TRAFFIC IMPACT STUDY

FOR THE

MARMEN WELCON TOWER MANUFACTURING PLANT

ALBANY, NEW YORK

JULY 21, 2021
(REVISED OCTOBER 22, 2021)

PREPARED FOR:

PORT OF ALBANY

PREPARED BY:

McFarland Johnson

60 RAILROAD PLACE #402
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MJ Project No. 18641.00

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INTRODUCTION

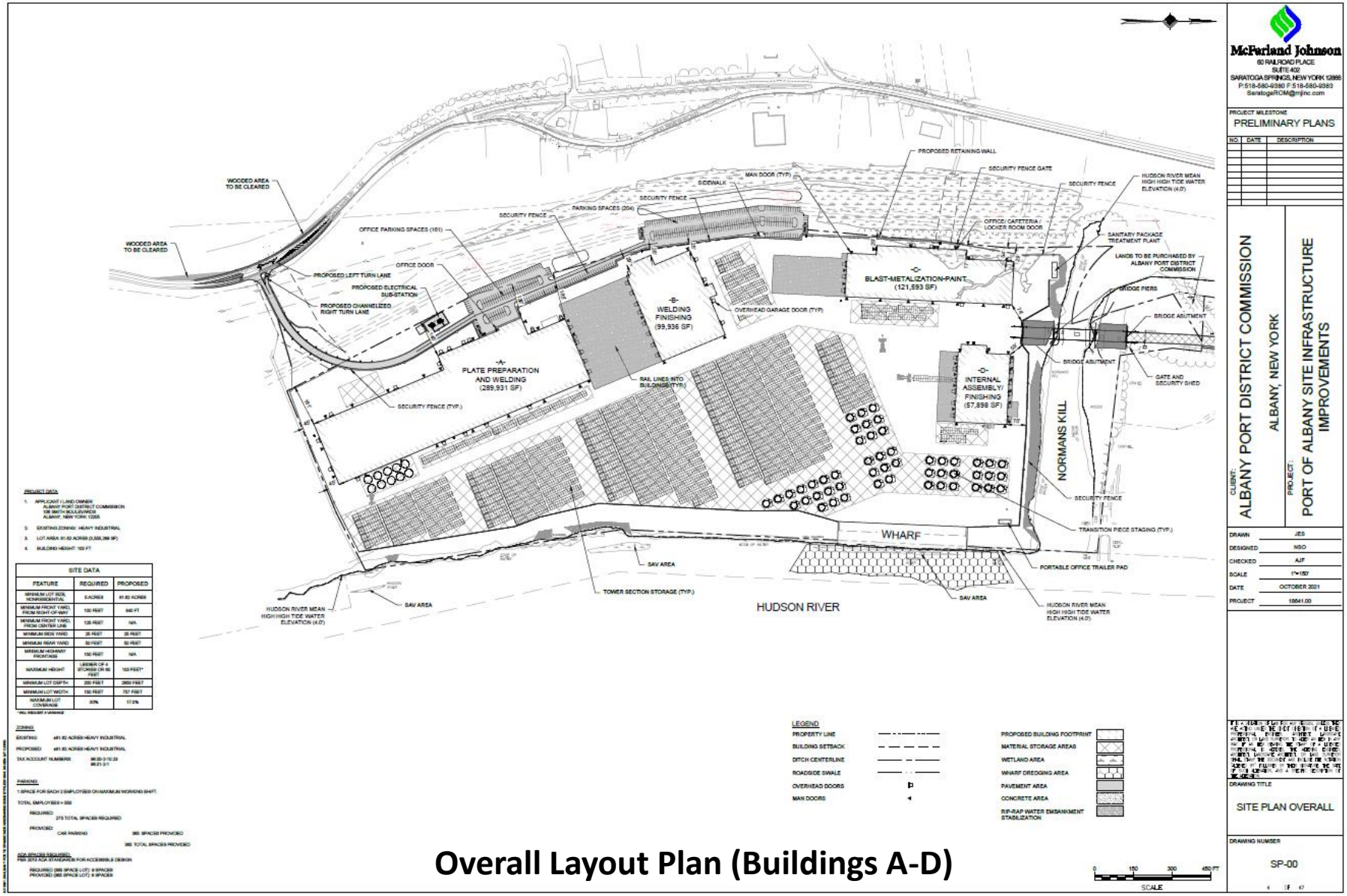
McFarland Johnson, Inc. (MJ) conducted this Traffic Impact Study (TIS) for the Marmen Welcon Tower Manufacturing Plant ("the project") to be built at the Port of Albany expansion property in the Town of Bethlehem and partially within the existing Port District at 700 Smith Boulevard. This TIS compares the traffic impacts associated with this specific project to the traffic volume thresholds identified in the 2020 Final Generic Environmental Impact Statement (FGEIS) prepared as part of the SEQRA review for development of this property. This TIS analyzes the impacts the project may have on the same FGEIS study area intersections and surrounding roadway network.

Proposed Project

The proposed project consists of a 589,000 +/- square foot offshore wind tower manufacturing facility spread out over 5 separate buildings. The project also includes a 500 linear foot wharf along the Hudson River to ship completed tower sections out to sea for installation. Tower production will occur within 4 buildings (buildings A-D) located at the Port Expansion property within the Town of Bethlehem (the production site) for which the FGEIS was previously completed. The 5th building (Building E) is located at 700 Smith Boulevard within the existing Port District in the City of Albany and will serve to manage delivery of raw materials (the receiving site). See Figures 1A and 1B for the proposed site plans for this project.

The production site access will be accomplished by two driveways, one at the north end to be gated for use only by Marmen Welcon owned delivery trucks and one at the south end for employees only. Marmen Welcon trucks will access the site via a gated/guarded truck-only bridge crossing the Normans Kill, connecting Normanskill Street to the site. Employees and visitors will access the site via the driveway on NYS Route 144 (River Road) at the southern end of the production site and will be restricted to passenger vehicles only. The proposed site access locations are consistent with the locations identified in the FGEIS; however, the functionality and operations associated with each driveway differs from the assumptions in the FGEIS traffic impact study.

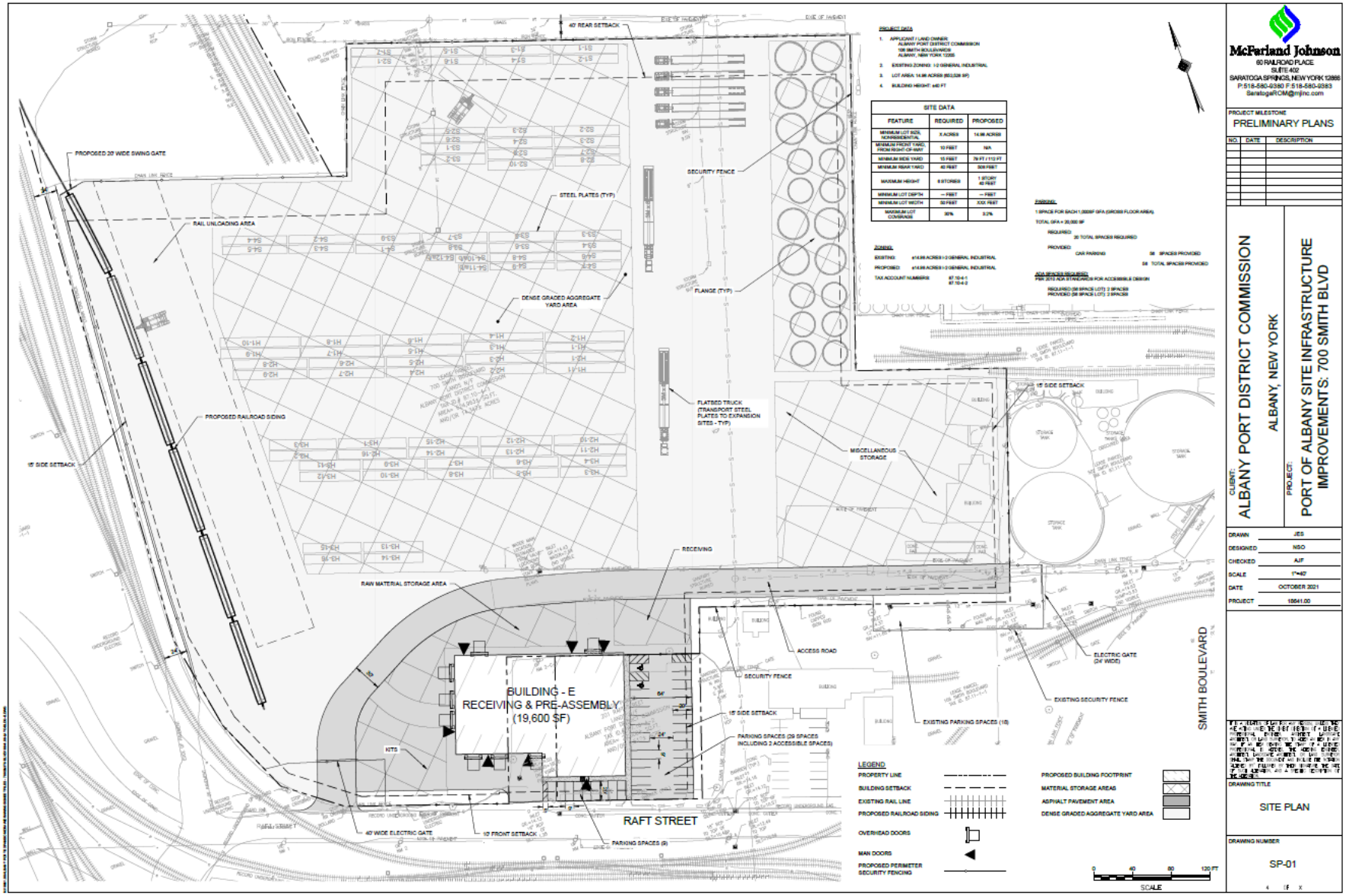
The proposed facility will employ a total of approximately 550 full time workers spread over three shifts, with the largest shift change consisting of 180 employees and secondary shifts with up to 140 employees. This is based on the staffing requirements for both production and office staff needed to operate the facility. Conclusions from the data received from Marmen Welcon indicates that the project will generate a maximum of 324 trips during the morning shift change and 324 trips during the evening shift change for all five buildings combined.



Overall Layout Plan (Buildings A-D)

McFarland Johnson

FIGURE 1A


PROPOSED 20' WIDE SWING GATE
RAIL UNLOADING AREA
STEEL PLATES (TYP)
SECURITY FENCE
FLANGE (TYP)
DENSE GRADED AGGREGATE YARD AREA
PROPOSED RAILROAD SIDING
15' SIDE SETBACK
FLATBED TRUCK (TRANSPORT STEEL PLATES TO EXPANSION SITES - TYP)
MISCELLANEOUS STORAGE
RECEIVING
RAW MATERIAL STORAGE AREA
ACCESS ROAD
BUILDING - E
RECEIVING & PRE-ASSEMBLY
(19,600 SF)
SECURITY FENCE
15' SIDE SETBACK
PARKING SPACES (29 SPACES INCLUDING 2 ACCESSIBLE SPACES)
EXISTING PARKING SPACES (18)
ELECTRIC GATE (24' WIDE)
EXISTING SECURITY FENCE
SMITH BOULEVARD
RAFT STREET
40' WIDE ELECTRIC GATE
10' FRONT SETBACK
PARKING SPACES (8)
40' REAR SETBACK
SITE DATA
FEATURE | REQUIRED | PROPOSED
MINIMUM LOT SIZE, NONRESIDENTIAL | X ACRES | 14.98 ACRES
MINIMUM FRONT YARD, FROM RIGHT-OF-WAY | 10 FEET | N/A
MINIMUM SIDE YARD | 15 FEET | 79 FT / 112 FT
MINIMUM REAR YARD | 40 FEET | 309 FEET
MAXIMUM HEIGHT | 6 STORIES | 1 STORY 40 FEET
MINIMUM LOT DEPTH | -- FEET | -- FEET
MINIMUM LOT WIDTH | 50 FEET | XXX FEET
MAXIMUM LOT COVERAGE | 90% | 3.2%
LEGEND
PROPERTY LINE
BUILDING SETBACK
EXISTING RAIL LINE
PROPOSED RAILROAD SIDING
OVERHEAD DOORS
MAN DOORS
PROPOSED PERIMETER SECURITY FENCING
PROPOSED BUILDING FOOTPRINT
MATERIAL STORAGE AREAS
ASPHALT PAVEMENT AREA
DENSE GRADED AGGREGATE YARD AREA
SCALE
McFarland Johnson
60 RAILROAD PLACE
SUITE 402
SARATOGA SPRINGS, NEW YORK 12866
P:518-580-9380 F:518-580-9383
SaratogaROM@mjinc.com
PROJECT MILESTONE
PRELIMINARY PLANS
NO. | DATE | DESCRIPTION
CLIENT:
ALBANY PORT DISTRICT COMMISSION
ALBANY, NEW YORK
PROJECT:
PORT OF ALBANY SITE INFRASTRUCTURE IMPROVEMENTS: 700 SMITH BLVD
DRAWN JES
DESIGNED NSO
CHECKED AJF
SCALE 1"=40'
DATE OCTOBER 2021
PROJECT 18641.00
DRAWING TITLE
SITE PLAN
DRAWING NUMBER
SP-01

Prior SEQRA Record

A traffic impact study was prepared in June 2019 (revised November 2019) which analyzed the potential traffic impact of a worst-case scenario, consisting of a 1,130,000 SF distribution center/warehouse building with associated internal driveways, parking areas, landscaped areas, and storm water infrastructure. The Findings Statement for the FGEIS established transportation improvements based upon the trip generation thresholds to the surrounding roadway network during the peak hours of adjacent street traffic corresponding to the three phases of development as summarized in Table 1.

Table 1 – Peak Hour of Adjacent Street Traffic Trip Generation Summary

PHASE I	PHASE II	PHASE III
0 - 300,000 SQUARE FEET	301,000 - 600,000 SQUARE FEET	601,000 - 1,130,000 SQUARE FEET
0 - 124 MORNING PEAK HOUR TRIPS	125 - 247 MORNING PEAK HOUR TRIPS	248 - 465 MORNING PEAK HOUR TRIPS
0 - 141 EVENING PEAK HOUR TRIPS	142 - 281 EVENING PEAK HOUR TRIPS	282 - 529 TOTAL SITE-GENERATED TRIPS

Based on the 589,000 s.f. proposed for the Project and the estimated 324 max trips generated during shift changes, the proposed project is within the Phase II threshold for square footage and the Phase III threshold for the proposed peak hour trips based on the FGEIS established thresholds. Intersection improvements associated with Phase III peak hour volumes stated in the FGEIS included:

NYS Route 32 (S. Pearl Street) at South Port Road

- Construction of a 200 ft southbound left-turn lane
- Construction of a 200 ft westbound right-turn lane
- Installation of new traffic signal equipment for additional lanes

NYS Route 144 (River Road) at NYS Route 32 (Corning Hill Road)

- Installation of a traffic signal to be coordinated with the existing traffic signal at South Port Road

NYS Route 144 (River Road) at Proposed South Driveway

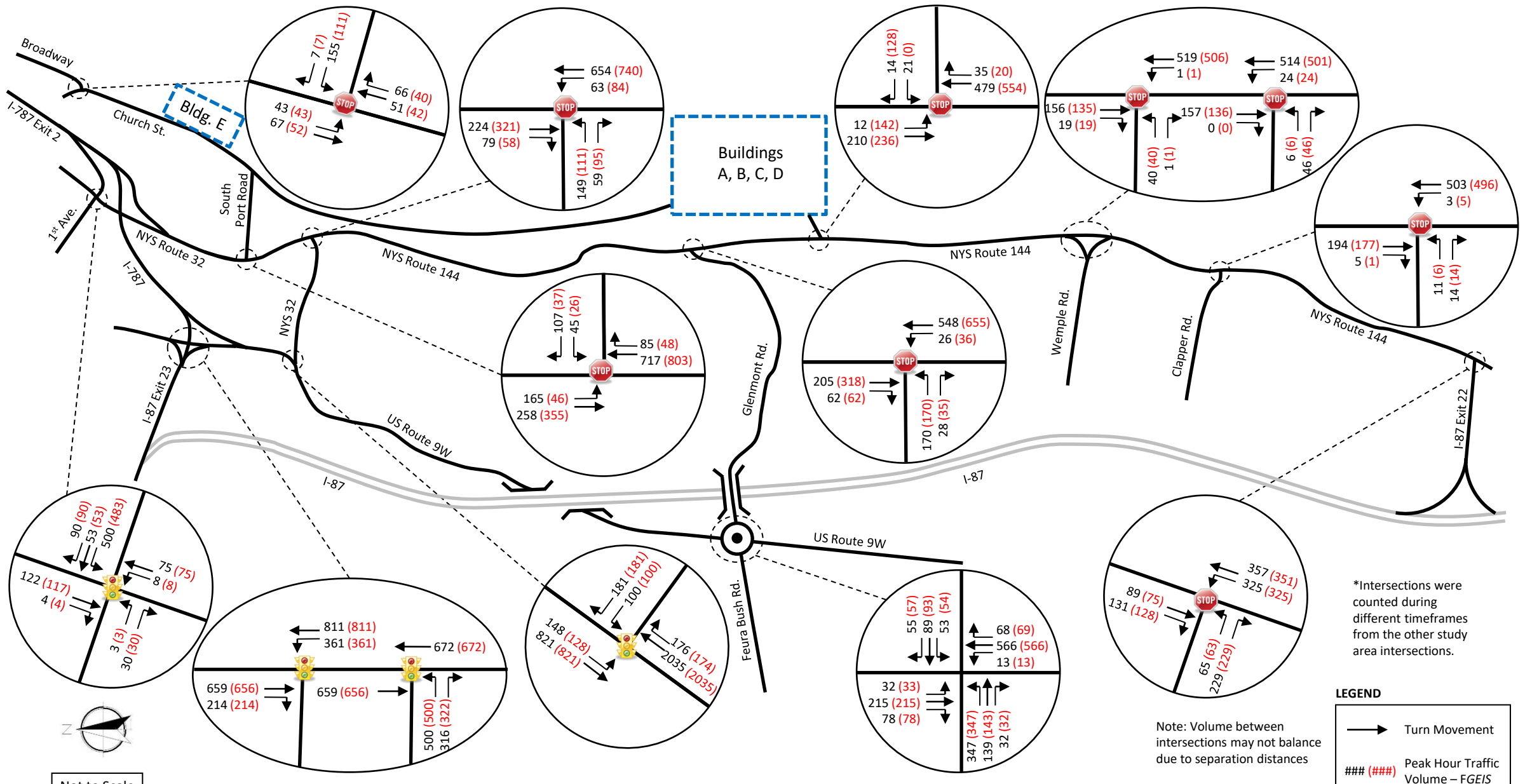
- Restrict driveway to passenger vehicles only
- Reduce speed limit along NYS Route 144 (River Road) in the vicinity of the intersection to 45 mph, which, in the event the NYSDOT does not approve a speed reduction, the driveway will become a right in, right out driveway only.

Marmen Welcon Traffic Patterns / Operations

Truck traffic operations on site consist of the delivery of raw materials to the Building E receiving yard at 700 Smith Boulevard by truck, rail, and shipping. These materials are then transported by truck across the proposed bridge via Smith Boulevard and Normanskill Street to the manufacturing plant. The finished products will then be loaded onto commercial vessels at the proposed 500' wharf. Employee will enter and exit the site at the proposed southern driveway onto NYS Route 144 and park outside the secured manufacturing facility. The previous FGEIS traffic impact study

assumed the development site would utilize a shared driveway for car and trucks to enter and exit the site via the bridge over the Normans Kill, with the southern driveway restricted to passenger vehicles only as a secondary means of access. Due to operational and safety requirements of Marmen Welcon, employee traffic and truck traffic must be separated and utilize separate driveways, with truck traffic restricted to the north access from the Normanskill/S. Port Road extension and employee and passenger vehicle access restricted to the southern driveway off of NYS Route 144 (River Road). No employee or public vehicles will be allowed within the manufacturing plant, which is secured by a security fence around its perimeter and a gated/guarded entrance at the northern end of the bridge crossing the Normans Kill.

Due to the proposed site's vehicular access and operational patterns, different trip distributions will result as employees will not be able to enter the site via the bridge crossing Normans Kill. A greater volume of employee traffic will pass through the three intersections requiring improvements with the proposed development. The remaining intersections within the FGEIS study area were analyzed in the 2019 GEIS with Phase III threshold and found that no mitigation was necessary. The three intersections requiring improvements in the FGEIS were reanalyzed in order to determine if the mitigation outlined in the FGEIS was still necessary, or if greater changes were required to increase capacity at these intersections. For the remaining intersections in the study area, the proposed project's trip distribution and trip generation was found to have equal or less traffic when compared to the Phase III build volumes in the GEIS. Figures 2A and 2B compare the full build volumes outlined in the FGEIS to the Marmen Welcon volumes proposed in this study.



FGEIS Phase III / Marmen Welcon AM Full Build Volume Comparison

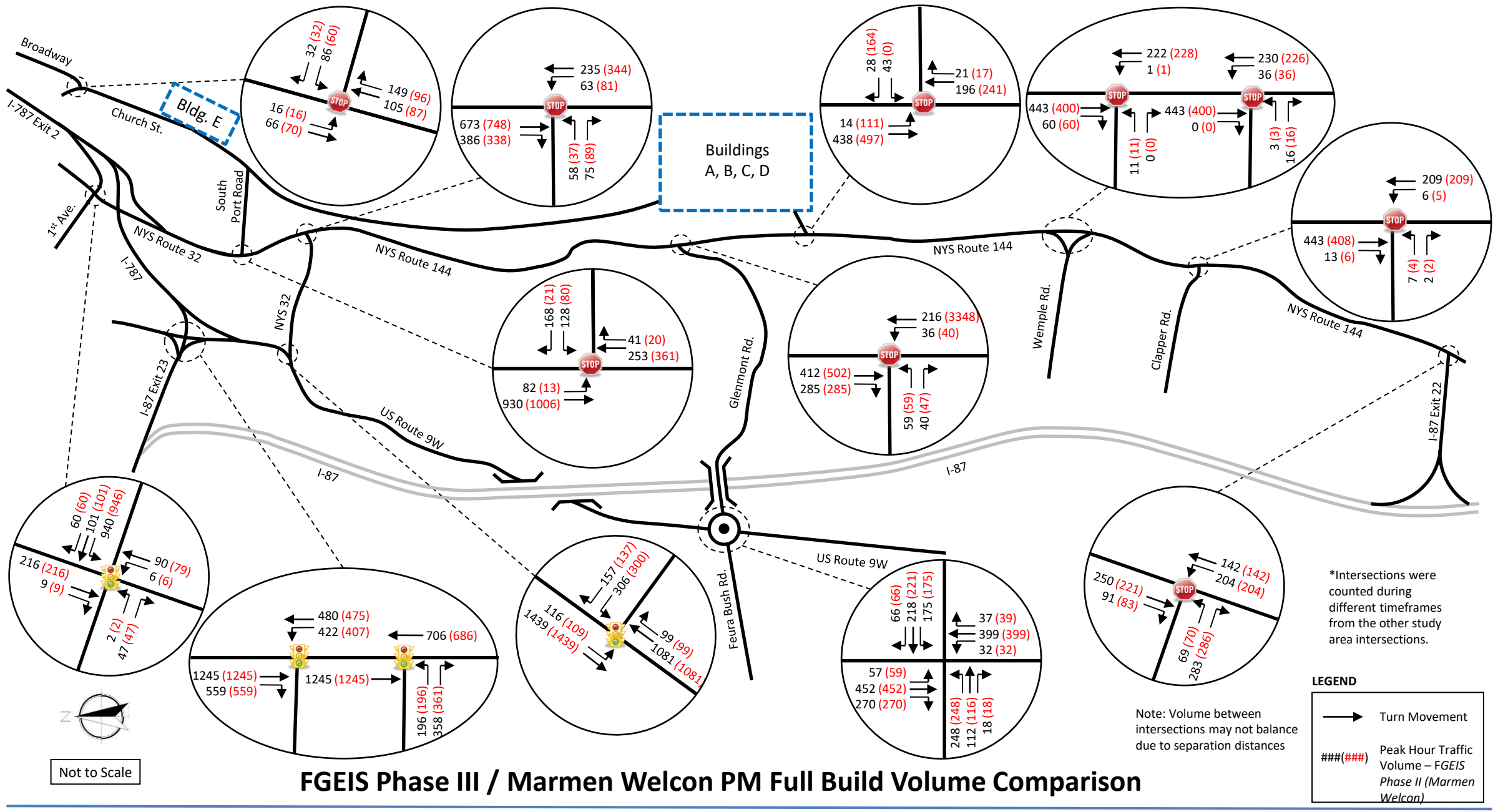
*Intersections were counted during different timeframes from the other study area intersections.

Note: Volume between intersections may not balance due to separation distances

LEGEND

→ Turn Movement

(###) Peak Hour Traffic Volume – *FGEIS Phase II (Marmen Welcon)*



FGEIS Phase III / Marmen Welcon PM Full Build Volume Comparison

*Intersections were counted during different timeframes from the other study area intersections.

Note: Volume between intersections may not balance due to separation distances

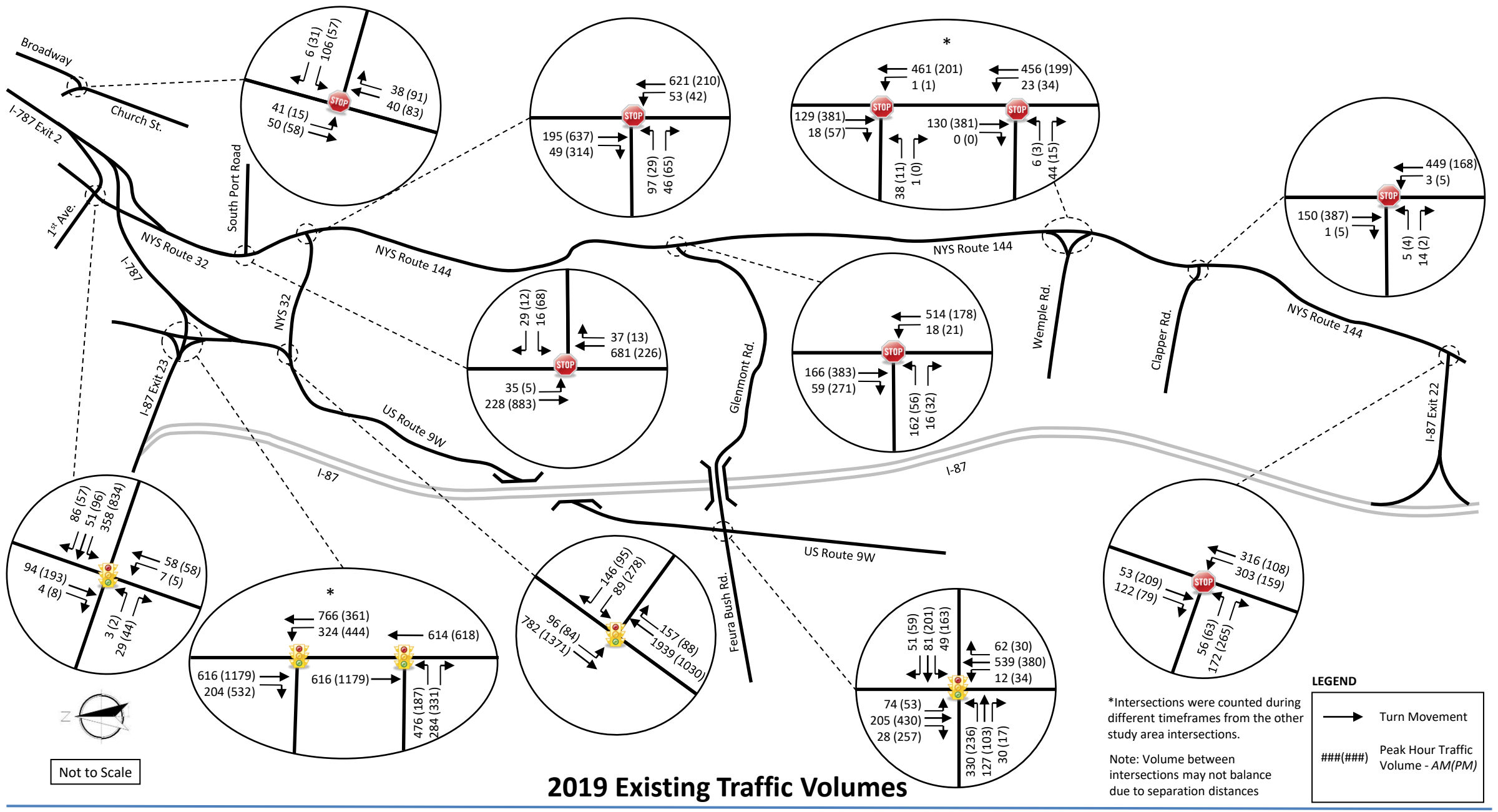
LEGEND

- Turn Movement
- ###(###) Peak Hour Traffic Volume – *FGEIS Phase II (Marmen Welcon)*

EXISTING CONDITIONS

2019 Existing Traffic Volumes

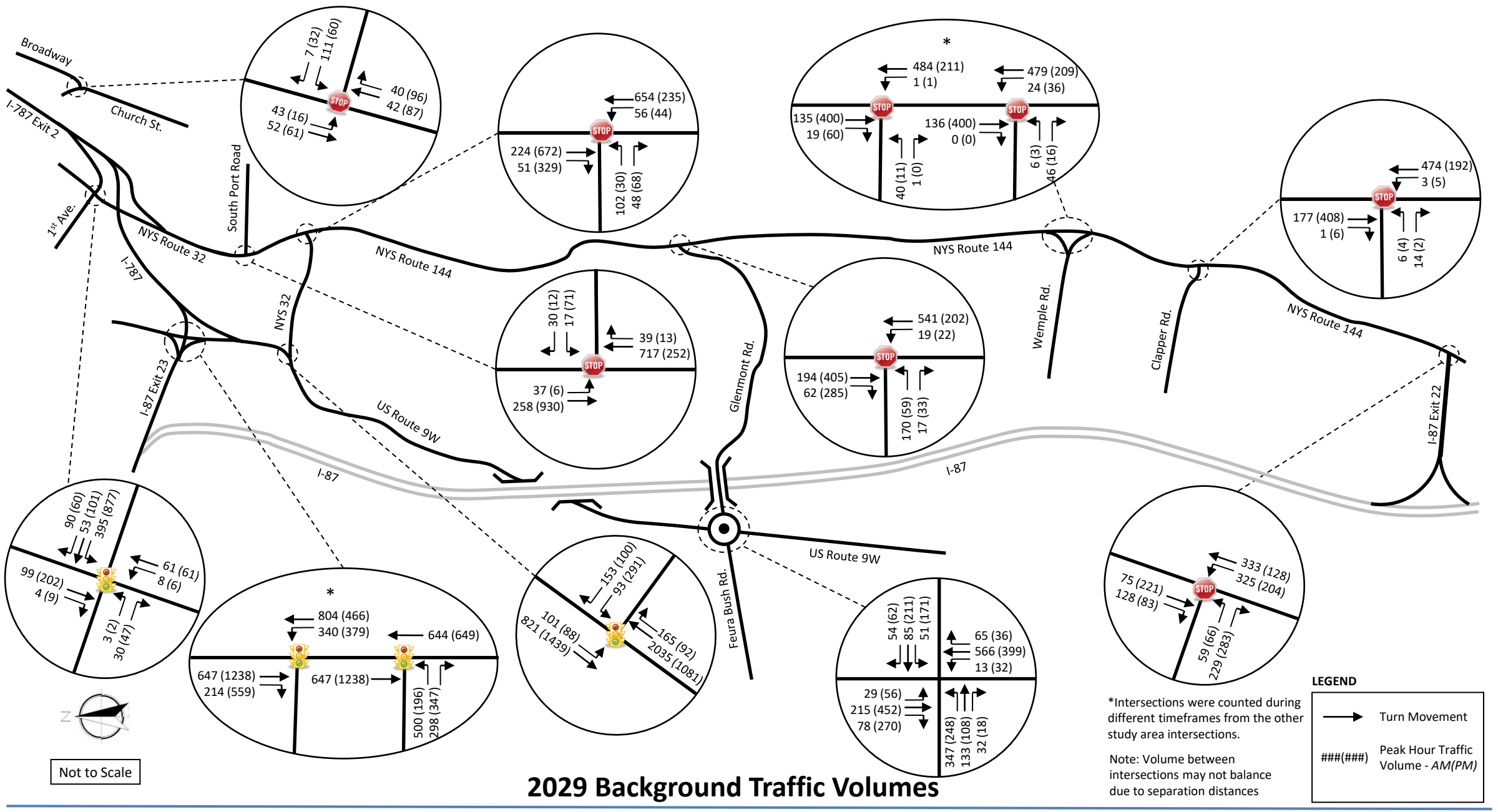
Existing traffic volumes for the study area intersections were established based on the turn movement counts (TMC's) used in the previously mentioned traffic impact study completed in 2019 as part of the FGEIS. Due to the pandemic, the traffic volumes counted in 2019 remain the most accurate current data available to conservatively analyze the post-pandemic traffic operations and follows the guidelines in the NYSDOT Memo "Traffic Data Collection Guidance During COVID-19 Pandemic" dated August 11, 2020. The 2019 Traffic Impact Study used to establish the 2019 traffic volumes is included in the list of referenced material and the existing 2019 volumes are shown on Figure 3.


Broadway
Church St.
I-787 Exit 2
1st Ave.
South Port Road
NYS Route 32
I-787
NYS 32
I-87 Exit 23
NYS Route 144
US Route 9W
I-87
Glenmont Rd.
Feura Bush Rd.
Wemple Rd.
Clapper Rd.
NYS Route 144
I-87 Exit 22
I-87
US Route 9W
6 (31)
106 (57)
38 (91)
40 (83)
41 (15)
50 (58)
621 (210)
53 (42)
195 (637)
49 (314)
97 (29)
46 (65)
*
461 (201)
1 (1)
456 (199)
23 (34)
129 (381)
18 (57)
130 (381)
0 (0)
38 (11)
1 (0)
6 (3)
44 (15)
449 (168)
3 (5)
150 (387)
1 (5)
5 (4)
14 (2)
29 (12)
16 (68)
37 (13)
681 (226)
35 (5)
228 (883)
514 (178)
18 (21)
166 (383)
59 (271)
162 (56)
16 (32)
86 (57)
51 (96)
358 (834)
58 (58)
7 (5)
94 (193)
4 (8)
3 (2)
29 (44)
*
766 (361)
324 (444)
614 (618)
616 (1179)
204 (532)
616 (1179)
476 (187)
284 (331)
146 (95)
89 (278)
96 (84)
782 (1371)
157 (88)
1939 (1030)
51 (59)
81 (201)
49 (163)
62 (30)
539 (380)
12 (34)
74 (53)
205 (430)
28 (257)
330 (236)
127 (103)
30 (17)
316 (108)
303 (159)
53 (209)
122 (79)
56 (63)
172 (265)
STOP
N
Not to Scale
2019 Existing Traffic Volumes
*Intersections were counted during different timeframes from the other study area intersections.
Note: Volume between intersections may not balance due to separation distances
LEGEND
Turn Movement
###(###)
Peak Hour Traffic Volume - AM(PM)

BACKGROUND CONDITIONS

2029 Background Traffic Volumes

The FGEIS traffic study completed in 2019 was used to establish the 2029 Background year for full development, background growth rate and volumes. The 2029 Background traffic volumes shown in Figure 2 include the 2019 existing traffic volumes and annual background traffic growth. The proposed project is targeted to be operational in 2023; however, the 2029 background traffic volumes were used as a conservative base upon which to add the proposed development's traffic and to remain consistent with the background volumes established in the 2019 FGEIS traffic study. These background volumes are shown on Figure 4 – 2029 Background Traffic Volumes.



2029 Background Traffic Volumes

BUILD CONDITIONS

Trip Distribution

The restriction of employee/public site access to only the proposed southern driveway on NYS Route 144 (River Road) decreases the number of vehicles turning onto South Port Road and increases through traffic traveling north and south through this intersection. A small number of passenger vehicles will still enter and exit South Port Road in order to staff the proposed Building E at 700 Smith Boulevard, roughly 10% of the overall development traffic. Because of the left-turn restriction on to NYS Route 144 (River Road), vehicles that enter the site from the south will not be able to exit in the same fashion. Instead, these vehicles will travel north on NYS Route 144 (River Road) before turning left on to NYS Route 32 (Corning Hill Road). From there, vehicles can travel south on US Route 9W. Figure 5 – Trip Distribution shows the calculated trip distribution percentages for the proposed development during weekday morning and evening peak hours. These trip distribution percentages were used to assign the trips generated by the proposed project to the study roadway network, shown in Figure 6 – Trip Assignment.

Trip Assignment

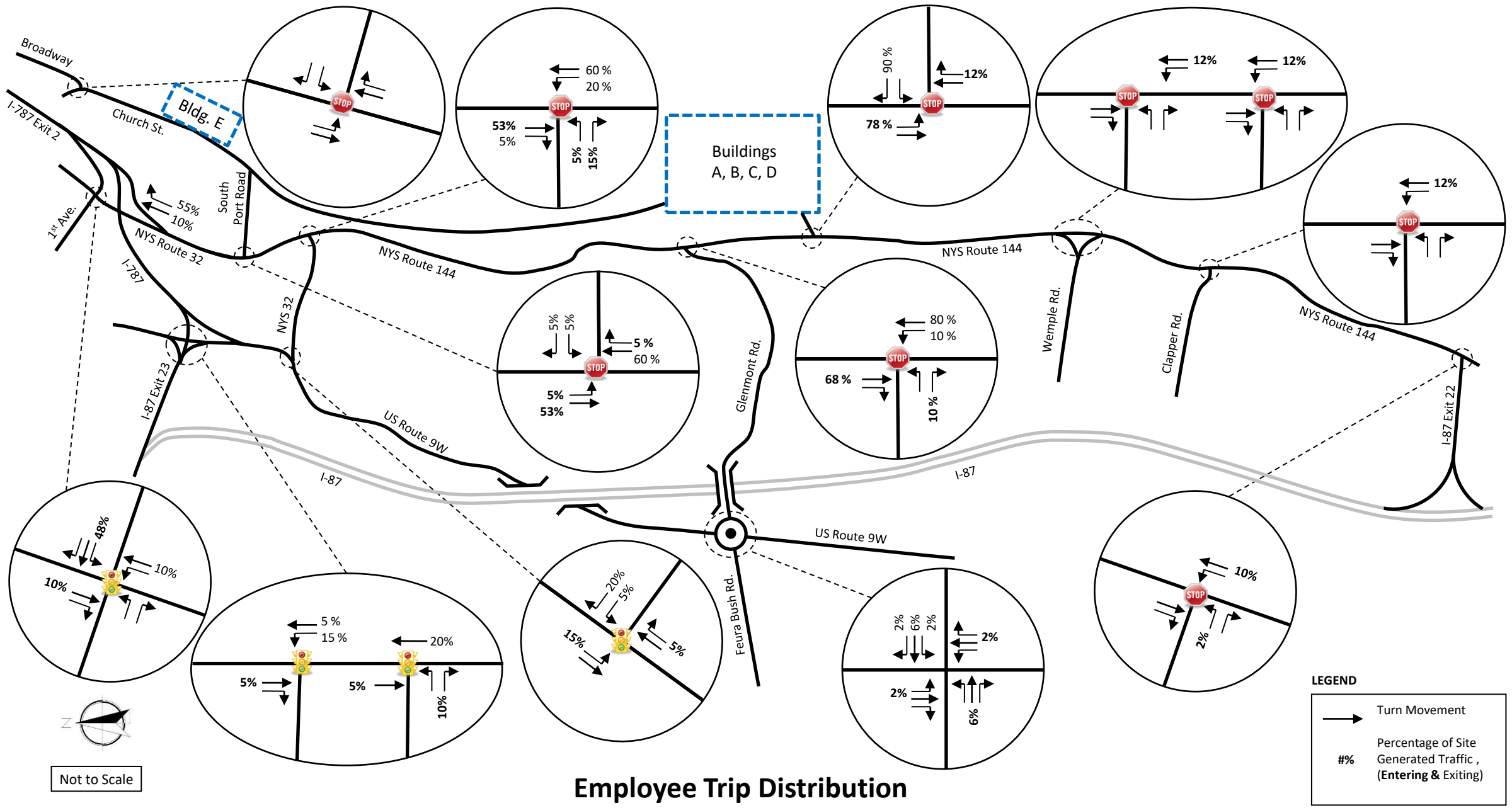
A production forecast-based traffic assessment received from Marmen Welcon indicates that the project will generate 324 trips during their largest shift change. To be conservative, the analysis assumes 324 trips during the morning peak hour and 324 trips during the evening peak hour will be added to the roadway network. This is a worst-case scenario, as it is more likely that the shift changes will not line up with the adjacent roadway traffic peaks.

Truck traffic generated by the proposed project is expected to be limited to 4 trucks during the peak hours and truck receiving hours are restricted to between 8:00 AM and 5:00 PM. The bulk of the proposed deliveries to the site will come through commercial vessels delivering materials to the existing port as well as rail delivery to a proposed rail spur into the 700 Smith Boulevard site. All material deliveries associated with the Marmen Welcon Plant, regardless of being transported by truck, train, or commercial vessel will be delivered to 700 Smith Blvd and then transferred to the Beacon Island site for on-time production delivery via private Marmen owned pickup and flatbed transport trucks through the gated access over the Normans Kill bridge. A figure showing the temporary construction and permanent truck route is included in Appendix A.

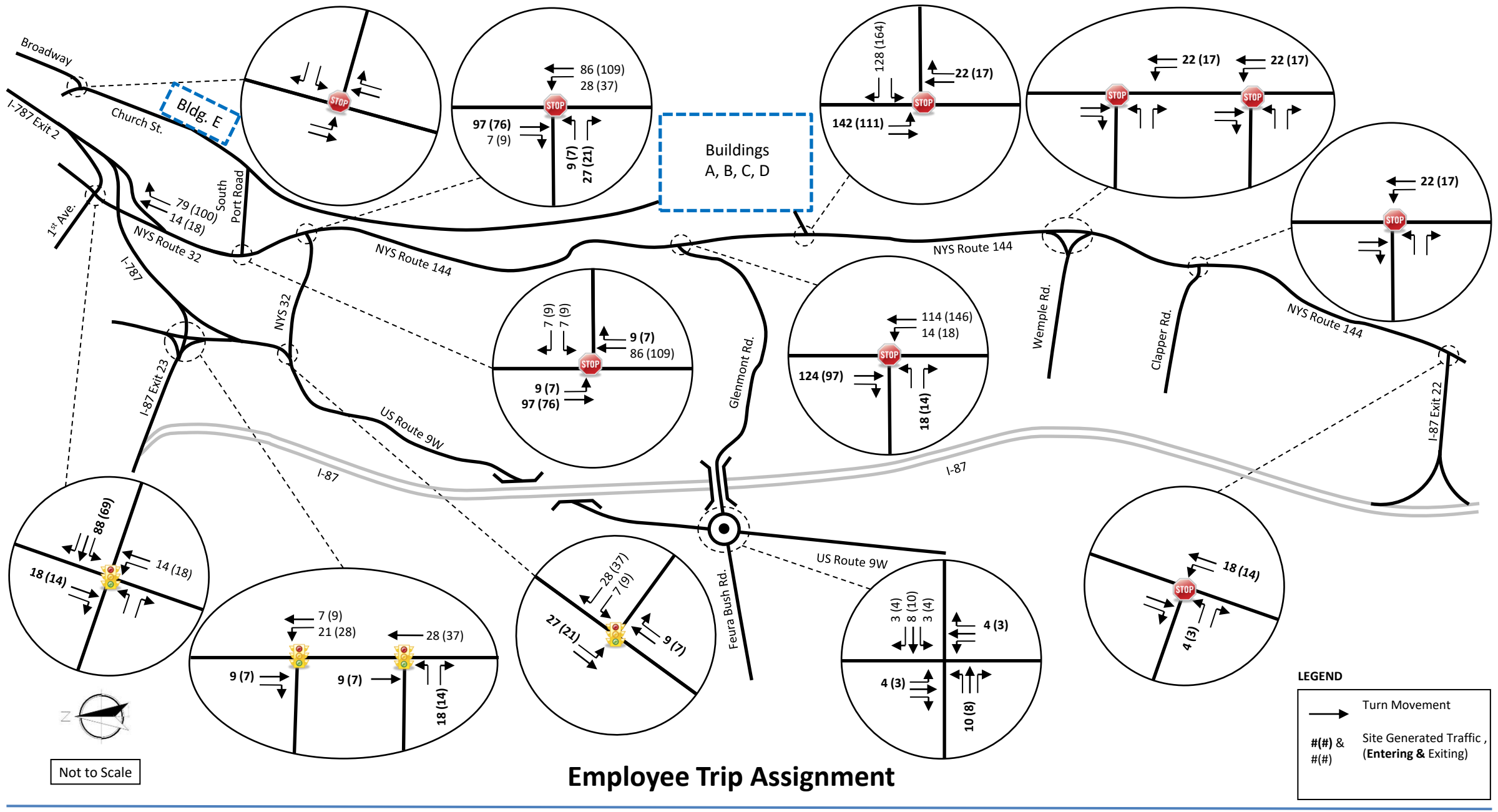
As shown in the table below these trip assignment volumes are lower than what was proposed in the Phase III mitigation thresholds as part of the FGEIS report. The traffic forecast provided by the future tenant is included in Appendix A.

Table 1
Trip Assignment Volume Comparison

	FGEIS PHASE III THRESHOLDS		PROPOSED	
	AM	PM	AM	PM
Vehicles	465	529	324	324



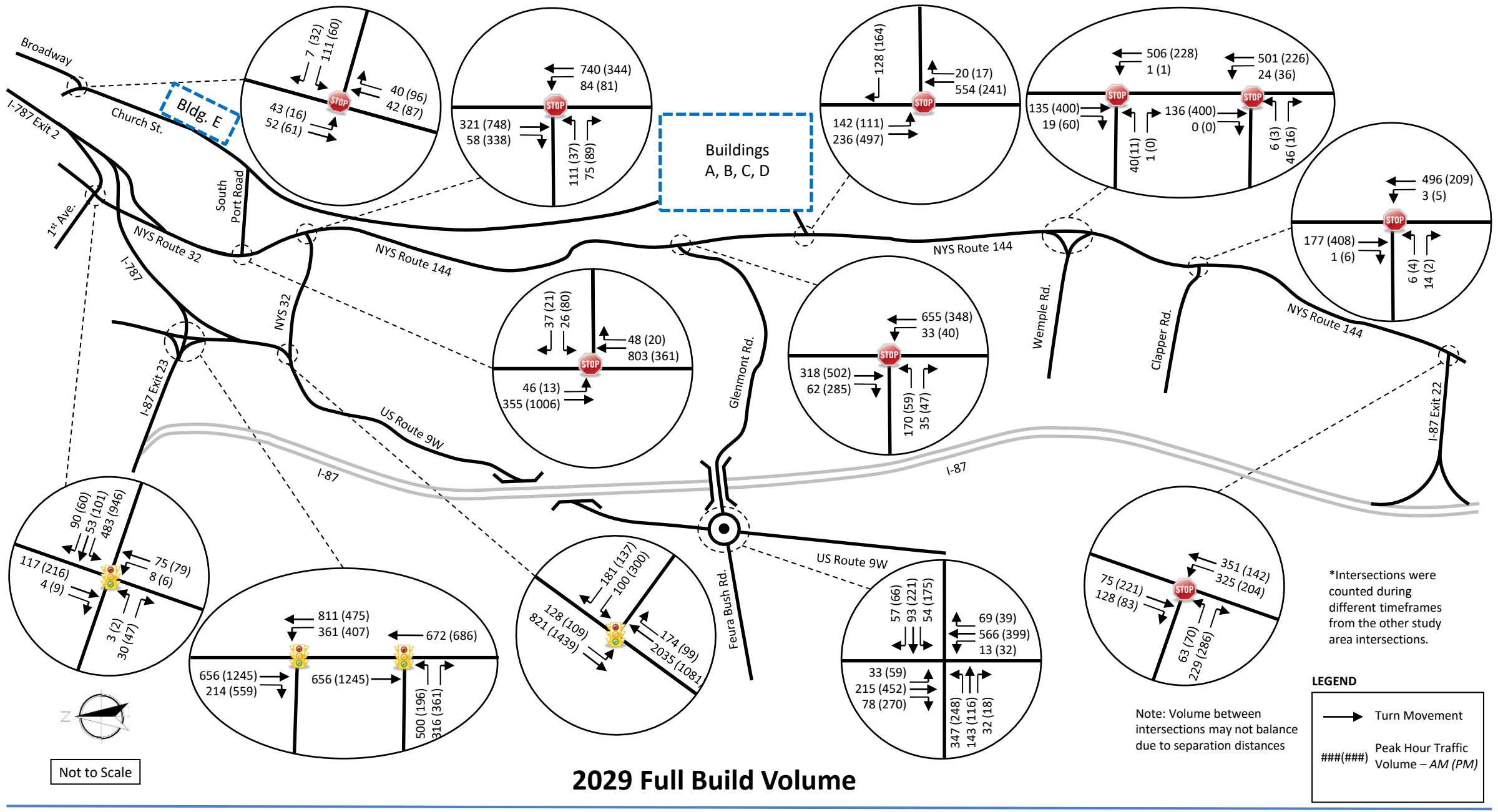
Employee Trip Distribution



Employee Trip Assignment

2029 Build Traffic Volumes

The build volumes shown in Figure 7 – 2029 Build Volumes represent the 2029 Background volumes combined with the site generated trips from the proposed development.



*Intersections were counted during different timeframes from the other study area intersections.

Note: Volume between intersections may not balance due to separation distances

LEGEND

→ Turn Movement

###(###) Peak Hour Traffic Volume – *AM (PM)*

2029 Full Build Volume

TRANSPORTATION ASSESSMENT

Intersection Capacity Analysis of Un-signalized Intersections

Level of service (LOS) is a term used to characterize the operational conditions of a traffic facility at a particular point in time. Numerous factors contribute to a facility's LOS including travel delay, speed, congestion, driver discomfort, convenience, and safety based on a comparison of the facility's capacity to the facility's demand. Alphabetic designations A through F define the six levels of service. LOS A represents very good traffic operating conditions with minimal delays while LOS F depicts poor traffic operating conditions with excessive delays and queues.

Operating levels of service are calculated using the procedures defined in the Highway Capacity Manual (HCM), 6th Edition, published by the Transportation Research Board (TRB). The operating LOS of two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections is the computed or measured delay. The intersection delay is based upon the quality of service for the vehicles turning into and out of minor approaches, i.e., approaches that are stop-controlled. The availability of sufficient gaps in the traffic stream on the major street controls the capacity for movements to and from the minor approaches, thus resulting in delays for the minor approaches. The criteria, or the delays associated with corresponding levels of service for TWSC and AWSC intersections, as specified by the HCM, are shown in Table 2 below.

Table 2
Un-signalized Intersection LOS Criteria

LOS	Control Delay (sec/veh) TWSC and AWSC Intersections
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Intersection Capacity Analysis of Signalized Intersections

The operating LOS of a signalized intersection is based on the average control delay per vehicle. The control delay per vehicle is estimated for each lane group, combined for each approach and the intersection as a whole. The criteria, i.e., the delays associated with corresponding LOS for signalized intersections, as specified by the HCM, are shown in Table 3 below.

Table 3
Signalized Intersection LOS Criteria

LOS	Control Delay (sec/veh) Signalized Intersections
A	≤ 10
B	> 10 and ≤ 20
C	> 20 and ≤ 35
D	> 35 and ≤ 55
E	> 55 and ≤ 80
F	> 80

Intersection Capacity Analysis Results

Analysis in each of the study scenarios was performed using the traffic modeling software Synchro®, Ver. 10.0. Synchro® utilizes the methodologies of the HCM, as described above for stop-controlled and signalized intersection, to calculate average vehicular delays (in seconds) and report as LOS. The full analysis printouts from Synchro® are provided in Appendix B.

The results of the intersection capacity analysis at each study intersection for all study scenarios are illustrated in Table 4. Volumes entered in Synchro® correspond to the scenario and peak hour being analyzed.

Table 4
LOS Tables

Study Intersection	Approach and Movement		MORNING PEAK HOUR							
			2019 EXISTING		2029 BACKGROUND		2029 BUILD		2029 BUILD MITIGATION	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
NYS Route 32 at South Port Road *(Signalized)*	Westbound	L-R	22.1	C	22.3	C	22.8	C		
	Northbound	T-R	5.7	A	6.3	A	10.4	B		
	Southbound	L-T	3.7	A	4.0	A	6.1	A		
	OVERALL		**6.0**	**A**	**6.5**	**A**	**9.8**	**A**		
NYS Route 144 at NYS Route 32 *(Un-Signalized/Signalized)*	Northbound	T-L	8.2	A	8.3	A	8.8	A	27.9	C
	Eastbound	L	41.0	E	54.3	F	200.6	F	18.7	B
		R	10.3	B	10.6	B	11.9	B	6.5	A
	Southbound	T-R							6.9	A
	OVERALL		**4.6**	**A**	**5.8**	**A**	**17.2**	**C**	**20.4**	**C**
NYS Route 144 at Proposed Site Driveway *(Un-Signalized)*	Southbound	L					9.6	A	9.6	A
	OVERALL						**3.4**	**A**	**3.4**	**A**

Study Intersection	Approach and Movement		EVENING PEAK HOUR							
			2019 EXISTING		2029 BACKGROUND		2029 BUILD		2029 BUILD MITIGATION	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
NYS Route 32 at South Port Road *(Signalized)*	Westbound	L-R	28.6	C	28.8	C	27.6	C		
	Northbound	T-R	4.0	A	4.2	A	5.5	A		
	Southbound	L-T	9.5	A	11.1	B	15.1	B		
	OVERALL		**9.5**	**A**	**10.6**	**B**	**13.0**	**B**		
NYS Route 144 at NYS Route 32 *(Un-Signalized/Signalized)*	Northbound	T-L	11.1	B	11.5	B	12.8	B	6.4	A
	Eastbound	L	32.3	D	37.2	E	87.0	F	50.4	D
		R	18.7	C	20.1	C	24.8	C	16.6	B
	Southbound	T-R							11.9	B
	OVERALL		**2.0**	**A**	**2.1**	**A**	**3.9**	**A**	**11.5**	**B**
NYS Route 144 at Proposed Site Driveway *(Un-Signalized)*	Southbound	L					8.2	A	8.2	A
	OVERALL						**2.9**	**A**	**2.9**	**A**

<u>NYS Route 32 at South Port Road</u>

As shown in the table, the existing intersection of NYS Route 32 at South Port Road is operating at an acceptable LOS for the 2029 Background scenario and will continue to operate with an overall LOS 'A' during the morning peak hour and LOS 'B' during the evening peak hour. All approaches will maintain background LOS with only minor increases in delay. Due to the low volume of vehicles generated by the site performing turning movements at this intersection, the mitigation recommended in the 2019 traffic study is not warranted for the proposed development.

<u>NYS Route 144 (River Road) at NYS Route 32</u>

This intersection is projected to operate at an overall LOS 'B' during the morning peak hour and LOS 'A' during the evening peak hour for the 2029 Background scenario. During the background and build scenarios, the eastbound left turn approach is at a LOS 'F' during both peak hours. To mitigate the delay for this movement and to improve traffic operations at this intersection, it is

recommended that a signal be considered by NYSDOT. Should a signal be installed, it is recommended to be coordinated with the NYS Route 32/South Port Road intersection. Signalizing the intersection will decrease the delay the eastbound approach experiences from LOS 'F' to LOS 'B' during the morning peak hour and LOS 'F' to LOS 'D' during the evening peak hour. It should be noted that the mitigation outlined in the GEIS recommended the consideration for signalization of this intersection prior to any development of Beacon Island, see the signal warrant analysis section of this study. Coordination with NYSDOT is recommended to determine if and when a signal should be installed at this intersection.

NYS Route 144 (River Road) at Proposed Site Driveway

The proposed site access driveway was modeled as a two-lane road with single entering and exiting lanes, under stop sign control for the exiting traffic. The driveway will be restricted to passenger vehicle traffic only as all truck traffic will be directed to South Port Road and Church Street as all deliveries will be received at the 700 Smith Blvd site. As outlined in the 2019 traffic study, this will be accomplished by including signage prohibiting trucks from using this entrance as well as enforcement by the Port, the Port's tenants, and local law enforcement. The driveway geometry also does not accommodate large delivery truck turn movements. The LOS summary table shows that this intersection will operate efficiently during the 2029 Build scenario, with no movement operating below LOS 'C'.

Due to sight distance restrictions, vehicles exiting the proposed site will be limited to right turn movements only with the use of a channelized turn island and signage. It is recommended that NYS Route 144 (River Road) be widened to accommodate a left turn lane into the proposed site to increase safety by separating through traffic on NYS Route 144 (River Road) from vehicles slowing to turn into the site, discussed further in the Left Turn Lane Analysis section of this report. In addition to the construction of a dedicated left turn lane, it is recommended that NYSDOT conduct a speed study in the vicinity of the proposed driveway Post Construction to determine if the current regulatory posted speed limit of 55 mph is appropriate after the intersection installation, or if the advisory speed limit of 45 mph in this section become the regulatory posted speed limit, further improving safety along NYS Route 144 (River Road). As noted in the FGEIS traffic analysis mitigation, advanced guidance signage, intersection lighting and driveway warning advisory signage will be proposed as part of the NYSDOT highway work permit plans to increase visibility of the proposed driveway.

Signal Warrant Analysis

Signal warrants were reviewed for the study area un-signalized intersections of NYS Route 144 (River Road) at NYS Route 32 (Corning Hill Road) and at the proposed driveway on NYS Route 144 (River Road) in accordance with the Federal Highway Administrations; Manual of Uniform Traffic Control Devices, 2009 edition. The NYS Route 144 (River Road) at NYS Route 32 (Corning Hill Road) intersection was reviewed using 2019 existing volumes due to the volumes and operating conditions which have the potential to warrant a traffic signal. Both intersections were also reviewed using the 2029 Build volumes to determine if the proposed development's additional traffic generation warranted a traffic signal.

The detailed signal warrant analysis worksheets for the existing and proposed conditions for both intersections are included in Appendix D.

The NYS Route 144 (River Road)/NYS Route 32 (Corning Hill Road) intersection met three warrants based on the existing traffic volumes, and the same three warrants when applying the projected Full Build volumes as noted below:

- Warrant 1B – Eight Hour Vehicle Volume Warrant, Interruption of Continuous Traffic (Existing & Full Build)
- Warrant 2 – Four Hour Vehicle Volume Warrant (Existing & Full Build)
- Warrant 3B - Peak Hour Vehicle Volume Warrant (Existing & Full Build)

Based on these warrants being met, a traffic signal was assessed for this intersection to determine what impacts it would have both positive and negative. The warrants were met based on the 85th percentile speed exceeding 40 mph and utilized the MUTCD 70% Factor for the volume-based warrants. River Road (NYS Route 144) at the intersection has a 55-mph posted speed limit; however, the intersection is just south of the city's 30 mph zone. At this intersection, southbound traffic is accelerating, while northbound traffic is slowing down. Speed data north of this intersection showed a 40 mph 85th percentile speed in both directions; therefore, it was concluded that the 85th percentile speed through the intersection is greater than 40 mph. From a capacity standpoint, a new signal will alleviate the anticipated future failing operations of the NYS Route 144 and NYS Route 32 stop sign controlled intersection and provide adequate levels of operations with minor increases in delay over the 2029 Background levels of operation. Installation of a traffic signal is not recommended based on the current volumes; however, due to the additional traffic generated by the development this intersection should be considered for a traffic signal installation and coordination with NYSDOT is recommended.

The NYS Route 144 (River Road)/Proposed Access Driveway intersection met one warrant based on the Full Build volumes as noted below:

- Warrant 3B - Peak Hour Vehicle Volume Warrant

Despite a warrant being met due to the volume of traffic exiting the site during the peak hour, the intersection is projected to have adequate operations during the peak hours and shift changes. This is partially due to limiting exiting vehicles to right turns out of the site onto NYS Route 144 (River Road) which serves to improve traffic operations and improve safety without the need for a traffic signal. Signal warrant worksheets for both intersections are included in Appendix D.

Sight Distance Analysis

The sight distance at the proposed southern site access driveway was measured to determine if the available intersection sight distances met the American Association of State Highway and Transportation Officials (AASHTO) recommended values for both the existing regulatory speed limit of 55 mph and the advisory speed limit of 45 mph. As shown on Figure 7A – Stopping Sight Distance Plan, Figure 7B – Stopping Sight Distance Profile, Figure 7C – Intersection Sight Distance Plan included in Appendix A and the table below, adequate site distance is currently available at the proposed driveway along NYS Route 144 (River Road) looking left to perform a right turn out of the site for 45-mph traveling speeds. The intersection with current conditions does not meet sight distance for a 55-mph speed due to the significant vegetation that currently exists adjacent to and over the southbound roadway shoulders. It is recommended and has been discussed with NYSDOT that vegetation along both sides of NYS Route 144 (River Road) will be removed as part of the

Highway Work Permit Plans in order to maximize sight distance for vehicles turning right out of the proposed driveway and to increase overall visibility of the intersection. Figure 7A, shows the extents of the vegetation removal. The proposed roadway widening will be completed with grading to allow proper maintenance to keep these areas mowed annually and free of large vegetation, which was discussed with NYSDOT. Left turns out of the site will not be allowed due to the lack of available sight distance.

Table 5
Sight Distance Analysis

SIGHT DISTANCE CALCULATIONS							
Location	Speed Limit	Direction	AASHTO/NYSDOT Recommended Intersection Sight Distance	Available Intersection Sight Distance *	AASHTO/NYSDOT Recommended Stopping Sight Distance	Available Stopping Sight Distance *	Visual Restriction
Access Drive at NYS Route 144	45 mph	Case B2: Looking Left / Right Turn From Stop	430 feet	495' / 590'	360 feet	410' / 500'	Vegetation & Horizontal Curve
Access Drive at NYS Route 144	55 mph	Case B2: Looking Left / Right Turn From Stop	530 feet	495' / 590'	495 feet	410' / 500'	Vegetation & Horizontal Curve

Note:
* = Sight distance was measured based on the current conditions with vegetation restricting the sight lines and also projected based on removal of this vegetation.

Left Turn Lane Analysis

An analysis of the proposed site driveway was performed in accordance with AASHTO guidelines to determine the need for a left-turn lane on NYS Route 144 (River Road). As shown in the table below, the proposed driveway meets the threshold for the addition of a left turn lane during the peak hours, due to the volume of traffic traveling on NYS Route 144 (River Road) during the peak hours. This was conservatively completed using a 45-mph operating speed, if the 55-mph regulatory speed limit was used, the left turn lane would still be warranted, as the volume threshold would still be exceeded. It should be noted that while the left turn movement LOS for vehicles turning into the proposed site driveway is projected to be acceptable with delays less than ten (10) seconds during the peak hours, the installation of the left turn lane is also recommended in order to increase safety and separate southbound through traffic from vehicles slowing to turn into the site.

Table 6
Left Turn Lane Analysis

Warrants for Left Turn Lanes AM Peak Hour					
Location	Operating Speed	V.P.H. Per Lane Major Road Volume	Left-Turn Warrant Threshold	Site-Generated Left-Turns	Turn lane Warranted
NYS Route 144 (River Road) at Proposed Site Driveway	45 mph	395	5	142	Yes

Warrants for Left Turn Lanes PM Peak Hour					
Location	Operating Speed	V.P.H. Per Lane Major Road Volume	Left-Turn Warrant Threshold	Site-Generated Left-Turns	Turn lane Warranted
NYS Route 144 (River Road) at Proposed Site Driveway	45 mph	369	5	111	Yes

Environmental Justice

Impact on South Pearl Street / Ezra Prentice Community

As shown in the table below, when compared to the thresholds set in the FGEIS, the Marmen Welcon Plant is expected to generate less traffic for passenger vehicles traveling north/south on South Pearl Street, passing the Ezra Prentice Community. The recommended truck route outlined in the FGEIS included a restriction on right turns for trucks exiting the site via South Port Road and traveling north, in order to limit any impact on the environmentally sensitive areas along South Pearl Street, including the Ezra Prentice community. All trucks entering and exiting the Marmen Welcon Plant will follow the truck routes identified in the FGEIS, as shown on Figure 3.7-2, included in Appendix B.

Table 7
Vehicle Traffic Passing South Pearl Street / Ezra Prentice Community

	FGEIS PHASE III THRESHOLDS		PROPOSED	
	AM	PM	AM	PM
Cars	204	231	199	201
Trucks	0	0	0	0

Impact on Recreational/Open Areas

Based on the Marmen Welcon Plant of Building E at 700 Smith Blvd., the volume of site generated traffic on Island Creek Park was compared to the volumes outlined in the FGEIS. As shown in the table below, the proposed tenant will generate no car traffic passing Island Creek Park as it is anticipated that passenger vehicles will utilize NYS Route 32 and South Port Road to enter and exit Building E and NYS Route 144 to enter and exit Buildings A-D.

Table 8
Vehicle Traffic Passing Island Creek Park

	FGEIS PHASE III THRESHOLDS		PROPOSED	
	AM	PM	AM	PM
Cars	94	106	0	0
Trucks	66	34	4	4

Rail Analysis

As described in the FGEIS, an existing railroad track owned by CSX runs north/south from the Port of Albany along the east side of NYS Route 32/144 and terminates at the Albany Port Railroad, a separate, short-line entity co-owned and operated by CSX and Canadian Pacific. The proposed Marmen Welcon traffic assessment is estimating a weekly rail traffic rate of approximately 25-40 rail cars for the delivery of raw materials utilizing this line. As shown in the table below, the proposed tenant's rail traffic is estimated to be greater than the projected rail traffic outlined in the FGEIS. However, no additional trains (engines) will be added to the line as a result of the proposed project and the additional 5-8 rail cars per day represents a negligible increase in rail operations in the area and will not add noise or diesel emissions to the Ezra Prentice neighborhood.

Table 9
Rail Analysis

	FGEIS	PROPOSED
Rail Cars	20-25 Rail Cars per Week	25-40 Rail Cars per Week
Trains (Engines)	1-2 Trains per Week	0

Maritime Analysis

The FGEIS estimated an approximate 10% increase in maritime traffic, equating to roughly 21 commercial vessels per year, as a result of a Port of Albany Expansion. The proposed tenant's maritime traffic assessment estimates approximately 2-3 commercial vessels per week for the transport of outbound products, and 1 vessel per month for the delivery of inbound materials. This increase in maritime traffic is not projected to have a significant impact on the existing Hudson River maritime commercial or recreational traffic, and the use of barges and vessels for the delivery and shipping of materials/products reduces the need for trucks, further minimizing the impact on the surrounding roadway network.

Table 10
Maritime Analysis

	FGEIS	PROPOSED
Vessels/Barges	>1 Vessel/Barge per Week	1 Vessel per Month 2-3 Barges per Week

Conclusions and Recommendations

The follow general conclusions were determined based on the updated traffic analysis associated with the proposed Marmen Welcon Plant:

- The proposed development will generate traffic volumes within the Phase 3 threshold range established in the FGEIS finding statement.
- The development will have a different trip distribution from the assumptions in the FGEIS, with more traffic utilizing the proposed southern River Road driveway; however, the remaining intersections will see similar or improved levels of service than those anticipated for the Phase 3 FGEIS analysis.
- The study area intersections LOS and delay analysis revealed that the additional traffic generated by the proposed Port of Albany expansion along River Road will have a negligible impact on the operations of the NYS Route 144 (River Road) corridor, as well as South Port Road.
- Supplementary turn lanes were reviewed at the developments access driveway and a dedicated left turn lane is recommended in order to separate through traffic from vehicles slowing to enter the proposed site.
- Additional recommended improvements to the surrounding roadway network include the consideration of a coordinated signal at the NYS Route 144 (River Road) / NYS Route 32 intersection, in accordance with the guidelines set in the FGEIS. Coordination with NYSDOT is recommended to review a signal installation at this intersection.
- A speed study completed by the NYSDOT is recommended at the proposed southern site driveway on NYS Route 144 to determine if the regulatory speed limits of 55-mph should be reduced to match the advisory speed limit of 45-mph.

REFERENCES:

- Trip Generation, 10th Edition. Institute of Transportation Engineers. Washington, D.C. 2017.

- Trip Generation Handbook, Second Edition. Institute of Transportation Engineers. Washington, D.C. June 2004.

- Highway Capacity Manual, Sixth Edition. Transportation Research Board. National Research Council, Washington, D.C. 2016.

- Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). Federal Highway Administration. 2009.

- "Traffic Data Collection Guidance during COVID-19 Pandemic" Memorandum. NYSDOT. August 11, 2020.

- Traffic Impact Study for the Port of Albany Expansion Project. McFarland Johnson. May 14, 2019 (Revised January 20, 2020).

APPENDICES

APPENDIX A **SUPPLEMENTAL TRAFFIC DATA**

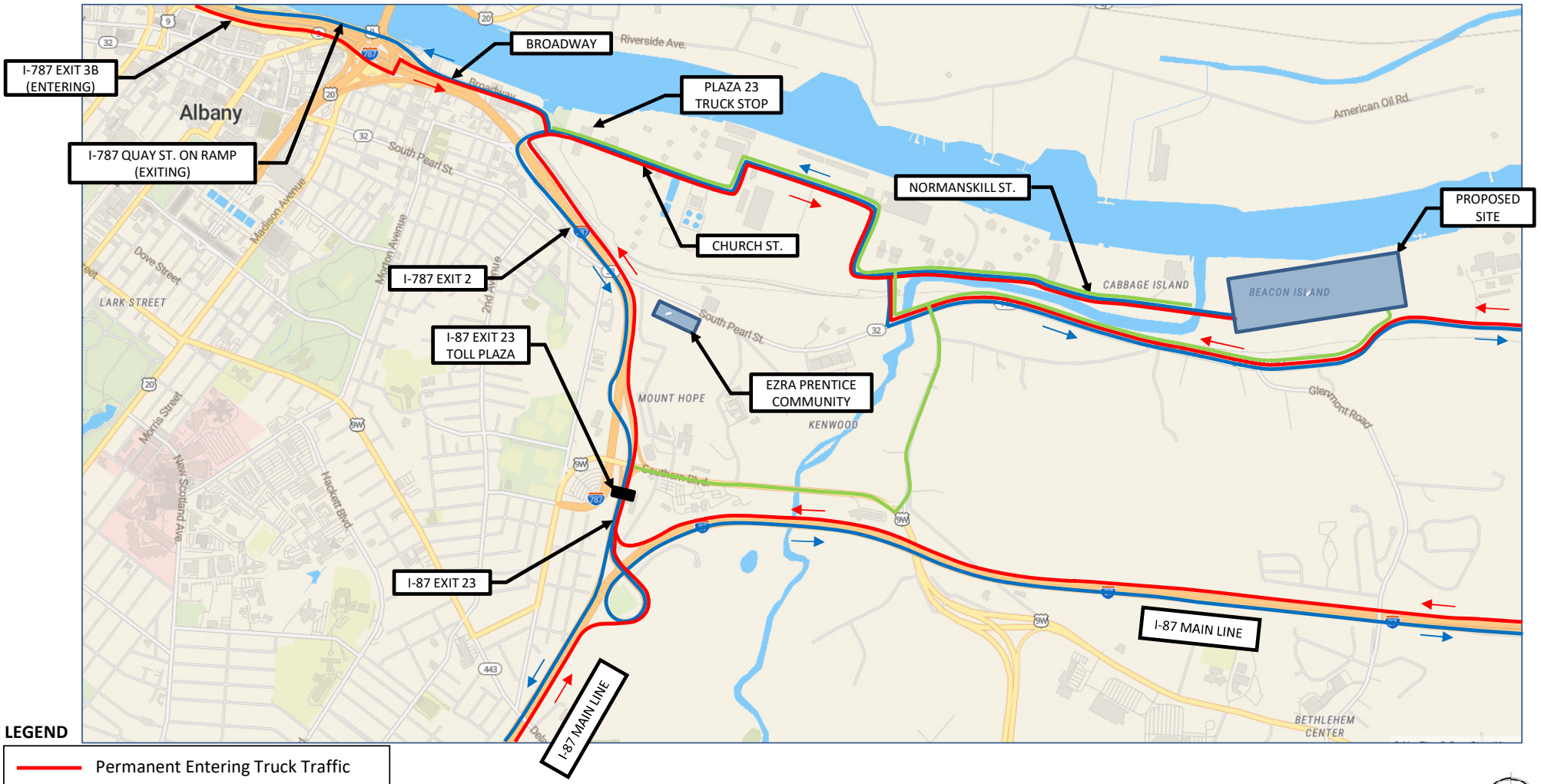
APPENDIX B **SYNCHRO ANALYSIS PRINTOUTS**

APPENDIX C **SIGNAL WARRANT WORKSHEETS**

APPENDIX A

SUPPLEMENTAL TRAFFIC DATA

- Permanent / Temporary Construction Truck Route
- Marmen Welcon Traffic Assessment – March 2021
- Traffic Volume Calculations
- Figure 7A – Stopping Sight Distance Plan
- Figure 7B – Stopping Sight Distance Profile
- Figure 7C – Intersection Sight Distance Plan



LEGEND

- Permanent Entering Truck Traffic
- Permanent Exiting Truck Traffic
- Temporary Construction Truck Traffic

Permanent / Temporary Construction Truck Routes

Not to Scale

McFarland Johnson

FIGURE 3.7-2

Production Forecast based Traffic Assessment

Preliminary Assessment :: March 2021

Employes

Total number of employees (est.) :	350
Busiest shift :	Weekly Day Shift
Quantity of employees on busiest shift (est.) :	150
Quantity of employees on busiest shift change (est.) :	220
Production operating hours :	24 / 7

Outbound Products

Tower Sections / Transition Pieces

Main transport mode :	Barge
Secondary transport mode :	Vessel
Estimated Weekly Barge traffic (avg.) :	2 - 3
(During shipping season / Logistics not yet determined)	
Shipping hours :	***TBD (will vary)***

Incoming Material

Steel Plates

Main transport mode :	Rail cars
Secondary transport mode :	Truck
Estimated Weekly Rail Car traffic (avg.) :	25 - 40
(Logistics not yet determined)	
Arrival site :	Site 2
Transfer mode to Site 1 :	Truck w/ Custom Trailer
Estimated Daily Truck traffic (avg.) :	10 - 12

Steel Flanges

Main transport mode :	Vessel
Secondary transport mode :	-
Estimated Monthly Vessel traffic (avg.) :	1
(Logistics not yet determined)	
Arrival site :	Site 1 & 2
Transfer mode to Site 1 :	Truck w/ Custom Trailer
Estimated Daily Truck traffic (avg.) :	2 - 3

Tower Internals

Main transport mode :	Truck
Secondary transport mode :	Vessel
Estimated Weekly[1] Truck traffic (avg.) :	8 - 12
(Logistics / Product Model not yet determined)	

Operations material

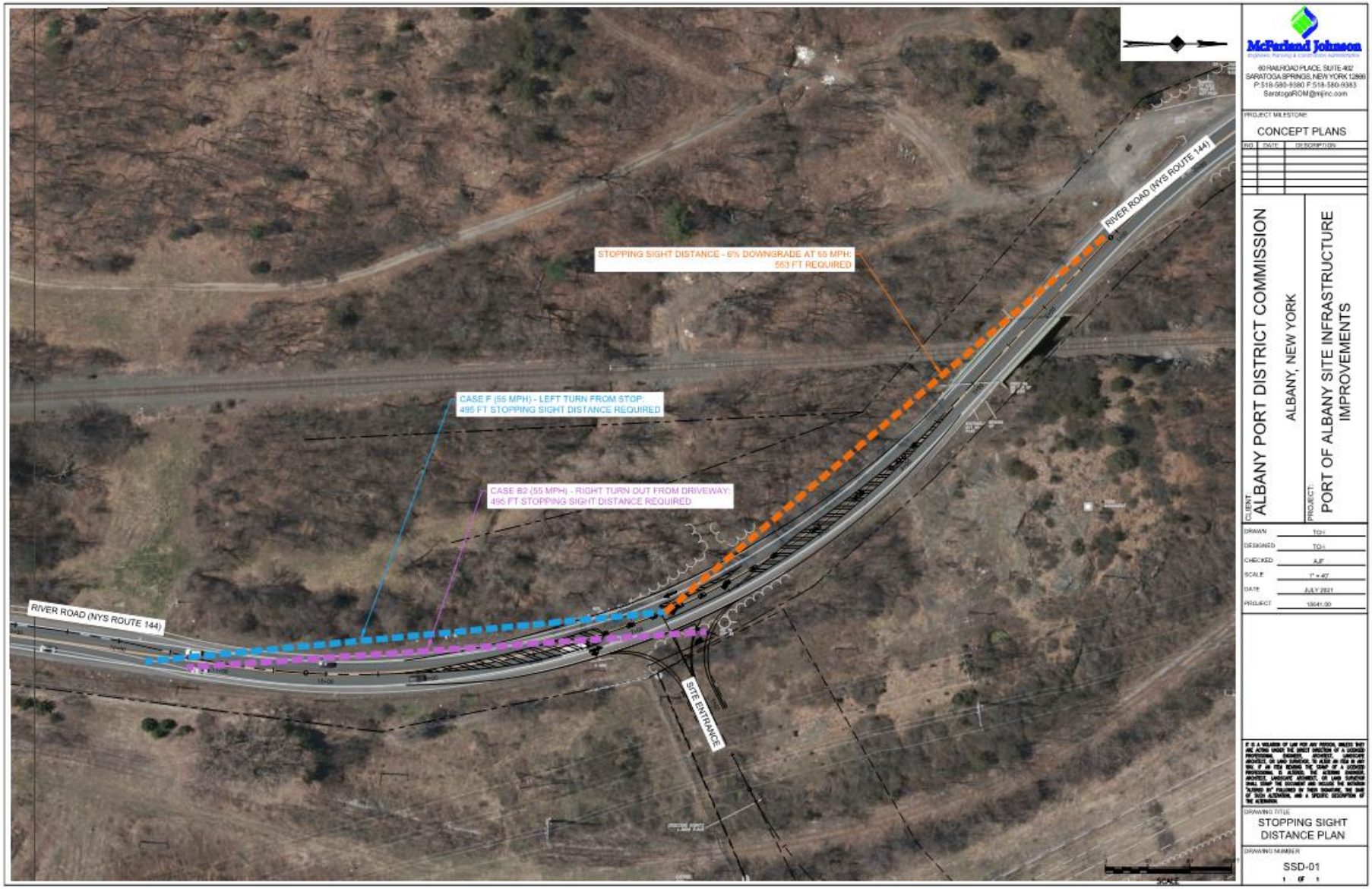
Main transport mode :	Truck
Secondary transport mode :	-
Estimated Daily Truck traffic (avg.) :	10 - 12
Truck Receiving hours :	***Typ. 8:00 - 17:00***

[1] *changed from Monthly to Weekly (typo) - 03-17-21*

PORT OF ALBANY TIS VOLUME TABLE

Study Intersection	Approach and Movement		MORNING PEAK HOUR						
			2019 EXISTING	2019 EXISTING (ADJUSTED)	2029 BACKGROUND	ENTERING TRIP GEN %	EXITING TRIP GEN %	2029 BUILD	
								TRIPS	TOTAL
NYS Route 32 at South Port Road *(Signalized)*	Westbound	L	15	16	17		5%	7	24
		R	27	29	30		5%	7	37
	Northbound	T	643	681	716		60%	86	802
		R	35	37	39	**5%**		9	48
	Southbound	L	33	35	37	**5%**		9	46
		T	215	228	258	**53%**		97	356
NYS Route 144 at NYS Route 32 *(Un-Signalized)*	Eastbound	L	92	97	102	**5%**		9	111
		R	43	46	48	**15%**		27	75
	Northbound	L	50	53	56		20%	28	84
		T	586	621	654		60%	86	740
	Southbound	T	184	195	224	**53%**		97	321
		R	46	49	51		5%	7	58
NYS Route 144 at Proposed Site Driveway (Un-Signalized)	Westbound	R					90%	128	128
	Northbound	T						0	554
		R				**12%**		22	22
	Southbound	L				**78%**		142	142
		T						0	236

Study Intersection	Approach and Movement		EVENING PEAK HOUR						
			2019 EXISTING	2019 EXISTING (ADJUSTED)	2029 BACKGROUND	ENTERING TRIP GEN %	EXITING TRIP GEN %	2029 BUILD	
								TRIPS	TOTAL
NYS Route 32 at South Port Road *(Signalized)*	Westbound	L	64	68	71		5%	9	80
		R	11	12	12		5%	9	21
	Northbound	T	214	227	253		60%	109	362
		R	12	13	13	**5%**		7	20
	Southbound	L	5	5	6	**5%**		7	13
		T	834	883	931	**53%**		76	1007
NYS Route 144 at NYS Route 32 *(Un-Signalized)*	Eastbound	L	27	29	30	**5%**		7	37
		R	61	65	68	**15%**		21	89
	Northbound	L	40	42	44		20%	37	82
		T	198	210	235		60%	109	344
	Southbound	T	603	639	673	**53%**		76	749
		R	296	314	329		5%	9	338
NYS Route 144 at Proposed Site Driveway (Un-Signalized)	Westbound	R					90%	164	164
	Northbound	T						0	241
		R				**12%**		17	17
	Southbound	L				**78%**		111	111
		T						0	497



Stopping Sight Distance Plan

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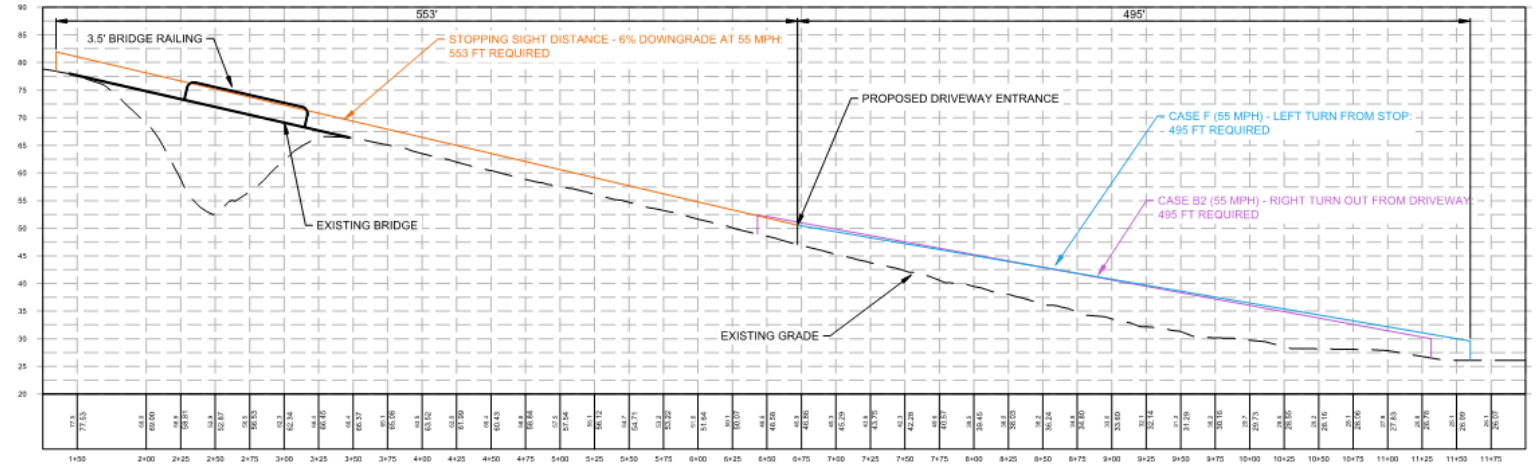
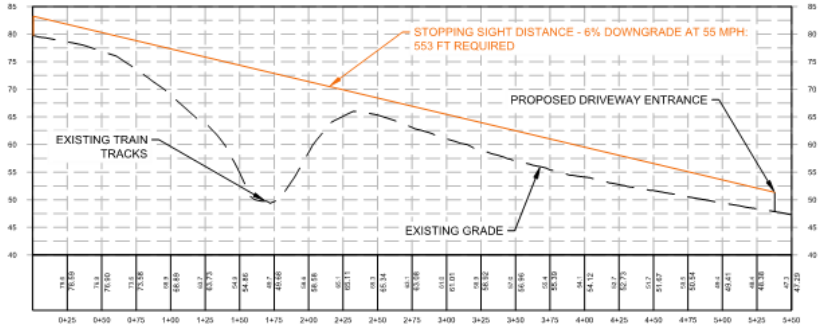
FIGURE 7A



Sight Distance
Horizontal Scale: 1" = 40'
Vertical Scale: 1" = 10'



Inside Curve Profile
Horizontal Scale: 1" = 40'
Vertical Scale: 1" = 10'

0 40 80 120FT
SCALE

McFarland Johnson
Engineers, Planning & Construction Administration
60 RAILROAD PLACE, SUITE 402
SARATOGA SPRINGS, NEW YORK 12866
P:518-580-9360 F:518-580-9383
SaratogaROM@mjinc.com

PROJECT MILESTONE
FINAL DESIGN PLANS

NO.	DATE	DESCRIPTION

CLIENT: ALBANY PORT DISTRICT COMMISSION
ALBANY, NEW YORK
PROJECT: PORT OF ALBANY SITE INFRASTRUCTURE IMPROVEMENTS

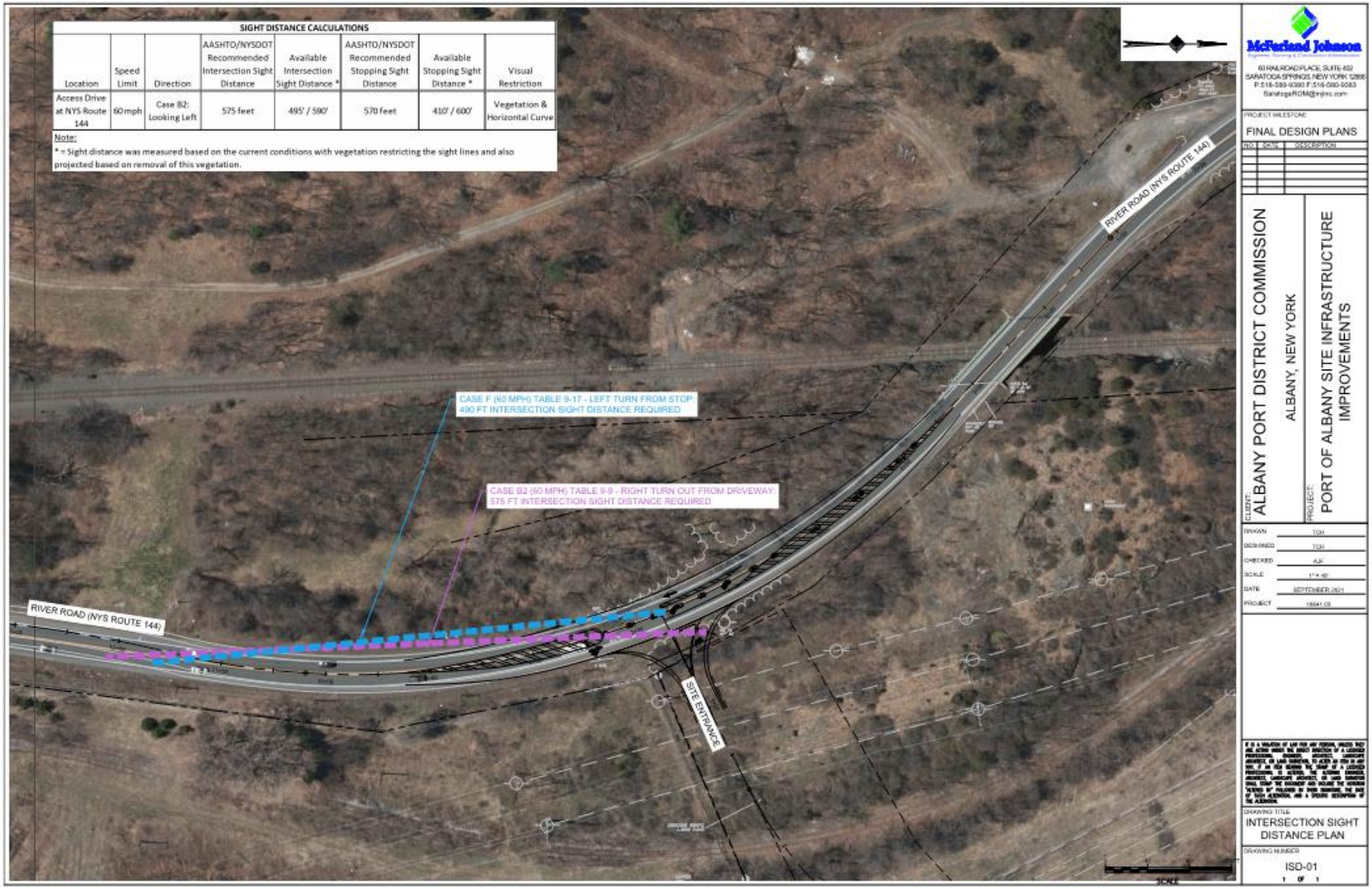
DRAWN	TCH
DESIGNED	TCH
CHECKED	AJF
SCALE	1" = 40'
DATE	JULY 2021
PROJECT	19541.00

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECT DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

DRAWING TITLE
STOPPING SIGHT DISTANCE PROFILE

DRAWING NUMBER
SSD-02
2 OF 2

Sight Distance Profile



Intersection Sight Distance Plan

APPENDIX B

SYNCHRO MODEL CAPACITY ANALYSIS RESULTS

- 2029 Build Conditions
  - AM Peak
  - PM Peak

- 2029 Build Conditions - Mitigation
  - AM Peak
  - PM Peak

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	37	802	48	46	356
Future Volume (vph)	24	37	802	48	46	356
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.918		0.992			
Flt Protected	0.981					0.995
Satd. Flow (prot)	1042	0	1767	0	0	1534
Flt Permitted	0.981					0.852
Satd. Flow (perm)	1042	0	1767	0	0	1313
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	49		7			
Link Speed (mph)	30		30			30
Link Distance (ft)	421		375			362
Travel Time (s)	9.6		8.5			8.2
Peak Hour Factor	0.75	0.75	0.87	0.87	0.90	0.84
Heavy Vehicles (%)	60%	67%	6%	18%	42%	21%
Adj. Flow (vph)	32	49	922	55	51	424
Shared Lane Traffic (%)						
Lane Group Flow (vph)	81	0	977	0	0	475
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			2
Permitted Phases	8				2	
Detector Phase	8		2		2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		23.0		23.0	23.0
Total Split (s)	25.0		45.0		45.0	45.0
Total Split (%)	35.7%		64.3%		64.3%	64.3%
Maximum Green (s)	20.0		40.0		40.0	40.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.5		1.5		1.5	1.5
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Act Effct Green (s)	8.3		52.7			52.7
Actuated g/C Ratio	0.12		0.78			0.78
v/c Ratio	0.48		0.71			0.46
Control Delay	22.8		10.4			6.1
Queue Delay	0.0		0.0			0.0
Total Delay	22.8		10.4			6.1
LOS	C		B			A
Approach Delay	22.8		10.4			6.1
Approach LOS	C		B			A
Queue Length 50th (ft)	14		176			61
Queue Length 95th (ft)	33		#448			138
Internal Link Dist (ft)	341		295			282
Turn Bay Length (ft)						
Base Capacity (vph)	344		1380			1024
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.24		0.71			0.46

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 67.5			
Natural Cycle: 70			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 9.8		Intersection LOS: A	
Intersection Capacity Utilization 69.9%		ICU Level of Service C	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: NYS Route 32 & South Port Road

Intersection	
Int Delay, s/veh	17.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	111	75	84	740	321	58
Future Vol, veh/h	111	75	84	740	321	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	86	86	90	90
Heavy Vehicles, %	13	28	20	9	23	28
Mvmt Flow	128	86	98	860	357	64

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1445	389	421	0	-	0
Stage 1	389	-	-	-	-	-
Stage 2	1056	-	-	-	-	-
Critical Hdwy	6.53	6.48	4.3	-	-	-
Critical Hdwy Stg 1	5.53	-	-	-	-	-
Critical Hdwy Stg 2	5.53	-	-	-	-	-
Follow-up Hdwy	3.617	3.552	2.38	-	-	-
Pot Cap-1 Maneuver	137	606	1048	-	-	-
Stage 1	662	-	-	-	-	-
Stage 2	319	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 112	606	1048	-	-	-
Mov Cap-2 Maneuver	~ 112	-	-	-	-	-
Stage 1	544	-	-	-	-	-
Stage 2	319	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	124.5	0.9	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1048	-	112	606	-	-
HCM Lane V/C Ratio	0.093	-	1.139	0.142	-	-
HCM Control Delay (s)	8.8	0	200.6	11.9	-	-
HCM Lane LOS	A	A	F	B	-	-
HCM 95th %tile Q(veh)	0.3	-	8	0.5	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

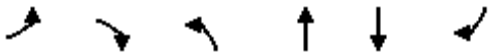
Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	128	554	22	142	236
Future Vol, veh/h	0	128	554	22	142	236
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	92	92	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	160	602	24	167	278

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	614	0	0	626	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	492	-	-	956	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	492	-	-	956	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.8	0	3.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	492	956	-
HCM Lane V/C Ratio	-	-	0.325	0.175	-
HCM Control Delay (s)	-	-	15.8	9.6	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0.6	-

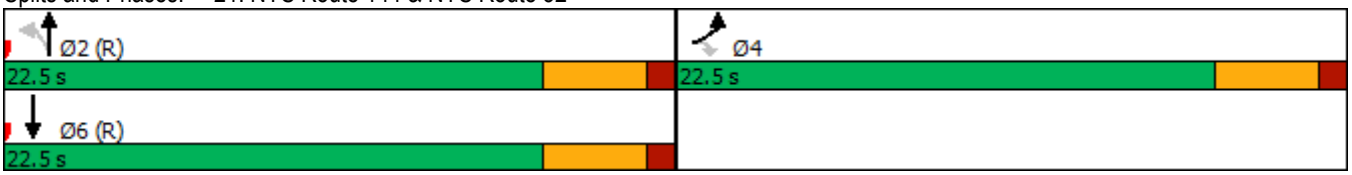


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	111	75	84	740	321	58
Future Volume (vph)	111	75	84	740	321	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125	0	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.979	
Flt Protected	0.950			0.995		
Satd. Flow (prot)	1597	1262	0	1717	1503	0
Flt Permitted	0.950			0.919		
Satd. Flow (perm)	1597	1262	0	1586	1503	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		86			24	
Link Speed (mph)	45			55	55	
Link Distance (ft)	2072			957	365	
Travel Time (s)	31.4			11.9	4.5	
Peak Hour Factor	0.87	0.87	0.86	0.86	0.90	0.90
Heavy Vehicles (%)	13%	28%	20%	9%	23%	28%
Adj. Flow (vph)	128	86	98	860	357	64
Shared Lane Traffic (%)						
Lane Group Flow (vph)	128	86	0	958	421	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	C-Max	C-Max	C-Max	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	
Act Effct Green (s)	8.9	8.9		30.0	30.0	
Actuated g/C Ratio	0.20	0.20		0.67	0.67	
v/c Ratio	0.40	0.27		0.91	0.42	
Control Delay	18.7	6.5		27.9	6.9	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	18.7	6.5		27.9	6.9	
LOS	B	A		C	A	
Approach Delay	13.8			27.9	6.9	
Approach LOS	B			C	A	
Queue Length 50th (ft)	29	0		~203	45	
Queue Length 95th (ft)	56	22		#457	117	
Internal Link Dist (ft)	1992			877	285	
Turn Bay Length (ft)	125					
Base Capacity (vph)	638	556		1056	1008	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.20	0.15		0.91	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 20.4		Intersection LOS: C	
Intersection Capacity Utilization 81.4%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 21: NYS Route 144 & NYS Route 32



Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	128	554	2	142	236
Future Vol, veh/h	0	128	554	2	142	236
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	92	92	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	160	602	2	167	278

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	603	0	0	604	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	499	-	-	974	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	499	-	-	974	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.6	0	3.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	499	974	-
HCM Lane V/C Ratio	-	-	0.321	0.172	-
HCM Control Delay (s)	-	-	15.6	9.5	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.4	0.6	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	80	21	362	20	13	1007
Future Volume (vph)	80	21	362	20	13	1007
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.972		0.993			
Flt Protected	0.962					0.999
Satd. Flow (prot)	1642	0	1712	0	0	1800
Flt Permitted	0.962					0.993
Satd. Flow (perm)	1642	0	1712	0	0	1789
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	19		7			
Link Speed (mph)	30		30			30
Link Distance (ft)	421		375			362
Travel Time (s)	9.6		8.5			8.2
Peak Hour Factor	0.85	0.85	0.72	0.72	0.94	0.94
Heavy Vehicles (%)	8%	9%	8%	50%	40%	5%
Adj. Flow (vph)	94	25	503	28	14	1071
Shared Lane Traffic (%)						
Lane Group Flow (vph)	119	0	531	0	0	1085
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			2
Permitted Phases	8				2	
Detector Phase	8		2		2	2
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		23.0		23.0	23.0
Total Split (s)	25.0		45.0		45.0	45.0
Total Split (%)	35.7%		64.3%		64.3%	64.3%
Maximum Green (s)	20.0		40.0		40.0	40.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.5		1.5		1.5	1.5
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	5.0		5.0			5.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Max		Max	Max
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Act Effct Green (s)	9.3		49.4			49.4
Actuated g/C Ratio	0.14		0.76			0.76
v/c Ratio	0.48		0.41			0.80
Control Delay	27.6		5.5			15.1
Queue Delay	0.0		0.0			0.0
Total Delay	27.6		5.5			15.1
LOS	C		A			B
Approach Delay	27.6		5.5			15.1
Approach LOS	C		A			B
Queue Length 50th (ft)	39		70			257
Queue Length 95th (ft)	69		103			#634
Internal Link Dist (ft)	341		295			282
Turn Bay Length (ft)						
Base Capacity (vph)	517		1295			1352
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.23		0.41			0.80

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 65.4			
Natural Cycle: 80			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 13.0		Intersection LOS: B	
Intersection Capacity Utilization 77.4%		ICU Level of Service D	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: NYS Route 32 & South Port Road

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	37	89	82	344	749	338
Future Vol, veh/h	37	89	82	344	749	338
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	125	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	88	88	91	91
Heavy Vehicles, %	29	14	10	7	7	2
Mvmt Flow	40	97	93	391	823	371

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1586	1009	1194	0	-	0
Stage 1	1009	-	-	-	-	-
Stage 2	577	-	-	-	-	-
Critical Hdwy	6.69	6.34	4.2	-	-	-
Critical Hdwy Stg 1	5.69	-	-	-	-	-
Critical Hdwy Stg 2	5.69	-	-	-	-	-
Follow-up Hdwy	3.761	3.426	2.29	-	-	-
Pot Cap-1 Maneuver	103	277	557	-	-	-
Stage 1	314	-	-	-	-	-
Stage 2	512	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	81	277	557	-	-	-
Mov Cap-2 Maneuver	81	-	-	-	-	-
Stage 1	247	-	-	-	-	-
Stage 2	512	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	43.1	2.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	557	-	81	277	-	-
HCM Lane V/C Ratio	0.167	-	0.497	0.349	-	-
HCM Control Delay (s)	12.8	0	87	24.8	-	-
HCM Lane LOS	B	A	F	C	-	-
HCM 95th %tile Q(veh)	0.6	-	2.1	1.5	-	-

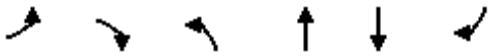
Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	164	241	17	111	497
Future Vol, veh/h	0	164	241	17	111	497
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	85	85	92	92
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	0	205	284	20	121	540

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	294	0	0	304	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	0	750	-	-	1257	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	750	-	-	1257	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	750	1257	-
HCM Lane V/C Ratio	-	-	0.273	0.096	-
HCM Control Delay (s)	-	-	11.6	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.3	-



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	37	89	82	344	749	338
Future Volume (vph)	37	89	82	344	749	338
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125	0	0			0
Storage Lanes	1	1	0			0
Taper Length (ft)	25		25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850			0.958	
Flt Protected	0.950			0.990		
Satd. Flow (prot)	1399	1417	0	1749	1726	0
Flt Permitted	0.950			0.557		
Satd. Flow (perm)	1399	1417	0	984	1726	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		97			60	
Link Speed (mph)	45			55	55	
Link Distance (ft)	2072			957	365	
Travel Time (s)	31.4			11.9	4.5	
Peak Hour Factor	0.92	0.92	0.88	0.88	0.91	0.91
Heavy Vehicles (%)	29%	14%	10%	7%	7%	2%
Adj. Flow (vph)	40	97	93	391	823	371
Shared Lane Traffic (%)						
Lane Group Flow (vph)	40	97	0	484	1194	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	77.5	77.5	77.5	
Total Split (%)	22.5%	22.5%	77.5%	77.5%	77.5%	
Maximum Green (s)	18.0	18.0	73.0	73.0	73.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	C-Max	C-Max	C-Max	

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	11.0	11.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	8.4	8.4		85.5	85.5	
Actuated g/C Ratio	0.08	0.08		0.86	0.86	
v/c Ratio	0.34	0.47		0.58	0.80	
Control Delay	50.4	16.6		6.4	10.7	
Queue Delay	0.0	0.0		0.0	1.2	
Total Delay	50.4	16.6		6.4	11.9	
LOS	D	B		A	B	
Approach Delay	26.5			6.4	11.9	
Approach LOS	C			A	B	
Queue Length 50th (ft)	25	0		74	279	
Queue Length 95th (ft)	56	47		170	#671	
Internal Link Dist (ft)	1992			877	285	
Turn Bay Length (ft)	125					
Base Capacity (vph)	251	334		841	1485	
Starvation Cap Reductn	0	0		0	123	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.16	0.29		0.58	0.88	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 11.5		Intersection LOS: B	
Intersection Capacity Utilization 98.1%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 21: NYS Route 144 & NYS Route 32

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	164	241	17	111	497
Future Vol, veh/h	0	164	241	17	111	497
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	50	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	85	85	92	92
Heavy Vehicles, %	0	0	2	2	2	2
Mvmt Flow	0	205	284	20	121	540

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	294	0	0	304	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	2.218	-
Pot Cap-1 Maneuver	0	750	-	-	1257	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	750	-	-	1257	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	750	1257	-
HCM Lane V/C Ratio	-	-	0.273	0.096	-
HCM Control Delay (s)	-	-	11.6	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.1	0.3	-

APPENDIX C

SIGNAL WARRANT ANALYSIS

- NYS Route 144/NYS Route 32 Signal Warrant Worksheet - Existing
- NYS Route 144/NYS Route 32 Signal Warrant Worksheet – Build
- NYS Route 144/Proposed Site Driveway Signal Warrant Worksheet – Build

SIGNAL WARRANT WORKSHEET

(Based on MUTCD 2009 Edition Signal Warrant Guidelines)

Project Name		Port of Albany	
Date:	4/1/2019	Analyst:	TCH
Major Street		River Road - NYS Route 144 (Existing)	
# of Lanes per Direction		1	
Minor Street		Corning Hill Road - NYS Route 32 (Existing)	
# of Lanes per Direction		1	

Warrants Met:

Warrant:		**Met?**
Warrant 1 – Eight Hour Vehicular Volume	1A	N
	1B	Y
	1C	N
Warrant 2 – Four Hour Vehicular Volume		Y
Warrant 3 – Peak Hour	3A	N
	3B	Y
Warrant 4 – Pedestrian Volume	4A	N
	4B	N
Warrant 5 – School Crossings		N
Warrant 6 – Coordinated Signal System		N
Warrant 7 – Crash Experience		N
Warrant 8 – Roadway Network		N
Warrant 9 – Intersection Near a Grade Crossing		N
Signal Should be Considered?		**Y**

Traffic Volume Data:

Hour	Both Approach Volumes		Higher Volume Approach		Crossing Ped. Volume	
	Major	Minor	Major	Minor	Major	Minor
7:00-8:00	875	126	596	126	0	0
8:00-9:00	763	122	521	122	0	0
9:00-10:00	721	125	454	125	0	0
Noon-1:00	571	100	321	100	0	0
2:00-3:00	599	90	344	90	0	0
3:00-4:00	662	82	410	82	0	0
4:00-5:00	1108	85	840	85	0	0
5:00-6:00	1053	87	829	87	0	0
AM Peak	918	143	674	143	0	0
PM Peak	1205	94	953	94	0	0

Accident Data:

Time Frame (Mo.)	Total Number of Accidents	Property Damage/Injury Acc.	Acc. Correctable with a Traffic Signal
36	4	3	3

Applicable Signal Warrant Details:

Warrant 1, Eight-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:
A. The vehicles per hour given in both of the 70 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

No hours meet warrant 1A

B. The vehicles per hour given in both of the 70 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

Yes, all 8 hours meet warrant 1B

In applying each condition, the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.
C. The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 56 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and

B. The vehicles per hour given in both of the 56 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

No, only three hours meet both the Warrant 1A & 1B 56% columns

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

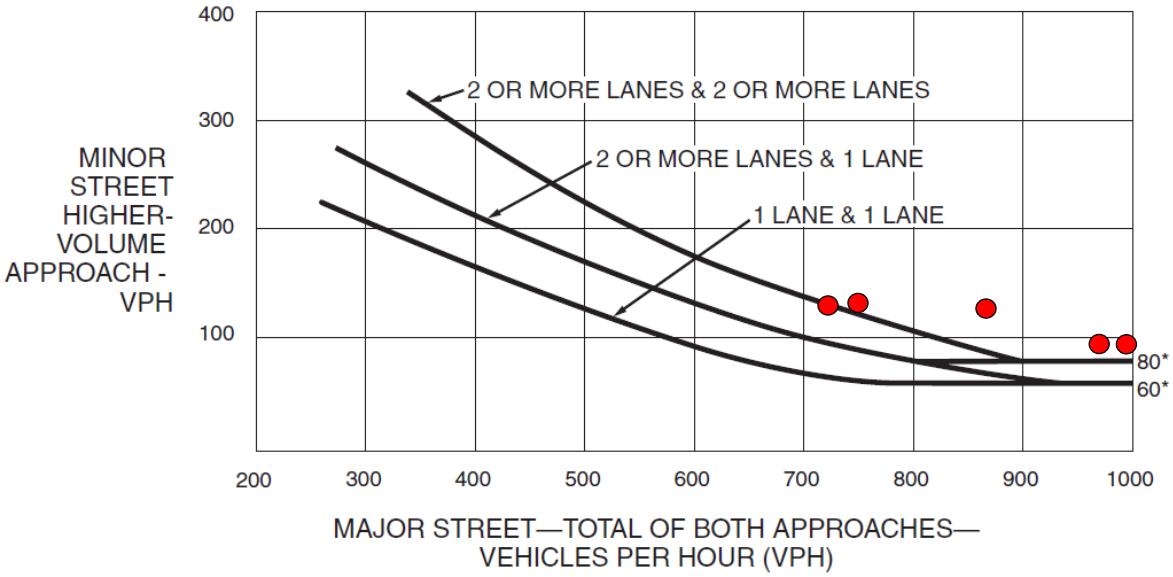
[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Warrant 2, Four-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Yes, at least 4 hours meet Warrant 2 based on a 2-lane approach for Route 32

Warrant 3, Peak Hour

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and

No, the minor approach has 2.00 hours of delay during the morning peak hour.

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and

Yes, the Minor-street approach does exceed 100 vehicles per hour (208 vehicles per hour during the AM peak hour & 133 vehicles per hour during the PM).

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for Intersections with three approaches.

Yes, the total entering volume does exceed 650 vehicles per hour (1207 vehicles per hour during the AM peak hour and 1469 vehicles per hour during the PM peak hour.

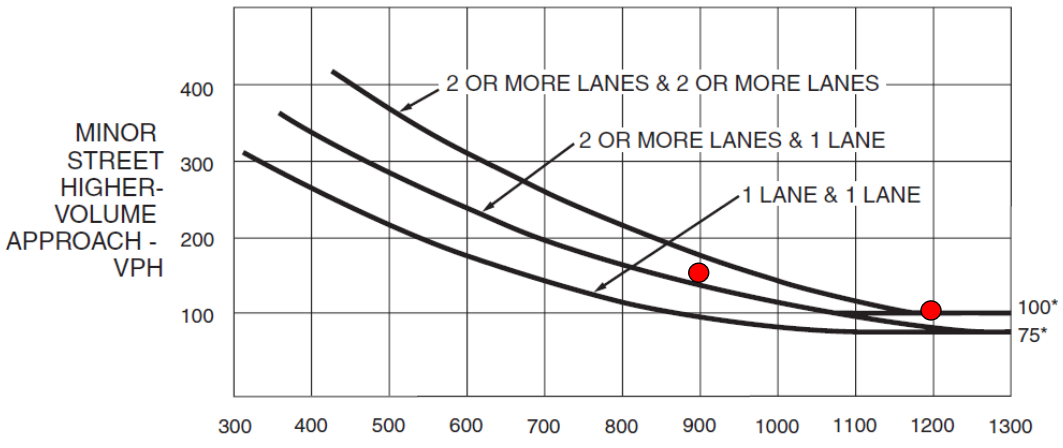
B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Yes, both peak hours meet warrant 3B.

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 4, Pedestrian Volume

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

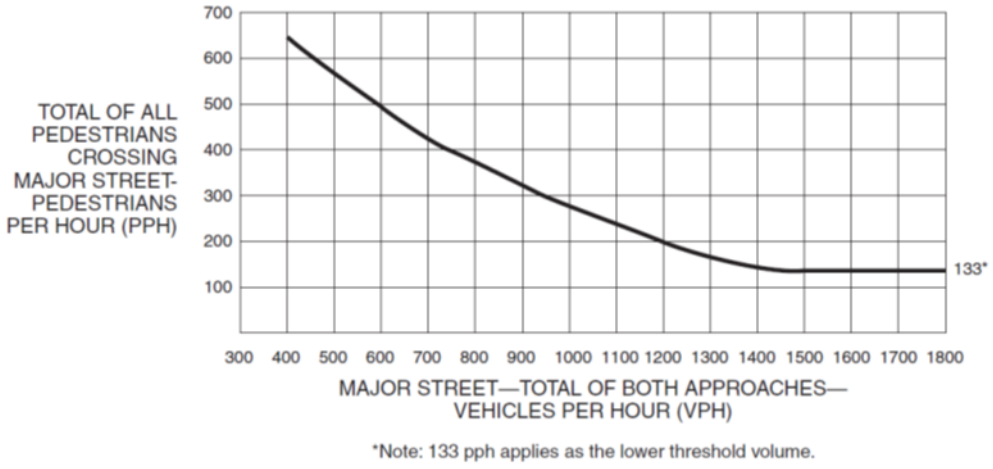
A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

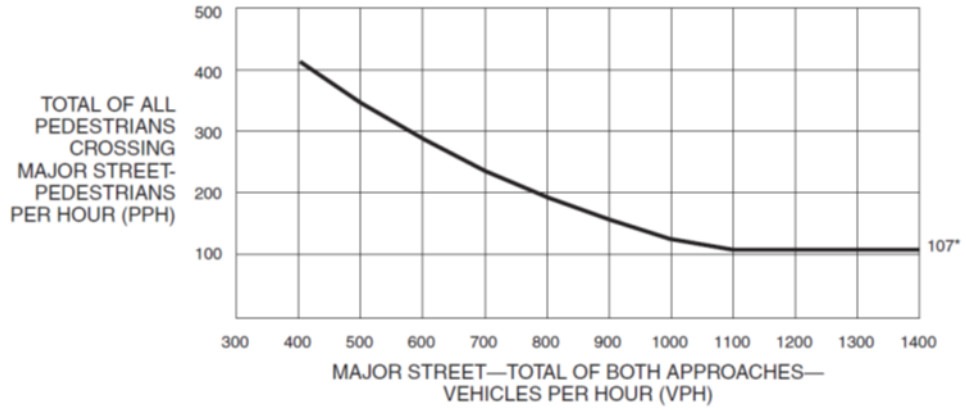
Warrant Not Met, no pedestrians were observed during the traffic counts.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



*Note: 107 pph applies as the lower threshold volume.

Warrant 5, School Crossing

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant Not Met, No school in the vicinity of the intersection.

Warrant 6, Coordinated Signal System

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning. **(Not Applicable)**

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation. **(Not Applicable)**

Warrant 7, Crash Experience

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

No, Currently in process for this corridor according to Town Police)

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

No, over the last three years 4 crashed total, 3 with multiple vehicles, 2 included injuries and 1 included property damage.

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 56 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 56 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 70 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours**.**

Yes, Condition B is met.

Warrant 7 not met.

Warrant 8, Roadway Network

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or **(Proposed entering volume is 1299 vehicles during the PM peak hour)**

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday). **(NOT REVIEWED)**

A major route as used in this signal warrant shall have at least one of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.
B. It includes rural or suburban highways outside, entering, or traversing a city.
C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Warrant not met based on condition A

Warrant 9, Intersection Near a Grade Crossing

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and **(NOT MET)**
B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13. **(NOT MET)**

Warrant not met no railroad crossing in close proximity to the intersection.

SIGNAL WARRANT WORKSHEET

(Based on MUTCD 2009 Edition Signal Warrant Guidelines)

Project Name		Port of Albany	
Date:	10/13/2021	Analyst:	TCH
Major Street		River Road - NYS Route 144 (Full Build)	
# of Lanes per Direction		1	
Minor Street		Corning Hill Road - NYS Route 32 (Full Build)	
# of Lanes per Direction		1	

Warrants Met:

Warrant:		**Met?**
Warrant 1 – Eight Hour Vehicular Volume	1A	N
	1B	Y
	1C	N
Warrant 2 – Four Hour Vehicular Volume		Y
Warrant 3 – Peak Hour	3A	N
	3B	Y
Warrant 4 – Pedestrian Volume	4A	N
	4B	N
Warrant 5 – School Crossings		N
Warrant 6 – Coordinated Signal System		N
Warrant 7 – Crash Experience		N
Warrant 8 – Roadway Network		N
Warrant 9 – Intersection Near a Grade Crossing		N
Signal Should be Considered?		**Y**

Traffic Volume Data:

Hour	Both Approach Volumes		Higher Volume Approach		Crossing Ped. Volume	
	Major	Minor	Major	Minor	Major	Minor
7:00-8:00	1004	146	714	146	0	0
8:00-9:00	886	141	598	141	0	0
9:00-10:00	878	135	571	135	0	0
Noon-1:00	613	116	398	116	0	0
2:00-3:00	479	98	335	98	0	0
3:00-4:00	610	101	427	101	0	0
4:00-5:00	1249	104	917	104	0	0
5:00-6:00	1190	105	905	105	0	0
AM Peak	1103	182	862	182	0	0
PM Peak	1526	130	1095	130	0	0

Accident Data:

Time Frame (Mo.)	Total Number of Accidents	Property Damage/Injury Acc.	Acc. Correctable with a Traffic Signal
36	4	3	3

Applicable Signal Warrant Details:

Warrant 1, Eight-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:
A. The vehicles per hour given in both of the 70 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

No, only 2 hours meet warrant 1A

B. The vehicles per hour given in both of the 70 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

Yes, 8 hours meet warrant 1B

In applying each condition, the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.
C. The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 56 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and

B. The vehicles per hour given in both of the 56 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

No, only six hours meet both the Warrant 1A & 1B 56% columns

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

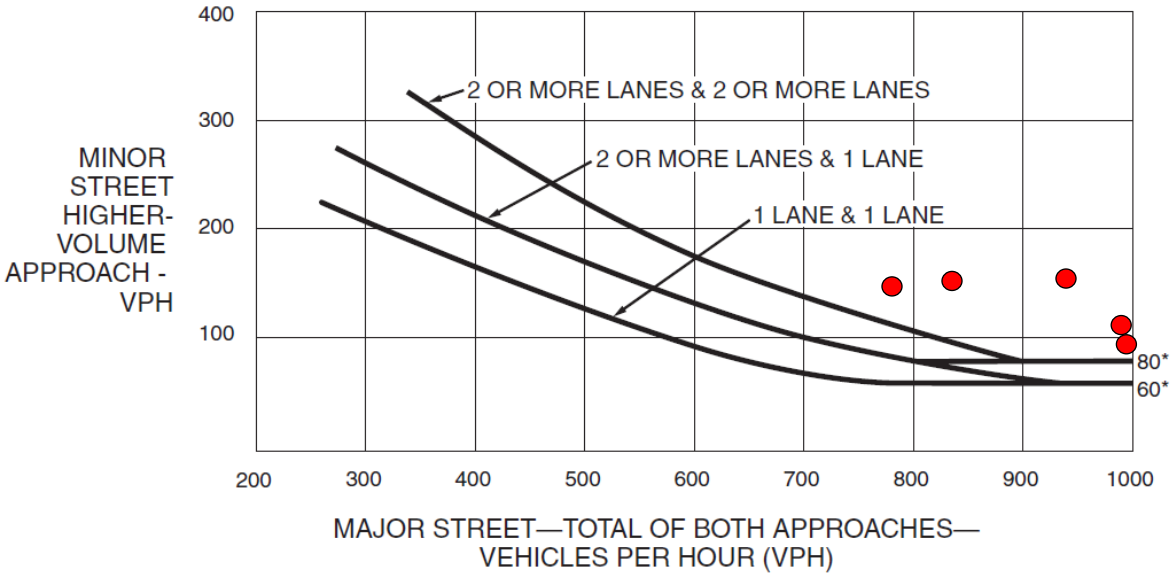
[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Warrant 2, Four-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Yes, at least 4 hours meet Warrant 2 based on a 2-lane approach for Route 32

Warrant 3, Peak Hour

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and

No, the minor approach has 4.59 hours of delay during the morning peak hour.

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and

Yes, the Minor-street approach does exceed 100 vehicles per hour (178 vehicles per hour during the AM peak hour & 126 vehicles per hour during the PM).

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for Intersections with three approaches.

Yes, the total entering volume does exceed 650 vehicles per hour (1334 vehicles per hour during the AM peak hour and 1578 vehicles per hour during the PM peak hour.

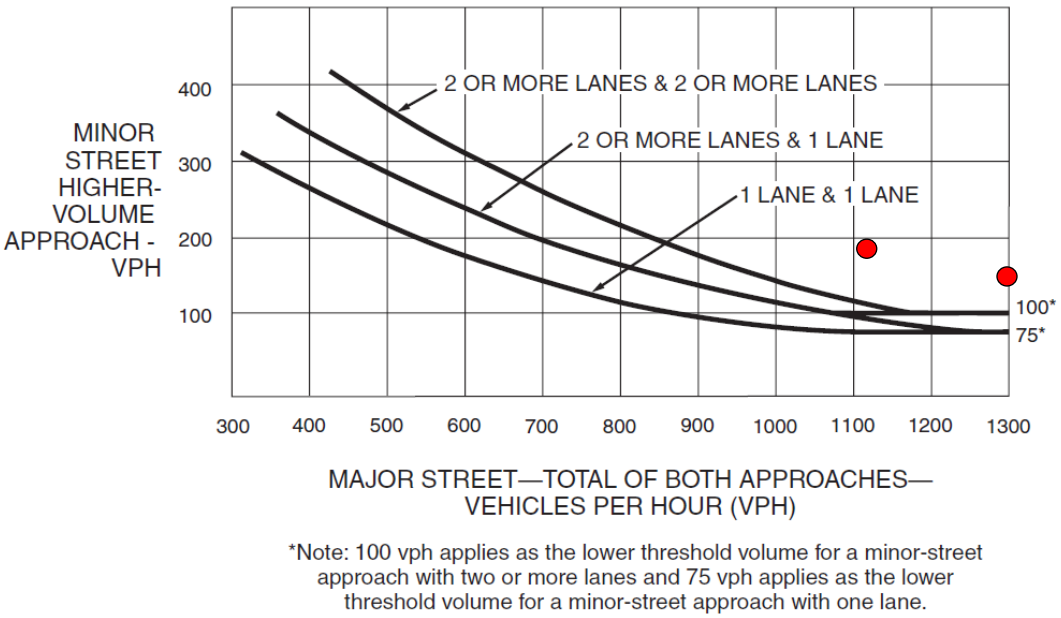
B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Yes, both peak hours meet warrant 3B.

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 4, Pedestrian Volume

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

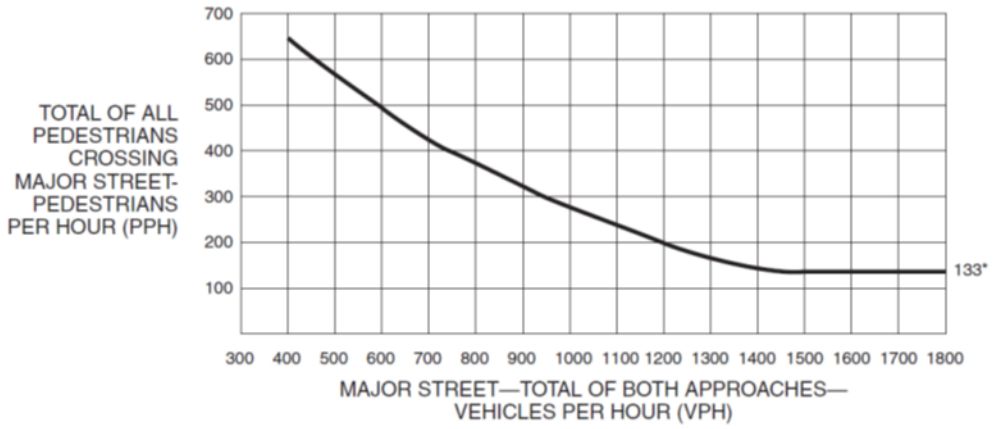
A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

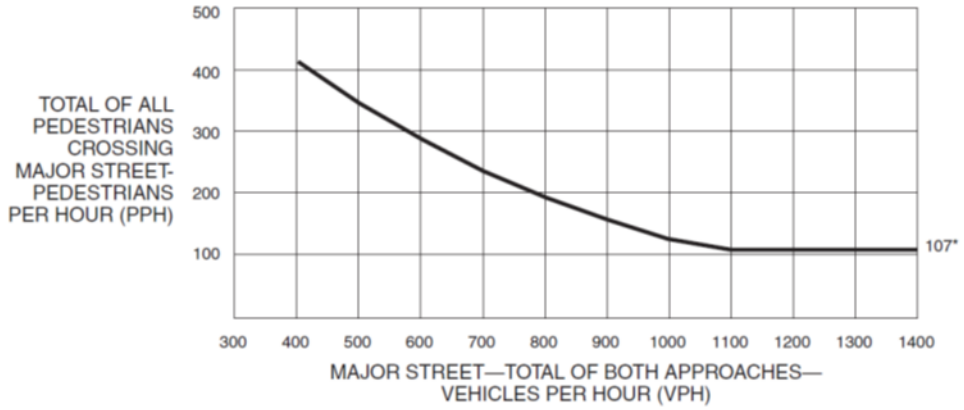
Warrant Not Met, no pedestrians were observed during the traffic counts.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



*Note: 107 pph applies as the lower threshold volume.

Warrant 5, School Crossing

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant Not Met, No school in the vicinity of the intersection.

Warrant 6, Coordinated Signal System

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning. **(Not Applicable)**

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation. **(Not Applicable)**

Warrant 7, Crash Experience

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

No, Currently in process for this corridor according to Town Police)

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

No, over the last three years 4 crashed total, 3 with multiple vehicles, 2 included injuries and 1 included property damage.

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 56 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 56 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 70 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Yes, Condition B is met.

Warrant 7 not met.

Warrant 8, Roadway Network

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or **(Proposed entering volume is 1578 vehicles during the PM peak hour)**

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday). **(NOT REVIEWED)**

A major route as used in this signal warrant shall have at least one of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.
B. It includes rural or suburban highways outside, entering, or traversing a city.
C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Warrant not met based on condition A

Warrant 9, Intersection Near a Grade Crossing

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and **(NOT MET)**
B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13. **(NOT MET)**

Warrant not met no railroad crossing in close proximity to the intersection.

SIGNAL WARRANT WORKSHEET

(Based on MUTCD 2009 Edition Signal Warrant Guidelines)

Project Name		Port of Albany	
Date:	10/21/2021	Analyst:	TCH
Major Street		NYS Route 144 (Full Build)	
# of Lanes per Direction		1	
Minor Street		Proposed Site Driveway (Full Build)	
# of Lanes per Direction		1	

Warrants Met:

Warrant:		Met?
Warrant 1 – Eight Hour Vehicular Volume	1A	N
	1B	N
	1C	N
Warrant 2 – Four Hour Vehicular Volume		N
Warrant 3 – Peak Hour	3A	N
	3B	Y
Warrant 4 – Pedestrian Volume	4A	N
	4B	N
Warrant 5 – School Crossings		N
Warrant 6 – Coordinated Signal System		N
Warrant 7 – Crash Experience		N
Warrant 8 – Roadway Network		N
Warrant 9 – Intersection Near a Grade Crossing		N
Signal Should be Considered?		**N**

Traffic Volume Data:

Hour	Both Approach Volumes		Higher Volume Approach		Crossing Ped. Volume	
	Major	Minor	Major	Minor	Major	Minor
7:00-8:00	936	146*	574	146*		
8:00-9:00	445	60*	249	60*		
9:00-10:00	204	44*	114	44*		
2:00-3:00	293	44*	164	44*		
3:00-4:00	381	51*	284	51*		
4:00-5:00	884	146*	623	146*		
5:00-6:00	797	98*	382	98*		
6:00-7:00	783	44*	185	44*		
AM Peak	936	146*	574	146*		
PM Peak	884	146*	623	146*		

* = Projected volumes

Accident Data:

Time Frame (Mo.)	Total Number of Accidents	Property Damage/Injury Acc.	Acc. Correctable with a Traffic Signal
NA	NA	NA	NA

Applicable Signal Warrant Details:

Warrant 1, Eight-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:
A. The vehicles per hour given in both of the 70 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or

No, two hours meet warrant 1A.

B. The vehicles per hour given in both of the 70 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

No, two hours meet warrant 1B.

In applying each condition, the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.
C. The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 56 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; and

B. The vehicles per hour given in both of the 56 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

No, only three hours meet warrant 1C.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

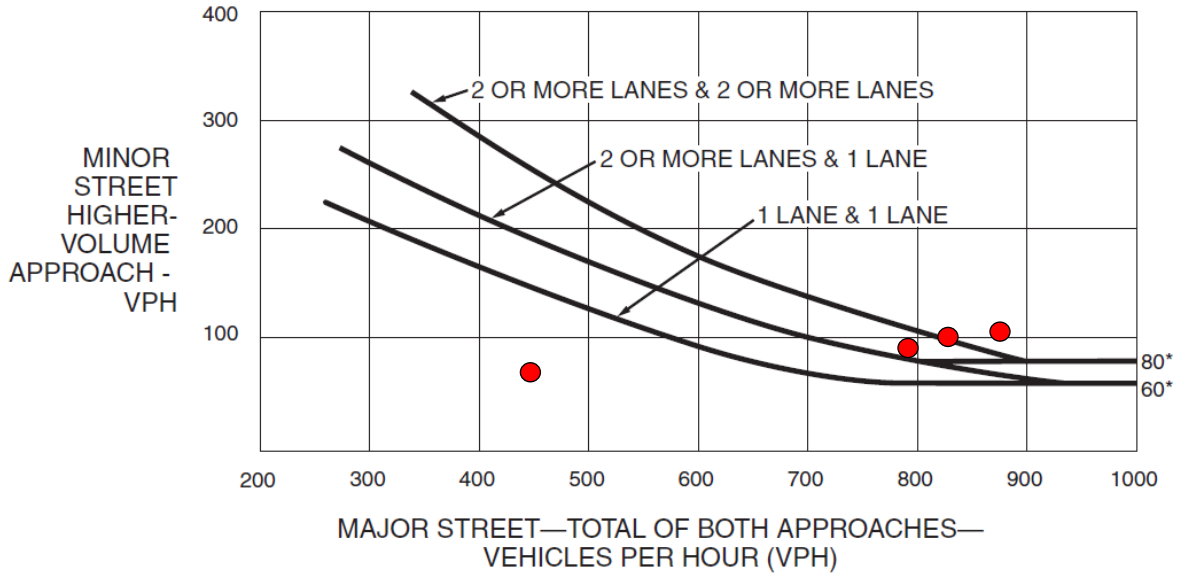
[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Warrant 2, Four-Hour Vehicular Volume

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-2 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Three hours meet Warrant 2.

Warrant 3, Peak Hour

This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time. The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and

Warrant Not Met

2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and

Minor-street approach equals 100 vehicles per hour.

3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for Intersections with three approaches.

The total entering volume is 1082 vehicles during the morning peak hour.

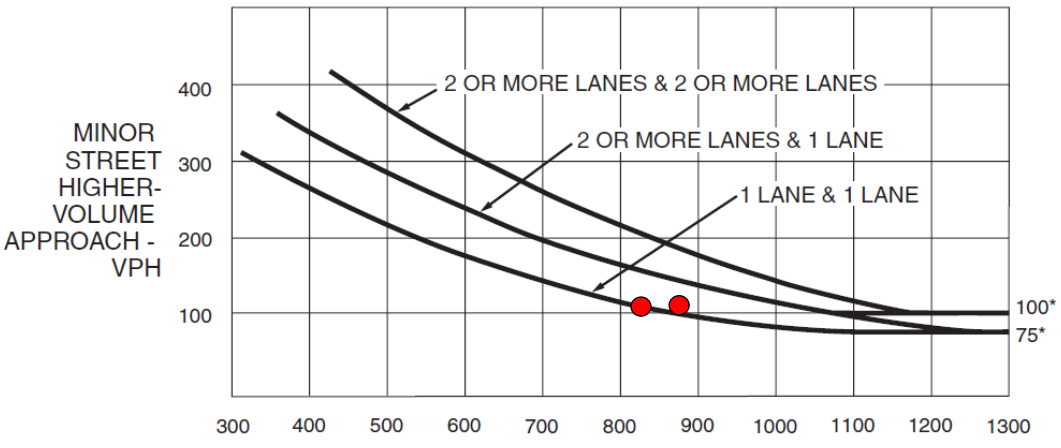
B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-4 for the existing combination of approach lanes.

Both peak hours meet Warrant 3B.

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 4, Pedestrian Volume

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

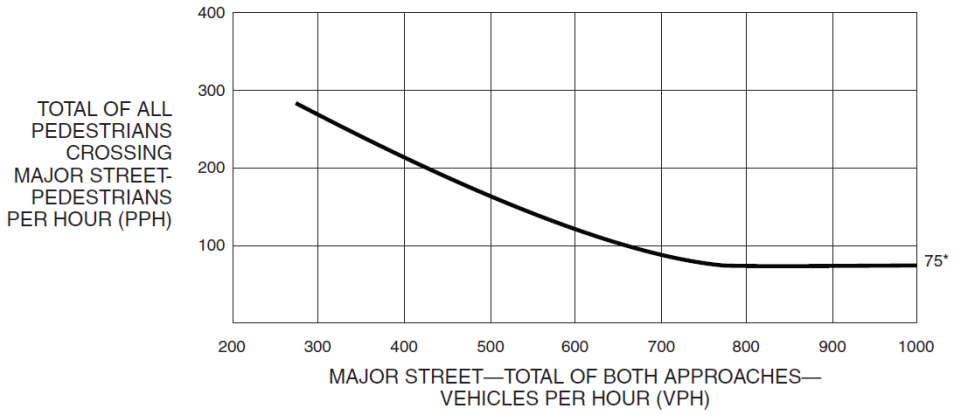
A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-6; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-8.

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

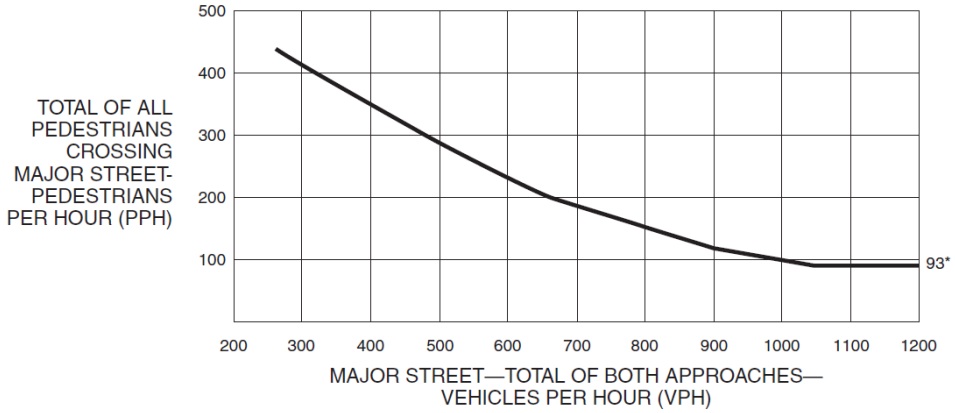
Warrant Not Met, no pedestrians were observed during the traffic counts.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



*Note: 75 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

Warrant 5, School Crossing

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Warrant Not Met, No school in the vicinity of the intersection.

Warrant 6, Coordinated Signal System

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning. **(Not Applicable)**

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation. **(Not Applicable)**

Warrant 7, Crash Experience

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and **(NOT REVIEWED)**

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and **(NOT REVIEWED)**

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 56 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 56 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 70 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours**. (NOT REVIEWED)**

Warrant 8, Roadway Network

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or **(Proposed entering volume is 1082 vehicles during the AM peak hour)**

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday). **(NOT REVIEWED)**

A major route as used in this signal warrant shall have at least one of the following characteristics:

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.
B. It includes rural or suburban highways outside, entering, or traversing a city.
C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Warrant not met based on condition A

Warrant 9, Intersection Near a Grade Crossing

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and **(NOT MET)**
B. During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13. **(NOT MET)**

Warrant not met no railroad crossing in close proximity to the intersection.