AIR QUALITY
Chapter Sixteen

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Introduction:

The FEIS was updated to reflect DEIS comments on the traffic report and updates to the project scope and this response addresses the resultant changes on potential environmental impacts for the year of Project completion 2015. The DEIS traffic study was updated by Frederick P. Clark and Associates, Inc. (FPCA) to address public and agency review comments and resultant traffic generated impacts for the minor changes in project size, and resultant changes in the projected 2015 No Build and Build traffic volumes. The potential traffic related air quality impacts of the proposed project as summarized in the DEIS were previously evaluated for the analysis year 2011. The results of the updated FPCA 2015 traffic analysis were reviewed with respect to the impact of the change in traffic volumes presented in Table A-1 and the capacity analysis results Tables 3, 5 & 6 attached at the end of the chapter on the results and conclusions of both the technical air quality and noise studies. The results of this qualitative assessment are as follows:

Air Quality Assessment

With respect to the air quality analysis, the effect of the revised 2015 traffic volumes on both intersection capacity and the corresponding levels-of-service (LOS) were reviewed to determine if there was any change in the prior study results and conclusions as described in the DEIS. The updated LOS analysis at the critical intersection of Route 312 with the I-84 WB Ramps and the proposed Site Entrance would remain at LOS C as reported in the DEIS. The 2015 Build volumes decrease by 255 vehicles compared to the 2011 Build conditions analyzed (see Table A-1 attached) due to trip diversions to the Northern Site Entrance and the reduction in project scope. Therefore, the updated 2015 traffic study will not alter the DEIS conclusions regarding the insignificant impact of the project on air quality.

Summary

Based on the review of the updated 2015 traffic study prepared for the FEIS, it was determined that the air quality assessment conclusions presented in the DEIS would not change for the updated 2015 project Build conditions consisting of a smaller project in scope than the project analyzed in the DEIS. Correspondingly, the DEIS analysis that was performed for the larger Project scope would be conservative in addressing potential air quality impacts for the smaller updated 2015 Project design presented in the FEIS. Therefore, an updated analysis of the 2015 Project described in the FEIS was not required to address the potential air quality impacts since the conclusions described in the DEIS would not change.

Table 16-1A

National and New York State Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM	ug/m3	PPM	ug/m3
Carbon Monoxide				
Maximum 8-Hour Concentration[1]	9/9		None	
Maximum 1-Hour Concentration[1]	35/35		None	
Lead[2]				
Maximum Quarterly Average		1.5		1.5
Rolling 3-Month Average (2008 Standard)		0.15		0.15
Nitrogen Dioxide				
Annual Arithmetic Mean[3]	53/50ppb		53ppb/None	
1-Hour[4]	100ppb/None		53ppb/None	
Ozone				
8-Hour Average[2,4,5]	0.08/0.08		0.08/None	
1-Hour Average[6]	0.12/0.12		0.12/None	
Total Suspended Particulates (TSP)				
Annual Mean[7]		None/75		None/None
Maximum 24-Hours[3]		260/250		150/None
Particulate Matter-Inhalable ($PM_{2.5}$)[2,5]				
Annual Arithmetic Mean		12		12
Maximum 24-Hour Concentration[4]		35		35
Particulate Matter-Inhalable (PM_{10})[2,7]				
Annual Arithmetic Mean		50		50
Maximum 24-Hour Concentration[8]		150		150
Sulfur Dioxide				
Annual Arithmetic Mean	0.03/0.03		None	
Maximum 24-Hour Concentration[1]	0.14/0.14		None	
Maximum 3-Hour Concentration[1]	None		0.50/0.50	
Maximum 1-Hour Concentration[1,2,4]	75ppb		None	
Hydrocarbons				
3-Hour (6-9AM)[3]	None/0.24		None/None	

NOTES: ppm-parts per million/ppb-parts per billion/ug/m3-micrograms per cubic meter. All values obtained from the information provided on the NYSDEC website.

1 Not to be exceeded more than once a year.
2 No New York State standard.
3 Denotes different NAAQS/NYS Standards.
4 3 year average.
5 Ozone Standard adopted 1997.
6 Not applicable to New York State.
7 No New York State standard.
8 NAAQS not officially adopted by New York State.

Comment Air-1

Chapter 13: Air Quality

1. *Please correct and supplement the discussion of NAAQS, including a table with the pollutants averaging periods and corresponding standards. For example, HC and TSP are incorrectly listed as having NAAQS, while* $PM^{2.5}$ for which NAQS *have been established is not mentioned. This should be revised in the FEIS. (AKRF (11/12/2013)*

Response:

In accordance with the 1970 Clean Air Act regulations and amendments, the United States Environmental Protection Agency (USEPA) has developed National Ambient Air Quality Standards (NAAQS) to protect the health and welfare of the general public which are presented in Table 16-1A below. The NAAQS were developed for specific criteria pollutants, which were identified as pollutants most common to all states and of primary concern due to the level of emissions nationwide. The New York State Department of Environmental Conservation (NYSDEC) is the responsible agency for the attainment and maintenance of the NAAQS and the State's air quality. The primary standards are to protect public health and represent pollutant levels at which there are no significant effects on humans. The secondary standards are intended to protect the public's welfare dealing with air pollutant effects on soil, water, visibility and other aspects of the environment. As shown in Table 16-1A, for pollutants such as nitrogen dioxide (NO_2), ozone (O3), and respirable particulates (PM10 & PM2.5), the primary and secondary standards are the same and for most pollutants the NAAQS have also been adopted as the ambient air quality standards for the State of New York. This information is being provided to clarify and correct the discussion of the NAAQS provided in the DEIS text.

Comment Air-2

2. *The section discussing the attainment status for the county should be corrected (The CO status and the ozone non-attainment classification). This section should also be supplemented to provide the attainment status for each criteria pollutant, including new 1-hour* NO^2 *and* SO^2 *standards. (AKRF (11/12/2013)*

Response:

The Clean Air Act regulations require each state to submit to the USEPA a SIP for attainment of the NAAQS. The 1977 and 1990 amendments to the Clean Air Act require comprehensive plan revisions for areas where one or more of the pollutant standards have yet to be attained. New York State is currently designated as being in marginal to moderate Non-Attainment status only for ozone, the 8-hour pollutant level (1997 standard), and in Maintenance status for carbon monoxide. However, Putnam County itself is currently identified as being in-attainment for all priority pollutants including ozone, carbon

monoxide, lead, oxides of nitrogen (NOx), sulfur dioxide, particulate matter, and inhalable PM10 and PM2.5.

The 1-hr ozone standard is currently not in effect in New York State as noted in Table 16-1A.

Comment Air-3

3. *In the discussion of the lack of modeling guidance or methods for N0x, please clarify that the text pertains to mobile sources only. Given the modeling constraints, provide instead a statement on the likelihood of potential impacts of the project on the 1-hour NO² NAAQS. (AKRF (11/12/2013)*

Response:

Regarding the DEIS discussion (Page 13-2) on the carbon monoxide (CO) modelling of local roadway traffic emissions, it was noted that HC and NOx pollutant emissions were not modeled for mobile sources due to the reactive nature of these pollutants. In addition, the annual average standards for NOx pollutants are generally addressed for the more significant regional effect of fossil fuel burning facilities on annual emissions and not the localized effect of vehicle emissions. Direct effects on these pollutant emissions would be generated by stationary sources on the project site, such as emissions from fuel burned on-site for heating, ventilation, and air conditioning systems. The assessment provided in the DEIS concluded the project would not result in any significant air quality impacts from such stationary sources. Any change in regional mobile source emissions of these pollutants would be related to the total number of vehicle trips and vehicle miles of travel throughout the New York area. The traffic associated with the project would have a negligible effect on the regional travel characteristics and related vehicle emissions. The text discussion relating to the lack of available models to accurately predict HC or NOx concentrations on a localized (microscale) basis adjacent to roadways was specific to mobile sources associated with the project generated traffic.

As noted, the emissions of HC and NOx pollutants from the project generated traffic would be negligible compared to the more regional emissions of these pollutants from direct stationary and industrial emission sources. The air quality modelling results using the NYSDEC accepted screening method indicated that the worst case project generated traffic emissions of CO would not significantly impact local CO levels at affected receptors in the study area. Consequently, the project generated traffic would not be expected to result in any significant emissions of HC or NOx pollutants, and therefore, would not have any significant localized or regional impact on the HC or NOx pollutant standards shown in Table 16-1A.

Comment Air-4

4. Consider using multiple years of monitored values in developing the background for CO, per EPAQ modeling guidance. (AKRF (11/12/2013)

Response:

Use of multiple years of monitored values to develop the background levels of carbon monoxide (CO) for the modelling of roadway traffic emissions was not warranted for this project based on the results of the screening analysis performed. The procedures followed to evaluate the project impact on traffic related air quality were contained in the New York State Department of Transportation (NYSDOT) Environmental Procedures Manual (EPM) that are accepted by the NYSDEC. According to the EPM, the project traffic impact on LOS conditions at the affected intersections did not warrant the microscale modeling of CO concentrations at affected receptors. Therefore, the use of local data from one representative NYSDEC monitoring station was appropriate for this project where the modeling study was performed to confirm the negligible incremental change the project would have on CO levels due to the site generated traffic. The results of the modeling analysis confirmed the screening method determination that the project would have an insignificant impact on local air quality regardless of the background CO levels. As such, the conclusion determined using the NYSDOT-EPM procedures and the background CO values as described in the DEIS were appropriate for the air quality assessment of potential project impacts.

Comment Air-5

5. Please note that the air quality section of the NYSDOT Environmental Procedures Manual (now The Environmental Manual) was updated in December 2012.

(AKRF (11/12/2013)

Response:

It was noted that the procedures followed to evaluate the project impact on traffic related air quality were contained in the NYSDOT-EPM, version dated 2001. The NYSDOT-EPM was updated in 2012 and is referred to as The Environmental Manual (TEM), but the recommended screening procedures to evaluate traffic related air quality impacts at signalized intersections were not changed except for use of the USEPA/NYSDEC recommended MOVES vehicle emission factor model. Any adjustment to update the vehicle emission factors used would be applied proportionally to both the predicted 2015 No Build and Build CO levels keeping the incremental change in CO levels similar to the

negligible impact reported in the DEIS and would not alter the project impact assessment findings. Therefore, the modeling of roadway traffic emissions at the critical intersection using the 2012 updated TEM procedures would not change the original conclusions of the CO air quality assessment performed for this project or the future update summarized for the change in the year of project completion as noted in the DEIS (see Response to Comment Air-6).

Comment Air-6

6. *It is noted that the EPA MOVES model is required for microscale analyses conducted after December 20, 2012. It is also noted that the analysis conducted for the proposed project was completed prior to this date and that a re-evaluation may therefore not be necessary. However, any additional air quality analyses for the project, or revisions of analyses already performed should use the MOVES model. (AKRF (11/12/2013)*

Response:

It was noted that the new USEPA MOVES model for estimating vehicle emission factors from mobile sources is now required by the NYSDOT/NYSDEC for the microscale analysis of project air quality impacts that are conducted after December 20, 2012. The DEIS air quality analysis was completed prior to the noted December 12, 2012 date and therefore is exempt from conducting any project reanalysis using the MOVES program according to the NYSDEC policy. In addition, the NYSDOT-EPM document procedures used for the screening of potential traffic related air quality impacts on CO levels did not identify any critical intersections where the level-of-service (LOS) operating conditions resulted in an overall LOS D or worse. The critical intersection at the Site Entrance on Route 312 and Interstate I-87 WB Ramps had one approach lane at a LOS D and a worst case LOS C for the overall intersection under Build conditions with recommended roadway improvements. According to both the EPM and new TEM screening procedures, none of the affected study area intersections meet the Build LOS criteria for performing the microscale air quality analysis included in the DEIS. The intersection LOS screening analysis that was performed indicated the project traffic impact would not have any impact on air quality and that conclusion would not change under the current TEM procedures. The CO modeling analysis at the critical intersection was performed only to confirm the negligible impact the project would have on air quality for the DEIS as indicated by the EPM screening method that did not change in the new TEM. Since the LOS screening results are not affected by the vehicle emission factors used and the EPM screening procedures concluded the project would not impact air quality or require microscale modeling, reanalysis using the updated TEM method with the MOVES emission factors as input to the microscale model would not be required for this project to reconfirm the DEIS conclusions. The updated 2015 traffic data

for the FEIS reflecting the smaller project scope than the project evaluated in the DEIS was reviewed and determined that the revised project scope and reduced traffic impact described in the FEIS would not alter the DEIS conclusions.

Comment Air-7

7. The air quality chapter should discuss the PM $^{2.5}$ Hot-Spot guidance and conduct an analysis, if applicable. (AKRF (11/12/2013)

Response:

Based on the NYSDOT-EPM screening procedures acceptable to the NYSDEC at the time of completion, the Project did not warrant a microscale air quality modeling analysis indicating the traffic generated by the project along with the proposed intersection improvements would not result in significant traffic related impact on local CO levels. Under similar logic, the project generated traffic would not be considered likely to result in any significant increment in PM2.5 emissions and would not be a large generator of diesel vehicles. The NYSDEC Policy (CP-33) regarding Assessing and Mitigating Impacts of Fine Particulate Emissions targets the larger transportation projects involving major highway or transit improvements that might significantly impact particulate emissions (PM) by generating greater than 15 tons per year of PM. As noted in the DEIS, the project generated traffic is not a primary source of PM emissions and similar to CO emissions would not be expected to generate significant emissions of PM2.5 close to or above the 15 tons per year limit in the NYSDEC CP-33 policy that triggers a quantitative assessment. Therefore, in accordance with the NYSDEC policy and the results of the LOS screening method, potential impact of the project on traffic related PM emissions would not be significant and the quantitative assessment of PM2.5 emissions would not be warranted.

Comment Air-*8*

8. The chapter should describe the parking proposed as part of the project and indicate whether there is a potential for impact on air quality from parking uses, supporting the conclusions with analyses, if needed. (AKRF (11/12/2013)

Response:

Special consideration of traffic related emissions from the proposed project parking lot area was not required based on the air quality assessment performed. The procedures followed to evaluate the project traffic impact on air quality were contained in the NYSDOT-EPM (now TEM) and addressed all the critical intersection receptors affected at the proposed Site Entrance where the most significant traffic congestion would occur. According to the EPM/TEM, the project traffic impact on LOS conditions at the affected

intersections indicated the project traffic would not impact air quality and did not warrant the microscale modeling of CO concentrations at any of the affected intersections. Despite this determination, the DEIS addressed the potential impact of the project on air quality at the worst-case critical intersection at the Site Entrance and the I84-Westbound Ramps where microscale modeling was performed to show the project traffic would have a negligible impact local CO levels. The CO analysis took into consideration peak hour traffic backed up 1000 feet into the proposed parking lot at the site entrance and the potential impact of that related congestion was addressed at midblock Receptor Site 4 near the intersection and associated parking area.

The air quality assessment was performed at the critical intersection receptors affected near the proposed Site Entrance where the most significant traffic congestion would occur and which covered the parking lot vehicular activity. As noted above, the CO analysis took into consideration peak hour traffic backed up 1000 feet into the proposed parking area at the site entrance. Therefore, the potential impact of vehicle congestion associated with parking lot activity was addressed at the Midblock Receptor-Site 4 near the Site Entrance. Based on the results of the modeling analysis, the CO levels at receptors near the site entrance included the effects of traffic backed up into the parking lot and were predicted to be well below the NAAQS for CO. No additional evaluation of the parking lot related vehicle emissions was warranted.

Comment Air-9

9. The Town Board may wish to consider requesting a broader discussion of the proposed project's energy use and greenhouse gas (GHG) emissions as ell as measures mentioned in he project description (including LEED design) that would be aimed at reducing energy use and GHG emissions. (AKRF (11/12/2013)

Response:

The project air quality analysis has shown the proposed action will not have a significant impact on increased pollutant emissions due to the minor increase in future traffic volumes associated with the project. Mitigation of congestion at key intersections has been implemented by making adjustments to signal timing with minor lane modifications to minimize the potential for increased energy use due to fuel consumption associated with traffic congestion. As such, with respect to traffic emissions, the project has implemented measures that will reduce both energy use and greenhouse gas (GHG) emissions related to congestion on the local roadways.

With respect to the operation of the proposed facility, the project will be designed taking into consideration features that address both the energy use concerns of the agencies, such as LEED design that would reduce both energy use and GHG emissions, as well as

concerns related to the operational costs for the tenants. These design features will likely include enhanced insulation, energy efficient utility systems, roof systems with high reflective ratings or perhaps some green roof technology, energy efficient interior lighting and LED exterior lighting, lighting fixtures on timers and movement sensors, energy conserving building heating and cooling control systems, use of recycled and recyclable building products, reduced flow toilets, and grey water recycling. These type of design features will be typical of those considered to reduce GHG emissions subject to final project design.

Comment Air-10

Air Quality *- Recent EPA publications have pointed out the deleterious effect of fine particulates often found in dust, dirt, soot, smoke and even liquid droplets. These fine particulates lodge in the lung and are cause for the most serious of respiratory illnesses. Emissions from trucks, trailers, vans, buses and vehicles slated to increase from the Crossroads project, will only exacerbate the poor air quality in the Hudson Valley reported by he American Lung Association and graded "F". Although the applicant has noted air quality in the DEIS, I would urge continuous monitoring of air quality in and around the Exits 18 & 19. (Ann Fanizzi (11/12/2013)*

Response:

The NYSDEC conducts and maintains ambient air quality monitoring stations throughout the State of New York aimed at collecting relevant air quality data regarding pollution levels that are used to determine compliance with USEPA regulations and where strategies might be needed to reduce air emissions. The request to conduct continuous pollution monitoring adjacent to both Exits 18 & 19 of the Interstate is better directed to the NYSDEC and is not the responsibility of a single development. In fact, the NYSDEC discourages the use of independent local monitoring data other than that taken from their air quality database of monitoring stations in the assessment of individual project impacts on air quality. Despite what may be perceived by local residents as undesirable traffic congestion and vehicle emissions in the project area, the NYSDEC has declared Putnam County in compliance with the primary air pollutants regulated by the USEPA and the NYSDEC standards. The air quality assessment methods recommended by the USEPA and the NYSDEC have been followed as described in the DEIS to determine the potential project impact on local air quality due to increased traffic related pollutant emissions. The results in the DEIS show the project would have a negligible impact on air quality at the critical intersection receptors analyzed in the study area. The suggestion of the extended ambient monitoring of air pollutant levels near Exits 18 & 19 is not necessary for this project to meet the requirements of SEQRA review.

Comment Air-11

What impact will the project have on air pollution? What impact will increase in truck traffic have? (Cherie Ingraham (November 11, 2013) (Public Hearing (11/07/2013)

Response:

The impact of the project on air quality has been addressed as discussed in Chapter 13 of the DEIS and considered the impact of changes in traffic volumes on the roadway network at nearby sensitive receptors affected by the project. The traffic related impact of the project was evaluated as required by the NYSDEC and addressed the potential effect of traffic on local carbon monoxide levels at critical intersections. The NYSDOT-EPM procedures were followed and considered the increase in both auto and truck volumes associated with the project and the results indicated the project would not have any significant impact on air quality.

Table A-1

2009/2014 TRAFFIC STUDIES – INTERSECTION TRAFFIC VOLUMES COMPARISON – PEAK HOURS

Crossroads 312

Route 312

Southeast, New York

INTERSECTIONS	DIFFERENCES IN TRAFFIC VOLUMES														
	Weekday Morning					Weekday Afternoon					Saturday Midday				
	2009/2012 Existing	2011/2015 No-Build	2011/2015 Build	Net Change Existing/ No-Build	Net Change No-Build/ Build	2009/2012 Existing	2011/2015 No-Build	2011/2015 Build	Net Change Existing/ No-Build	Net Change No-Build/ Build	2009/2012 Existing	2011/2015 No-Build	2011/2015 Build	Net Change Existing/ No-Build	Net Change No-Build/ Build
U.S. Route 6 at Route 312/Access Road	-191	-184	-214	7	-30	-252	-246	-330	6	-84	-56	-52	-157	4	-105
Route 312 at I-84 Eastbound Interchange 19 On/Off Ramps/Independent Way	173	188	144	15	-44	93	109	44	16	-65	5	16	-32	11	-48
Route 312 at I-84 Westbound Interchange 19 On/Off Ramps/Site Access Drive	45	52	-29	7	-81	99	109	-100	10	-209	139	150	-105	11	-255
Route 312 at International Boulevard/ Site Access Drive	59	66	N/A	7	N/A	105	126	N/A	21	N/A	34	39	N/A	5	N/A
Route 312 at Zimmer Road	55	59	45	4	-14	102	109	73	7	-36	38	44	17	6	-27
Route 312 at North Brewster Road	27	37	20	10	-17	33	46	-27	13	-73	28	45	-8	17	-53
Route 312 at Farm to Market Road/Brewster Hill Road	34	50	38	16	-12	38	60	-10	22	-70	8	40	-7	32	-47
Route 22 at Route 312/Towne Centre Access Drive	58	269	256	211	-13	71	273	225	202	-48	54	177	136	123	-41

Note: N/A = Comparison is invalid because in the 2013 traffic study the northerly access drive will be included at this intersection.

Table 3
2012 EXISTING CONDITIONS – MEASURE OF EFFECTIVENESS (MOE) – PEAK HOURS
Crossroads 312 – Proposed Action
Route 312
Southeast, New York

INTERSECTION	CONTROL TYPE	STORAGE/ LINK LENGTH	PHYSICAL UNITS	2012 EXISTING CONDITIONS								
				Weekday Morning			Weekday Afternoon			Saturday Midday		
				LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)
U.S. Route 6 at Route 312/Access Road	Traffic Signal	400	EB L	C/22.6	0.77	413	C/21.5	0.73	320	B/18.9	0.77	328
		730	TR	A/8.5	0.24	122	A/6.5	0.17	83	A/4.8	0.15	59
		--	APP.	B/18.6	--	--	B/17.9	--	--	B/16.1	--	--
		125	WB L	A/0.0	0.00	0	A/0.0	0.00	0	A/0.0	0.00	0
		1,025	T	D/36.6	0.45	159	D/35.5	0.58	241	C/32.8	0.52	184
		250	R	A/10.0	0.19	37	A/6.6	0.37	54	A/7.2	0.30	45
		--	APP.	C/28.6	--	--	C/23.1	--	--	C/22.9	--	--
		315	NB LTR	C/22.2	0.01	11	C/28.5	0.02	17	C/27.2	0.05	26
		--	APP.	C/22.2	--	--	C/28.5	--	--	C/27.2	--	--
		200	SB LT	D/35.8	0.64	225	D/39.3	0.60	192	D/36.1	0.48	129
		2,400	R	A/1.6	0.46	28	A/8.8	0.72	325	A/3.7	0.56	97
		--	APP.	B/11.8	--	--	B/14.5	--	--	A/9.1	--	--
		--	Overall	B/16.9	--	--	B/17.5	--	--	B/14.7	--	--
Route 312 at I-84 Eastbound Interchange 19 On/Off Ramps/ Independent Way	Traffic Signal	450	EB L	E/65.5	0.69	151	E/65.7	0.63	123	E/65.6	0.67	141
		500	T	C/28.7	0.41	337	C/32.3	0.68	632	D/36.2	0.47	315
		325	R	A/1.7	0.19	22	A/1.5	0.24	19	A/6.7	0.37	117
		--	APP.	C/34.6	--	--	C/31.2	--	--	C/32.1	--	--
		275	WB L	E/71.9	0.83	209	F/156.8	1.20	340	D/49.3	0.64	228
		1,285	TR	C/22.9	0.28	184	C/21.7	0.32	242	C/25.6	0.29	203
		--	APP.	D/43.0	--	--	F/81.2	--	--	D/37.2	--	--
		300	NB L	E/65.0	0.56	154	D/53.2	0.42	147	E/57.5	0.58	212
		300	LT	E/59.0	0.56	134	D/55.0	0.60	178	D/54.3	0.62	198
		300	R	B/10.9	0.49	55	B/10.9	0.71	95	A/9.9	0.66	90
		--	APP.	D/44.0	--	--	C/32.2	--	--	D/35.6	--	--
		315	SB L	E/62.9	0.69	226	E/67.6	0.51	113	E/57.4	0.33	91
		1,130	TR	D/36.1	0.80	201	D/36.8	0.65	100	D/54.5	0.65	136
		--	APP.	D/42.7	--	--	D/43.9	--	--	D/55.0	--	--
		--	Overall	D/40.8	--	--	D/48.1	--	--	D/37.1	--	--

Table 3 (Cont'd)

INTERSECTION	CONTROL TYPE	STORAGE/ LINK LENGTH	PHYSICAL UNITS	2012 EXISTING CONDITIONS								
				Weekday Morning			Weekday Afternoon			Saturday Midday		
				LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)
Route 312 at I-84 Westbound	Traffic Signal	250	EB L	C/28.8	0.32	58	C/26.2	0.20	42	C/28.5	0.27	49
Interchange 19 On/Off		1,300	R	A/6.0	0.47	51	B/16.7	0.64	192	B/17.1	0.68	186
Ramps		--	APP.	B/10.8	--	--	B/17.6	--	--	B/18.3	--	--
		425	NB L	A/4.7	0.18	36	D/47.4	0.94	339	A/4.3	0.39	34
		1,285	T	A/5.3	0.39	188	A/4.5	0.41	84	A/2.1	0.33	48
		--	APP.	A/5.2	--	--	C/26.2	--	--	A/2.9	--	--
		445	SB T	A/8.3	0.38	153	C/21.0	0.68	331	B/15.1	0.48	206
		350	R	A/0.6	0.05	5	A/3.8	0.21	43	A/1.5	0.08	12
		--	APP.	A/7.5	--	--	B/16.1	--	--	B/12.9	--	--
		--	Overall	A/7.2	--	--	C/21.2	--	--	B/10.2	--	--
Route 312 at International	Traffic Signal	365	EB L	B/19.1	0.05	17	C/21.7	0.25	54	A/4.2	0.09	14
Boulevard		365	R	A/7.6	0.20	27	A/7.4	0.45	45	A/4.1	0.37	101
		--	APP.	A/9.7	--	--	B/11.4	--	--	A/4.1	--	--
		440	NB L	A/6.1	0.39	47	A/5.5	0.22	23	B/11.0	0.43	199
		440	T	A/3.8	0.31	87	A/5.6	0.44	113	B/11.0	--	--
		--	APP.	A/4.5	--	--	A/5.6	--	--	B/18.8	0.02	8
		600	SB TR	B/13.8	0.54	219	B/15.3	0.62	316	A/8.2	0.15	21
		--	APP.	B/13.8	--	--	B/15.3	--	--	A/9.2	--	--
		--	Overall	A/8.6	--	--	B/10.5	--	--	A/7.4	--	--
Route 312 at Farm to Market	Traffic Signal	125	EB L	B/16.3	0.41	102	B/13.0	0.38	82	B/10.1	0.26	60
Road/Brewster Hill Road		465	TR	C/21.6	0.49	301	C/21.3	0.54	384	B/14.2	0.37	219
		--	APP.	B/19.9	--	--	B/18.9	--	--	B/13.0	--	--
		175	WB L	B/11.4	0.11	31	A/8.3	0.08	22	A/7.8	0.07	19
		735	TR	C/21.3	0.49	253	C/23.3	0.60	327	B/17.7	0.46	203
		--	APP.	C/20.1	--	--	C/22.0	--	--	B/16.8	--	--
		420	NB LTR	D/41.1	0.47	135	C/32.4	0.60	127	C/24.7	0.39	69
		--	APP.	D/41.1	--	--	C/32.4	--	--	C/24.7	--	--
		125	SB L	C/31.5	0.45	133	B/17.9	0.14	45	B/17.8	0.17	49
		770	TR	C/34.0	0.72	304	B/11.5	0.44	90	A/7.1	0.25	44
		--	APP.	C/33.3	--	--	B/12.7	--	--	B/10.7	--	--
		--	Overall	C/26.0	--	--	B/20.0	--	--	B/14.7	--	--

Table 3 (Cont'd)

INTERSECTION	CONTROL TYPE	STORAGE/ LINK LENGTH	PHYSICAL UNITS	2012 EXISTING CONDITIONS								
				Weekday Morning			Weekday Afternoon			Saturday Midday		
				LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)
Route 22 at Route 312/Towne Centre Access Drive	Traffic Signal	225	EB L	E/76.3	0.55	141	E/72.3	0.77	331	F/--	3.44	402
		560	TR	C/25.3	0.48	85	E/56.5	0.75	298	D/38.9	0.58	264
		--	APP.	D/47.9	--	--	E/64.1	--	--	F/461.0	--	--
		135	WB L	E/73.1	0.31	72	E/75.6	0.51	130	E/72.3	0.58	142
		345	T	E/66.7	0.11	35	E/72.6	0.45	123	E/56.7	0.25	103
		135	R	A/1.4	0.12	0	A/1.5	0.16	0	A/0.7	0.11	0
		--	APP.	D/49.0	--	--	E/60.8	--	--	D/54.2	--	--
		270	NB L	A/9.8	0.40	45	B/15.4	0.45	108	C/22.2	0.44	149
		1,325	T	A/7.6	0.16	107	C/22.4	0.55	538	C/31.3	0.40	294
		270	R	A/0.3	0.04	3	A/5.2	0.10	41	A/5.8	0.13	38
		--	APP.	A/7.4	--	--	C/20.4	--	--	C/26.8	--	--
		150	SB L	A/5.1	0.05	20	B/13.8	0.24	53	C/20.2	0.30	109
		385	TR	B/17.0	0.69	744	C/28.7	0.61	576	C/32.1	0.46	316
		--	APP.	B/16.8	--	--	C/27.8	--	--	C/30.2	--	--
		--	Overall	B/18.0	--	--	C/32.5	--	--	F/112.5	--	--
Route 312 at North Brewster Road	TWSC	355	WB L	A/0.0	0.29	0	A/2.1	0.17	15	A/1.1	0.10	8
		930	NB L	E/36.3	0.71	131	F/74.2	0.91	205	E/48.1	0.83	188
		930	R	E/36.3	0.71	131	F/74.2	0.91	205	E/48.1	0.83	188
Route 312 at Zimmer Road	TWSC	785	EB L	C/17.9	0.24	22	D/28.3	0.58	86	D/34.1	0.65	107
		785	R	C/17.9	0.24	22	D/28.3	0.58	86	D/34.1	0.65	107
		600	NB L	A/1.4	0.13	11	A/1.1	0.09	7	A/0.7	0.06	5
Route 312 at Park and Ride Lot Drive	TWSC	315	WB L	A/0.2	0.02	1	A/0.2	0.01	1	A/0.2	0.02	1
		145	NB L	C/19.4	0.03	2	C/24.5	0.05	4	C/23.1	0.43	3
		145	R	C/19.4	0.03	2	C/24.5	0.05	4	C/23.1	0.43	3
Route 312 at Office Building Drive	TWSC	135	WB L	A/9.5	0.06	5	B/10.3	0.05	4	A/9.8	0.01	1
		615	NB L	C/17.9	0.03	2	F/57.2	0.64	90	C/22.7	0.05	4
		615	R	C/17.9	0.03	2	F/57.2	0.64	90	C/22.7	0.05	4
Route 312 at Pugsley Road	TWSC	1,215	EB L	A/0.0	0.00	0	A/0.1	0.01	0	A/0.0	0.00	0
		4,000	SB L	D/30.9	0.11	9	C/21.1	0.04	3	E/36.9	0.13	11
		4,000	R	D/30.9	0.11	9	C/21.1	0.04	3	E/36.9	0.13	11

Table 3 (Cont'd)

INTERSECTION	CONTROL TYPE	STORAGE/ LINK LENGTH	PHYSICAL UNITS	2012 EXISTING CONDITIONS								
				Weekday Morning			Weekday Afternoon			Saturday Midday		
				LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)
Independent Way at	TWSC	65	EB L	F/110.9	0.99	213	F/758.3	2.22	255	F/--	6.16	--
Applebee's/Home Depot		65	T	F/110.9	0.99	213	F/758.3	2.22	255	F/--	6.16	--
Access Drives		65	R	F/110.9	0.99	213	F/758.3	2.22	255	F/--	6.16	--
		275	WB L	A/0.0	0.00	0	C/19.2	0.50	70	F/115.9	1.08	312
		275	T	B/10.6	0.05	4	C/19.2	0.50	70	F/115.9	1.08	312
		275	R	B/10.6	0.05	4	C/19.2	0.50	70	F/115.9	1.08	312
		475	NB L	A/0.3	0.03	2	A/0.1	0.01	1	A/0.5	0.04	3
		325	SB L	A/0.5	0.06	4	A/2.8	0.25	24	A/3.7	0.32	34

Notes:

- Synchro 8.0 is used for capacity analysis and storage/queue analysis.
- Level of Service determining parameter is called the service measure.
- For Signalized Intersections: Level of Service/Average Total delay per vehicle (seconds/vehicle).
- For Unsignalized Intersections: Level of Service/Average Control delay per vehicle (seconds/vehicle).
- Where TWSC = Two-way STOP control
- ITE publication for Traffic Access and impact studies for site development "A Recommended Practice" indicated that overall Level of Service ratings of A to D are normally considered acceptable for signalized intersections (Level C or better are considered desirable). Levels of Service E and F are normally undesirable. Also, it indicates that when recommendations are formulated, they should include modifications to reduce delay and increase capacity on critical movements.
- V/C ratio indicates the amount of congestion for each Lane Group or Movement. Any V/C ratio greater than or equal to one indicates that the Lane Group or Movement is operating at above capacity.
- The Queue Length rows show the 95th percentile maximum queue length in feet.
- The 95th percentile queue is the maximum back of the queue with the 95th percentile traffic volumes.
- **Highlighted** 95th percentile queue exceeds the storage available.
- Physical Units consist of the following
  1. Lane Group for Traffic Signal Controlled Intersections; and
  2. Movement for TWSC Intersections.

NB = Northbound EB = Eastbound SB = Southbound WB = Westbound
L = Left Turn T = Through R = Right Turn APP. = Approach

Table 5
2015 FUTURE CONDITIONS – MEASURE OF EFFECTIVENESS (MOE) AND IMPACT ASSESSMENT – PEAK HOURS
Crossroads 312 – Proposed Action
Route 312
Southeast, New York

		2015 NO-BUILD CONDITIONS											2015 BUILD CONDITIONS											PROJECT IMPACTS					
				Weekday Morning			Weekday Afternoon			Saturday Midday					Weekday Morning			Weekday Afternoon			Saturday Midday			Weekday Morning		Weekday Afternoon		Saturday Midday	
INTERSECTION	CONTROL TYPE	STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)
U.S. Route 6 at	Traffic	400	EB L	C/25.7	0.81	522	C/25.0	0.78	420	C/22.1	0.80	487	400	EB L	C/27.4	0.84	600	C/32.0	0.86	634	D/43.5	0.97	772	No	1.7	No	7.0	C – D	21.4
Route 312/Access	Signal	730	TR	A/8.7	0.24	128	A/6.8	0.17	89	A/5.1	0.15	64	730	TR	A/8.6	0.24	128	A/7.2	0.17	95	A/6.2	0.15	76	No	-0.1	No	0.4	No	1.1
Road		--	APP.	C/21.1	--	--	C/20.7	--	--	B/18.8	--	--	--	APP.	C/22.4	--	--	C/26.7	--	--	D/37.1	--	--	No	1.3	No	6.0	B – D	18.3
		125	WB L	A/0.0	0.00	0	A/0.0	0.00	0	A/0.0	0.00	0	125	WB L	A/0.0	0.00	0	A/0.0	0.00	0	A/0.0	0.00	0	No	0.0	No	0.0	No	0.0
		1,025	T	D/38.4	0.47	165	D/37.8	0.60	253	D/35.6	0.56	193	1,025	T	D/38.8	0.48	165	D/40.2	0.62	258	D/38.3	0.58	206	No	0.4	No	2.4	No	2.7
		250	R	A/9.8	0.22	39	A/6.7	0.39	56	A/7.2	0.32	47	250	R	A/9.8	0.23	40	A/6.7	0.42	58	A/7.3	0.40	55	No	0.0	No	0.0	No	0.1
		--	APP.	C/29.2	--	--	C/24.1	--	--	C/24.3	--	--	--	APP.	C/29.0	--	--	C/25.0	--	--	C/23.8	--	--	No	-0.2	No	0.9	No	-0.5
		315	NB LTR	C/21.8	0.01	10	C/28.6	0.02	16	C/27.4	0.05	26	315	NB LTR	C/22.2	0.01	10	C/28.6	0.02	17	C/26.6	0.05	26	No	0.4	No	0.0	No	-0.8
		--	APP.	C/22.2	--	--	C/28.6	--	--	C/27.4	--	--	--	APP.	C/22.2	--	--	C/28.6	--	--	C/26.6	--	--	No	0.0	No	0.0	No	-0.8
		200	SB LT	D/37.8	0.67	233	D/41.6	0.63	208	D/38.9	0.55	144	200	SB LT	D/38.5	0.68	233	D/44.5	0.68	228	D/41.5	0.64	185	No	0.7	No	2.9	No	2.6
		2,400	R	A/1.7	0.47	31	B/10.9	0.77	430	A/4.7	0.61	150	2,400	R	A/1.9	0.49	35	B/14.8	0.83	644	A/7.1	0.70	279	No	0.2	No	3.9	No	2.4
		--	APP.	B/12.5	--	--	B/16.6	--	--	B/10.4	--	--	--	APP.	B/12.5	--	--	C/20.2	--	--	B/13.3	--	--	No	0.0	B – C	3.6	No	2.9
		--	Overall	B/18.5	--	--	B/19.6	--	--	B/16.5	--	--	--	Overall	B/19.1	--	--	C/23.4	--	--	C/25.2	--	--	No	0.6	B – C	3.8	B – C	8.7
Route 312 at I-84	Traffic	450	EB L	E/65.2	0.70	156	E/65.5	0.68	144	D/51.6	0.71	391	450	EB L	E/66.0	0.71	157	E/65.5	0.68	104	E/67.1	0.73	165	No	0.8	No	0.0	D - E	15.5
Eastbound	Signal	500	T	C/31.1	0.46	377	D/40.1	0.82	894	D/42.4	0.65	438	500	T	D/35.3	0.55	453	F/81.2	1.05	1,238	F/111.0	1.11	953	C - D	4.2	D - F	41.1	D – F	68.6
Interchange 19		325	R	A/1.8	0.20	24	A/2.1	0.25	24	A/7.5	0.38	127	325	R	A/2.0	0.20	26	A/3.1	0.26	40	A/7.8	0.39	127	No	0.2	No	1.0	No	0.3
On/Off Ramps/		--	APP.	D/35.6	--	--	D/37.1	--	--	D/37.0	--	--	--	APP.	D/37.7	--	--	E/63.7	--	--	E/73.4	--	--	No	2.1	D - E	26.6	D – E	36.4
Independent Way		275	WB L	E/73.4	0.85	211	F/167.0	1.23	350	D/49.4	0.64	240	275	WB L	E/74.3	0.85	211	F/160.4	1.23	317	D/54.7	0.68	320	No	0.9	No	-6.6	No	5.3
		1,285	TR	C/25.2	0.35	220	C/25.1	0.38	298	D/38.6	0.48	237	1,285	TR	C/28.1	0.40	247	C/23.8	0.52	335	C/34.2	0.56	378	No	2.9	No	-1.3	D – C	-4.4
		--	APP.	D/43.4	--	--	F/84.0	--	--	D/43.6	--	--	--	APP.	D/44.5	--	--	E/72.8	--	--	D/41.5	--	--	No	1.1	D - E	-11.2	No	-2.1
		300	NB L	E/65.0	0.57	157	D/52.6	0.42	148	E/57.3	0.59	216	300	NB L	E/65.0	0.57	157	D/52.1	0.42	146	E/57.3	0.59	216	No	0.0	No	-0.5	No	0.0
		300	LT	E/58.8	0.57	105	D/54.6	0.60	181	D/54.1	0.63	203	300	LT	E/58.8	0.56	137	D/54.1	0.59	179	D/54.1	0.63	203	No	0.0	No	-0.5	No	0.0
		300	R	B/11.4	0.56	59	B/10.7	0.71	96	A/9.8	0.66	91	300	R	B/11.4	0.50	59	B/12.8	0.73	119	B/16.0	0.72	152	No	0.0	No	2.1	A – B	6.2
		--	APP.	D/44.2	--	--	C/31.9	--	--	D/35.4	--	--	--	APP.	D/44.2	--	--	C/32.8	--	--	D/38.1	--	--	No	0.0	No	0.9	No	2.7
		315	SB L	E/62.2	0.71	247	E/67.9	0.54	123	E/57.6	0.35	98	315	SB L	E/61.3	0.74	282	E/68.2	0.64	169	E/67.5	0.68	197	No	-0.9	No	0.3	No	9.9
		1,130	TR	C/34.5	0.80	210	C/34.4	0.65	102	D/52.9	0.66	141	1,130	TR	C/30.6	0.74	203	C/29.5	0.55	97	D/46.3	0.55	133	No	-3.9	No	-4.9	No	-6.6
		--	APP.	D/41.5	--	--	D/42.4	--	--	D/53.9	--	--	--	APP.	D/39.3	--	--	D/42.0	--	--	D/54.1	--	--	No	-2.2	No	-0.4	No	0.2
		--	Overall	D/40.9	--	--	D/50.7	--	--	D/39.9	--	--	--	Overall	D/41.1	--	--	E/57.4	--	--	D/52.9	--	--	No	0.2	D - E	6.7	No	13.0
Route 312 at I-84	Traffic	250	EB L	C/29.2	0.40	72	C/26.1	0.24	50	C/28.7	0.30	55	250	EB L	E/62.3	0.71	123	F/108.8	0.75	132	E/72.8	0.52	134	C - E	33.1	C - F	82.7	C - E	44.1
Westbound	Signal	--	--	--	--	--	--	--	--	--	--	--	1,300	T	C/29.1	0.12	25	E/66.0	0.49	113	E/71.8	0.65	166	N/A	N/A	N/A	N/A	N/A	N/A
Interchange 19		1,300	R	A/9.3	0.53	78	B/17.7	0.67	207	B/19.8	0.73	209	350	R	B/15.9	0.62	83	C/22.9	0.67	279	C/27.8	0.78	271	A - B	6.6	B - C	5.2	B - C	8.0
On/Off Ramps		--	APP.	B/14.1	--	--	B/18.6	--	--	C/20.8	--	--	--	APP.	C/27.3	--	--	D/37.0	--	--	D/40.6	--	--	No	13.2	B - D	18.4	C - D	19.8
		--	--	--	--	--	--	--	--	--	--	--	230	WB L	C/32.1	0.17	17	E/77.2	0.66	124	E/68.0	0.62	148	N/A	N/A	N/A	N/A	N/A	N/A
		--	--	--	--	--	--	--	--	--	--	--	230	T	C/28.9	0.11	22	E/67.9	0.53	122	D/52.3	0.24	77	N/A	N/A	N/A	N/A	N/A	N/A
		--	--	--	--	--	--	--	--	--	--	--	100	R	A/0.2	0.02	0	A/0.0	0.01	0	A/0.0	0.01	0	N/A	N/A	N/A	N/A	N/A	N/A
		--	--	--	--	--	--	--	--	--	--	--	--	APP.	C/27.9	--	--	E/71.8	--	--	E/60.7	--	--	N/A	N/A	N/A	N/A	N/A	N/A
		425	NB L	A/5.7	0.20	40	F/108.8	1.14	543	A/7.0	0.48	103	425	NB L	A/6.3	0.24	54	E/70.9	1.05	614	C/31.2	0.68	164	No	0.6	F - E	-37.9	A – C	24.2
		1,285	T	A/6.4	0.43	211	A/5.0	0.48	132	A/2.7	0.39	153	1,285	TR	B/10.6	0.53	355	B/11.4	0.69	352	B/16.7	0.82	754	A – B	4.2	A – B	6.4	A – B	14.0
		--	APP.	A/6.2	--	--	E/56.3	--	--	A/4.3	--	--	--	APP.	A/9.9	--	--	D/36.9	--	--	C/20.6	--	--	No	3.7	E - D	-19.4	A – C	16.3
		--	SB --	--	--	--	--	--	--	--	--	--	--	SB L	A/4.0	0.01	1	A/8.2	0.02	5	A/9.6	0.03	5	N/A	N/A	N/A	N/A	N/A	N/A
		445	T	A/9.5	0.43	186	C/26.0	0.77	404	B/16.6	0.55	242	445	T	B/10.6	0.47	235	F/100.8	0.90	818	D/51.0	0.72	652	A - B	1.1	C – F	74.8	B – D	34.4
		350	R	A/0.6	0.05	5	A/4.8	0.24	54	A/1.5	0.09	13	350	R	A/0.1	0.06	0	A/8.3	0.32	91	A/0.9	0.11	7	No	-0.5	A – B	3.5	No	-0.6
		--	APP.	A/8.5	--	--	C/20.0	--	--	B/14.2	--	--	--	APP.	A/9.5	--	--	E/76.4	--	--	D/44.4	--	--	No	1.0	C – E	56.4	B – F	30.2
		--	Overall	A/8.9	--	--	D/37.1	--	--	B/11.7	--	--	--	Overall	B/14.2	--	--	D/50.6	--	--	C/34.9	--	--	A – B	5.3	No	13.5	B - C	23.2

Cont'd Table 5

INTERSECTION	CONTROL TYPE	2015 NO-BUILD CONDITIONS										2015 BUILD CONDITIONS										PROJECT IMPACTS					
				Weekday Morning			Weekday Afternoon			Saturday Midday												Weekday Morning		Weekday Afternoon		Saturday Midday	
		STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)
Route 312 at International Boulevard	Traffic Signal	365	EB L	B/19.1	0.05	19	C/22.1	0.28	59	B/18.8	0.02	10	365	EB L	B/17.8	0.05	19	B/18.5	0.22	58	B/16.8	0.02	10	No	-1.3	C - B	-3.6	No	-2.0
		365	R	A/7.4	0.21	29	A/7.4	0.49	48	A/8.1	0.17	22	365	TR	A/0.5	0.14	0	A/3.9	0.49	3	A/0.7	0.14	0	No	-6.9	No	-3.5	No	-7.4
		--	APP.	A/9.5	--	--	B/11.6	--	--	A/9.3	--	--	--	APP.	A/3.5	--	--	A/8.0	--	--	A/2.5	--	--	No	-6.0	B - A	-3.6	No	-6.8
		--	--	--	--	--	--	--	--	--	--	--	150	WB L	B/18.8	0.07	25	B/19.6	0.24	58	E/61.2	0.86	158	N/A	N/A	N/A	N/A	N/A	N/A
		--	--	--	--	--	--	--	--	--	--	--	150	TR	A/0.1	0.03	0	A/1.4	0.27	0	A/1.0	0.23	0	N/A	N/A	N/A	N/A	N/A	N/A
		--	--	--	--	--	--	--	--	--	--	--	--	APP	B/11.3	--	--	A/8.7	--	--	D/37.0	--	--	N/A	N/A	N/A	N/A	N/A	N/A
		440	NB L	A/8.1	0.49	61	A/6.4	0.28	25	A/4.4	0.11	15	440	NB L	B/15.1	0.56	132	B/11.9	0.33	43	A/7.8	0.14	26	A - B	7.0	A - B	5.5	No	3.4
		440	T	A/4.0	0.34	99	A/6.4	0.52	141	A/4.6	0.43	127	440	TR	B/13.2	0.43	291	C/24.9	0.75	438	C/20.7	0.72	381	A - B	9.2	A – C	18.5	A – C	16.1
		--	APP.	A/5.3	--	--	A/6.4	--	--	A/4.6	--	--	--	APP.	B/13.8	--	--	C/23.2	--	--	B/19.6	--	--	A - B	8.5	A – C	16.8	A – B	15.0
		--	--	--	--	--	--	--	--	--	--	--	150	SB L	A/7.6	0.05	16	C/22.2	0.55	70	B/17.2	0.50	61	N/A	N/A	N/A	N/A	N/A	N/A
		600	SB TR	B/16.7	0.63	298	C/21.3	0.76	374	B/12.3	0.48	235	600	TR	C/20.5	0.65	377	C/32.0	0.83	485	B/17.8	0.57	338	B - C	3.8	No	10.7	No	5.5
		--	APP.	B/16.7	--	--	C/21.3	--	--	B/12.3	--	--	--	APP.	B/19.9	--	--	C/30.5	--	--	B/17.7	--	--	No	3.2	No	9.2	No	5.4
		--	Overall	B/10.2	--	--	B/13.1	--	--	A/8.2	--	--	--	Overall	B/15.4	--	--	C/22.0	--	--	C/21.4	--	--	No	5.2	A – C	8.9	A – C	13.2
Route 312 at Farm to Market Road/Brewster Hill Road	Traffic Signal	125	EB L	B/19.5	0.46	114	B/17.2	0.46	89	B/12.7	0.38	75	125	EB L	B/20.4	0.47	115	C/22.3	0.52	127	B/15.9	0.42	78	No	0.9	No	5.1	B – C	3.2
		465	TR	C/25.5	0.54	367	C/25.6	0.66	479	B/18.4	0.51	352	465	TR	C/26.6	0.56	404	C/31.4	0.77	414	C/21.5	0.60	462	No	1.1	C – D	5.8	No	3.1
		--	APP.	C/23.6	--	--	C/23.2	--	--	B/16.7	--	--	--	APP.	C/24.7	--	--	C/29.1	--	--	B/20.0	--	--	No	1.1	C – D	5.9	No	3.3
		175	WB L	B/12.1	0.11	34	A/9.4	0.10	23	A/8.1	0.08	19	175	WB L	B/12.2	0.11	34	B/11.6	0.11	21	A/8.9	0.09	20	No	0.1	No	2.2	No	0.8
		735	TR	C/26.8	0.59	365	C/28.4	0.71	400	C/22.2	0.59	277	735	TR	C/28.3	0.62	396	D/35.2	0.81	403	C/27.3	0.70	397	No	1.5	No	6.8	No	5.1
		--	APP.	C/25.3	--	--	C/26.8	--	--	C/21.1	--	--	--	APP.	C/26.8	--	--	C/33.4	--	--	C/26.0	--	--	No	1.5	No	6.6	No	4.9
		420	NB LTR	D/49.2	0.57	160	D/41.6	0.71	135	C/28.8	0.46	78	420	NB LTR	D/53.1	0.62	177	D/44.7	0.76	147	C/32.0	0.51	87	No	3.9	No	3.1	C – D	3.2
		--	APP.	D/49.2	--	--	D/44.6	--	--	C/28.8	--	--	--	APP.	D/53.1	--	--	D/44.7	--	--	C/32.0	--	--	No	3.9	No	0.1	C – D	3.2
		125	SB L	C/33.9	0.47	151	B/18.7	0.16	47	B/19.9	0.20	58	125	SB L	C/34.5	0.48	154	B/18.3	0.15	39	C/20.2	0.20	59	No	0.6	No	-0.4	No	0.3
		770	TR	D/36.5	0.74	343	B/11.2	0.47	100	A/7.1	0.32	52	770	TR	D/37.0	0.75	349	B/10.7	0.46	84	A/7.1	0.32	53	N	0.5	No	-0.5	No	0.0
		--	APP.	D/35.7	--	--	B/12.6	--	--	B/11.1	--	--	--	APP.	D/36.3	--	--	B/12.1	--	--	B/11.2	--	--	No	0.6	No	-0.5	No	0.1
		--	Overall	C/29.8	--	--	C/24.0	--	--	B/17.9	--	--	--	Overall	C/31.0	--	--	C/28.9	--	--	C/21.4	--	--	No	1.2	C – D	4.9	No	3.5
Route 22 at Route 312/Towne Centre Access Drive	Traffic Signal	225	EB L	E/76.0	0.68	217	E/79.6	0.89	502	E/63.3	0.66	291	225	EB L	E/75.7	0.69	225	F/87.0	0.94	590	E/63.1	0.68	321	No	-0.3	No	7.4	No	-0.2
		560	TR	C/20.4	0.39	82	D/50.0	0.71	332	D/49.1	0.75	302	560	TR	B/19.5	0.39	82	D/50.3	0.74	362	D/50.0	0.80	342	No	-0.9	No	0.3	No	0.9
		--	APP.	D/52.0	--	--	E/65.9	--	--	E/55.2	--	--	--	APP.	D/51.7	--	--	E/70.2	--	--	E/55.5	--	--	No	-0.3	No	4.3	No	0.3
		135	WB L	E/73.2	0.32	73	E/75.7	0.52	133	E/67.9	0.46	145	135	WB L	E/73.2	0.32	73	E/75.7	0.52	133	E/67.9	0.46	145	No	0.0	No	0.0	No	0.0
		345	T	E/66.5	0.10	35	E/72.5	0.46	125	E/63.4	0.33	133	345	T	E/66.5	0.10	35	E/72.5	0.46	125	E/63.4	0.33	133	No	0.0	No	0.0	No	0.0
		135	R	A/1.4	0.13	0	A/1.5	0.16	0	A/1.1	0.14	0	135	R	A/1.4	0.13	0	A/1.5	0.16	0	A/1.1	0.14	0	No	0.0	No	0.0	No	0.0
		--	APP.	D/48.7	--	--	E/60.8	--	--	D/54.5	--	--	--	APP.	D/48.7	--	--	E/60.8	--	--	D/54.5	--	--	No	0.0	No	0.0	No	0.0
		270	NB L	D/46.7	0.65	173	D/42.1	0.59	254	B/19.1	0.54	179	270	NB L	D/47.4	0.65	181	D/42.3	0.61	284	C/21.9	0.61	213	D – E	0.7	E – F	0.2	No	2.8
		1,325	T	B/10.1	0.20	144	C/27.8	0.63	577	C/25.7	0.36	301	1,325	T	B/10.4	0.20	147	C/28.8	0.65	577	C/26.7	0.37	301	No	0.3	No	1.0	No	1.0
		270	R	A/0.4	0.04	3	A/5.8	0.12	42	A/5.2	0.11	38	270	R	A/0.4	0.04	4	A/5.8	0.12	42	A/5.3	0.12	38	No	0.0	No	0.0	No	0.1
		--	APP.	B/17.4	--	--	C/28.5	--	--	C/22.1	--	--	--	APP.	B/18.1	--	--	C/29.5	--	--	C/23.3	--	--	No	0.7	No	1.0	No	1.2
		150	SB L	A/7.5	0.06	24	B/17.7	0.29	55	B/15.5	0.27	100	150	SB L	A/7.8	0.06	24	B/18.5	0.30	55	B/16.6	0.28	100	No	0.3	No	0.8	A – B	1.1
		385	TR	C/28.9	0.84	1148	D/50.7	0.90	796	C/29.5	0.48	376	385	TR	C/30.8	0.86	1,178	E/69.9	1.00	834	C/34.3	0.55	387	No	1.9	No	19.2	No	4.8
		--	APP.	C/28.5	--	--	D/49.0	--	--	C/27.5	--	--	--	APP.	C/30.3	--	--	E/67.2	--	--	C/31.8	--	--	No	1.8	No	18.2	B – C	4.3
		--	Overall	C/28.6	--	--	D/44.3	--	--	C/33.3	--	--	--	Overall	C/30.0	--	--	D/52.4	--	--	D/35.6	--	--	No	1.4	C – D	8.1	No	2.3
Route 312 at North Brewster Road	TWSC	355	WB L	A/1.8	0.15	14	A/2.6	0.18	17	A/1.4	0.11	9	355	WB L	A/1.9	0.16	14	A/3.2	0.20	19	A/1.7	0.12	10	No	0.1	No	0.6	No	0.3
		930	NB L	E/49.9	0.81	168	F/197.0	1.26	338	F/151.6	1.18	354	930	NB L	F/59.1	0.86	189	F/526.3	1.99	534	F/367.8	1.68	552	E – F	9.2	No	329.3	No	216.2
		930	R	E/49.9	0.81	168	F/197.0	1.26	338	F/151.6	1.18	354	930	R	F/59.1	0.86	189	F/526.3	1.99	534	F/367.8	1.68	552	E – F	9.2	No	329.3	No	216.2
Route 312 at Zimmer Road	TWSC	785	EB L	C/21.9	0.32	33	F/85.2	0.95	222	F/199.1	1.29	410	785	EB L	C/25.0	0.36	39	F/330.7	1.56	418	F/582.7	2.14	647	No	3.1	No	245.5	No	383.6
		785	R	C/21.9	0.32	33	F/85.2	0.95	222	F/199.1	1.29	410	785	R	C/25.0	0.35	39	F/330.7	1.56	418	F/582.7	2.14	647	No	3.1	No	245.5	No	383.6
		600	NB L	A/1.9	0.16	15	A/1.8	0.13	11	A/1.2	0.09	8	600	NB L	A/2.0	0.17	15	A/2.3	0.14	12	A/1.5	0.10	9	No	0.1	No	0.5	No	0.3
Route 312 at Park and Ride Lot Drive	TWSC	315	WB L	A/0.2	0.02	1	A/0.2	0.01	1	A/0.3	0.02	2	315	WB L	A/0.2	0.02	1	A/0.3	0.02	1	A/0.4	0.03	2	No	0.0	No	0.1	No	0.1
		145	NB L	C/20.8	0.04	3	D/30.9	0.07	6	D/28.6	0.05	4	145	NB L	C/22.1	0.04	3	E/39.2	0.09	7	E/47.3	0.09	7	No	1.3	D – E	8.3	D – E	18.7
		145	R	C/20.8	0.04	3	D/30.9	0.07	6	D/28.6	0.05	4	145	R	C/22.1	0.04	3	E/39.2	0.09	7	E/47.3	0.09	7	No	1.3	D – E	8.3	D – E	18.7

Cont'd Table 5

INTERSECTION	CONTROL TYPE	2015 NO-BUILD CONDITIONS										2015 BUILD CONDITIONS										PROJECT IMPACTS					
				Weekday Morning			Weekday Afternoon			Saturday Midday					Weekday Morning			Weekday Afternoon			Saturday Midday			Weekday Morning		Weekday Afternoon		Saturday Midday	
		STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	STORAGE/ LINK LENGTH	PHYSICAL UNITS	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	LOS/ Delay	V/C Ratio	Queue Length (Feet)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)	Deterio-ration in LOS	Project Delay (Seconds)
Route 312 at	TWSC	135	WB L	B/10.3	0.16	15	B/11.0	0.11	9	B/10.4	0.07	5	135	WB L	B/10.6	0.17	15	B/12.0	0.13	11	B/12.0	0.09	7	No	0.3	No	1.0	No	1.6
Office Building		615	NB L	D/29.9	0.14	12	F/583.6	2.11	554	F/165.6	1.11	224	615	NB L	D/33.9	0.16	14	F/--	3.55	--	F/855.4	2.58	411	No	4.0	No	N/A	No	689.8
Drive		615	R	D/29.9	0.14	12	F/583.6	2.11	554	F/165.6	1.11	224	615	R	D/33.9	0.16	14	F/--	3.55	--	F/855.4	2.58	411	No	4.0	No	N/A	No	689.8
Route 312 at	TWSC	1,000+	EB L	A/0.0	0.00	0	A/0.1	0.01	0	A/0.0	0.00	0	1,215	EB L	A/0.0	0.00	0	A/0.2	0.01	0	A/0.0	0.00	0	No	0.0	No	0.1	No	0.0
Pugsley Road		1,000+	SB L	D/34.2	0.12	10	C/23.7	0.05	4	E/44.6	0.16	13	4,000	SB L	E/37.6	0.13	11	D/30.6	0.07	5	F/95.8	0.30	26	D – E	3.4	C – D	6.9	E – F	51.2
		1,000+	R	D/34.2	0.12	10	C/23.7	0.05	4	E/44.6	0.16	13	4,000	R	E/37.6	0.13	11	D/30.6	0.07	5	F/95.8	0.30	26	D – E	3.4	C – D	6.9	E – F	51.2
Independent Way	TWSC	65	EB L	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.71	--	65	EB L	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.75	--	No	0.0	No	0.0	No	N/A
at Applebee's/		65	T	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.71	--	65	T	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.75	--	No	0.0	No	0.0	No	N/A
Home Depot		65	R	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.71	--	65	R	F/131.1	1.05	235	F/898.0	2.50	271	F/--	7.75	--	No	0.0	No	0.0	No	N/A
Access Drives		275	WB L	A/0.0	0.00	0	C/20.1	0.53	76	F/153.7	1.19	364	275	WB L	A/0.0	0.00	0	C/20.1	0.53	76	F/154.3	1.19	365	No	0.0	No	0.0	No	0.6
		275	T	B/10.7	0.06	4	C/20.1	0.53	76	F/153.7	1.19	364	275	T	B/10.7	0.06	4	C/20.1	0.53	76	F/154.3	1.19	365	No	0.0	No	0.0	No	0.6
		275	R	B/10.7	0.06	4	C/20.1	0.53	76	F/153.7	1.19	364	275	R	B/10.7	0.06	4	C/20.1	0.53	76	F/154.3	1.19	365	No	0.0	No	0.0	No	0.6
		475	NB L	A/0.3	0.03	2	A/0.1	0.01	1	A/05	0.05	4	475	NB L	A/0.3	0.03	2	A/0.1	0.01	1	A/0.5	0.05	4	No	0.0	No	0.0	No	0.0
		325	SB L	A/0.6	0.06	5	A/2.9	0.26	25	A/3.9	0.33	36	325	SB L	A/0.5	0.06	5	A/2.9	0.26	25	A/3.9	0.33	36	No	0.0	No	0.0	No	0.0

Notes:

- Synchro 8.0 is used for capacity analysis and storage/queue analysis.
- Level of Service determining parameter is called the service measure.
- For Signalized Intersections: Level of Service/Average Total delay per vehicle (seconds/vehicle).
- For Unsignalized Intersections: Level of Service/Average Control delay per vehicle (seconds/vehicle).
- ITE publication for Traffic Access and impact studies for site development "A Recommended Practice" indicated that overall Level of Service ratings of A to D are normally considered acceptable for signalized intersections (Level C or better are considered desirable). Levels of Service E and F are normally undesirable.
- V/C ratio indicates the amount of congestion for each Lane Group or Movement. Any V/C ratio greater than or equal to one indicates that the Lane Group or Movement is operating at above capacity.
- The Queue Length rows show the 95th percentile maximum queue length in feet.
- The 95th percentile queue is the maximum back of the queue with the 95th percentile traffic volumes.
- **Bolded** 95th percentile queue exceeds the storage available.
- TWSC = Two-Way STOP Control
- N/A = Not Applicable
- Physical Units consist of the following
    1. Lane Group for Traffic Signal Controlled Intersections; and
    2. Movement for TWSC Intersections.

NB = Northbound EB = Eastbound SB = Southbound WB = Westbound
L = Left Turn T = Through R = Right Turn APP. = Approach

Frederick P. Clark Associates, Inc.
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