Route 9 Active Transportation Plan: Appendix A

Traffic Analysis

November 2018

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Introduction

This memorandum describes the methodology and findings of the traffic analysis for the Route 9 Active Transportation Corridor project. A model was created of existing study area intersections and roadways using the Synchro 9 (Trafficware) software suite to determine vehicle level of service (LOS) and delay during typical peak-hour weekday and midday weekend conditions. This method was chosen to anticipate the New York State Department of Transportation comments with respect to the Active Transportation Corridor's impact on operations.

Historic Traffic Data

The nature of transportation and land development has been changing over the last decade, and the only certainty with respect to the future, is uncertainty. Studies show that mixed use development and a millennial preference for shared mobility may be reducing vehicle miles traveled. With bus rapid transit and shared autonomous vehicles on the horizon in this corridor, it is worth considering whether more auto trips are a necessary consequence of growth and development. One source of data to explore this question is historical traffic volume counts from New York State. Unfortunately, there are only two continuous counts along Route 9 near the study area, one in the Bronx[1] which shows a decline in automobile daily trips since 2006, and another in Croton which shows not growth[2], while population in both Bronx and Westchester counties increased during the same time period[3].

Figure 1 Population and AADT growth (2006-2015)

	Bronx County		Westchester County	
	AADT	POP	AADT	POP
2015	11,877	1,428,357	49,066	967,315
2014	11,626	1,413,357	47,407	962,391
2013	12,314	1,397,315	47,758	956,283
2012	13,086	1,386,364	49,102	950,227
2011	13,165	1,374,593	46,239	944,249
2010		1,365,725		939,406
2008	13,477		50,095	
2007	16,049		50,068	
2006	14,681		49,575	
2005		1,365,000		933,401

[1] http://ftp.dot.ny.gov/tdv/YR2015/R11/01_Bronx/01_0012_VOL_00-2015.pdf
[2] http://ftp.dot.ny.gov/tdv/YR2015/R08/87_Westchester/87_0021_VOL_00-2015.pdf
[3] https://www.opendatanetwork.com

Data Collection

Morning and afternoon weekend and weekday peak hour turning movements and signal timing information were collected in the fall of 2017 for 16 signalized study intersection:

1. Pierson Avenue/Old Broadway
2. Pocantico Street/Old Broadway
3. Bedford Road
4. Beekman Avenue
5. Depeyster Street
6. Neperan Road
7. Route 119
8. Interstate 87 (I-87)
9. Fieldpoint Drive
10. Harriman Road
11. West/East Clinton Avenue
12. Ashford Avenue
13. Cedar Street
14. Livingston Avenue
15. Villard Avenue
16. Farragut Avenue

Additionally, 24 hour screen line traffic volumes were taken for four days using Automatic Traffic Recorders (ATR) at the following locations:

- Between Cedar Street and Ashford Avenue in Dobbs Ferry (September 13th – 22nd, 2017)
- Between Benedict Avenue and Franklin Street in Tarrytown (October 4th – 9th, 2017)

ATR counts were taken in 15 minute increments. Results at the Dobbs Ferry location show a week average of 10,632 veh/day southbound (SB) and 9,325 veh/day northbound (NB), totaling 19,956 veh/day. Daily volumes were higher on Friday than the rest of the days, and average weekday peak hours were from 8:00 a.m. to 9:00 a.m. and from 6:00 p.m. to 7:00 p.m. Weekend peak hours were from 11:00 a.m. to 2:00 p.m. Figure 122 and Figure 123 illustrate typical traffic conditions on this part of Route 9 over a 24-hour period.

Counts in Tarrytown were taken in 15 minute increments from October 4th to October 9th. Traffic volumes were significantly higher than those collected in Dobbs Ferry, with 27,896 veh/day (54% SB) on Thursday and 29,807 veh/day on Saturday. Figure 124 and Figure 125 illustrate typical traffic conditions in Tarrytown at this location over a 24-hour period for weekdays and weekends, respectively. Peak hours at this location were 7:30 a.m. to 8:30 a.m. and 5:00 p.m. to 6:00 p.m. on weekdays, and 12:30 p.m. to 1:30 pm. on Saturday.

A continuous New York State Department of Transportation count located on Route 9 shows that both September and October traffic volumes are among the highest of the year. Accordingly, the counts were adjusted to calculate annual average daily traffic (AADT). See Figure 121, below.

Figure 2 Conversion to AADT

	Total lanes	MADT	%AADT	AADT
Dobbs Ferry	4 lanes (44’ curb to curb)	20,481	102%	20,079
Tarrytown	2 through lanes and 1 turning lane (39’ curb to curb)	27,336	109%	25,079

Figure 3 Dobbs Ferry: 24-Hour Weekday Traffic Count, Thursday, September 14, 2017

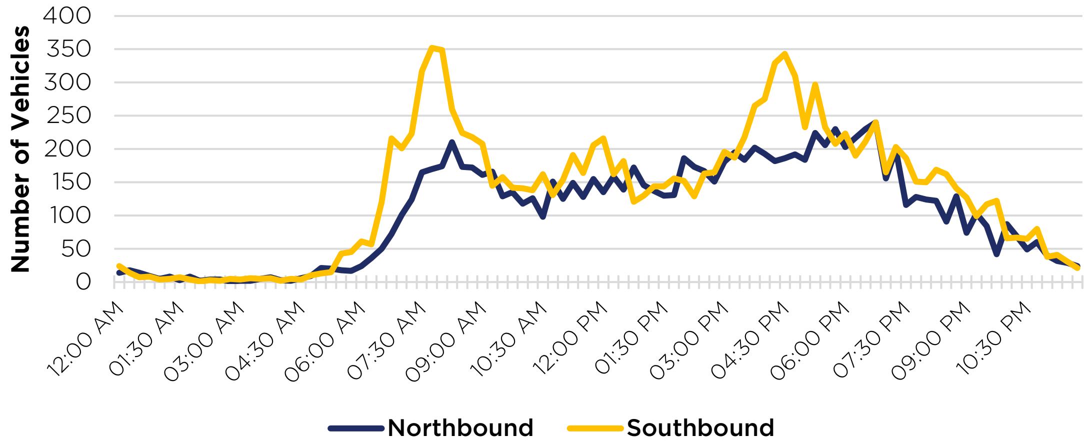


Figure 4 Dobbs Ferry: 24-Hour Weekend Traffic Count, Saturday, September 16, 2017

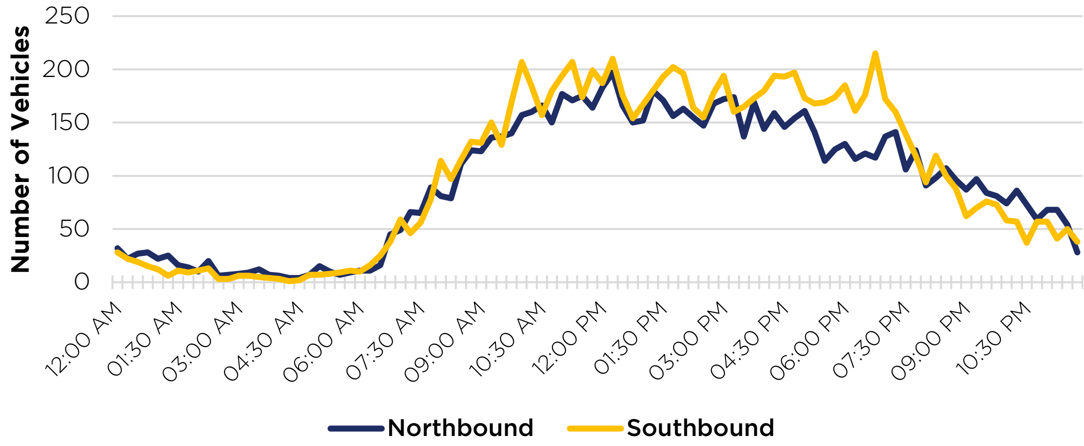


Figure 5 Tarrytown: 24-Hour Weekday Traffic Count, Thursday, October 5, 2017

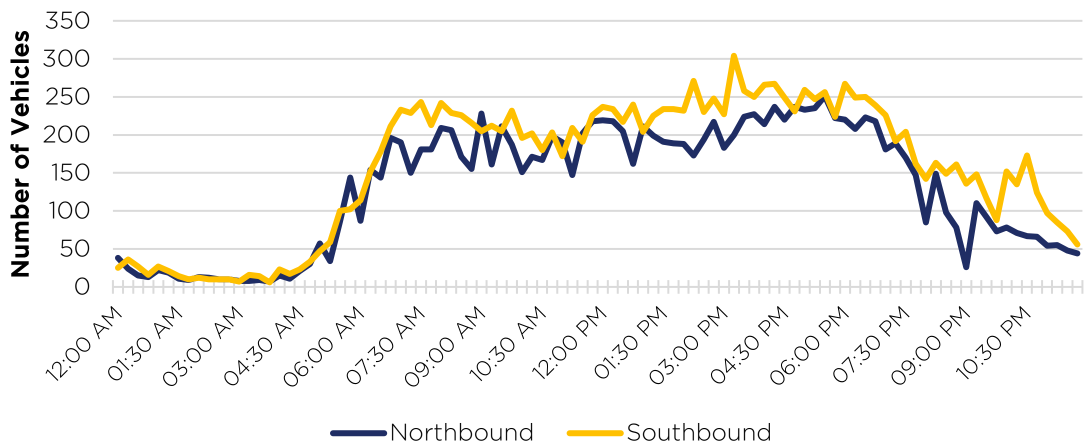
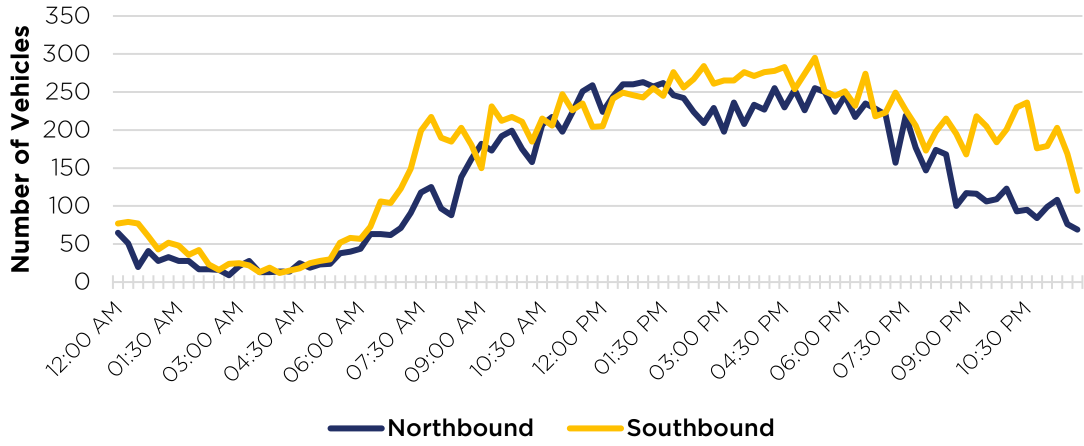


Figure 6 Tarrytown: 24-Hour Weekend Traffic Count, Saturday, October 7, 2017



Methodology

Data were entered into Synchro to estimate intersection LOS during the peak hours. Intersection LOS is based on the observed "peak hour" which is typically defined as the one continuous hour of peak traffic flow counted within the two-hour period in the morning and afternoon. Existing lane configurations, intersection controls, and vehicle turning movement counts are included in the traffic analysis.[4] Generally, LOS A through E are considered acceptable during peak hour, and any intersection that operates at LOS F is considered over capacity during the same period (Figure 126).

Figure 7 Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.
1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Two analyses were conducted using Synchro and SimTraffic. The Synchro analysis provided overall LOS for all approaches at the intersection level. SimTraffic is a microscopic simulation component of Synchro, and five runs were conducted to determine any potential improvements in LOS. The 5th run of the SimTraffic analysis was used to determine overall LOS for all approaches at the intersection level.

[4] Synchro 9 Trafficware is used to model and calculate intersection LOS according to the HCM 2000/2010 method.

Results

NYSDOT recognizes that LOS D is the minimum standard. Below is a list of intersections where LOS was E of F during peak periods. All results are based on the Synchro9 model and Synchro9 methodology.

During the weekday AM Peak, the intersections that experienced LOS E or F in the Synchro analysis include I-87 WB (Tarrytown), Ashford Avenue (Dobbs Ferry), and Farragut Avenue (Hastings-on-Hudson). The worst approaches for each intersection are listed below:

1. The westbound through and right movements of I-87 experienced the most delay, operating at LOS F.
2. The eastbound left turn movement of Ashford Avenue experienced the most delay, operating at LOS F.
3. The westbound through movement of Farragut Avenue experienced the most delay, operating at LOS F.

During the weekday PM Peak, the intersections that experienced LOS E or F in the Synchro analysis include Beekman Avenue (Sleepy Hollow), I-87 (Tarrytown), and Farragut Avenue (Hastings-on-Hudson). The worst approaches for each intersection are listed below:

1. The eastbound through movement of Beekman Avenue experienced the most delay, operating at LOS F.
2. The northbound through movement at I-87 of Route 9 experienced the most delay, operating at LOS F.
3. The northwestbound through movement of Farragut Avenue experienced the most delay, operating at LOS F.

In addition, Farragut Avenue (Hastings-on-Hudson) experienced LOS F during the midday Saturday period. The worst approach for this intersection is listed below:

1. The eastbound through movement experienced the most delay, operating at LOS F.

All intersections were further modeled for five runs using SimTraffic, the microsimulation component of Synchro. Results of the 5^{th} iteration show that each intersection that experienced LOS E or F in the Synchro analysis improved to LOS D or better. Intersection operations are summarized in Figure 127.

Figure 8 Weekday AM Peak, Weekday PM Peak, and Saturday Midday Level of Service – Existing Conditions

Intersection	Village	Peak Hour	Synchro 9 Analysis		SimTraffic Analysis	
			Delay (sec)	LOS	Delay (sec)	LOS
Pierson Avenue/Gordon Avenue	Sleepy Hollow	AM	-	-	-	-
		PM	9.1	A	5.4	A
		Saturday (PM)	8.4	A	2.9	A
Pocantico Street/Old Broadway	Sleepy Hollow	AM	-	-	-	-
		PM	17.0	B	8.3	A
		Saturday (PM)	13.9	B	10.3	B
Bedford Road	Sleepy Hollow	AM	34.8	C	17.0	B
		PM	40.5	D	28.3	C
		Saturday (Midday)	30.8	C	22.6	C
Beekman Avenue	Sleepy Hollow	AM	47.8	D	13.6	B
		PM	87.1	F	18.4	B
		Saturday (Midday)	44.9	D	13.0	B
Depeyster Street	Sleepy Hollow	AM	21.4	C	13.4	B
		PM	11.4	B	10.5	A
		Saturday (Midday)	5.9	A	6.7	A
Main Street/Neperan Road	Tarrytown	AM	19.4	B	15.9	B
		PM	23.6	C	19.5	B
		Saturday (Midday)	24.4	C	25.9	C
Route 119	Tarrytown	AM	26.6	C	28.1	C
		PM	35.6	D	23.1	C
		Saturday (Midday)	26.5	C	20.3	C
I-87 (WB)	Tarrytown	AM	58.4	E	21.3	C
		PM	97.6	F	27.2	C
		Saturday (Midday)	38.6	D	21.4	C
Main Street/Fieldpoint Drive	Irvington	AM	28.5	C	13.7	B
		PM	31.3	D	16.0	B
		Saturday (Midday)	23.3	C	15.3	B
Harriman Road	Irvington	AM	3.0	A	3.0	A
		PM	11.8	B	9.5	A
		Saturday (Midday)	11.7	B	6.3	A

Intersection	Village	Peak Hour	Synchro 9 Analysis		SimTraffic Analysis	
			Delay (sec)	LOS	Delay (sec)	LOS
West/East Clinton Avenue	Irvington	AM	8.5	A	7.7	A
		PM	15.7	B	13.0	B
		Saturday (Midday)	7.8	A	3.4	A
Ashford Avenue	Dobbs Ferry	AM	78.1	E	20.8	C
		PM	54.3	D	20.3	C
		Saturday (Midday)	15.4	B	12.0	B
Cedar Street	Dobbs Ferry	AM	10.7	B	16.3	B
		PM	11.4	B	12.4	B
		Saturday (Midday)	10.9	B	12.1	B
Livingston Avenue	Dobbs Ferry	AM	6.0	A	6.9	A
		PM	5.7	A	5.9	A
		Saturday (Midday)	5.4	A	6.7	A
Villard Avenue	Hastings-on-Hudson	AM	6.4	A	7.1	A
		PM	7.0	A	7.7	A
		Saturday (Midday)	6.8	A	4.8	A
Farragut Avenue	Hastings-on-Hudson	AM	158.0	F	49.5	D
		PM	117.8	F	53.6	D
		Saturday (Midday)	86.6	F	36.0	D

Source: Nelson\Nygaard, 2017.

Note 1. BOLD indicates intersections that experienced LOS F under the Synchro 9 Analysis.

Note 2. AM and PM peak conditions were analyzed for a typical weekday. Midday conditions were analyzed on a typical weekend.

Note 3. Pierson Avenue/Gordon Avenue and Pocantico Street/Old Broadway evaluated for Saturday PM only due to lack of midday Saturday data. In addition, no weekday AM peak data were available for these intersectionsDiscussion

Although the current performance at some signalized intersections is below standard, personal communication with NYSDOT staff and the Highway Design Manual both indicate that projects are considered on a case-by-case basis.

The State of New York utilizes adopted Complete Streets and traffic calming policies to help make design decisions that reflect local values. According to the Complete Streets policy, all project applicants are required to evaluate the project limits for needed bicycle and pedestrian accommodations as part of initial scoping. Chapter 17 and 18 of the Highway Design Manual specify that bicycle and pedestrian accommodation should be considered for all projects, based on an evaluation of the following characteristics:

- Existing and expected land-use patterns and generators of bicycle/pedestrian traffic
- Existing and anticipated bicycle/pedestrian characteristics
- Existing site accommodations and characteristics
- Local or regional transportation plans which identify existing or proposed bicycle/ pedestrian facilities.
- Accident history, including causes and site context (roadway description and surrounding land use).[5]

In the case of the Route 9 corridor within these project limits the Route 9 Active Transportation Corridor project has demonstrated a need for complete streets accommodation, which may warrant bicycle and pedestrian accommodation with a tradeoff of vehicle quality of service. The state recognizes that some locations may provide LOS below D and that making Complete Streets improvements may be difficult, so that where existing operations are at LOS is E or F, mitigations may be limited to changes such as signal timing or hardware improvements. Ch. 5.2 of the design manual provides more information.

The Highway Design Manual provides direction on:

- Complete Streets implementation in Chapter 18,
- Traffic Calming in Chapter 25,
- Temporary traffic calming installations in Appendix A of Chapter 25, and
- Non-standard feature justification in Chapter 2.

[5] Pedestrian accident history should include actual recorded incidents and local feedback on perceived safety. The absence of an accident history does not necessarily indicate a safe and accessible condition exists for pedestrians. Information may be gathered from local highway supervisors, local police, residents, or business owners.