. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES BETWEEN DRAWINGS SPECIFICATIONS OR FIELD CONDITIONS TO THE ARCHITECT IMMEDIATELY.

6. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY WORK DAMAGED BY HIS FORCES WHILE PERFORMING THIS CONTRACT. 7. THE CONTRACTOR SHALL WARRANTEE HIS WORK FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL COMPLETION.

ZONING SUMMARY ARTICLE VI Bus SUBDISTRICT

DWELLING	MIN. LOT SIZE	MIN. LOT AREA PER UNIT	TOTAL LOT SIZE	LOT WIDTH	FAR	BLDG. HEIGHT	<u>OPEN</u>
REQUIRED BY ZONING	4000	1200 PER UNIT	4000	180	1.5	5 stories $50' \pm$	30
PROPOSED PROJECT <u>PARKING REQUIREMENT</u> RESIDENTIAL USE: 1.5 SP.	NA ACE PER UI	1/1119 NIT	8957 S.F. violation	70' violation	11219/8957 1.25	3 stories 33'-6"±	VIOLA
REQUIRED 12 SPACE PROPOSED 16 SPACE	s s		<u>USE SU</u> MULTI	<u>JMMARY:</u> FAMILY			<u>over</u> Noni

NOTE: THERE HAS BEEN NO SOIL TESTING PROVIDED TO THIS OFFICE FOR THIS PROJECT. THE SOIL BEARING CAPACITY OF THIS FOUNDATION SYSTEM AS DESIGNED IS BASED ON A 2 TON MINIMUM SOIL BEARING CAPACITY. SOIL BORINGS SHOULD BE PERFORMED TO VERIFY THAT THE MINIMUM DESIGN BEARING CAPACITIES ARE ACHIEVABLE. IF A SUITABLE SOIL THAT CAN NOT WITHSTAND A 2 TON BEARING CAPACITY IS NOT AVAILABLE, THAN THIS OFFICE SHOULD BE CONTACTED BY THE CONTRACTOR OR OWNER FOR A FOUNDATION REDESIGN.





WAK MASSA



POSED FANCLY ELL STREET EFIELD, CHUSETTS	PROPOSED MULTIFAMILY 404 LOWELL STREET WAKEFIELD, MA
	No. Revision Date 02-12-2019 04-02-2019 04-02-2019 02-17-2021
CODE SUMMARY PROP TYPE 5A CONSTRUCTION PROP 3 STORIES PROP R-2 USE GROUP (MULTI) PROP FULLY SPRINKLED NFPA 13 STANDPIPE SYSTEM PER WFD CLASS 1 PROP FULL FIRE ALARM SYSTEM	Project No: 18223 Scale: AS NOTED Date: 10-11-2018 Drawing Name COVER SHEET



PROPOSED **GUARD RAIL**

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		Boxwood		Buxus Sempervirens		24-30"		}
		Spreading Yew		Taxus Media Densiformis		5 Gal	S	
		Climbing Hydranger		Hydrangea Petiolaris		1 Gal	5	
		IVULY HAIO DOgWOOQ	+	Comus Ana Ivory Halo		IBD C		
	PERENNIALS							
		Lilyturf		Lirope Muscari Variegata		1 Gal	46	
		Daylily		Hemorocallis Stella D Oro		1 Gal	<u> </u>	

LANDSCAPING SHALL HAVE AN AUTOMATIC IRRIGATION SYSTEM THROUGHOUT THE SITE













A DOOR S hd NEI 8'-2" 8'-2" VARIES 8'-2" VARIES 8'-2" NOOWS WITH SILL N 6' UP FROM THE TROL DEVISES THA R LIGHT	CHEDULE # DED SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIZE SIES THAN 3' ABE SIZE SIESS THAN 3' ABE SIZE SIENC SIZE SIESS THAN 3' ABE SIZE SIZE SIENC SIZE SIENC SIZE SIENC SIESTHAN 3' ABE SIZE SIENC SIES SIESTHAN 3' ABE SIENC SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIES SIE	E REMARKS 2"H DOUBLE HUNG VINYL CLAD W/ FALL PROTECTI 3"H AWNING VINYL CLAD BT=TEMP 2"H DOUBLE HUNG VINYL CLAD BT=TEMP 2"H DOUBLE HUNG VINYL CLAD W/ FALL PROTECTI 5"H FIXED VINYL CLAD TEMP 5"H CASEMENT VINYL CLAD TEMP 6"H WOOD ENTRY DOOR-W 16" TRANSOM AND 36" 02"H ALUM / GLASS GARAGE DOOR - TEMP 4"H FIBERGLASS SINGLE PANEL 5"H PATIO ALUM CLAD W SCREENS-TEMP OVE THE FLOOR SHALL HAVE IM F2090	CTION DEVICE 36" SI-AIL TEMP WAKEFIELD, MA MAKEFIELD, MA
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		 AZEK TRIM BOARD PAINTED ARCTIC WHITE BOX GUTTER METAL-WHITE AZEK TRIM BOARD PAINTED ARCTIC WHITE PELLA 250 WINDOWS WHITE FINISH FIBER CEMENT SIDING SMOOTH FINISH 7" REVEAL HARDIE BOOTHBAY BLUE FIBER CEMENT PANEL HARDIE ARCTIC WHITE REGLETS AND SCREWS TO BE COLOR MATCHED WRAP CORNER 	Project No: 18223 Scale: AS NOTED Date: 10-11-2018 Drawn By: SL Drawing Name PROPOSED ELEVATION DETAILS Sheet No.































REAR ELEVATION OPTION B ALL PANEL

-OF	VDED APPL	ICATIONS				
MA	XIMUM UNIF <i>O</i> F	RM SIDE LOAD	(PLF)			
211 DIA, THROUGH BOLT (1)			5/8" DIA. 1HROUGH BOLT(1)			
	2 ROWS @ 12'' 0.C.	2 ROWS @ 6'' 0.C.	2 ROWS @ 24'' 0.C.	2 ROWS @ 12'' 0.C.	2 ROW5 @ 6'' 0,C,	
2ED	STAGGERED	STAGGERED	STAGGERED	STAGGERED	STAGGERED	
jA-LA	M (DEPTHS C) F 18'' AND LE	55)		I	
	1010	2020	560	20	2020	
	755	1515	420	840	1685	
	670	1345	370	745	1495	
3-1	/ 311 VERSA-L	AM				
	1715	N/ A	25	2250	N/ A	
VER	5A-LAM (DEP1	1HS OF 24'')				
211 DIA, THROUGH BOLT (1)			5/8" DIA, 14ROUGH BOLT(1)			
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	1010	1515	840	1120	1685	
	755	35	630	840	1260	
	670	1010	560	745	1120	
5ME ST E BETW AT LEA	'ANDARD B18.21-1981 EEN 1HE WOOD AND ST 2'' FOR 1/ 2'' BOI	(ASTM A307 GRADE THE BOLT HHEAD AND LTS AND 2-1/211 FO	:5 A&B SAE J429 GR/ 2 BETWEEN THE WOO R 5/ 8'' BOLTS, BOL	DES I OR 2, OR D AND THE NUT, THE T HOLES SHALL BE		
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VS 16d BOX/SINKER NAILS @ 1211 O.C.					DO PLF	
VS 16d BOX/ SINKER NAILS @ 1211 O.C.					800 PLF	
VS 16d BOX/ SINKER NAILS @ 1211 O.C.					DO PLF	
VS 16d BOX/ SINKER NAILS @ 1211 O.C.					50 PLF	
VS 16d BOX/ SINKER NAILS @ 1211 O.C.					DO PLF	





BUILDING ELEMENT	NAIL SIZE AND TYPE	NUMBER AND LOCATION
STUD TO SOLE PLATE	80 COMMON	4 TOE-NAIL OR 2 DIRECT-NAIL
STUD TO CAP PLATE	160 COMMON	2 TOE-NAIL OR 2 DIRECT-NAIL
POUBLE STUPS	IOP COMMON	1211 O.C. DIRECT
CORNER STUDS	1612 C.O.MMON	24" OC DIRECT
SOLE PLATE 10, 10151 OR BLOCKING		16 ¹¹ O.C.
DOI BLE CAP PLATE		
CAP PLATE LAPS		2 DIRECT-NAIL.
PIBBON STRIP 6" OP LESS		2 FACH DIDECT BEADING
		3 FACH DIDECT BEADING
	80 COMMON	
ROUF RAFIER TO PLATE		
JACK RAFTER TO KIDDE		2 TOE-NAIL OR DIRECT-NAIL
JACK RAFTER TO PIIP	IGD COMMON	9 TUE-WAIL UR Z DIRECT-WAIL
FLOOR JOISTS TO STUDS	IOD COMMON	5 DIRECT OR 3 DIRECT
(NO CEILING JOISTS)	IOP COMMON	
(W17H CEILING JOISTS)	IOD COMMON	
FLOOR JOISTS TO SILL OR GIRDER	3D COMMON	3 TOE-NAIL
LEDGER STRIP	16D COMMON	3 EACH DIRECT
CEILING JOISTS TO PLATE	160 COMMON	3 TOE-NAIL
CEILING JOISTS (LAPS OVER PARTITION)	IOD COMMON	3 DIRECT-NAIL
CEILING JOISTS (PARALLEL TO RAFTER)	IOP COMMON	3 DIRECT
COLLAR BEAM	IOP COMMON	3 DIRECT
BRIDGING TO JOISTS	82 COMMON	2 EACH DIRECT END
PLAGONAL BRACE (172 STUD AND PLATE)	8p common	2 EACH DIDECT BEADING
TAIL BEAMS TO HEADERS	202 COMMON	I EACH END 4 50, FT, FLOOR AREA
(WHEN NAILING PERMITTED)		
HEADER BEAMS TO TRIMMERS	200 COMMON	I EACH END 8 SQ. FT. FLOOR AREA
I'' ROOF DECKING	8P COMMON 8P COMMON	2 EACH DIRECT RAFTER
(UVER 6" IN WILLIN)		2 EACH DIRECT DIST
Z DUPLOVING		
		Z EACH DIRECT STUD
	OF COMMON	
(1/2" OR LESS)	6D COMMON	6" O.C. DIRECT EDGES & 12" O.C. INTERMEDIATE
(5/8" OR GREATER)	80 COMMON	6" O.C. DIRECT EDGES & 12" O.C. INTERMEDIATE
(57 16'', 57 6'', UK 17 2'')	16 GAUGE GALVANIZED WIRE STAPLES, 37 8" MINIMUM CROWN; LENGTH OF 1" PLUS	
(OVER 6'' IN WIDTH)	PLYWOOD THICKNESS SAME AS IMMEDIATELY ABOVE	4" O.C. EDGES & 8" O.C. INTERMEDIATE 2.1/2" O.C. EDGES & 5" O.C. INTERMEDIATE
PLWOOD SUBFLOORING		
(1/2")	6D COMMON OR 6D ANNULAR OR SPIRAL THREAD	6" O.C. PIRECT EDGES & IO" O.C. INTERMEDIATE
(", /8")	100 COMMON OR 80 RING SHANK OR 80	6" O.C. DIRECT EDGES & 6" O.C. INTERMEDIATE
(1/2")	ANNULAR OR SPIRAL THREAD 1612 GALVANIZED WIRE STAPLES	4" O.C. EDGES & 7" O.C. INTERMEDIATE
(3/8")	3/8" MINIMUM CROWN; 13/8' LENGTH	21/2" O.C. EDGES & 4" O.C. INTERMEDIATE
BUILT-UP GIRDERS AND BEAMS	20P COMMON	32" O.C. DIRECT
CONTINUOUS HEADER TO STUD	8p common	4 TOE-NAIL
CONTINUOUS HEADER, TWO PIECES	IGD COMMON	1611 O.C. DIRECT
1/2" FIBER BOARD SHEATHING	11/2" GALVANIZED ROOFING NAIL OR 16 GAUGE STAPLE, 11/2" LONG WITH MIN, CROWN OF 7/16"	3" O.C. EXTERIOR EDGE 6" O.C. INTERMEDIATE
25/3211 FIBER BOARD SHEATHING	1 3/ 4" GALVANIZED ROOFING NAIL OR 8D COMMON	3" O.C. EXTERIOR EDGE 6" O.C. INTERMEDIATE
	MIN. CROWN OF 7/16"	
GYPSUM SHEATHING	12 GAUGE 3/4" LARGE HEAD CORROSION- RESISTANT	4" O.C. EDGE 8" O.C. INTERMEDIATE
PARTICLE BOARD UNDERLAYMENT (1/4"-3/4")	6D ANNULAR THREADED	6" O.C. DIRECT EDGES IO" O.C. INTERMEDIATE
PARTICLE BOARD ROOF AND WALL SHEATHING 1/211 OR LESS	60 COMMON 611 0.C. DIRECT EDGES 1211 0.C.	
5/8" OR GREATER	8p common	6" O.C. DIRECT EDGES 12" O.C. INTERMEDIATE
PARTICLE BOARD SUBFLOORING	80 COMMON 6" O.C. DIRECT EDGES 12" O.C.	
SHINDI FS WOOD*	NO 14 B&S GAGE CODDOGIONI DEGISTIVE	2 FACH BEADINIC
MEATLED BOADDINK		
WEATHER BOARDING 8D CORROSION		2 UNUTI VUTINIINU



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NOTE *: SHINGLE NAILS SHALL PENETRATE NOT LESS THAN 3/4" INTO NAILING STRIPS, SHEATHING OR SUPPORTING CONSTRUCTION EXCEPT AS OTHERWISE PROVIDED IN 780 CMR 1225.4.4.





WOOD JOISTS SUPPORTED ON WOOD GIRDERS







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42.00: GROUP 1 BATHROOMS 521 CMR 43.00: GROUP 1 KITCHENS 42.4 **DOORS 43.1 GENERAL** Shall be capable of complying with 521 CMR 26.5, Width through 521 CMR 26.11, Door Hardware. In all Group 1 Dwelling units, kitchens shall be designed so that when a unit is adapted a person in a 42.4.1 Operation: Doors may swing into the *bathroom* if the swing of the door does not impede *clear floor* wheelchair has access to the sink, cooking surface, refrigerator, and a food preparation surface and can turn space. If the door impedes the *clear floor space*, the doors shall be capable of being adapted to swing out, around without having to leave the kitchen. fold or slide. **43.2 CLEAR FLOOR SPACE:** 42.5 WATER CLOSETS Shall be measured at the face of the base cabinets or appliances, (excluding cabinet hardware and appliance Shall comply with the following: hardware) and shall be provided at the time of first occupancy as follows: 42.5.1 *Clear Floor Space*: As defined in **521 CMR 42.2**, **Clear Floor Space**, shall be provided or shall be 43.2.1 L-shaped kitchens shall have a minimum *clear floor space* of 48 inches by 48 inches (48" x 48" = capable of being provided without *structural change* in at least one of two specific locations at the water 1219mm x 1219mm). See Fig. 43a. closet. One shall be beside the water closet with its short edge parallel to the wall behind the water closet. 43.2.2 U-shaped kitchens shall provide a minimum *clear floor space* of 48 inches (48" = 1219mm) between The other shall be in front of the water closet with its long edge parallel to the wall behind the water closet. opposing base cabinets or appliances. See Fig. 43b. 42.5.2 Location: 43.2.3 Galley kitchens shall provide a minimum *clear floor space* of 40 inches (40" = 1016mm) between a. When a water closet is located between a wall and a fixture, its centerline shall be 18 inches (18" = 457 mm)opposing base cabinets or appliances. See Fig. 43c. 521 CMR: ARCHITECTURAL ACCESS BOARD from the wall. If the *clear floor space* is provided in front of the water closet, the centerline of the water 1/27/06 521 CMR - 183 closet shall be a minimum of 15 inches (15'' = 381 mm) from the closest edge of the fixture. See Fig. 42c. 43.00: GROUP 1 KITCHENS b. When a water closet is located between two fixtures, its centerline shall be 18 inches (18'' = 457 mm) from **43.3 SINKS** a bathing fixture and a minimum of 15 inches (15'' = 381 mm) from other types of fixtures. See Fig. 42c. Shall comply with the following: 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 179 521 CMR: 43.3.1 Sink Cabinet: The base cabinet under the sink shall be capable of being removed to provide a ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 180 kneespace of 30 inches (30'' = 762 mm) in width. 42.00: GROUP 1 BATHROOMS 43.3.2 Sink Depth: The sink bowl shall not exceed $6\frac{1}{2}$ inches ($6\frac{1}{2}$ " = 165mm) in depth. Where more than one 42.5.3 Wall reinforcement: Walls adjacent to and behind the water closet shall be capable of structurally bowl is provided, only one bowl must meet this requirement. supporting the future installation of grab bars from 32 to 38 inches (32'' to 38'' = 813mm to 965mm) above **43.4 COOKING UNITS** the floor. The back wall shall have reinforcement from the interior corner to a distance of six inches (6'' =Shall comply with the following to ensure that both burners and ovens can be made functional and safe for a 152mm) beyond the widest part of the water closet. The side wall shall have reinforcement from the person in a wheelchair. interior corner to a distance of six inches (6'' = 152mm) beyond the front edge of the water closet, unless 43.4.1 In-Counter cooktops: If a cooktop is provided, its base cabinet shall be capable of being removed to interrupted by a door or other fixture, then the reinforcement shall be installed as far as possible. provide future kneespace the width of the cooktop but not less than 30 inches (30'' = 762 mm) wide. When the water closet is located between two fixtures, the wall reinforcement behind the water closet shall be Cooktops shall have controls located at the front or side of the unit. extend at least six inches (6'' = 152mm) beyond the widest part of the water closet. 43.4.2 Wall Ovens: If a wall oven is provided, the floor of the wall oven shall be located 30 inches (30" =42.6 **SINKS** 762mm) above the floor. At least one sink in a *bathroom* must meet the following: **43.5 WALL CABINETS** 42.6.1 Vanity Cabinets: If a cabinet is provided under a sink, it shall be capable of being removed without Walls shall be capable of structurally supporting wall cabinets at any location from 42 inches to 54 inches structural change. (42" to 54" = 1067mm to 1372mm) from the floor to the bottom of the inside of the cabinet. 42.6.2 Knee Space Width: The sink shall have or be capable of having a knee space of 30 inches (30" =- 43.6 BASE CABINETS 762mm) in width. Each base cabinet shall be capable of being removed to provide kneespace for persons using wheelchairs. 521 42.6.3 Knee Space Depth: The front edge of the sink fixture, or the countertop in which a sink is located, shall CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 184 be a minimum of 19 inches (19'' = 482mm) from the back wall or shall be capable of being relocated to 43.00: GROUP 1 KITCHENS create a *space* of that depth under the sink. 43.7 REFRIGERATORS 42.6.4 Height: The sink shall be capable of being relocated without structural change. *Space* shall be provided so that the refrigerator can be located so that its doors can be opened to 180 degrees. 42.6.5 Clear Floor Space: Shall be provided at the sink, as defined in 521 CMR 42.2, Clear Floor Space and If doors cannot be opened to 180 degrees, a minimum of 30 inches (30"= 762mm) of counter space next to shall be perpendicular to the face of the sink and may extend under the sink. See Fig. 42d. 521 CMR: the refrigerator shall be provided. ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 181 43.7.1 Where refrigerators are provided with less than nine cubic feet of capacity, **521 CMR 43.7**, 42.00: GROUP 1 BATHROOMS **Refrigerators** shall not apply. 42.7 **BATHING FIXTURES 43.8 OUTLETS AND CONTROLS** If more than one bathing fixture is provided in a *bathroom*, at least one must meet the requirements of 521 Shall comply with 521 CMR 39.00: CONTROLS. CMR 42. 43.9 ALARMS 42.7.1 Bathtubs shall comply with the following: - Shall comply with **521 CMR 40.00: ALARMS**. a. Size: Bathtubs shall be at least a nominal 60 inches $(60" = 1524 \text{mm}) \log 1000$ b. Clear Floor Space: At the bathtub, as defined in 521 CMR 42.2, Clear Floor Space shall be parallel to the 521 CMR 46.00: GROUP 1 BEDROOMS face of the tub. **46.1 BEDROOMS IN GROUP 1 UNITS** c. Wall Reinforcement: All tub walls shall be capable of structurally supporting the future installation of grab Group 1 units shall provide or be capable of providing, wheelchair turning space as defined in 521 CMR 6.3, bars from six inches (6'' = 152mm) above the tub rim to a height of 48 inches (48'' = 1219mm) above the Wheelchair Turning Space, *clear* of the door swing, at one side of the bed in the primary bedroom (based tub bottom and shall extend the length and width of the tub. on a full size bed). Where more than one bedroom is provided, an additional bedroom shall also provide or d. Door Enclosure: Tracks for sliding doors or enclosures mounted on the rim of a bathtub must be capable of be capable or providing wheelchair turning space (based on one twin size bed). removal to provide a smooth tub rim for transfer. **46.2 DOORS:** 42.7.2 Showers shall comply with the following: Doors to all bedrooms required to comply under **521 CMR 46.1**, shall comply with **521 CMR 26.00**: a. Size: Shower stalls shall be a minimum, nominal dimension of 36 inches by 36 inches (36" x 36" = 914mm **DOORS AND DOORWAYS.** x 914mm). 46.3 CLOSETS b. Minimum *Clear Floor Space*: At the shower, as defined in **521 CMR 42.2**, **Clear Floor Space** shall be - All closets in bedrooms required to be *accessible* shall comply with **521 CMR 9.5.8**, Closets. located parallel to and centered on the shower stall opening. **46.4 ELECTRICAL OUTLETS AND CONTROLS** c. Wall Reinforcement: All shower walls shall be capable of structurally supporting the future installation of Shall comply with 521 CMR 39.00: CONTROLS. grab bars, seats, etc., from a height of six inches (6'' = 152mm) to 48 inches (48'' = 1219mm) above the 46.5 ALARMS floor and shall extend the full width and length of the shower stall. Grab bars shall not be located behind - Shall comply with **521 CMR 40.00: ALARMS**. the seat. d. Door: The opening of the shower stall must be 32 inches (32'' = 813 mm) wide. If a shower door is provided, it shall be capable of swinging open 180 degrees or capable of being removed. e. Seat: If a wall mounted seat is provided, it shall be located on a wall adjacent to the opening. The seat shall be mounted with the edge as close as possible to the door opening to allow a safe transfer. f. Hardware Location: Mixing valves shall be mounted on the wall opposite the seat. The centerline of the shower controls shall be located between 38 inches and 48 inches (38" to 48" = 965mm to 1219mm). g. Where curbs are provided, they shall not exceed four inches (4'' = 102 mm) in height. 42.7.3 Soap Tray shall not have a hand hold feature unless it can support 250 lbs for five minutes. Soap dispensers, holders, etc., shall be located within the *zone of reach* from the seat. 42.7.4 Prefabricated Units: In prefabricated showers and tubs, structural reinforcement for grab bars must be in full contact with the surface of walls of the unit on which grab bars may be mounted as described in 521 CMR 42.7.1 (c) and 521 CMR 42.7.2 (c). 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 182 42.00: GROUP 1 BATHROOMS **42.8 OUTLETS AND CONTROLS** Shall comply with 521 CMR 39.00: CONTROLS. 42.9 ALARMS Shall comply with **521 CMR 40.00: ALARMS**.

ocatior - 9.5 DWELLING UNIT INTERIORS - The interiors of all *Group 1* and *2 dwelling units*, except as exempted by **521 CMR 9.2.1**, shall comply with the following requirements: 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 46 9.00: MULTIPLE DWELLINGS 9.5.1 Doorways: All doorways and all openings that allow passage in a *Group 2* unit must comply with **521** CMR 26.2, Double Leaf Doorways, through 521 CMR 26.11, Door Hardware. All doorways and all MII openings that allow passage in *Group 1* units shall be capable of complying, without *structural change*, with 521 CMR 26.2, Double Leaf Doorways, through 521 CMR 26.11, Door Hardware. For door types such as bifold, pocket, and accordion doors, the clear opening is measured when the door is in its most fully open position. See Fig. 26b and 26c. For Group 1 units, only the common area and apartment entrance door hardware are required to comply with 521 CMR 26.11, Door Hardware. H 9.5.2 Every entry door to each *dwelling unit* shall have a means by which the resident can visually identify a [L] visitor before opening the door. This may be achieved by any of the following means: a. In *Group 1 and 2A* units, a peephole mounted 60 inches (60'' = 1524mm) above the floor, a vision panel in the door with its bottom edge no higher than 60 inches (60'' = 1524mm) above the floor, or a sidelight with its bottom edge no higher than 60 inches (60" = 1524 mm) above the floor, shall be provided. - b. In *Group 2B* units, an additional peephole mounted at 42 inches (42'' = 1067mm) above the floor; a vision panel in the door with its bottom edge no higher than 42 inches (42'' = 1067mm) above the floor; or a MU sidelight with its bottom edge no higher than 42 inches (42'' = 1067mm) above the floor. See Fig. 9a. \mathbf{V} 9.5.3 Buzzers/bells and intercoms: All buzzers/bells and intercom systems shall comply with 521 CMR 6.5, Forward Reach or 521 CMR 6.6, Side Reach. 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 47 9.5.4 Accessible routes: An accessible route at least 36 inches (36" = 914mm) wide shall be provided to all $[\mathbf{T}]$ rooms and spaces in the *dwelling unit* including exterior decks, patios, balconies, attached garages, and storage closets. An *accessible route* shall be provided to mechanical spaces, only if the resident is expected \mathbf{H} S to service, adjust or maintain the equipment therein. Ľ a. Patios, Terraces, and Balconies: Where it is necessary to use a door threshold or a change in level between OPO the interior and exterior, greater than $\frac{1}{2}$ inch ($\frac{1}{2}$ " = 13mm) to protect the integrity of the unit from water or \bigcirc snow damage, equivalent facilitation such as raised decking or a ramp shall be provided or capable of JX being provided. In Group 2B Units, the exterior deck, patio, balcony surfaces shall be either permanently installed at no more than $\frac{1}{2}$ inch ($\frac{1}{2}$ " = 13mm) below the floor level of the interior of the *dwelling unit* or a temporary raised PR surface, such as duckboards, that is no more than $\frac{1}{2}$ inch ($\frac{1}{2}$ " = 13mm) below the interior floor *level* shall 40 \mathbb{N} be available upon request. 9.5.5 Laundry Facilities: If a washer or dryer is provided in a Group 1 or Group 2A unit, it shall be front loading or capable of being replaced with a front loading appliance. If a washer or dryer is provided in a Group 2B dwelling unit, it shall be front loading. Operating controls for washers and dryers shall be located within the zone of reach. If residents are expected to operate shut-off valves for the washer, the shut-off valves shall be located within the *zone of reach*. For common area laundry facilities, *see* **521** CMR 10.8, Laundry Facilities. 9.5.6 Outlets: Electrical outlets, telephone outlets, cable TV jacks, and other wall outlets shall be located hoo between 15 inches (15'' = 381 mm) and 48 inches (48'' = 1219 mm) above the floor, measured at the centerline of the lowest receptacle. All outlets shall be located no less than 18 inches (18'' = 457 mm) from Company Inc. interior corners. When outlets are located on walls above counters or other fixtures that are 22 inches (22" = 559mm) or greater in depth, they shall be no higher than 44 inches (44'' = 1118mm). In *Group 1* and 2 units, at least one electrical outlet must be provided on the same wall as the telephone outlet and the door One Billings Road Quincy, MA 02171 chime. Wherever exterior decks, patios, and balconies are provided, an exterior electrical outlet shall also 617-786-7727 fax 617-786-7715 be provided. - In *Group 2B* units, all telephone outlets must have an electrical outlet located within 12 inches (12" = 305mm) for installation of a *TTY*. 9.5.7 Controls and alarms: In Group 2A and 2B units, the operable portions of all controls and alarms, including but not limited to: intercoms, and heat and air controls, shall be located between 36 and 48 inches (36" to 48" = 914mm to 1219mm) above the floor, measured at the centerline of the operable portion in its highest position. Operable portions shall be located at least 24 inches (24'' = 610 mm) from interior corners. Controls and alarms in *Group 1* units may be located at other locations so long as sufficient wiring is provided to permit future location from 36 inches to 48 inches (36" to 48" = 914mm to 1219mm) above the floor. 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 48 - 9.5.8 Closets/pantries and linen closets: Shall comply with the following: Revision Date - a. Closet shelves/poles: Closet walls shall be structurally capable of supporting the installation of shelves and poles which are relocatable from 42 inches to 72 inches (42" to 72" = 1067mm to 1829mm) to the top of 04-02-2019 shelf or pole whichever is higher. $\underline{2}$ 02-17-2021 - b. Closet depth: Where the interior depth of the closet exceeds 24 inches (24'' = 610 mm), the doorway must comply with 521 CMR 26.5, Width so that a disabled person can enter the closet. The bottom track of the closet door must also be recessed with no more than $\frac{1}{4}$ of an inch ($\frac{1}{4}$ " = 6mm) change in finish material. For *Group 2 units*, when the interior depth of the closet is 24 inches (24'' = 610 mm) or less, it shall be open to the room to permit a person with a disability to reach all parts of the closet. See Fig. 9b. 521 CMR: ARCHITECTURAL ACCESS BOARD 1/27/06 521 CMR - 49 9.6 TOWNHOUSES - GROUP 1 UNITS ONLY: RESERVED until further notice. In the interim, they 18223 roject No: are exempt. - 9.7 SLEEPING ACCOMMODATIONS FOR PERSONS WHO ARE DEAF OR HARD OF AS NOTED cale: HEARING - In addition to those units required to be *accessible* by **521 CMR 9.4**, **Group 2 Dwelling Units**, 2% of the 10-11-2018 ate: total number of *dwelling units* in the complex or project, but not less than one shall comply with the following: SL rawn By: - 9.7.1 *Sleeping accommodations* for persons who are deaf or hard of hearing required by **521 CMR 9.7** shall comply with the following requirements for smoke/fire/safety alarms, visual signal devices, telephones, Prawing Name televisions, alarm clocks and climate controls. - 9.7.2 Auxiliary Visual Alarms: *Sleeping accommodations* shall be equipped with auxiliary visual alarms which comply with 521 CMR 40.4: PROPOSED - b. a standard 110-volt electrical receptacle into which such an alarm can be connected and a means by which a signal from the *building* emergency alarm system can trigger such an auxiliary alarm. Such receptacle DETAILS shall be connected to the emergency or standby power, (if provided in the *building*). - The visual alarm signal shall be visible in all areas of the unit or room. Instructions for use of the auxiliary alarm or receptacle shall be provided. - 9.7.3 Visual Notification Devices shall be provided in *sleeping accommodations* to alert room occupants of incoming telephone calls and a door knock or doorbell. Visual notification devices shall not be connected to auxiliary visual alarm signal appliances. 2- 9.7.4 Equivalent Facilitation: For rooms required under **521 CMR 9.7**, the operator of a *facility* may either permanently install the equipment required under 521 CMR 9.7 or may elect to install electrical outlets_____ bheet No. (including outlets connected to a *facility*'s central alarm system) and telephone wiring in sleeping rooms and suites to enable persons with hearing impairments to utilize portable visual alarms and communication OTE: SHEET A-3.6 *facility* during the tenancy of a person with a hearing impairment. NO LONGER USED $\wedge \wedge \wedge$

- 9.00: MULTIPLE DWELLINGS

- 9.00: MULTIPLE DWELLINGS

- 9.00: MULTIPLE DWELLINGS

- a. a visual alarm connected to the *building* emergency alarm system; or











ROOF FRAMING PLAN |/4"=|'-0"

(2) 1 $\frac{1}{4}$ "x7.5" LVL		(2) $1\frac{3}{4}$ "x7.5" LV	$\mathbf{L} = \frac{1}{4} (2) 1 \frac{3}{4} \times 7.5 \mathbf{L} \mathbf{L} \mathbf{L} = 1$
		HD	
	O.C		
			14" TRIMJØIST @ 19.2"O.C.
	<u> </u>		
	5		
$(3) 1\frac{3}{4} 'x14 'LVL$		(3) $1\frac{3}{4}$ "x14" LVL	BEARING WALL BELOW
	4		
			BEARING WALL BELLOW
╶┼─┼┼┼┼┼┼┼┼	x15		
			14" TRIMJOIST @ 19.2"O.C.
		3. 1.4. 7.7.7	
		$\frac{3}{4}$	
	——————————————————————————————————————		$6 \times 6 \text{ VL}$
	POST		POST
$(2) L4x4x_4^{1}$			
W8x15	<u> </u>		
			14'' TRIMJOIST @ 19.2''O.C. □
		1 <u>3</u> "x7.5" LVL	(2) $1\frac{3}{4}$ "x7.5" LVL
NOTE:			
1. ALL INTERIOR BEARING WALLS	TO BE 2x6 STUDS @16"	O.C. W/ CENTER	

2. ALL EXTERIOR STUDS WALLS TO BE 2x6 @ 16"O.C. W/ CENTER BLOCKINGS TYPICAL.

3. ADD SOLID BLOCKINGS @ 8'O.C. ON ALL JOISTS 4. ALL EXTERIOR WALL SHEATHING TO BE ³/₄" PLYWOOD.

5. ALL STAIR WELL WALL SHEATHING TO \vec{BE}_{4}^{3} " PLYWOOD.

6. H.D. = HOLDDOWNS SEE SCHEDULE





GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN CONFORMANCE TO THE LATEST EDITION OF THE MASSACHUSETTS STATE BUILDING CODE AND ALL OTHER APPLICABLE CODES AND LAWS.

2. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ALL PERMITS **REQUIRED FOR THIS PROJECT.** 3. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR MEANS, METHODS,

TECHNIQUES, SEQUENCING, SCHEDULING AND SAFETY FOR THIS PROJECT 4. THE CONTRACTOR SHALL VISIT THE SITE AND BE THOROUGHLY AQUATINTED WITH THE PROJECT PRIOR TO SUBMITTING A PRICE. ADDITIONAL MONEY WILL NOT BE GRANTED FOR WORK NOT CLARIFIED PRIOR TO BIDDING. 5. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES BETWEEN DRAWINGS SPECIFICATIONS OR FIELD CONDITIONS TO THE ARCHITECT IMMEDIATELY.

6. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY WORK DAMAGED BY HIS FORCES WHILE PERFORMING THIS CONTRACT. 7. THE CONTRACTOR SHALL GIVE A WARRANTY FOR HIS WORK FOR A PERIOD OF ONE

YEAR FROM THE DATE OF FINAL COMPLETION.

FOUNDATION NOTES:

- 1. ALL FOUNDATION FOOTINGS SHALL BE CARRIED DOWN TO A MINIMUM OF 4'-0" BELOW FINISH GRADE, OR DEEPER, IF NECESSARY, TO OBTAIN A SAFE SOIL BEARING PRESSURE OF 2 TONS PER SQUARE FOOT, FOUNDATION DESIGN IS BASED ON ASSUMED SOIL BEARING CAPACITY OF 2 TONS PER SQUARE FOOT.
- 2. ALL FOOTINGS SHALL BE PLACED ON UNDISTURBED SOIL; OR, ON ENGINEERED BANK RUN GRAVEL FILL MATERIAL WITH A MINIMUM DRY DENSITY OF 95%.
- 3. ALL FOOTING SHALL BE POURED IN THE DRY ONLY. WATER SHALL NOT BE ALLOWED TO FLOW THROUGH THE DEPOSITED CONCRETE.
- 4. NO FOOTING SHALL BE POURED ON FROZEN GROUND. FOUNDATIONS NEED TO BE PROTECTED FROM FREEZING FOR A MIN OF 5 DAYS AFTER THEY WERE POURED.
- 5. THE MINIMUM REINFORCING FOR ALL FOUNDATION WALLS SHALL BE 2-#6 BARS AT THE TOP AND BOTTOM, CONTINUOUS; OR, AS SHOWN ON DRAWINGS.
- 6. LAP ALL BARS 40 DIAMETERS AND PROVIDE CORNER BARS.
- 7. ALL REINFORCEMENT: ASTM A615-60, WWF A185.

CONCRETE NOTES:

- 1. ALL CONCRETE SHALL ATTAIN A MINIMUM COMPRESSIVE STRENGTH
- OF: FOR BASEMENT SLABS, FOUNDATION WALL, EXTERIOR WALLS AND 3000 PSI OTHER VERTICAL CONCRETE SURFACES EXPOSED TO THE WEATHER FOR DRIVEWAYS, CURBS, WALKS, PATIOS, PORCHES, CARPORT SLAB, 3500 PSI STEPS AND OTHER FLATWORK EXPOSED TO WEATHER AND GARAGE FLOOR SLABS
- 2. MAXIMUM SLUMP SHALL NOT EXCEED 4"; AND MAXIMUM; COARSE
- AGGREGATE SIZE SHALL NOT EXCEED 3/4" IN DIAMETER.
- 3. ALL CONCRETE SLABS ON GRADE SHALL BE POURED IN 900 SQUARE FOOT PANELS, MAXIMUM; OR, PROVIDE CONTROL JOINTS BY SAW CUTTING THE SLAB WHILE THE CONCRETE IS STILL GREEN.

REINFORCING NOTES:

- 1. ALL REINFORCEMENT, EXCEPT FOR TIES AND STIRRUPS, SHALL CONFORM TO ASTM 615-60.
- 2. ALL REINFORCEMENT FOR TIES AND STIRRUPS SHALL CONFORM TO ASTM 615-40.
- 3. ALL WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185-70 SPECIFICATIONS.
- 4. ALL REINFORCEMENT SHALL BE INSPECTED AND APPROVED BY THE ARCHITECT OR HIS ENGINEER PRIOR TO THE PLACEMENT OF ANY CONCRETE.
- 5. THE CONTRACTOR SHALL SUBMIT FOUR PRINTS OF SHOP DRAWINGS: SHOWING ALL REINFORCING DETAILS, CHAIR BARS, HIGH CHAIRS, SLAB BOLSTERS, ETC. TO THE ARCHITECT FOR HIS APPROVAL. THE CONTRACTOR SHALL RECEIVE WRITTEN APPROVED SHOP DRAWINGS FROM THE ARCHITECT OR HIS ENGINEER PRIOR TO THE
- FABRICATION OF REINFORCEMENT. 6. CLEARANCES OF MAIN REINFORCING FROM ADJACENT CONCRETE SURFACES
- SHALL BE AS FOLLOWS: A. FOOTINGS 3 INCHES
- B. SIDES OF FOUNDATIONS WALLS.
- EXPOSED FACES OF FOUNDATIONS.
- SIDES OF COLUMNS/PIERS, SLABS ON GRADE FROM TOP SURFACE
- C. INTERIOR FACES OF FOUNDATIONS, TOP REINFORCING IN SLABS EXPOSED TO THE WEATHER
- D. TOP STEEL OF INTERIOR SLABS 7. MAXIMUM DEVIATION FROM THESE REQUIREMENTS SHALL BE 1/4" OF SECTIONS 10" OR LESS, 1/2" FOR SECTIONS GREATER THAN 10".

NOTE: THERE HAS BEEN NO SOIL TESTING PROVIDED TO THIS OFFICE FOR THIS PROJECT. THE DESIGNING ARCHITECT OR STRUCTURAL ENGINEER ACCEPTS NO RESPONSIBILITY FOR EXISTING SOIL CONDITIONS. ANY SOIL BEARING CAPACITY OF THIS FOUNDATION SYSTEM IS DESIGNED BASED ON A 2 TON MINIMUM SOIL BEARING CAPACITY. IT SHALL BE THE CONTRACTORS OR OWNERS' RESPONSIBILITY TO DETERMINE SUITABLE SOIL CONDITIONS AND VERIFY THE BEARING PRESSURE. IF A SUITABLE SOIL THAT CAN WITHSTAND A 2 TON BEARING CAPACITY IS NOT AVAILABLE, THIS OFFICE SHOULD BE CONTACTED BY THE CONTRACTOR OR OWNER FOR A FOUNDATION REDESIGN.

WOOD NOTES:

- FB=1,200 PSI, FV=135 PSI, E=1,300,000 PSI. 3. ALL L.V.L. LUMBER DENOTED ON PLANS SHALL HAVE A MINIMUM:
- FB=2,650 PSI, FV=285 PSI, E=1,900,000 PSI FOR STUDS - FB-3100 PSI, FV=285 PSI, E=2,000,000 PSI - FOR BEAMS
- 4. ALL JOIST SPANS SHALL HAVE ONE ROW OF 1" X 3: CROSS BRIDGING AT MID SPAN
- AND NOT MORE THAN 8'-O" O.C. 5. ALL STUD BEARING WALLS SHALL HAVE ONE ROW OF 2X HORIZONTAL BLOCKING AT
- 1/2 STUD HEIGHT, AND NOT MORE THAN 6'-O" O.C. MAXIMUM.
- 6. PROVIDE AND INSTALL ALL NECESSARY TIMBER CONNECTORS WITH ADEQUATE STRENGTH. 7. PROVIDE DOUBLE JOIST BELOW PARTITIONS PARALLEL TO JOIST FRAMING.
- 8. PROVIDE SOLID BRIDGING BELOW PARTITIONS PERPENDICULAR TO JOIST FRAMING.
- 9. PROVIDE SOLID BRIDGING BETWEEN JOIST FRAMING MEMBERS WHEN BEARING ON STUD PARTITIONS OR BEAMS.
- 10. PROVIDE A CONTINUOUS BAND JOIST AT EXTERIOR STUD WALLS.
- 11. PROVIDE DIAGONAL METAL STRAP BRACING AT ALL CORNERS AND WALL INTERSECTIONS, AT THE INSIDE FACE OF STUDS, FROM TOP PLATE TO FLOOR PLATE AT A 45 DEGREE ANGLE WITH A SIMPSON TYPE "RCWB" STRAP, OR EQUAL.
- 12. ALL BUILT-UP BEAMS SHALL BE BOLTED WITH ½" Ø THRU BOLTS, MEETING A307 STANDARDS, OR, AS NOTED ON DRAWINGS.

WOOD LINTEL SCHEDULE:

Span of opening: less than 4'-0" up to 6'-0" up to 8'-0"

up to 10'-0"

STEEL NOTES:

STEEL DECK NOTES:

1. ALL STEEL DECK SHALL BE DESIGNED AND FABRICATED IN ACCORDANCE WITH THE SPECIFICATIONS OF THE STEEL DECK INSTITUTE AND AMERICAN INSTITUTE OF STEEL CONSTRUCTION. 2. PROVIDE WELD WASHERS FOR WELDING. ALL WELDS SHALL BE A MINIMUM OF 1-1/2" IN LENGTH, AND NOT TO EXCEED 12" ON CENTER SPACING. 3. WELD INTERMEDIATE SUPPORTS IN AN X-PATTERN. 4. WELD IN THE VALLEY OF THE SIDE LAP ON EVERY OTHER JOIST: AND, IN THE VALLEY OF THE CENTER CORRUGATION ON THE REMAINING JOIST. 5. SIDE LAPS SHALL BE MADE WITH A MINIMUM OF ONE CORRUGATION. 6. END LAPS SHALL BE MADE ON THE TOP SHEET IN THE VALLEY OF THE SIDE LAP, AND, AGAINST THE MIDDLE OF

THE SHEET. END LAPS SHALL BE AT LEAST 2" AND SHALL BE MADE OVER SUPPORTS.

7. PROVIDE DECK ANGLES, AS NECESSARY, TO SUPPORT DECK SPANS WHERE DECK SPAN DIRECTION CHANGES. 8. STEEL DECK MATERIALS: ROOF DECKING - 1-1/2" DEEP, TYPE "B", GALVANIZED, 22 GA.

9. THE CONTRACTOR SHALL SUBMIT ON REPRODUCIBLE SEPIA AND FOUR PRINTS OF SHOP DRAWING; SHOWING LENGTH OF DECKING, OPENINGS THROUGH DECKING, CLOSURE PANELS AT OPENINGS, END CLOSURE PANELS, ALL STRUCTURAL SUPPORTS, AND OTHER DETAILS, AS NECESSARY, TO THE ARCHITECT FOR HIS APPROVAL. FABRICATION OF STEEL DOCKING SHALL NOT BEGIN WITHOUT WRITTEN APPROVED SHOP DRAWINGS FROM THE ARCHITECT OR THIS ENGINEER.

STRUCTURAL STEEL NOTES:

1. ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM A50 SPECIFICATIONS, EXCEPT SQUARE STEEL TUBE COLUMNS. 2. ALL SQUARE STEEL TUBE COLUMNS SHALL CONFORM TO ASTM A500, WITH A MINIMUM YIELD STRESS OF 46,000 PSI

- RUST

- AND OPENINGS, ETC.
- OR HIS ENGINEER.

- 1 INCHES
- 1-1/2 INCHES

- 2 INCHES

1. ALL LUMBER SHALL HAVE A MOISTURE CONTENT OF NOT MORE THAN 19%. 2. ALL FRAMING LUMBER SHALL BE #2 SPF, OR BETTER, HAVING A MINIMUM:

COLUMNS

Lintels over openings in bearing walls shall be as follows; or as noted on drawings.

Size: 2x6 studs	Size: 2x4 studs
3 - 2x4	2 - 2x4
3 - 2x6	2 - 2x6
3 - 2x8	2 - 2x8
3 - 2x10	2 - 2x10

1. ALL COLUMNS: A36, STEEL PIPE, A46 STEEL TUBE

2. BOLTS: A325. ANCHOR BOLTS: A307.

MINIMUM MOMENT OF INERTIA - 0.20"

MINIMUM SECTION MODULUS - 0.20"

3. ALL SHOP CONNECTIONS SHALL BE WELDED. 4. FIELD CONNECTION SHALL BE MADE WITH HIGH STRENGTH FRICTION BOLTS MEETING A325-X SPECIFICATIONS. 5. ALL BOLTS SHALL BE 3/4" IN DIAMETER, OR AS NOTED ON DRAWINGS. HOLES SHALL BE 1/16" LARGER. 6. ALL STRUCTURAL STEEL SHALL RECEIVE ONE SHOP COAT OF RUST INHIBITIVE PAINT; SUCH AS TNEMEC-99, OR

INHIBITOR BY "MAINLINE". OR, PAINT, AS NOTED IN THE SPECIFICATIONS.

7. AFTER STRUCTURAL STEEL ERECTION IS IN PLACE, ALL EXPOSED AREAS SHALL BE TOUCHED UP. SEE SPECIFICATIONS ON PAINTING FOR ADDITIONAL REQUIREMENTS.

8. PROVIDE 3/4: GROUT, 3,000 PSI, AND 1/4" THICK LEVELING PLATES UNDER ALL COLUMN BASE PLATES, WITH FOUR (4) 3/4" DIAMETER x 16" LONG ANCHOR BOLTS; OR AS NOTED.

9. PROVIDE A MINIMUM OF 8" BEARING ON EACH SIDE OF LINTELS AND HEADERS OVER DOORS, WINDOWS, LOUVERS,

10. THE CONTRACTOR SHALL SUBMIT A REPRODUCIBLE SEPIA AND FOUR PRINTS OF SHOP DRAWINGS; SHOWING ALL STRUCTURAL STEEL SIZES, CONNECTIONS AND DETAILS, TO THE ARCHITECT FOR HIS APPROVAL. FABRICATION OF STRUCTURAL STEEL MEMBERS SHALL NOT BEGIN WITHOUT PRIOR WRITTEN APPROVAL BY THE ARCHITECT

11. ALL WORK SHALL BE PERFORMED IN CONFORMANCE WITH THE LATEST COMMONWEALTH OF MASSACHUSETTS BUILDING CODE AND THE STRUCTURAL STEEL INSTITUTE SPECIFICATIONS FOR BUILDINGS AND BRIDGES.

REBAR SPLICE SCHEDULE

	REINFORCING BAR DEVELOPMENT AND LAP SPLICE LENGTHS FOR fc = 4500 PSI AND Fy = 60 KSI						SI
DAD	TENSION DEVELOPMENT		TENSION SPLICE (CLASS B)		STANDARD 90° HOOK	COMPRESION BARS	
SIZE	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	EMBEDMENT Ldh	DEVELOPMENT Ldb	SPLICE LENGTH
#3	18"	14"	23"	18"	7"	8"	12"
#4	24"	18"	31"	24"	9"	10"	15"
#5	30"	23"	38"	30"	12"	12"	19"
#6	35"	27"	46"	35"	14"	14"	24"
#7	41"	32"	54"	41"	16"	16"	27"
#8	47"	36"	61"	47"	18"	18"	30"

CONNECTION REACTION FACTORS

5 1/4 " SLAB		3500 PSI L.W.
BM. DEPTH	BM, WT, RANGE	REACT, FACTOR
W <i>8</i>	ALL	2,0
W IO	ALL	1,9
W12	ALL	1,8
W 14	ALL	1,8
W 16	ALL	1.7
W 18	ALL	1.6
W 21	ALL	1,6
W 24	ALL	1,6
W 27	ALL	1,5
W 30	ALL	1,5
W 33	ALL	1.4

NOTE: ALL CONNECTIONS AT COMPOSITE BEAMS SHALL BE DESIGNED FOR A MINIMUM OF AISC, TABULATED LOAD TIMES REACTION FACTOR, REFER TO PART 2, AISC, OR USE REACTION LOADS SHOWN ON PLAN

DESIGN CRITERIA: ALL WORK PERFORMED UNDER THIS CONTRACT SHALL N OF THE MASSACHUSETTS

CONFORM TO THE 9th EDITIO
BUILDING CODE.

DESIGN LIVE LOAD	=40 POU
	FLC
	= 100 PC
	- DE
DESIGN SNOW LOAD	= 45 PO
	WIT
	WH
WIND LOAD	= 105 M
SEISMIC:	
Ss	= 0.29

S1 = 0.068

=40 POUNDS PER SQUARE FOOT OORS OUNDS PER SQUARE FOOT ECK AND STAIRS OUNDS PER SQUARE FOOT TH SNOW DRIFT HERE APPLICABLE. IILES PER HOUR







ocation



	FOOTING S	CHEDULE.		(2.0 TC	NS PER SO	QUARE FOO	t beaf
MARK	F2.5	F3.0	F3.5	F4.0	F4.5	F5.0	F5.5
SIZE	2'-6" x 2'-6" x 1'-6"DP.	3'-0" x 3'-0" x 1'-6"DP.	3'-6" x 3'-6" x 1'-6"DP.	4'-0" x 4'-0" x 1'-6"DP.	4'-6" x 4'-6" x 1'-6"DP.	5'-0" x 5'-0" x 1'-6"DP.	5'-6" 2 5'-6" 2 1'-6"E
REINF. EA. WAY BOTTOM	5 - #4	6 - #4	7 - #4	6 - #5	6 - #5	7 - #5	7 - #:

OTING AND REBAR SCHEDULE

/ 2"=|'-0"

HOLDDOWN DETAILS

	HOLDDOWN SIZES & ATTACHMENT		
М	AT FLOOR	AT ROOF	
T HDS M	HD7B EACH SIDE AT DOUBLE STUD	H1 CLIP AT EACH RAFTER	
	HD5B EACH SIDE AT DOUBLE STUD	H1 CLIP AT EACH RAFTER	
	HD3B EACH SIDE AT DOUBLE STUD	H1 CLIP AT EACH RAFTER	

7. FRAMING AT ADJOINING PANEL EDGES TO BE 3" NOMINAL OR WIDER; NAILS TO BE STAGGERED WHERE NAILS ARE SPACED 2".



HOLDOWN SEE SCHEDULE - FLOOR JOISTS

HOLDOWN SEE SCHEDULE

2x6 STUD WALL

HOLDOWN SEE SCHEDULE

ANCHOR BOLT SEE SCHEDULE

 $\frac{5}{8}$ " Ø THREADED ROD

hoo Company Inc. One Billings Road Quincy, MA 02171 617-786-7727 fax 617-786-7715 Revision Date

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18223 Project No: AS NOTED Scale: Date: 10-11-2018

SL2rawn By:

Drawing Name

PROPOSED DETAILS

Sheet No.

5-2,2



RECOMENDED	FASTENING SCH	EDULE
BUILDING ELEMENT	NAIL SIZE AND TYPE	NUMBER AND LOCATION
STUD TO SOLE PLATE	8D COMMON 16D COMMON	4 TOE-NAIL OR 2 DIRECT-NAIL
STUD TO CAP PLATE	16D COMMON	2 TOE-NAIL OR 2 DIRECT-NAIL
DOUBLE STUDS	10D COMMON	12" O.C. DIRECT
CORNER STUDS	16D COMMON	24" O.C. DIRECT
SOLE PLATE TO JOIST OR BLOCKING	16D COMMON	16" O.C.
DOUBLE CAP PLATE	10D COMMON	16" O.C. DIRECT
CAP PLATE LAPS	10D COMMON	2 DIRECT-NAIL
RIBBON STRIP, 6" OR LESS	10D COMMON	2 EACH DIRECT BEARING
RIBBON STRIP, 6" OR MORE	10D COMMON	3 EACH DIRECT BEARING
ROOF RAFTER TO PLATE	8D COMMON	3 TOE-NAIL
JACK RAFTER TO RIDGE	16D COMMON	2 TOE-NAIL OR DIRECT-NAIL
JACK RAFTER TO HIP	10D COMMON 16D COMMON	3 TOE-NAIL OR 2 DIRECT-NAIL
FLOOR JOISTS TO STUDS (NO CEILING JOISTS)	10D COMMON 10D COMMON	5 DIRECT OR 3 DIRECT
FLOOR JOISTS TO STUDS (WITH CEILING JOISTS)	10D COMMON	2 DIRECT
FLOOR JOISTS TO SILL OR GIRDER	3D COMMON	3 TOE-NAIL
LEDGER STRIP	16D COMMON	3 EACH DIRECT
CEILING JOISTS TO PLATE	16D COMMON	3 TOE-NAIL
CEILING JOISTS (LAPS OVER PARTITION)	10D COMMON	3 DIRECT-NAIL
CEILING JOISTS (PARALLEL TO RAFTER)	10D COMMON	3 DIRECT
COLLAR BEAM	10D COMMON	3 DIRECT
BRIDGING TO JOISTS	8D COMMON	2 EACH DIRECT END
DIAGONAL BRACE (TO STUD AND PLATE)	8D COMMON	2 EACH DIRECT BEARING
TAIL BEAMS TO HEADERS (WHEN NAILING PERMITTED)	20D COMMON	1 EACH END 4 SQ. FT. FLOOR AREA
HEADER BEAMS TO TRIMMERS	20D COMMON	1 EACH END 8 SQ. FT. FLOOR AREA
1" ROOF DECKING (OVER 6" IN WIDTH)	8D COMMON 8D COMMON	2 EACH DIRECT RAFTER 3 EACH DIRECT RAFTER
1" SUBFLOORING (6" OR LESS)	8D COMMON	2 EACH DIRECT JOIST
1" SUBFLOORING (8" OR MORE)	8D COMMON	3 EACH DIRECT JOIST
2" SUBFLOORING	16D COMMON	2 EACH DIRECT JOIST
1" WALL SHEATHING (8" OR LESS IN WIDTH)	8D COMMON	2 EACH DIRECT STUD
1" WALL SHEATHING (OVER 8" IN WIDTH)	8D COMMON	3 EACH DIRECT STUD
PLYWOOD ROOF & WALL SHEATHING (1/2" OR LESS) (5/8" OR GREATER) (5/16",3/8", OR 1/2")	6D COMMON 8D COMMON 16 GAUGE GALVANIZED WIRE STAPLES, 3/8" MINIMUM CROWN; LENGTH OF 1" PLUS PLYWOOD THICKNESS	6" O.C. DIRECT EDGES & 12" O.C. INTERMEDIATE 6" O.C. DIRECT EDGES & 12" O.C. INTERMEDIATE
(OVER 6" IN WIDTH)	SAME AS IMMEDIATELY ABOVE	2 1/2" O.C. EDGES & 5" O.C. INTERMEDIATE
PLYWOOD SUBFLOORING (1/2") (3/8", 3/4") (1", 1 1/8")	6D COMMON OR 6D ANNULAR OR SPIRAL THREAD 8D COMMON OR 8D ANNULAR OR SPIRAL THREAD 10D COMMON OR 8D RING SHANK OR 8D ANNULAR OR SPIRAL THREAD	6" O.C. DIRECT EDGES & 10" O.C. INTERMEDIATE 6" O.C. DIRECT EDGES & 10" O.C. INTERMEDIATE 6" O.C. DIRECT EDGES & 6" O.C. INTERMEDIATE
(1/2") (3/8")	16D GALVANIZED WIRE STAPLES 3/8" MINIMUM CROWN; 1 3/8' LENGTH	4" O.C. EDGES & 7" O.C. INTERMEDIATE 2 1/2" O.C. EDGES & 4" O.C. INTERMEDIATE
BUILT-UP GIRDERS AND BEAMS	20D COMMON	32" O.C. DIRECT
CONTINUOUS HEADER TO STUD	8D COMMON	4 TOE-NAIL
CONTINUOUS HEADER, TWO PIECES	16D COMMON	16" O.C. DIRECT
1/2" FIBER BOARD SHEATHING	1 1/2" GALVANIZED ROOFING NAIL OR 16 GAUGE STAPLE, 1 1/2" LONG WITH MIN. CROWN OF 7/16"	3" O.C. EXTERIOR EDGE 6" O.C. INTERMEDIATE
25/32" FIBER BOARD SHEATHING	1 3/4" GALVANIZED ROOFING NAIL OR 8D COMMO NAIL OR 16 GAUGE STAPLE, 1 1/2" LONG WITH MIN. CROWN OF 7/16"	N 3" O.C. EXTERIOR EDGE 6" O.C. INTERMEDIATE
GYPSUM SHEATHING	12 GAUGE 1 3/4" LARGE HEAD CORROSION- RESISTANT	4" O.C. EDGE 8" O.C. INTERMEDIATE
PARTICLE BOARD UNDERLAYMENT (1/4"-3/4")	6D ANNULAR THREADED	6" O.C. DIRECT EDGES 10" O.C. INTERMEDIATE
PARTICLE BOARD ROOF AND WALL SHEATHING 1/2" OR LESS	6D COMMON	6" O.C. DIRECT EDGES 12" O.C. INTERMEDIATE
5/8" OR GREATER	8D COMMON	6" O.C. DIRECT EDGES 12" O.C. INTERMEDIATE
PARTICLE BOARD SUBFLOORING (5/8" OR GREATER)	8D COMMON	6" O.C. DIRECT EDGES 12" O.C. INTERMEDIATE
SHINGLES, WOOD*	NO. 14 B&S GAGE CORROSION RESISTIVE	2 EACH BEARING
WEATHER BOARDING	8D CORROSION	2 EACH BEARING

NOTE *: SHINGLE NAILS SHALL PENETRATE NOT LESS THAN 3/4" INTO NAILING STRIPS, SHEATHING OR SUPPORTING CONSTRUCTION EXCEPT AS OTHERWISE PROVIDED IN 780 CMR 1225.4.4.





(1/4	2 ⊥ 3 1/2x3 1/2x1/4	3 JIL 3 1/2x3 1/2x1/
1/2x1/4	2 L 4x3 1/2x1/4	3 _11 4x3 1/2x1/4
1/2x1/4	2 L 5x3 1/2x1/4	3 _11 _ 5x3 1/2x1/4
1/2x1/4	2 ⊥ 6x3 1/2x3/8	3 11 6x31/2x3/8
1/2x3/8	2 ⊥ 6x3 1/2x3/8	3 ⊥⊥ 6x3 1/2x3/8
1/2x3/8	2 ⊥ 6x3 1/2x1/2	3 ⊥⊥ 6x3 1/2x1/2
	•	



Location		
PROPOSED MULTIFAMILY	404 LOWELL STREET WAKEFIELD, MA	
One Billings 617-786-7727	Description of the second seco	
No	Pevision Date	
Project No: Scale: A Date: 10 Drawn By:	18223 S NOTED -11-2018 SL	
Prawing Name PROF DETA	POSED AILS	
Sheet No. 5-2,4		







404 LOWELL STREET WAKEFIELD

RESIDENTIAL

8 Units: 6 Two Bedrooms

	<u>1088-1134 SF +/-</u>	No Change			
2 On	e Bedrooms				
	<u>923 SF +/-</u>	No Change			
PARKING:	20 Parking Spaces	16 Parking Spaces			
	4 Exterior	<u>5 Exterior</u>			
	16 garage (2 tandem)	11 garage (0 tandem)			
HEIGHT: 3 Sto	ories/33'-6"	No Change			

Affordable Unit : <u>Unit 4 (2 Bedroom)</u>

No Change

ZONING SUMMARY <u>ARTICLE VI</u> Bus SUBDISTRICT

DWELLING	MIN. LOT SIZE	MIN. LOT AREA PER UNIT	TOTAL LOT SIZE	LOT WIDTH FRONTAGE	FAR 1	BLDG. HEIGHT	OPEN AREA	SETBACK S FRONT	ETBACK SIDE	SETBACK REAR	BUILDING COVERAGE	BUILDING SEPERATION
REQUIRED BY ZONING	4000	1200 PER UNIT	4000	180	1.5	5 stories 50' ±	30 %	33.5	33.5	33.5	35%	50'
PROPOSED PROJECT <u>PARKING REQUIREMENT</u> <u>RESIDENTIAL USE: 1.5 SP</u>	NA ACE PER U	1/1119 NIT	8957 S.F. VIOLATION	70' violation	11219/8957 1.25	3 stories 33'-6"±	25.5% 23.5% VIOLATION	11' ave VIOLATION	6.25' violation	29' ave violation	56 % violation	16' +/- VIOLATION
REQUIRED 12 SPACE PROPOSED 2 0 SPACE	s 5 16	SPACES	USE SU MULTI	JMMARY: IFAMILY			OVERLAYS: NONE				OTHER: -NONE	







B.E. FROM THE NORTH



B.E. FROM THWEST



B.E. FROM THE SOUTH



$\sim\sim\sim$	COMMON NAME	SIZE	QUANITY						
TREES	~~~~~	~~~~~							
1)						
	Japanese Maple	Acer Palmatum	3" Min Caliper	ζ4					
				$\langle \dots \rangle$					
SHRUBS				\sim					
	Eastern Aboritive	Thuja Occidentalis	7-8' Min	(35)					
	Boxwood	Buxus Sempervirens	24-30"	{ 14					
	Spreading Yew	Taxus Media Densiformis	5 Gal	$\sim_{s} \cdots$					
	Climbing Hydranger	Hydrangea Petiolaris	1 Gal	5					
	Ivory Halo Dogwood	Cornus Alba Ivory Halo	3 Gal	10					
PERENNIALS				\sim					
	Lilyturf	Lirope Muscari Variegata	1 Gal	{46 {					
	Daylily	Hemorocallis Stella D Oro	1 Gal	<u></u> {27 ∫					
				$\langle \rangle$					
LANDSCAPING SHALL HAVE AN AUTOMATIC IRRIGATION SYSTEM THROUGHOUT THE SITE									



Site Changes:

-The exterior driveway that served the basement will now be landscaping.

-The rear exterior parking is being reworked to add a parking space.

-The stairs and ramp at the entry lobby are being removed and is now flat.

-The rear basement stair is being removed

-Left side walkway switched from crushed stone to Pavers and shortened with the eliminated portion switched to grass.

-Right side walkway switched from crushed stone to Pavers

-Rear Trees relocated and changed to Japanese Maples at request of rear neighbor.



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Basement changes:

-The lower level of the garage and basement area has been removed from the proposal due to excessive water levels detected on the site.

-Sheet A-1.1, The previous lower garage plan, has been deleted from the set.



Ground level changes:

-The 1st level is being redesigned to accommodate 16 spaces.

- -The interior ramp down to the basement will now be 4 added grade parking spaces.
- -The floor height in the middle of the garage is being reduced. This allows for the entry ramp in the entry lobby to be removed.
- -Utility space is being added in the garage as well as in the entry lobby.



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Elevation Changes:

-Windows have been added where the garage door to the basement previously existed.

-Some of the garage venting has been removed as a smaller amount is now required do the reduction of garage size.



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404 Lowell Street







404 Lowell Street



TRAFFIC IMPACT STATEMENT

TO:	Mr. Steven Boccelli Central Development 222 Central Street Saugus, MA 01960	FROM:	Scott W. Thornton, P.E. <i>and</i> Rana Eslamifard Vanasse & Associates, Inc. 35 New England Business Center Drive Suite 140 Andover, MA 01810-1066 (978) 474-8800
DATE:	February 8, 2021	RE:	8813
SUBJECT:	Proposed Residential Development – 44 Wakefield, Massachusetts	4-48 Cresce	ent Street

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Statement (TIS) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a 56-unit multifamily residential building to be located off of Crescent Street in Wakefield, Massachusetts (hereafter referred to as "The Project"). This assessment evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project along Crescent Street and the major intersection where Project-related traffic will travel.

PROJECT DESCRIPTION

The Project entails construction of a 56-unit multifamily residential development to be located at 44-48 Crescent Street in Wakefield, Massachusetts. On-site parking will be provided for 72 vehicles including 3 handicapped accessible spaces. The access and egress to the site will be proposed by two new driveways; one full access driveway onto Crescent Hill, approximately 60 feet east of Crescent Street; and one full access driveway onto Crescent Street, approximately 140 feet north of Water Street. The Project site encompasses $0.58\pm$ acres of land which is generally bounded by Crescent Hill to the north; residential properties to the south and east; and Crescent Street to the west. At present, the Project site includes three existing residential buildings which will be razed to accommodate the Project. Figure 1 depicts the Project site location in relation to the existing roadway network.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions on the study area roadways was conducted in January 2021. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; traffic volumes; and operating characteristics; as well as posted speed limits; and land use information. The study area for the Project contains the major roadways which provide access to the Project site including Water Street (Route 129) and Crescent Street as well as the intersections of Crescent Street at Crescent Hill and Water Street at Crescent Street which are expected to accommodate the majority of Project-related traffic. The following summarizes the existing conditions within the study area.



Roadway

Water Street (Route 129)

Water Street is an urban principal arterial under Town jurisdiction that traverses the study area in a general east-west direction. Water Street provides two 14- to 18-foot wide travel lanes separated by a double-yellow centerline with marked shoulders. Within the study area, a 7- to 8-foot on-street parallel parking lane is provided in the westbound direction. Illumination is provided on Water Street by way of streetlights mounted on utility poles. The posted speed limit along Water Street within the study area is 20 miles per hour (mph), with land use consisting of residential and commercial properties.

Crescent Street

Crescent Street is a two-way urban minor arterial under Town jurisdiction that traverses the study area in a general north-south direction. Crescent Street provides a 29-foot wide travel lane with no centerline or shoulder markings. Illumination is provided on Crescent Street by way of streetlights mounted on utility poles. Land use within Crescent Street consists of residential and commercial properties.

Intersections

Figure 2 summarizes existing lane use and travel lane widths at the study area intersection as observed in January 2021.

Traffic Volumes

In order to determine existing traffic-volume demands and flow patterns within the study area, manual turning movement counts (TMCs) and vehicle classification counts were completed on Wednesday, January 6, 2021 at the Water Street and Crescent Street intersection during the weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak period. These time periods were selected for analysis purposes as they are representative of the peak-traffic-volume hours for both the Project and the adjacent roadway network. In addition to the January 2021 TMC, historical traffic count data collected by others¹ was obtained for the intersection of Water Street at Crescent Street. The obtained data was collected in March of 2016 in conjunction with a prior traffic study that was conducted at this intersection.

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, trafficvolume data from the Massachusetts Department of Transportation (MassDOT) Continuous Count Station No. 5099 located on Interstate-95 (I-95) in Lynnfield were reviewed.² Based on a review of this data, it was determined that traffic volumes for the month of January and March are approximately 19.0 and 5.0 percent *below* average-month conditions. As such, the raw traffic count data was adjusted upward in order to provide conservative (above-average) analysis conditions.

In order to adjust January 2021 traffic-volume data due to the impact on traffic volumes and trip patterns resulting from the COVID-19 pandemic, the January 2021 TMCs were compared to March 2016. For the purpose of this comparison, the January and March traffic volumes were both adjusted to average-month conditions and the 2016 traffic volumes were expanded to 2021 by applying a background traffic growth rate of 1.0 percent per year (discussion follows). Based on this comparison, we concluded that the adjusted March data represents higher traffic volumes and more reasonable trip patterns compared to adjusted January data. Please note that traffic volumes at the intersection of Crescent Street at Crescent Hill were

¹*Traffic Impact Assessment*, Mixed-Used Development - Wakefield, Massachusetts; Tighe & Bond; May 2, 2016. ²MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2021.







Figure 2

Existing Intersection Lane Use, Travel Lane Width and Pedestrian Facilities obtained by using trip-generation statistics published by the Institute of Transportation Engineers (ITE)³, for trips entering and exiting Crescent Hill with the number of residential units used as the independent variable. In order to estimate through traffic along Crescent Street, traffic count data obtained at the Crescent Street, Otis Street, and Centre Street intersection was used in conjunction with a prior traffic study that was conducted by others⁴.

Based on a review of the traffic count data, Crescent Street in the vicinity of the Project site accommodates approximately 290 vehicles per hour (vph) during the weekday morning peak hour (7:00 to 8:00 AM) and 844 vph during the weekday evening peak hour (4:30 to 5:30 PM). The 2021 Existing weekday morning and weekday evening peak-hour traffic volumes are graphically depicted on Figure 3.

Pedestrian and Bicycle Accommodations

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in January 2021. The field inventory consisted of a review of the location of sidewalks and pedestrian crossings along the study area roadways and at the study area intersections. As detailed on Figure 2, sidewalks exist on both sides of Water Street and Crescent Street. At the study area intersection, painted crosswalks are provided for crossing the Water Street west leg and Crescent Street north leg with traffic signal equipment and phasing and Americans with Disabilities Act (ADA) wheelchair ramps exist at all of the pedestrian crossings. Bicycle facilities were not provided in the vicinity of the Project.

Public Transportation

Public transportation services are provided within the Town of Wakefield by the Massachusetts Bay Transportation Authority (MBTA) (Commuter Rail service and fixed-route bus service). Access to MBTA bus Routes 136 (Reading Depot to Malden Center Station) and 137 (Reading Depot to Malden Center Station) are provided along Main Street with approximate 2-minute walking distance from the Project site. The Wakefield Station on the Haverhill Line of the MBTA commuter rail system is located at 225 North Avenue in Wakefield (an approximate 10-minute walking distance), from which commuter rail service is provided to North Station in Boston.

Motor Vehicle Crash Data

Motor vehicle crash information for the study area intersection was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2013 through 2017, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, roadway and weather conditions, and day of occurrence, and presented in Table 1.

³*Trip Generation*, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.

⁴ Traffic Impact Assessment, Senior Living Community-Wakefield, Massachusetts Tighe & Bond; December 1, 2014.



WEEKDAY EVENING PEAK HOUR (4:30 - 5:30 PM)





Figure 3

2021 Existing Peak Hour Traffic Volumes

	Water Street at Crescent Street	Crescent Street at Crescent Hill
Traffic Control Type: ^b	TS	U
Year:		
2013	7	0
2014	5	1
2015	3	1
2016	2	1
<u>2017</u> T_t_1	$\frac{2}{10}$	<u>2</u>
Total	19	5
Average	3.80	1.0
Crash Rate ^c	0.64	0.84
MassDOT Crash Rate: ^d	0.73	0.57
Significant? ^e	No	Yes
Type		
Angle	11	1
Rear-End	4	2
Head-On	3	0
Sideswipe	1	1
Single Vehicle Crash	0	1
Unknown/Other	0	<u>0</u>
Total	19	5
Conditions:		
Clear	14	3
Cloudy	2	1
Rain	3	0
Snow/Ice	0	1
Not Reported/Other	0	<u>0</u>
Total	19	5
Lighting:		
Daylight	18	4
Dawn/Dusk	0	1
Dark (Road Lit)	1	0
Dark (Road Unlit)	0	<u>0</u>
Total	19	5
Day of Week		
Monday-Friday	14	5
Saturday	3	0
Sunday	2	0
Total	19	5
Soucritu		
Property Damage Only	14	4
Non-fatal Injury	5	4
Not Reported	0	1
Total	19	5

Table 1 MOTOR VEHICLE CRASH DATA SUMMARY^a

^aSource: MassDOT Safety Management/Traffic Operations Unit records, 2013 through 2017.

^bTraffic Control Type: U = unsignalized; TS = traffic signal.

^cCrash rate per million vehicles entering the intersection.

^dDistrict crash rate.

^eThe intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (District 4).

As can be seen in Table 1, the study area intersections were found to have averaged approximately 4 or fewer reported motor vehicle crashes per year over the five-year review period, the majority of which occurred on a weekday, under clear weather conditions during daylight, and involved angle or rear-end type collisions that resulted in property damage only. With the exception of the Crescent Street at Crescent Hill intersection, the intersection of Water Street and Crescent Street was found to have a motor vehicle crash rate *below* the MassDOT District 4 average crash rates for a signalized intersection. The intersection of Crescent Street and Crescent Hill was shown to have a motor vehicle crash rate *above* the MassDOT District 4 average crash rates for a signalized intersection.

A Road Safety Audit (RSA) was conducted at the Water Street and Vernon Street intersection in 2017 by WorldTech Engineering including the intersection of Water Street and Crescent Street that resulted in a series of recommendations for safety enhancements. Some of the improvements that were identified include upgrading pedestrian signal equipment and replacement/upgrading of existing signs.

The detailed MassDOT crash rate worksheet is provided in the Appendix.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2028, which reflects a seven-year planning horizon consistent with MassDOT's Guidelines. Independent of the Project, traffic volumes on the roadway network in the year 2028 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2028 No-Build traffic volumes reflect 2028 Build traffic-volume conditions with the Project.

Future Traffic Growth

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

The Town of Wakefield Planning Board was contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes along Crescent Street. Based on this consultation, no developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate (discussion follows).

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from permanent count station located along I-95 was reviewed. This data provides the most recent data and indicates a growth rate of 0.91 percent over the past several years. In order to provide a prudent planning condition for the Project, a slightly higher 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

MassDOT and the Town of Wakefield were consulted in order to determine if there were any planned future roadway improvement projects expected to be complete by 2028 within the study area. Based on these discussions, no roadway improvement projects aside from routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2028 No-Build condition peak-hour traffic volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2021 Existing peak-hour traffic volumes. The resulting 2028 No-Build weekday morning and evening peak-hour traffic volumes are shown on Figure 4.

PROJECT-GENERATED TRAFFIC

As proposed, the Project will entail the construction of 56 multifamily residential units. In order to develop the traffic characteristics of the Project, trip-generation statistics published by ITE for similar land uses as those proposed were used. ITE Land Use Code (LUC) 221, *Multifamily Housing (Mid-Rise)* was used to establish the base traffic characteristics of the Project. A summary of the expected vehicle trip generation for the Project is Summarized in Table 2.



WEEKDAY EVENING PEAK HOUR (4:30 - 5:30 PM)





Figure 4

2028 No Build Peak Hour Traffic Volumes

Table	2	
TRIP	GENERATION	SUMMARY

Time Period/Direction	Proposed Residential Community ^a
4 117 7 7	
Average Weekday:	
Entering	152
<u>Exiting</u>	<u>152</u>
Total	304
Weekday Morning Peak Hour: Entering <u>Exiting</u> Total	5 <u>14</u> 19
Weekday Evening Peak Hour:	
Entering	15
Exiting	10
Total	$\frac{10}{25}$

^aBased on ITE LUC 221, *Multifamily Housing (Mid-Rise)*, 56 units.

Project-Generated Traffic Volume Summary

As can be seen in Table 2, the Project is expected to generate approximately 304 new vehicle trips on an average weekday (two-way volume, 24-hour volume), with 19 new vehicle trips (5 entering and 14 exiting) expected during the weekday morning peak hour, and 25 new vehicle trips (15 entering and 10 exiting) expected during the weekday evening peak hour. The traffic-volume increases that are expected to be associated with the Project are relatively modest (approximately 1 additional vehicle every 4 minutes during the peak hours) and would not be expected to result in a material increase in motorist delays or vehicle queuing over existing conditions.

Trip Distribution and Assignment

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Wakefield and then refined based on existing traffic patterns within the study area during the commuter peak periods. This methodology is consistent with the residential nature of the Project and commuter traffic patterns during the peak hours. The general trip distribution for the Project is graphically depicted on Figure 5, with the additional traffic that is expected to be generated by the Project assigned on the study area roadway network as shown on Figure 6.

Build Traffic Volumes

The 2028 Build condition traffic volumes were developed by adding the traffic expected to be generated by the Project to the 2028 No-Build condition traffic volumes. The 2028 Build weekday morning and evening peak-hour traffic volumes are graphically depicted on Figure 7.





Figure 5

2021 Existing Peak Hour Traffic Volumes Transportation Impact Assessment - Proposed Multifamily Residential Development - Wakefield, Massachusetts

WEEKDAY MORNING PEAK HOUR (7:00 - 8:00 AM)



WEEKDAY EVENING PEAK HOUR (4:30 - 5:30 PM)





Figure 6

Project Generated Peak Hour Traffic Volumes



WEEKDAY EVENING PEAK HOUR (4:30 - 5:30 PM)





TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

In brief, six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions. Since the level-of-service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the SynchroTM 10 software as required by MassDOT. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on "percentile" delay. The levels of service of unsignalized intersections are measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. The numerical delay thresholds for signalized and unsignalized intersections are based on the 2010 *Highway Capacity Manual* (HCM)⁵ method.

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2021 Existing, 2028 No-Build, and 2028 Build conditions for the Intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized in Table 3 and Table 4, with the detailed analysis results presented in the Appendix. The following is a summary of the level-of-service and delay analyses for the intersections within the study area:

Signalized Intersection Analysis Results

Project-related impacts at the signalized study area intersection are shown on Table 3 and are defined as follows:

Water Street at Crescent Street

Under all conditions, all the movements at this signalized intersection were shown to operate at LOS C or better during the weekday morning and evening peak hours with negligible increases in overall delay and vehicle queuing.

⁵*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Analysis Results

Project-related impacts at the unsignalized study area intersection are shown on Table 4 and are defined as follows:

Crescent Street at Crescent Hill

All movements at this unsignalized intersection were shown to operate at LOS B or better with no vehicle queuing expected to occur.

Project Site Driveways

All movements exiting the Project site driveways to Crescent Street and Crescent Hill were shown to operate at LOS B or better, with no vehicle queuing predicted to occur.

Table 3 SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY

	2021 Existing				2028 N	No-Build		2028 Build				
Signalized Intersection/ Critical Movement/Peak Hour	V/C ^a	Delay ^b	LOS ^c	Queue ^d Ave/95 th	V/C	Delay	LOS	Queue/ Ave/95 th	V/C	Delay	LOS	Queue/ Ave/95 th
Water Street at Crescent Street:												
Weekday Morning:	0.51	12.0	р	4/10	0.52	12.0	р	4/12	0.52	12.0	р	4/12
Water Street ED L1/11/K1	0.51	12.9	D	4/12	0.35	12.9	D	4/15	0.35	12.9	D	4/15
water Street wB L1/1H/K1	0.76	19.0	В	//21	0.78	19.0	В	8/20	0.78	19.7	В	8/20
Private Driveway NB LT/TH/RT	0.02	21.2	С	0/0	0.02	22.2	С	0/0	0.02	22.2	С	0/0
Crescent Street SB LT/TH/RT	0.33	22.0	С	2/4	0.37	23.9	С	2/4	0.39	24.1	С	2/4
Overall		17.2	В			17.7	В			17.8	В	
Weekday Evening:												
Water Street EB LT/TH/RT	0.70	20.1	С	5/16	0.73	20.6	С	6/18	0.74	20.9	С	6/18
Water Street WB LT/TH/RT	0.65	18.6	В	4/14	0.67	18.8	В	5/15	0.67	18.7	В	5/15
Private Driveway NB LT/TH/RT	0.05	21.5	С	0/1	0.06	22.1	С	0/1	0.06	22.1	С	0/1
Crescent Street SB LT/TH/RT	0.31	24.9	Ċ	1/5	0.34	26.1	Ċ	1/6	0.36	26.4	Ċ	1/6
Overall		20.1	č			20.6	č			20.7	č	

^aVolume-to-capacity ratio

^bDelay in seconds per vehicle. ^cLevel of service.

^dQueue length, in vehicle.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 4 UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2021 Existing			2028 No-Build				2028 Build				
Unsignalized Intersection/Peak- hour/Movement	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Crescent Street at Crescent Hill:												
Weekday Morning:												
Crescent Hill WB LT	6	9.9	А	0	6	10.1	В	0	7	10.1	В	0
Crescent Street SB LT	1	7.5	А	0	1	7.6	А	0	2	7.6	А	0
Weekday Evening:												
Crescent Hill WB LT	3	9.8	А	0	3	9.9	А	0	4	9.9	А	0
Crescent Street SB LT	2	7.5	А	0	2	7.5	А	0	7	7.5	А	0
Crescent Street at the Project Site Driveway: Weekday Morning:												
Site Driveway WB LT									7	10.4	В	0
Weekday Evening:												
Site Driveway WB LT									5	10.1	В	0
Crescent Hill at the Project Site Driveway: Weekday Morning:												
Site Driveway NB LT Weekday Evening:									6	8.6	А	0
Site Driveway NB LT									4	8.6	А	0

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel-of-Service.

^dQueue length in vehicle.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements

RECOMMENDATIONS AND CONCLUSION

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any conditions identified at off-site locations evaluated in conjunction with this study. The following recommendations are proposed as part of this evaluation and, where applicable, will be completed in conjunction with the Project:

Project Access

Access and egress to the Project site will be provided by way of two new driveways. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulation, many of which are reflected on the Site Plans:

- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP line provided.
- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).⁶
- ADA-compliant wheelchair ramps should be provided at all pedestrian crossings internal to the Project site and for crossing the Project site driveways, or the driveway should be designed such that the sidewalks along Crescent Street and Crescent Hill are flush with (i.e., cross) the driveway.
- Signs and landscaping to be installed as a part of the Project within the intersection sight triangle areas of the Project site roadway should be designed and maintained so as not to restrict lines of sight.

CONCLUSIONS

VAI has conducted a TIS in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a 56-unit multifamily residential community at 44-48 Crescent Street in Wakefield, Massachusetts. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

- 1. Using trip-generation statistics published by the ITE,⁷ the Project is expected to generate approximately 304 new vehicle trips on an average weekday (two-way volume, 24-hour volume), with 19 new vehicle trips (5 entering and 14 exiting) expected during the weekday morning peak hour, and 25 new vehicle trips (15 entering and 10 exiting) expected during the weekday evening peak-hour;
- 2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), with the majority of the movements at the study intersections continuing to operate at a LOS C or better; and

⁶*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009. ⁷Ibid.

3. The traffic-volume increases that are expected to be associated with the Project are relatively modest (approximately 1 additional vehicle every 4 minutes during the peak hours) and would not be expected to result in a material increase in motorist delays or vehicle queuing over existing conditions.

With implementation of the above recommendations, safe and efficient access will be provided to the project site and the project can be accommodated within the confines of the existing and improved transportation system.



Traffic Calming Policy

Introduction

Traffic calming is a method of employing specific measures to reduce speeding, aggressive driving, and high levels of vehicular traffic traveling through local neighborhoods.

This policy has been developed in order to establish a structured process through which the Town can respond to and address residents' concerns regarding these types of traffic issues that occur on Town maintained residential streets. For traffic issues that arise on arterials and collectors streets, each concern will be evaluated on a case by case basis.

The purpose of the policy is to verify a concern once it is brought to the Town's attention, evaluate it against set criteria, rank it against other known locations in Town, provide recommendations to address the issue, and determine the effectiveness of recommendations that are implemented.

Other requests for traffic controls such as stop signs, traffic signals etc. may be requested using the same process but each will be evaluated on a case by case basis. These requests must conform with MUTCD and other local, state and federal traffic standards.

A flow chart of the overall process is presented on the next page, while a description of each step is outlined in the following section.

Traffic Calming Policy Process



Process and Requirements

Step 1 – Report the Problem

If a resident feels that there is a speeding or traffic problem on their local residential street, they should report the problem to Wakefield Police Traffic Division at (339) 219-4525 or by email to JAnderson@wakefieldpd.org

Staff will review the concern to verify that it meets the following initial minimum criteria:

- 1. Location of the concern must be a Town maintained residential roadway.
- 2. The roadway must be at least 600 feet long.
- 3. The majority of the property adjoining the roadway is residential.
- 4. The posted speed limit is not greater than 30 mph.

If the initial minimum criteria is met, the resident will be provided with a Traffic Calming Request Form (a copy of the request form is provided in the appendix as Attachment A).

Once this form is completed and submitted to the Wakefield Police Department's Traffic Division, a letter will be sent to the Applicant with notification of the upcoming Traffic Advisory Committee (TAC) meeting date.

Step 2 – Traffic Advisory Committee Initial Review

The TAC will review the application to determine the limits of the affected area and will request a petition from a representative number of residents in this affected area to verify that there is a widespread concern for the speeding or traffic issue (a blank copy of the petition to be signed is provided in the appendix as Attachment B). The neighborhood shall identify and list on the petition a resident who will serve as the primary contact with the Town.

A letter will be sent to the applicant with the petition forms and limits of the affected area.

Step 3 - Neighborhood support

Once the applicant submits the petition signed by at least 70% of the residents within the subject area, it will be reviewed by staff. If a request has met the next minimum criteria it will proceed to Step 4. A letter will be sent to the applicant indicating receipt of petition forms and that data will be collected to evaluate the concern.

<u>Minimum Criteria</u> – Petition must be signed by at least 70% of residents within the subject area as defined by the Town in order to qualify as "widespread concern".

In the event that the Applicant is not able to garner 70% of the required signatures, the TAC may, at its discretion, continue to move the application on to the next step if it is determined that the concern is a problem area.

Step 4 – Data Collection and Evaluation

After verifying that the concern meets the minimum criteria set forth above, Town staff or its contracted traffic consultants will collect traffic volume and speed data, observe traffic patterns, evaluate existing conditions in the area such as stopping sight distances and accident histories, and present their findings to the TAC.

Step 5 – TAC Data Review, Evaluation, and Recommendation

The TAC reviews and evaluates the data. If the data meets the minimum criteria as set forth below, the TAC may recommend Stage 1 traffic calming measures as appropriate. A letter will be sent to the Applicant indicating the TAC's determination.

Each valid request will be evaluated based on the criteria shown below. If multiple potential projects are being considered, they will be ranked by their score to help prioritize the order in which they are completed in relation to available funds and resources, and anticipated benefits.

Criteria									
Traffic Speeds – amount the 85% speed is above the posted speed limit									
	<u>0-7 mpn</u>	<u> </u>	pn	<u>>10 mpn</u>					
	0 points	to poin	lS	ro points					
Traffic Volumes – average daily traffic (ADT) measured in vehicles per day (VPD)<400vpd401-1000vpd1001-2000vpd>2000vpd0 points5 points10 points15 points									
Other Considerations – School zone or pedestrian generator – 10 points No sidewalk on either side of street – 5 points									

Requests must have a point total greater than 0 to be further evaluated for Stage 1 traffic calming measures. However, the TAC may, at its discretion, continue to move the application on to the next step if it is determined that there are other factors involved that indicate the concern is a significant safety hazard.

Step 6 – Stage 1 Traffic Calming

Projects that meet the minimum criteria will be eligible for Stage 1 traffic calming measures. These measures are typically low cost, can be easy to deploy, and can offer a relative easy solution to the problem. These methods may include:

Use of a speed monitoring radar trailer Education / Public Awareness Traffic enforcement Signing and pavement markings

If recommended, a Stage 1 measure will be installed or employed at this time.

Step 7 – Follow-up Data Collection

If one or more of the Stage 1 traffic calming measures are implemented, the Town will wait approximately six months before collecting additional traffic data to determine the effectiveness of the implemented measures.

Step 8 – TAC Data Review, Evaluation, and Recommendation

The TAC will review the follow-up data. If the measure was successful in addressing the concern, then the traffic calming process will end at this point.

If the TAC deems the measure to be unsuccessful, then further measures will be evaluated and the TMG will discuss concepts, cost estimates, and funding availability for possible Stage 2 traffic calming measures.

Stage 2 measures would typically involve physical modifications to the roadway in order to control traffic. They can be rather expensive and can require extensive construction. Possible Stage 2 measures *may* include:

Bulb-outs / Curb extensions Center island medians Chicanes Landscape treatments Mid-block chokers Pedestrian refuge islands Raised crosswalks Realigned intersections Roundabouts Sidewalks Speed humps Speed tables

While these types of measures may address the initial traffic concerns, their implementation can also present a different set of problems such as difficulties in snow removal, impeding emergency response vehicles, adverse impact to traffic in other areas, and creating additional noise as in the case with speed humps or speed tables.

A letter will be sent to applicant indicating the TAC's determination and the next steps, if any, to be taken. If Stage 2 measures are to be recommended, the Town will again require that there be a neighborhood wide consensus on the proposed improvements. The Town will require 75% of the residents within the defined area of the improvements sign another petition describing the proposed improvements and their estimated cost. A blank copy of the petition for implementation of Stage 2 measures is provided in the appendix as Attachment C and will be sent to the Applicant as necessary.

Step 9 - Neighborhood Support for Stage 2 Measures

Once the Applicant submits signatures of at least 75% of residents within the subject area to show support for recommended concept design, costs, and funding track, Town staff will schedule and notify the Applicant of a neighborhood site meeting.

Step 10 – Neighborhood Site Meeting

A neighborhood site meeting will be organized by the TAC and held to present proposed Stage 2 measures which will involve physical modifications to the roadway and/ public right-of-way. This informational meeting will provide a public forum to solicit comments regarding a proposed project.

Step 11 – TAC Review of Neighborhood Site Meeting Comments

The TAC will review feedback presented at the neighborhood site meeting and determine if design and construction of the proposed recommendations should be pursued.

Step 12 – Identify Funding

Once the TAC determines that the recommended Stage 2 measures are to be implemented, funding for the design and construction of the proposed improvements will need to be identified.

Step 13 – Design and Construction

Actual implementation of stage 2 measures will be dependent on a project's point ranking as determined in Step 5 compared to other traffic calming projects and available funding.

Once funding for a specific project is in place, design and construction of the proposed improvements will proceed.

Step 14 – Follow-up Evaluation

After the Stage 2 measures have been in place for approximately six months, additional data may be collected to determine their effectiveness.

Unless the DPW determines that the installed measures are a hazard, once they are installed, measures shall remain for at least 3 years. If a neighborhood decides that it no longer wants the measures in place following the first three years, a process similar to that used for implementation of the Stage 2 measures will be followed, including demonstrating public support for their removal as evidenced by a petition signed by 75% of the residents within the defined area of the improvements, and evaluation by the TAC.

APPENDIX
Attachment A – Traffic Calming Request Form

This form is used to report a speeding or traffic problem on a residential street. When this form is submitted, Town staff will evaluate the complaint to determine the nature of the problem, and make sure that the location is a town maintained, residential street. After the initial report Town staff will explain how residents may put together a petition to verify that there is a widespread concern for the speeding or traffic issue.

- 2. Please describe the location of the traffic concern. Attach a map or picture if necessary:
- 3. Please describe the nature of the neighborhood traffic problem you are concerned with (attach additional sheets if necessary):______

4. Please list possible solutions to the problem that you would like the Town of Wakefield to consider: ______

Please fill out this form and return to:

Wakefield Police Department Traffic Division 1 Union St. Wakefield, MA 01880

Attachment B- Neighborhood Petition Form (Page 1)

Please fill out this form and return with attached sheets to: Wakefield Police Department Traffic Division 1 Union St. Wakefield, MA 01880

THE UNDERSIGNED AGREE TO THE FOLLOWING:

1.	All persons signing this pet	ition do hereby certify that	they own property or reside within			
	the following area:					
2						
2.	All persons signing this petr	ition do hereby agree to the	e following problem in the defined			
	area:					
3.	All persons signing this petition do hereby agree that the following contact person(s) represents the neighborhood in matters pertaining to items 1 and 2 above:					
Name	e of key contact person #1 (ple	ease print):				
Addres	ess, City, and Zip Code:					
Teleph	hone (day):	Fax:	E-mail:			
Name	e of key contact person #2 (op	tional) (please print):				
Addres	ess, City, and Zip Code:					
Teleph	whone (day):	Fax:	E-mail:			

Please attach additional pages if necessary to discuss the request.

Date Submitted:

Attachment B-Neighborhood Petition Form (Page 2)

This petition is provided so that residents in a neighborhood may verify that there is a widespread concern for a speeding of traffic issue.

Town staff will identify an "area of influence" in the neighborhood. The area of influence includes properties abutting the street and properties on intersecting streets within a reasonable distance of the problem street. The DPW will provide a map and addresses for the area of influence.

The petition must be signed by at least 70 percent of the owners or residents of properties within the "area of influence." Each property is entitled to one signature. Valid signatures include those from (1) a property owner or spouse, (2) an adult head of household, or (3) an adult renting the property.

SIGNATURE AND PRINTED NAME	ADDRESS OF PROPERTY	DATE

(Additional copies of this page may be used.)

Attachment C- Neighborhood Petition Form (Page 1) for Construction of Traffic Calming Measures

Please fill out this form and return with attached sheets to: Wakefield Police Department Traffic Division 1 Union St. Wakefield, MA 01880

THE UNDERSIGNED AGREE TO THE FOLLOWING:

1. All persons signing this petition do hereby certify that they own property or reside within the following area:

2. All persons signing this petition do hereby agree to the construction of the following proposed traffic calming measures, the estimated cost of which is indicated below:

____(to be completed by DPW) _____

Estimated Construction Cost:

3. All persons signing this petition do hereby acknowledge that unless DPW determines that the installed measures are a hazard, once they are installed, measures shall remain for at least 3 years. If a neighborhood decides that it no longer wants the measures in place following the first three years, a process similar to that used for implementation of the Stage 2 measures will be followed, including demonstrating public support for their removal as evidenced by a petition signed by 75% of the residents within the defined area of the improvements, and evaluation by the TAC.

Date Submitted:	

Attachment C-Neighborhood Petition Form (Page 2) for Construction of Traffic Calming Measures

This petition is provided so that residents in a neighborhood may verify that there is a consensus for the construction of traffic calming measures as described on the previous page.

Town staff will identify an "area of influence" in the neighborhood. The area of influence includes properties abutting the street and properties on intersecting streets within a reasonable distance of the problem street. The Engineering Division will provide a map and addresses for the area of influence.

The petition must be signed by at least 75 percent of the owners or residents of properties within the "area of influence." Each property is entitled to one signature. Valid signatures include those from (1) a property owner or spouse, (2) an adult head of household, or (3) an adult renting the property.

SIGNATURE AND PRINTED NAME	ADDRESS OF PROPERTY	DATE

(Additional copies of this page may be used.)