

DRAFT FOR PLANNING BOARD REVIEW

**ANALYSIS OF FULL-BUILD
TRAFFIC AND ENVIRONMENTAL IMPACTS
MIDDLETOWN, RI**



DECEMBER 2019

Prepared for: Planning Department
Town of Middletown
350 East Main Road
Middletown, RI 02842

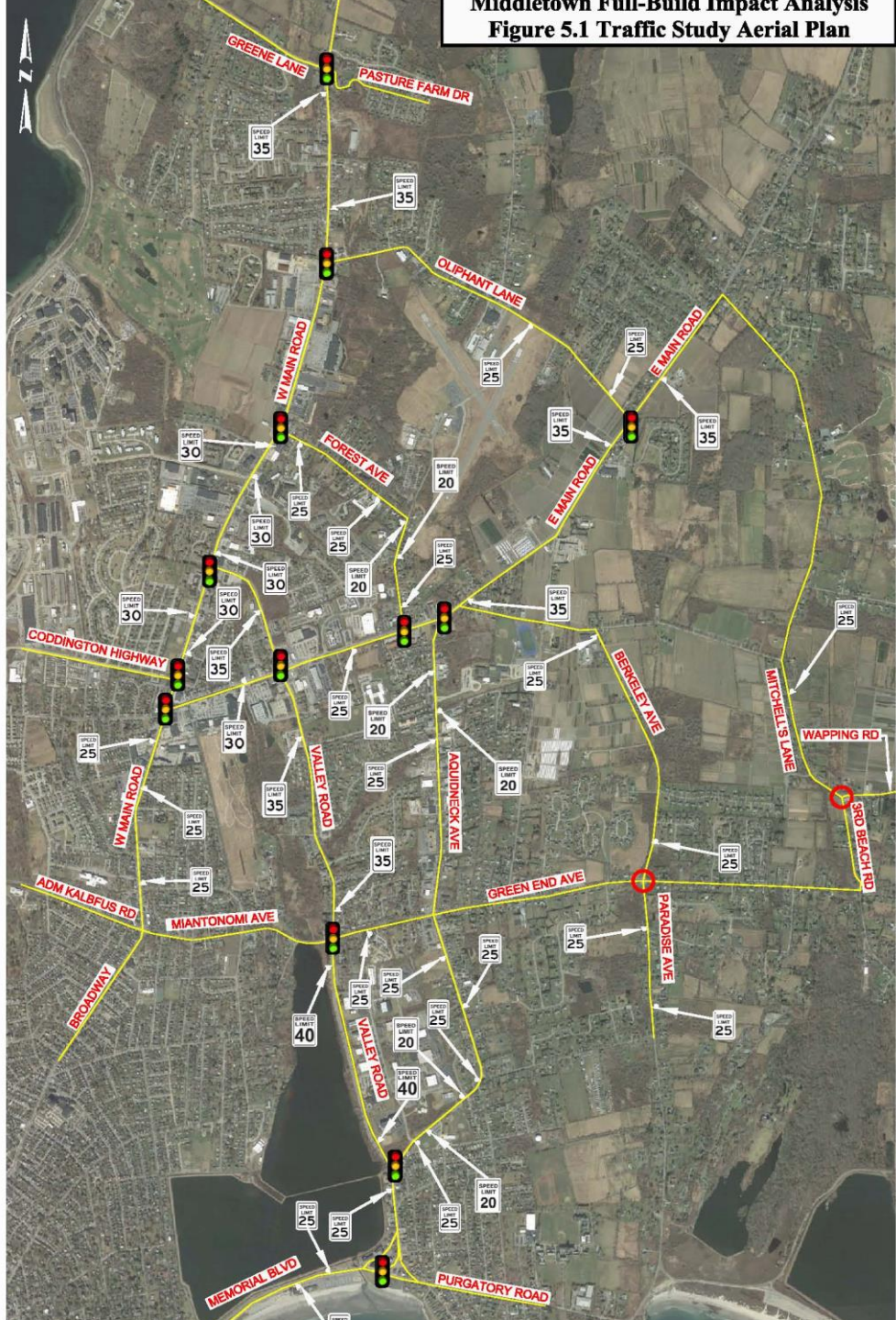
Prepared by: Crossman Engineering, Inc.
Engineers & Surveyors
151 Centerville Road
Warwick, RI 02886

TRAFFIC IMPACTS OF FULL BUILD-OUT

3 GENERAL STEPS :

1. EXISTING CONDITIONS – INVENTORY ROADWAY GEOMETRY, EXISTING TRAFFIC VOLUMES AND SAFETY CHARACTERISTICS
2. FUTURE CONDITIONS – FORECAST FUTURE YEAR VOLUMES WHICH INCLUDES EXISTING TRAFFIC VOLUME + SITE GENERATED TRAFFIC FROM FUTURE DEVELOPMENT
3. TRAFFIC OPERATIONS ANALYSIS – QUANTIFY AND COMPARE TRAFFIC IMPACTS /DELAYS BETWEEN EXISTING AND FUTURE CONDITIONS

Middletown Full-Build Impact Analysis
Figure 5.1 Traffic Study Aerial Plan



EXISTING CONDITIONS

- STUDY AREA CHOSEN INCLUDES 15 INTERSECTIONS THAT WERE DETERMINED TO BE MOST IMPACTED BY THE FULL BUILD-OUT DEVELOPMENT
- WEEKDAY AM & PM PEAK HOUR TURNING MOVEMENT COUNTS WERE COLLECTED AT EACH INTERSECTION FROM 7-9 AM AND 4-6 PM IN JUNE 2019
- THE WEEKDAY AM & PM PEAK HOURS IN THIS STUDY AREA (WHICH WILL BE ANALYZED) ARE 8-9 AM AND 4:15-5:15 PM

EXISTING AM PEAK HOUR 8-9 AM

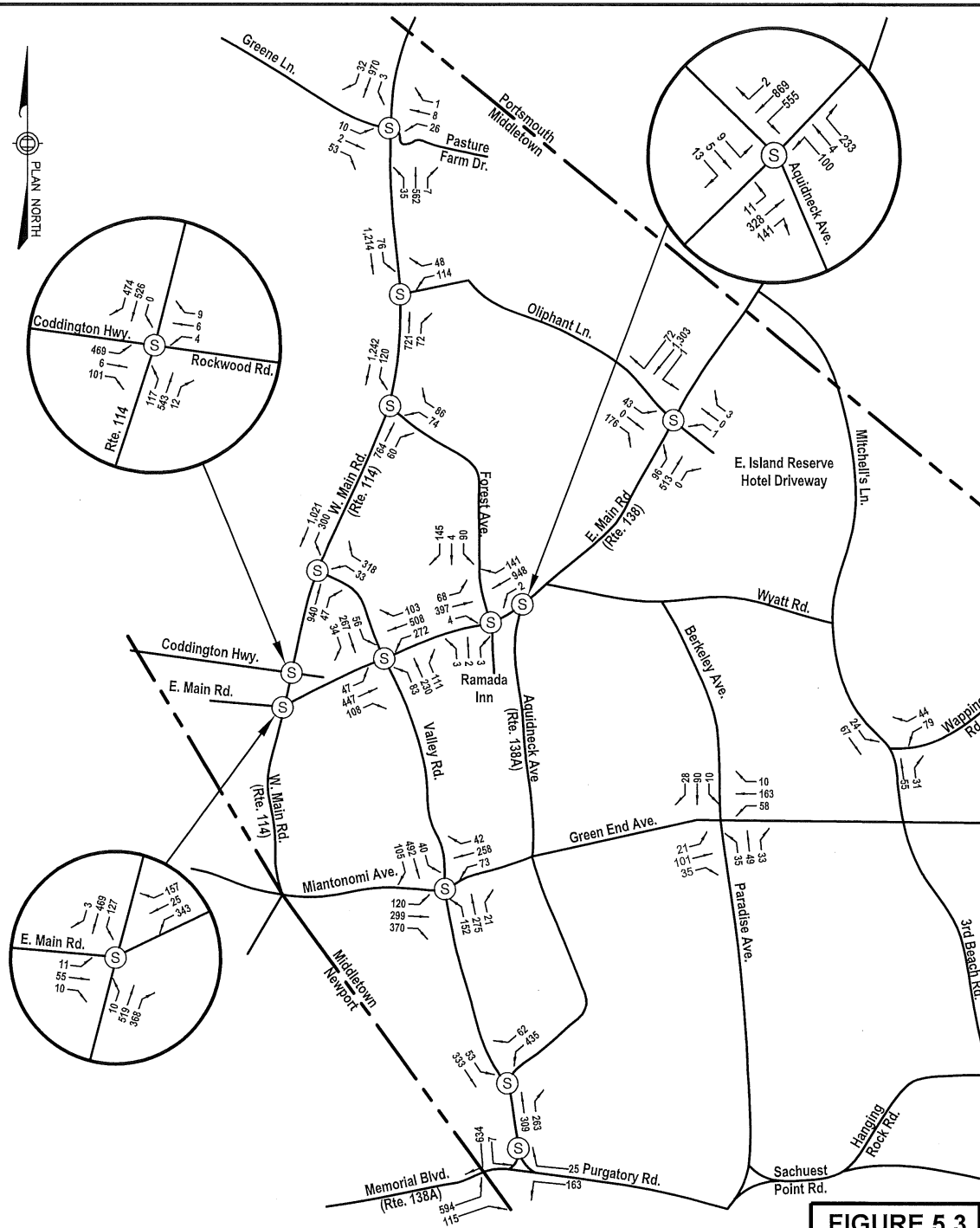
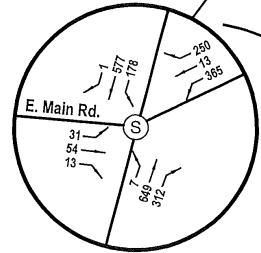
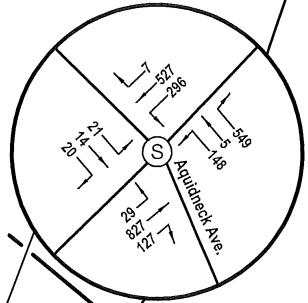
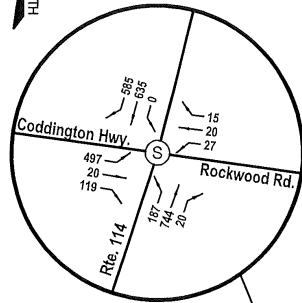


FIGURE 5.3



EXISTING PM
PEAK HOUR
4:15-5:15 PM

FIGURE 5.4

FUTURE CONDITIONS

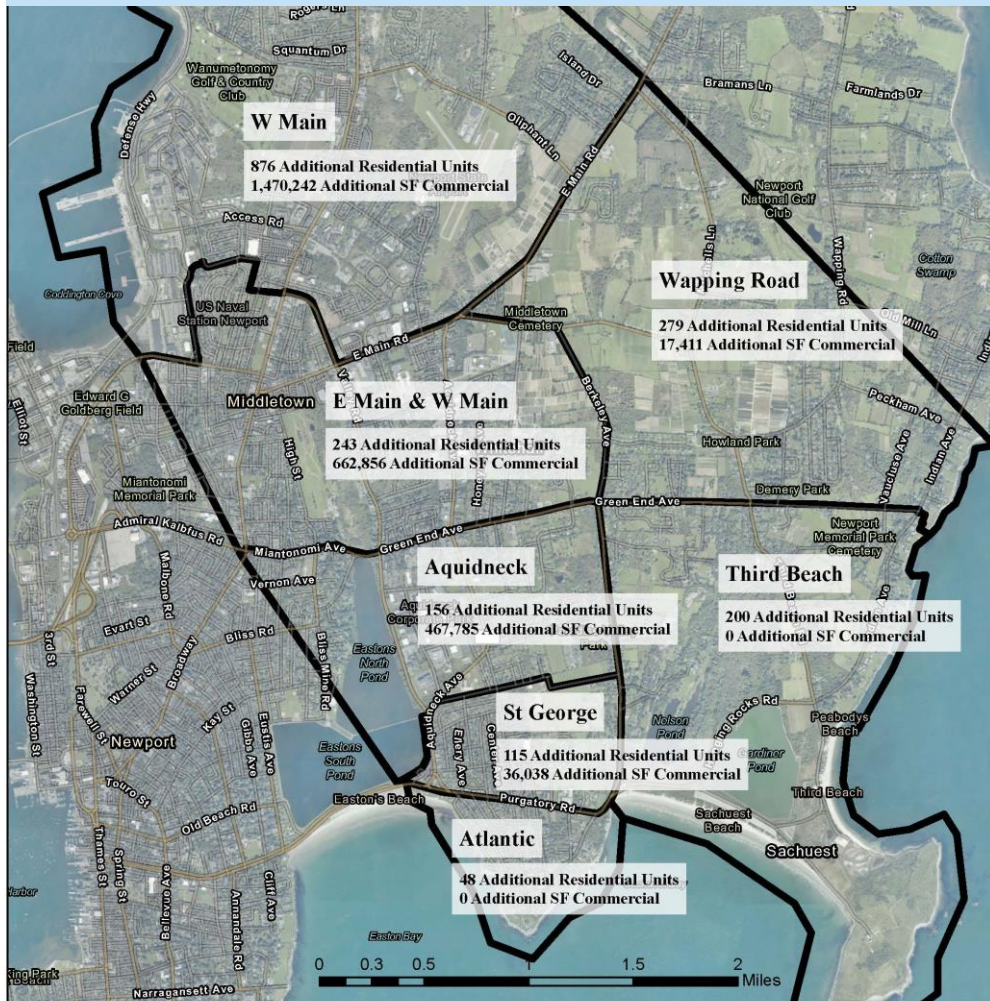
GENERALLY FUTURE CONDITIONS INCLUDES 2 ANALYSIS SCENARIOS:

1. NO-BUILD CONDITIONS – FUTURE TRAFFIC WITHOUT THE NEW DEVELOPMENT. INCLUDES EXISTING TRAFFIC VOLUMES INCREASED BY HISTORIC ANNUAL GROWTH (TO PLANNING HORIZON YEAR) AND INCLUDES TRAFFIC FROM ANY OTHER PLANNED DEVELOPMENTS
2. BUILD CONDITIONS – FUTURE TRAFFIC CONDITIONS WITH THE PROJECT DEVELOPMENT. THIS GENERALLY EQUALS NO-BUILD CONDITIONS + ADDITIONAL TRAFFIC GENERATED BY BUILT PROJECT.

SINCE DATA FROM STATEWIDE PLANNING SHOWS HISTORIC GROWTH IN AREA IS ON THE DECLINE, TO BE CONSERVATIVE, WE ASSUMED 0% ANNUAL GROWTH. IN ADDITION, THIS LONG-TERM STUDY ALREADY INCLUDES ALL PLANNED GROWTH IN MIDDLETOWN. SO IN THIS CASE, THERE IS NO “NO-BUILD” CONDITION TO ANALYZE. BUILD CONDITIONS WERE ATTAINED BY ADDING THE SITE GENERATED TRAFFIC TO EXISTING VOLUMES.

Middletown Full-Build Impact Analysis
Figure 5.2a Build-Out per Traffic Areas,
Full-Build with Current Zoning

	W Main	E.Main/ W.Main	Aquidneck	St George	Wapping	Third Beach	Atlantic	Total
Residential (# of units)	452	186	156	115	279	200	48	1436
Industrial	406,241	0	0	0	0	0	0	406,241
Mixed Use	1,210,142	161,577	0	0	0	0	0	1,371,719
Office Park	0	0	378,220	0	0	0	0	378,220
Office/ Business	76,784	69,786	0	0	0	0	0	146,570
Retail	200,625	488,045	89,565	36,038	17,411	0	0	831,684



THE PROPOSED FULL BUILD-OUT
 CONSISTS OF THE FOLLOWING
 DEVELOPMENTS:

- 1,436 UNITS - RESIDENTIAL (SINGLE-UNIT HOUSES) UNITS
- 406,241 SF - INDUSTRIAL
- 1,371,719 SF - MIXED USE
- 378,220 SF - OFFICE PARK
- 146,570 SF - OFFICE SPACE
- 831,684 SF – RETAIL

PROPOSED TRIP GENERATION

PEAK HR VEHICLE TRIP GENERATION ESTIMATES FOR THE PROPOSED DEVELOPMENT WERE CALCULATED USING ITE TRIP GENERATION. THIS IS THE TRAFFIC INDUSTRY STANDARD WHICH PUBLISHES TRIP RATES USING STATISTICAL DATA FOR SIMILAR LAND USE DEVELOPMENTS BASED ON RESIDENTIAL UNITS AND COMMERCIAL AREA.

THE ESTIMATED TRIP GENERATION FOR THE ADDITIONAL DEVELOPMENT:

	AM PEAK HOUR TRIPS*			PM PEAK HOUR TRIPS*		
	TOTAL	ENTERING	EXITING	TOTAL	ENTERING	EXITING
RESIDENTIAL	1,063	266	797	1,422	896	526
INDUSTRIAL	164	133	31	164	34	130
MIXED USE	1,102	624	478	2,516	1,081	1,435
OFFICE PARK	152	123	29	152	32	120
OFFICE / BUSINESS	172	148	24	170	27	143
RETAIL	782	485	297	3,169	1,521	1,648
TOTAL TRIPS	3,435	1,779	1,656	7,593	3,591	4,002

*IT SHOULD BE NOTED THAT NOT ALL TRIPS GENERATED WILL BE DISTRIBUTED ALONG THE STUDY AREA STREETS ANALYZED FOR CAPACITY

PROPOSED TRIP DISTRIBUTION / ROUTE ASSIGNMENT

Middletown



Number of working residents aged 16+: 7,999
 Percentage of residents who work in hometown: 35.6%
 Number of workers aged 16+: 11,207
 Percentage of workers who live in hometown: 25.4%
 Number of households: 6,832
 Median household income: \$65,799
 Number of families: 4,412
 Median family income: \$81,628
 Annual unemployment rate: 3.9%
 Percentage of residents aged 25+ with HS diploma/equivalency or higher: 92.3%
 Percentage of residents aged 25+ with Bachelors degree or higher: 41.4%

Where Middletown Residents Work

	Total	7,999	100.0%
Newport, RI	3,194	39.9%	
Middletown, RI	2,844	35.6%	
Portsmouth, RI	353	4.4%	
Providence, RI	196	2.5%	
North Kingstown, RI	115	1.4%	
South Kingstown, RI	108	1.4%	
Bristol, RI	99	1.2%	
Warwick, RI	68	0.9%	
Fall River, MA	57	0.7%	
Exeter, RI	56	0.7%	
Pawtucket, RI	52	0.7%	
Tiverton, RI	48	0.6%	
Jamestown, RI	46	0.6%	
Cranston, RI	43	0.5%	
East Greenwich, RI	42	0.5%	
Dartmouth, MA	35	0.4%	
East Providence, RI	32	0.4%	
Sandwich, MA	32	0.4%	
Westerly, RI	32	0.4%	
West Milwaukee, WI	30	0.4%	
Other Communities	517	6.5%	

Middletown Residents Work in the State of:

Rhode Island	7,445	93.1%
Massachusetts	385	4.8%
Connecticut	14	0.2%
Other State/Country	155	1.9%
Total	7,999	100.0%

Where Middletown Workers Live

	Total	11,207	100.0%
Middletown, RI	2,844	25.4%	
Newport, RI	1,565	14.0%	
Portsmouth, RI	1,552	13.8%	
Tiverton, RI	743	6.6%	
Bristol, RI	604	5.4%	
Fall River, MA	557	5.0%	
North Kingstown, RI	397	3.5%	
Warwick, RI	249	2.2%	
South Kingstown, RI	217	1.9%	
Cranston, RI	181	1.6%	
Warren, RI	175	1.6%	
Jamestown, RI	159	1.4%	
Johnston, RI	134	1.2%	
Narragansett, RI	133	1.2%	
Dartmouth, MA	118	1.1%	
Exeter, RI	115	1.0%	
Providence, RI	106	0.9%	
East Providence, RI	74	0.7%	
North Attleborough, MA	69	0.6%	
New Bedford, MA	63	0.6%	
Other Communities	1,152	10.3%	

Middletown Workers Live in the State of:

Rhode Island	9,821	87.6%
Massachusetts	1,133	10.1%
Connecticut	182	1.6%
Other State/Country	71	0.6%
Total	11,207	100.0%

THE PROPOSED DISTRIBUTION OF SITE GENERATED TRAFFIC IS BASED ON:

- EXISTING TRAFFIC PATTERNS
- CENSUS DATA FROM 2011-2015
- WHERE MIDDLETOWN RESIDENTS WORK – FOR RESIDENTIAL & RETAIL
- WHERE MIDDLETOWN WORKERS LIVE – FOR OFFICE, BUSINESS & INDUSTRIAL

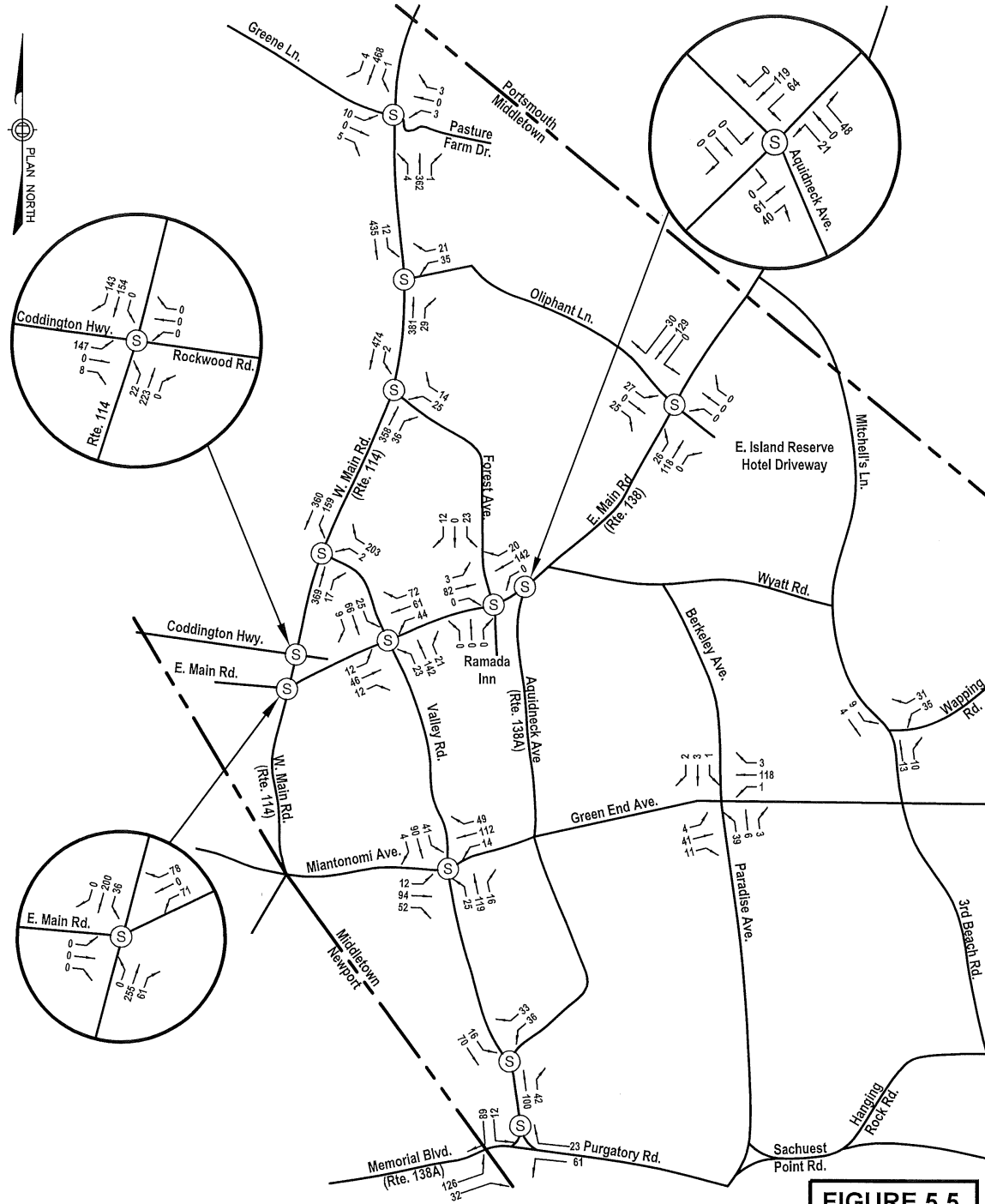
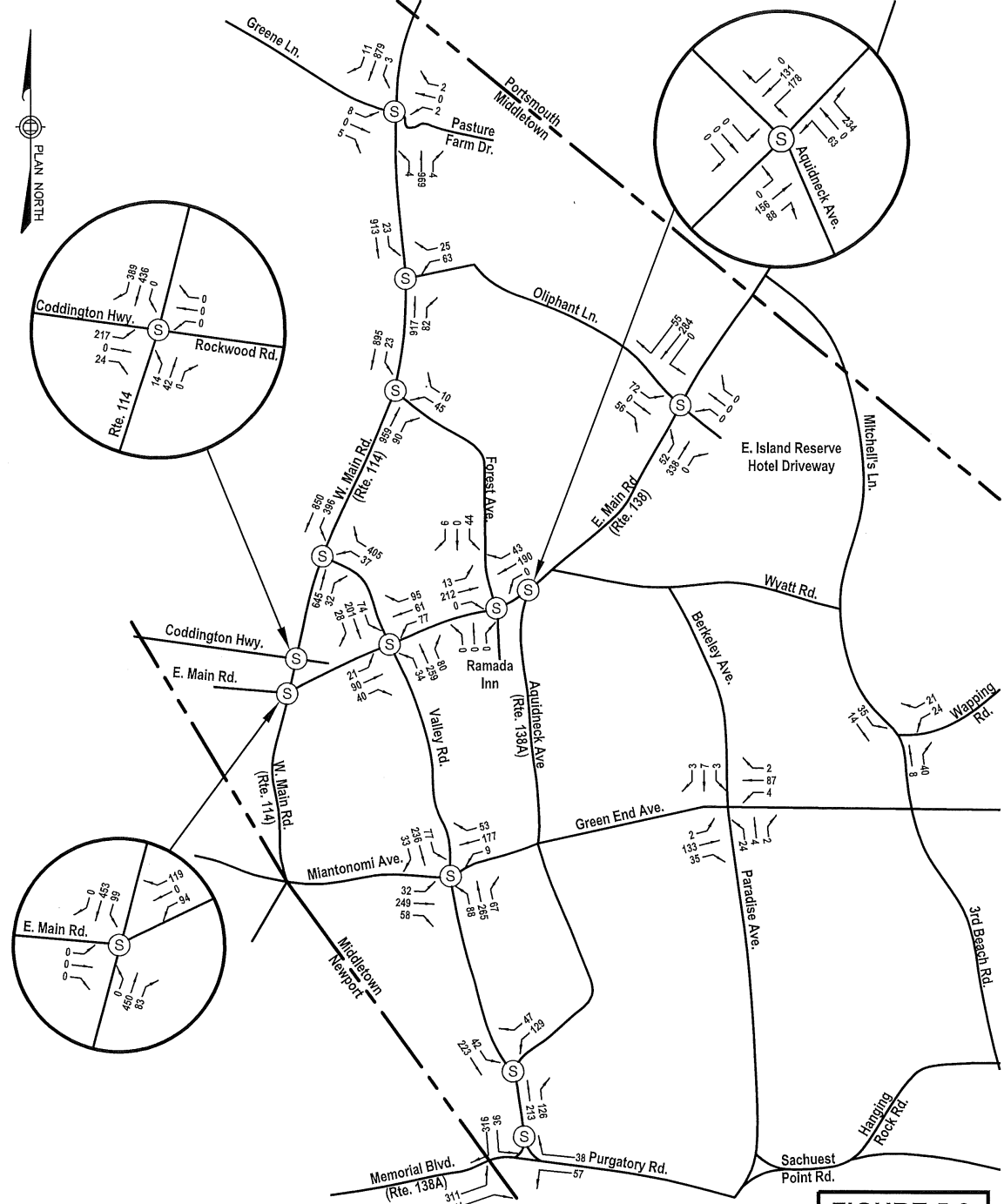
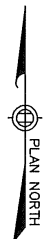


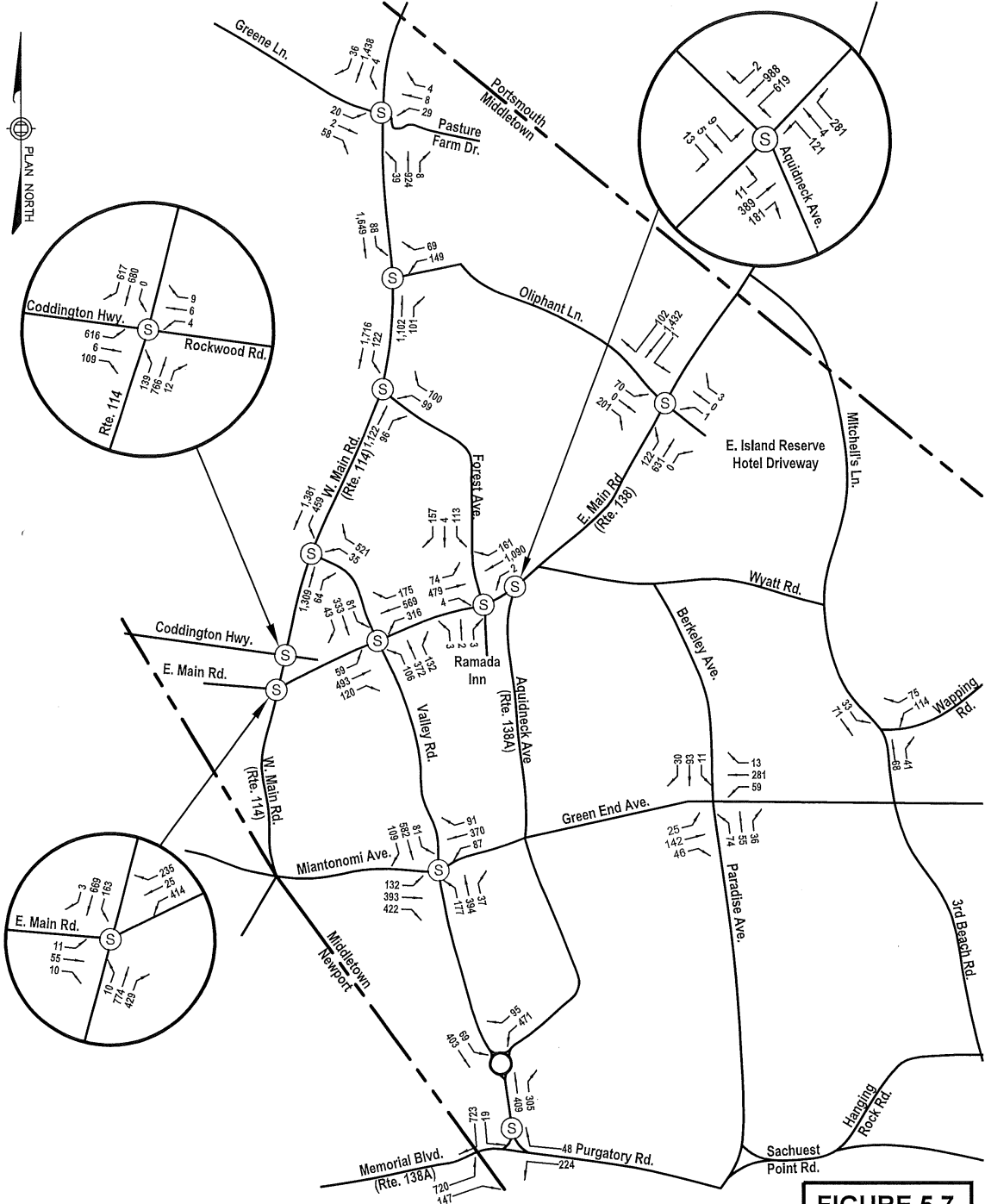
FIGURE 5.5

AM PEAK HOUR FULL BUILD SITE GENERATED TRAFFIC



PM PEAK HOUR FULL BUILD SITE GENERATED TRAFFIC

FIGURE 5.6



BUILD
AM PEAK HR
FULL BUILD

FIGURE 5.7

TRAFFIC OPERATIONS ANALYSIS

USING SYNCHRO SOFTWARE, INPUT EXISTING CONDITIONS AND VOLUMES, THIS ANALYSIS QUANTIFIES QUALITY OF TRAFFIC FLOW BY LEVEL OF SERVICE (LOS) WHICH IS BASED ON VEHICLE DELAY. LOS RANGE FROM LOS A WHICH IS LITTLE OR NO DELAY TO LOS F WHICH IS HIGH DELAY. IN ADDITION, V/C IS THE DEGREE OF SATURATION - ABILITY OF INTERSECTION TO HANDLE VEHICLE DEMAND. WITH A $V/C > 1$ THERE IS EXCESSIVE DELAYS AND QUEUES CAN BE EXPECTED.

CAPACITY ANALYSIS WAS PERFORMED FOR:

- 2019 EXISTING CONDITIONS
- "BUILD" FULL-BUILD CONDITIONS BASED ON CURRENT ZONING
- "BUILD ALTERNATIVE" CONDITIONS WHICH EXCLUDES WATERSHED PROTECTION DISTRICT 1 (WPD1)

SEVERAL ALTERNATIVES WERE EXAMINED BUT WPD1 RESULTED IN THE LARGEST REDUCTION OF SITE GENERATED TRAFFIC COMPARED TO THE FULL-BUILD

THE FOLLOWING TABLES SHOW THAT FULL-BUILD OUT WILL HAVE SIGNIFICANT IMPACTS ON MOST OF THE SIGNALIZED INTERSECTIONS, ESPECIALLY DURING PM PEAKS. ALSO, REDUCING BUILDOUT TO WPD1 (~17% LESS TRAFFIC GENERATED) WILL NOT PROVIDE SIGNIFICANT IMPROVEMENT COMPARED TO FULL BUILDOUT.] 4

Table 5.8A- Signalized Level-Of-Service Analysis Summary

Location	Movement	2019 Existing			Build			Build Alternative		
		v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
AM PEAK HOUR										
W. Main Rd / Greene Ln / Pasture Farm Dr	OVERALL	0.56	17.5	B	0.84	54.9	D	0.79	42.3	D
Greene Ln	EB	0.10	38.5	D	0.20	38.3	D	0.18	38.3	D
Pasture Farm Dr	WB	0.49	41.9	D	0.52	42.1	D	0.52	42.1	D
W. Main Rd (RI 114)	NB	0.29	3.6	A	0.52	22.4	C	0.48	20.2	C
W. Main Rd (RI 114)	SB	0.74	23.3	C	1.10	78.6	E	1.04	57.5	E
W. Main Rd / Oliphant Ln	OVERALL	0.70	15.7	B	1.07	92.7	F	0.99	64.1	E
Oliphant Ln	WB	0.68	29.8	C	0.75	42.1	D	0.74	42.1	D
W. Main Rd (RI 114)	NB	0.61	16.4	B	1.03	68.4	E	0.97	49.2	D
W. Main Rd (RI 114)	SB	0.70	13.3	B	1.17	117.2	F	1.07	77.6	E
W. Main Rd / Forest Ave	OVERALL	0.82	20.1	C	1.23	121.2	F	1.15	96.6	F
Forest Ave	WB	0.74	44.9	D	0.83	50.5	D	0.82	48.9	D
W. Main Rd (RI 114)	NB	0.58	16.4	B	0.88	31.9	C	0.83	29.8	C
W. Main Rd (RI 114)	SB	0.84	18.1	B	1.35	191.5	F	1.26	148.0	F
W. Main Rd / Valley Rd	OVERALL	0.65	13.0	B	1.05	28.6	C	0.99	22.7	C
Valley Rd	WB	0.52	19.4	B	0.83	30.2	C	0.78	26.6	C
W. Main Rd (RI 114)	NB	0.67	20.8	C	0.96	40.1	D	0.91	33.2	C
W. Main Rd (RI 114)	SB	0.64	5.4	A	1.08	19.7	B	1.02	13.8	B
W. Main Rd / Coddington Hwy	OVERALL	0.51	28.2	C	0.65	31.8	C	0.63	30.3	C
Coddington Hwy	EB	0.70	43.7	D	0.86	49.1	D	0.83	47.2	D
Rockwood Rd	WB	0.25	56.1	E	0.25	56.1	E	0.25	56.1	E
W. Main Rd (RI 114)	NB	0.61	26.3	C	0.62	28.4	C	0.62	25.9	C
W. Main Rd (RI 114)	SB	0.41	18.9	B	0.58	23.1	C	0.55	22.3	C
W. Main Rd / E. Main Rd	OVERALL	0.63	34.1	C	0.82	43.0	D	0.78	38.8	D
E. Main Rd	EB	0.57	55.7	E	0.57	55.7	E	0.57	55.7	E
E. Main Rd (RI 138)	WB	0.70	49.4	D	0.66	43.8	D	0.66	44.7	D
W. Main Rd (RI 114)	NB	0.59	28.1	C	0.96	54.4	D	0.89	44.2	D
W. Main Rd (RI 114)	SB	0.72	25.9	C	0.82	25.0	C	0.81	24.3	C
E. Main Rd / Oliphant Ln	OVERALL	0.79	26.6	C	1.01	111.2	F	0.97	91.8	F
E. Main Rd (RI 138)	NB	0.50	6.3	A	0.61	8.9	A	0.59	8.4	A
E. Main Rd (RI 138)	SB	0.98	35.3	D	1.33	176.9	F	1.26	144.1	F
Oliphant Ln	SE	0.42	29.0	C	0.74	37.8	D	0.69	34.5	C
Hotel Driveway	NW	0.04	26.6	C	0.04	24.1	C	0.04	24.6	C
E. Main Rd / Aquidneck Ave	OVERALL	0.75	17.9	B	0.87	26.6	C	0.85	24.1	C
E. Main Rd (RI 138)	EB	0.72	26.3	C	0.87	32.7	C	0.85	30.4	C
E. Main Rd (RI 138)	WB	0.78	11.4	B	0.95	23.3	C	0.92	20.1	C
Aquidneck Ave	NB	0.57	31.3	C	0.60	30.2	C	0.60	30.6	C
Plaza / Bank	SB	0.12	29.3	C	0.10	27.8	C	0.11	28.2	C

Location	Movement	2019 Existing			Build			Build Alternative		
		v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
AM PEAK HOUR										
E. Main Rd / Forest Ave / Ramada	OVERALL	0.72	21.2	C	0.84	35.1	D	0.81	31.1	C
E. Main Rd (RI 138)	EB	0.36	8.5	A	0.43	12.5	B	0.42	14.7	B
E. Main Rd (RI 138)	WB	0.71	17.6	B	0.79	18.3	B	0.78	16.9	B
Hotel Driveway	NB	0.04	24.7	C	0.04	25.7	C	0.04	25.4	C
Forest Ave	SB	0.87	53.0	D	1.14	130.1	F	1.08	107.2	F
E. Main Rd / Valley Rd	OVERALL	0.69	28.1	C	0.86	34.4	C	0.83	33.0	C
E. Main Rd (RI 138)	EB	0.58	26.7	C	0.79	35.2	D	0.75	33.1	C
E. Main Rd (RI 138)	WB	0.86	21.1	C	0.94	26.6	C	0.95	27.6	C
Valley Rd	NB	0.65	35.8	D	0.87	43.5	D	0.81	38.8	D
Valley Rd	SB	0.71	37.1	D	0.75	37.8	D	0.73	36.9	D
Green End Ave / Valley Rd	OVERALL	0.66	25.7	C	0.87	37.2	D	0.83	34.2	C
Green End Ave	EB	0.48	20.8	C	0.73	27.8	C	0.67	26.4	C
Green End Ave	WB	0.64	33.5	C	0.90	53.5	D	0.86	47.4	D
Valley Rd	NB	0.57	17.6	B	0.77	24.5	C	0.73	22.8	C
Valley Rd	SB	0.74	33.7	C	0.91	48.8	D	0.87	44.7	D
Aquidneck Ave / Valley Rd	OVERALL	0.79	14.3	B	PROPOSED ROUNDABOUT*			PROPOSED ROUNDABOUT*		
Aquidneck Ave	WB	0.80	16.0	B	0.70	17.0	C	0.67	15.0	B/C
Aquidneck Ave	NB	0.79	15.9	B	0.61	10.0	A/B	0.58	10.0	A/B
Valley Rd	SE	0.60	9.9	A	0.63	15.0	B/C	0.60	14.0	B
Aquidneck Ave / Valley Rd (w/SIGNAL)	OVERALL	0.79	14.3	B	0.92	25.8	C	0.90	22.8	C
Aquidneck Ave	WB	0.80	16.0	B	0.90	24.0	C	0.88	21.6	C
Aquidneck Ave	NB	0.79	15.9	B	0.94	30.4	C	0.92	27.4	C
Valley Rd	SE	0.60	9.9	A	0.92	21.7	C	0.86	17.9	B
Aquidneck Ave / Purgatory Rd	OVERALL	0.60	9.4	A	0.75	14.0	B	0.73	13.2	B
Aquidneck Ave	SB	0.63	8.7	A	0.80	15.0	B	0.78	13.8	B
Memorial Blvd	NW	0.48	17.4	B	0.62	21.6	C	0.59	20.6	C
Purgatory Rd	NE	0.64	8.0	A	0.76	10.9	B	0.74	10.4	B

*Proposed roundabout at Aquidneck Avenue / Valley Road follows unsignalized LOS criteria

Table 5.8B- Signalized Level-Of-Service Analysis Summary

Location	Movement	2019 Existing			Build			Build Alternative		
		v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
PM PEAK HOUR										
W. Main Rd / Greene Ln / Pasture Farm Dr	OVERALL	0.70	21.8	C	1.47	297.9	F	1.36	242.0	F
Greene Ln	EB	0.67	39.8	D	0.69	39.7	D	0.68	39.6	D
Pasture Farm Dr	WB	0.01	31.9	C	0.02	31.4	C	0.02	31.4	C
W. Main Rd (RI 114)	NB	0.71	19.6	B	1.53	276.5	F	1.41	224.5	F
W. Main Rd (RI 114)	SB	0.69	21.1	C	1.73	355.5	F	1.58	290.0	F
W. Main Rd / Oliphant Ln	OVERALL	0.95	44.2	D	1.54	273.7	F	1.44	226.3	F
Oliphant Ln	WB	0.96	89.4	F	1.46	270.4	F	1.38	236.5	F
W. Main Rd (RI 114)	NB	1.00	49.4	D	1.58	296.0	F	1.49	252.2	F
W. Main Rd (RI 114)	SB	0.73	26.2	C	1.44	241.9	F	1.32	186.6	F
W. Main Rd / Forest Ave	OVERALL	0.94	40.6	D	1.52	325.1	F	1.41	269.3	F
Forest Ave	WB	0.72	44.5	D	0.86	53.7	D	0.83	50.9	D
W. Main Rd (RI 114)	NB	1.05	58.3	E	1.69	337.4	F	1.58	288.4	F
W. Main Rd (RI 114)	SB	0.85	15.6	B	1.73	347.6	F	1.57	276.7	F
W. Main Rd / Valley Rd	OVERALL	0.90	19.3	B	1.83	151.6	F	1.67	121.1	F
Valley Rd	WB	0.83	33.3	C	1.55	260.6	F	1.43	211.2	F
W. Main Rd (RI 114)	NB	0.83	24.6	C	1.28	155.5	F	1.21	121.8	F
W. Main Rd (RI 114)	SB	0.87	10.7	B	1.83	112.7	F	1.67	90.8	F
W. Main Rd / Coddington Hwy	OVERALL	0.66	32.4	C	0.98	107.5	F	0.91	81.6	F
Coddington Hwy	EB	0.72	44.7	D	1.02	74.3	E	0.96	63.3	E
Rockwood Rd	WB	0.52	54.8	D	0.52	54.8	D	0.52	54.8	D
W. Main Rd (RI 114)	NB	0.53	20.2	C	0.55	22.1	C	0.55	22.1	C
W. Main Rd (RI 114)	SB	0.77	34.2	C	1.34	163.2	F	1.24	120.4	F
W. Main Rd / E. Main Rd	OVERALL	0.73	40.6	D	1.05	122.0	F	1.00	103.0	F
E. Main Rd	EB	0.64	56.7	E	0.64	56.7	E	0.64	56.7	E
E. Main Rd (RI 138)	WB	0.69	48.1	D	0.67	42.8	D	0.66	43.0	D
W. Main Rd (RI 114)	NB	0.75	36.0	D	1.40	223.9	F	1.31	186.5	F
W. Main Rd (RI 114)	SB	0.83	37.6	D	1.20	66.6	E	1.09	53.8	D
E. Main Rd / Oliphant Ln	OVERALL	0.89	30.9	C	1.27	174.0	F	1.20	145.0	F
E. Main Rd (RI 138)	NB	0.95	24.7	C	1.38	189.6	F	1.30	156.8	F
E. Main Rd (RI 138)	SB	0.93	42.3	D	1.33	180.6	F	1.26	152.5	F
Oliphant Ln	SE	0.63	32.3	C	0.97	70.2	E	0.92	57.4	E
Hotel Driveway	NW	0.05	25.2	C	0.04	21.9	C	0.04	22.2	C
E. Main Rd / Aquidneck Ave	OVERALL	0.86	30.8	C	1.35	120.7	F	1.26	100.0	F
E. Main Rd (RI 138)	EB	1.00	40.9	D	1.26	141.5	F	1.22	122.0	F
E. Main Rd (RI 138)	WB	0.67	12.7	B	1.44	108.8	F	1.35	90.4	F
Aquidneck Ave	NB	0.84	37.6	D	1.23	116.6	F	1.14	90.7	F
Plaza / Bank	SB	0.14	22.0	C	0.12	18.1	B	0.11	18.1	B

Location	Movement	2019 Existing			Build			Build Alternative		
		v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
PM PEAK HOUR										
E. Main Rd / Forest Ave / Ramada	OVERALL	0.71	21.1	C	0.97	30.7	C	0.93	27.6	C
E. Main Rd (RI 138)	EB	0.63	17.6	B	0.92	21.8	C	0.88	20.0	B
E. Main Rd (RI 138)	WB	0.55	12.1	B	0.73	16.1	B	0.70	13.9	B
Hotel Driveway	NB	0.08	23.7	C	0.08	23.0	C	0.08	23.0	C
Forest Ave	SB	0.90	54.9	D	1.08	101.4	F	1.05	90.8	F
E. Main Rd / Valley Rd	OVERALL	0.77	38.0	D	1.15	180.3	F	1.08	150.1	F
E. Main Rd (RI 138)	EB	0.71	31.1	C	0.88	38.6	D	0.86	37.1	D
E. Main Rd (RI 138)	WB	0.81	36.7	D	1.12	57.0	E	1.06	52.1	D
Valley Rd	NB	0.78	40.5	D	1.88	372.5	F	1.72	308.1	F
Valley Rd	SB	0.85	45.3	D	1.44	208.2	F	1.35	171.4	F
Green End Ave / Valley Rd	OVERALL	1.00	45.5	D	1.64	210.7	F	1.56	187.9	F
Green End Ave	EB	0.77	26.1	C	1.17	74.7	E	1.14	62.9	E
Green End Ave	WB	0.79	41.3	D	1.23	155.3	F	1.15	125.8	F
Valley Rd	NB	1.19	71.8	E	1.98	229.4	F	1.91	208.0	F
Valley Rd	SB	0.74	36.6	D	1.76	390.0	F	1.69	357.8	F
Aquidneck Ave / Valley Rd	OVERALL	0.74	12.1	B	PROPOSED ROUNDABOUT*			PROPOSED ROUNDABOUT*		
Aquidneck Ave	WB	0.68	14.2	B	0.71	18.0	C	0.64	15.0	B/C
Aquidneck Ave	NB	0.78	13.4	B	0.90	26.0	D	0.84	20.0	C
Valley Rd	SE	0.66	8.6	A	0.90	34.0	D	0.83	24.0	C
Aquidneck Ave / Valley Rd (w/SIGNAL)	OVERALL	0.74	12.1	B	1.15	91.8	F	1.08	71.6	E
Aquidneck Ave	WB	0.68	14.2	B	0.85	19.5	B	0.81	17.8	B
Aquidneck Ave	NB	0.78	13.4	B	1.30	158.3	F	1.21	120.1	F
Valley Rd	SE	0.66	8.6	A	1.36	59.6	E	1.27	48.6	D
Aquidneck Ave / Purgatory Rd	OVERALL	0.71	8.6	A	0.98	49.3	D	0.93	32.8	C
Aquidneck Ave	SB	0.51	5.2	A	1.02	47.1	D	0.93	26.5	C
Memorial Blvd	NW	0.62	26.7	C	0.62	24.1	C	0.61	24.1	C
Purgatory Rd	NE	0.73	7.6	A	1.09	55.8	E	1.03	39.1	D

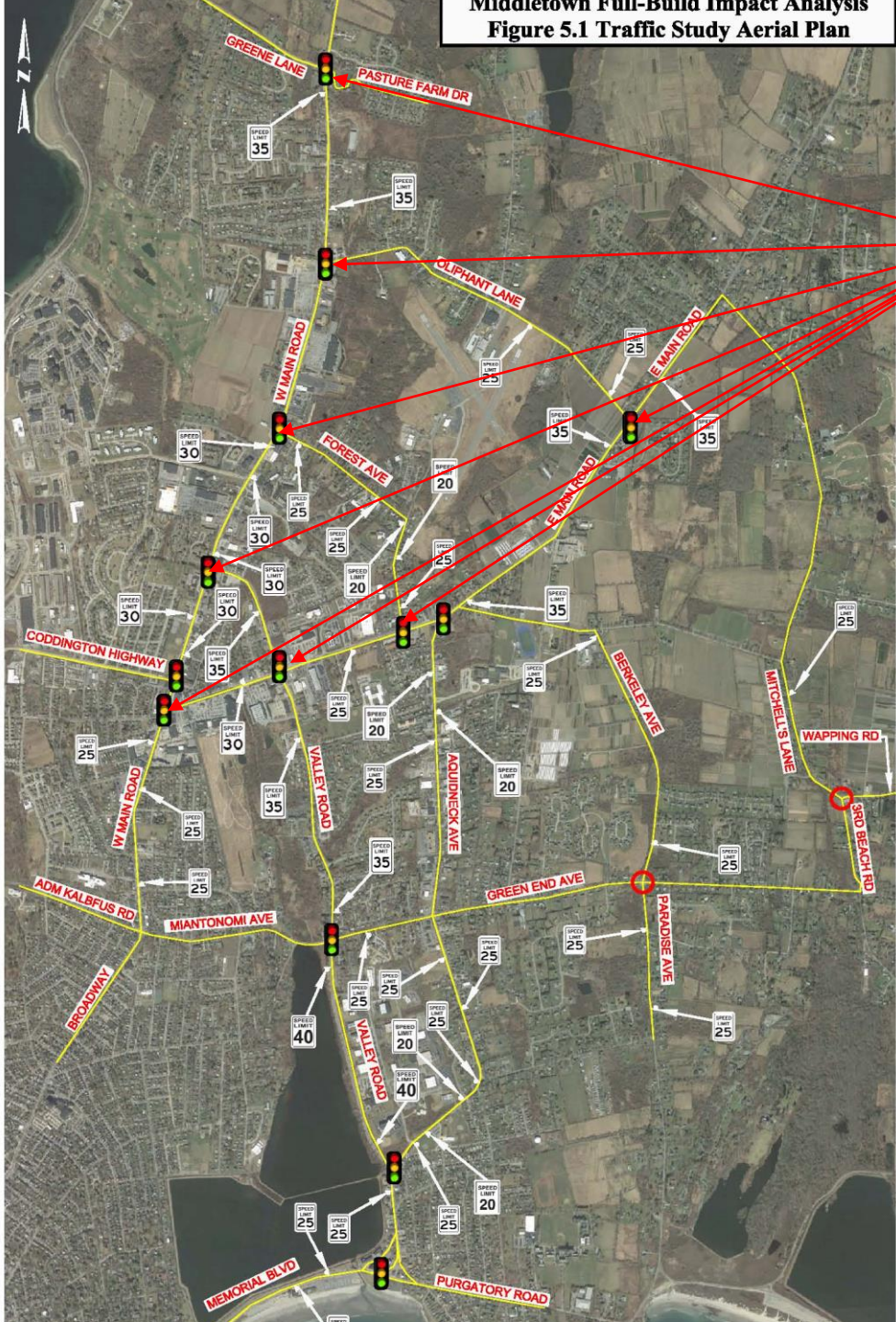
*Proposed roundabout at Aquidneck Avenue / Valley Road follows unsignalized LOS criteria

Table 5.9 - Unsignalized Level-Of-Service Analysis Summary

Location	Movement	2019 Existing			Build			Build Alternative		
		v/c	Delay	LOS	v/c	Delay	LOS	v/c	Delay	LOS
AM PEAK HOUR										
Green End Ave / Berkeley Ave / Paradise Ave										
Green End Ave	EB	0.02	1.2	A	0.03	1.2	A	0.03	1.2	A
Green End Ave	WB	0.05	2.4	A	0.06	1.9	A	0.05	2.0	A
Paradise Ave	NB	0.35	18.6	C	0.80	60.1	F	0.70	44.5	E
Berkeley Ave	SB	0.37	17.5	C	0.52	26.8	D	0.50	24.8	C
Green End Ave / Berkeley Ave / Paradise Ave					PROPOSED ROUNDABOUT*			PROPOSED ROUNDABOUT*		
Green End Ave	EB				0.27	6.0	A	0.26	6.0	A
Green End Ave	WB				0.34	7.0	A	0.32	6.0	A
Paradise Ave	NB				0.19	5.0	A	0.17	5.0	A
Berkeley Ave	SB				0.19	6.0	A	0.19	6.0	A
Third Beach Rd / Mitchell's Ln / Wapping Rd										
Wapping Rd	WB	0.07	5.4	A	0.10	5.4	A	0.09	5.4	A
Third Beach Rd	NB	0.21	11.6	B	0.31	13.9	B	0.29	13.5	B
Mitchell's Ln	SE	0.09	0.0	A	0.10	0.0	A	0.10	0.0	A
PM PEAK HOUR										
Green End Ave / Berkeley Ave / Paradise Ave										
Green End Ave	EB	0.04	1.5	A	0.04	1.3	A	0.04	1.3	A
Green End Ave	WB	0.03	1.6	A	0.04	1.4	A	0.04	1.4	A
Paradise Ave	NB	0.50	21.7	C	1.02	108.2	F	0.90	73.2	F
Berkeley Ave	SB	0.40	21.1	C	0.77	60.4	F	0.70	47.7	E
Green End Ave / Berkeley Ave / Paradise Ave					PROPOSED ROUNDABOUT*			PROPOSED ROUNDABOUT*		
Green End Ave	EB				0.42	7.0	A	0.39	7.0	A
Green End Ave	WB				0.31	6.0	A	0.29	6.0	A
Paradise Ave	NB				0.29	7.0	A	0.27	7.0	A
Berkeley Ave	SB				0.18	6.0	A	0.17	5.0	A
Third Beach Rd / Mitchell's Ln / Wapping Rd										
Wapping Rd	WB	0.05	4.3	A	0.08	4.5	A	0.07	4.4	A
Third Beach Rd	NB	0.22	11.3	B	0.34	13.3	B	0.32	12.9	B
Mitchell's Ln	SE	0.12	0.0	A	0.16	0.0	A	0.15	0.0	A

*Proposed roundabout at Green End Ave / Berkeley Ave / Paradise Ave follows unsignalized LOS criteria

Middletown Full-Build Impact Analysis
Figure 5.1 Traffic Study Aerial Plan



RECOMMENDATIONS

1. OPTIMIZING THE SIGNAL TIMINGS WILL PROVIDE SOME LEVEL OF IMPROVEMENT BUT MORE SIGNIFICANT MITIGATIONS WILL BE NEEDED IN THE FUTURE TO IMPROVE CAPACITY SUCH AS CHANGE IN SIGNAL PHASING, RE-STRIPING, ROAD WIDENING AND CONVERSION TO ROUNDABOUT

- WEST MAIN RD / GREENE LN / PASTURE FARM DR
- WEST MAIN RD / OLIPHANT LN
- WEST MAIN RD / FOREST AVE
- WEST MAIN RD / VALLEY RD
- WEST MAIN RD / EAST MAIN RD
- EAST MAIN RD / OLIPHANT LN
- EAST MAIN RD / FOREST AVE / RAMADA DRIVE
- EAST MAIN RD / VALLEY RD

TRAFFIC RECOMMENDATIONS

2. ROCKWOOD RD (32' TO 23.5' WIDE) COULD POSSIBLY BE RE-STRIPED WITH 11' TRAVEL LANES AND MINIMAL SHOULDER TO PROVIDE A LEFT/THRU AND THRU/RIGHT LANE FOR A SHORT DISTANCE TO COMMERCIAL DRIVEWAY CURB CUT. THIS MAY PROVIDE SOME DELAY AND QUEUE IMPROVEMENT



TRAFFIC RECOMMENDATIONS

3. SLIGHTLY EXTEND THE STRIPING FOR THE RIGHT LANE TURN POCKET ON AQUIDNECK AVE AT EAST MAIN RD. SINCE THE AQUIDNECK AVE NB LT/TH LANE CARRIES A SMALL AMOUNT OF TRAFFIC COMPARED TO THE RIGHT LANE, RE-STRIPING THE LEFT/THRU AS A LEFT/THRU/RIGHT GENERAL USE LANE MAY IMPROVE CAPACITY FOR THIS APPROACH



TRAFFIC RECOMMENDATIONS

4. FOR GREEN END AVE AT VALLEY RD, IT APPEARS THAT USING THE DEDICATED EASTBOUND RIGHT TURN LANE AS A RIGHT/THRU LANE MAY PROVIDE SOME IMPROVEMENT TO CAPACITY EASTBOUND



TRAFFIC RECOMMENDATIONS

5. THERE ARE ALREADY PLANS TO RECONSTRUCT THE SIGNALIZED INTERSECTION OF AQUIDNECK AVE / VALLEY ROAD TO A SINGLE LANE ROUNDABOUT. ANALYSIS SHOWS THAT THE PROPOSED ROUNDABOUT WILL PROVIDE MUCH IMPROVED LOS FOR THE FUTURE FULL BUILDOUT CONDITIONS



TRAFFIC RECOMMENDATIONS

6. IN THE FUTURE THE TOWN MAY WANT TO ANALYZE AND CONSIDER THE OPTION OF A ROUNDABOUT TO REPLACE THE SIGNAL AT AQUIDNECK AVE/ PURGATORY ROAD /MEMORIAL BLVD



TRAFFIC RECOMMENDATIONS

7. FOR FUTURE MITIGATION, A PROPOSED ROUNDABOUT SHOULD BE CONSIDERED AT GREEN END AVE / BERKELEY AVE / PARADISE AVE. ANALYSIS SHOWS THAT THE INTERSECTION WOULD FUNCTION VERY WELL AS A ROUNDABOUT
8. THE LOS AT THIRD BEACH ROAD / MITCHELL'S LANE / WAPPING ROAD REMAINS VERY GOOD FOR FUTURE CONDITIONS. SHOULD TRAFFIC CONDITIONS CHANGE, THE TOWN MAY WANT TO CONSIDER THE OPTION OF A ROUNDABOUT IN THE FUTURE.