

DE Route 9 / 6th Street & Delaware Street

All Way Stop Control Conversion

June 2018

Why are we here?

6th Street & Delaware Street listed in *top 10 signals for rebuild* on the DelDOT statewide signal rebuild list.

Rebuild issues:

- No Opticom Receivers
- Signal Cabinet Upgrade Needed
- Signal Heads in Fair/Poor Condition
- Signal Head Locations not to Standard
- Signal Head Vertical Clearance Issues
- Additional Maintenance Concerns

Standard Procedure:

- Analyze location to determine best traffic control before re-build

Traffic Volumes and Crash Data is collected and analyzed for All-Way Stop Control Conversion to determine safety and operational benefits.

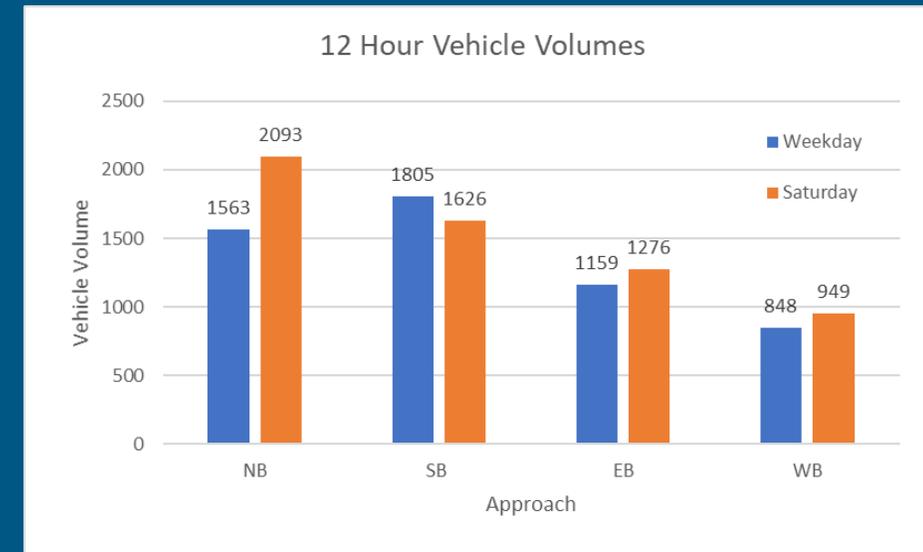
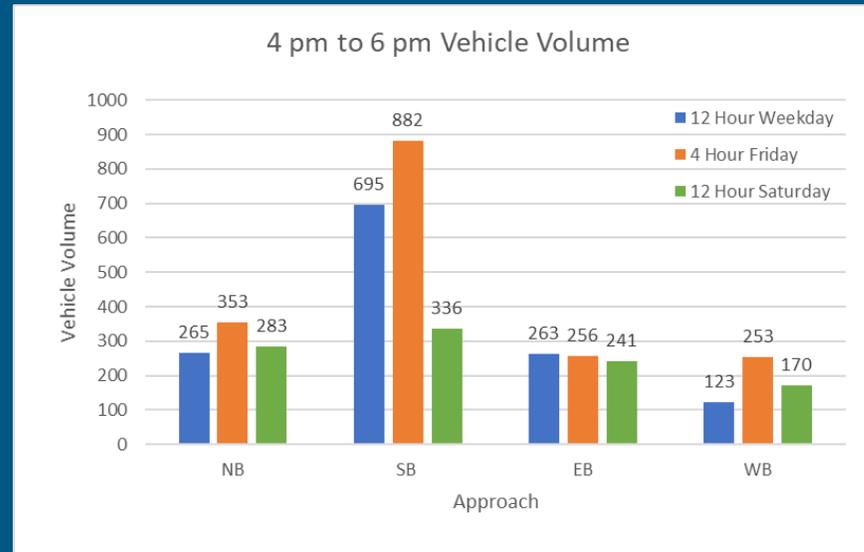
- Traffic Volumes (Turning Movement Count Data):
 - **12-Hour Weekday Count** (October 2015) – captured AM, Midday & PM Peak for analysis.
 - **Peak Hour Volumes** (2017) – comprised of **AM peak** (7:30 AM – 8:30 AM), **midday peak** (12:30 PM – 1:30 PM) and **PM peak** (4:15 PM – 5:15 PM) periods.
 - **2017 Summer Seasonal Count Data** - Additional count data was collected during August 2017 to capture summer seasonal weekday volumes, as well as **Friday evening and Saturday peak period** volumes.
- Crash Data (three (3) year study period) – **no consistent crash pattern found.**
 - Additionally, crash data for a 21-month period, from Sept. 9th, 2016 to June 7th, 2018, was collected. There were three (3) reported crashes, two of which were angle collisions due to a **vehicle running a red light and striking another vehicle traveling from an adjacent approach.** The third crash resulted from a truck hitting a parked car, so it may be considered independent from the traffic signal.

Traffic Count Data

Up-to-date Traffic Volume Data for Weekday, Friday, and Saturday was collected as requested for the All Way Stop Control Conversion.

- 2017 Turning Movement Count Data

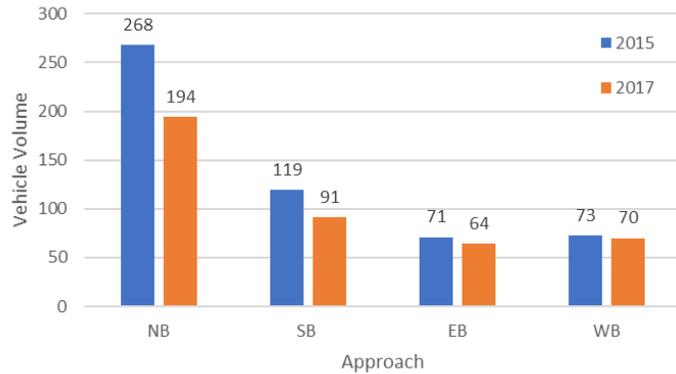
- 12-Hour Weekday** Turning Movement Count on August 22nd, 2017 from 6AM to 6PM capturing AM, Midday, & PM Peak Periods (see Figure 2A).
 - 4-Hour Friday** Turning Movement Count on August 18th, 2017 from 4PM to 8PM capturing PM Peak Period (Figure 2B).
 - 12-Hour Saturday** Turning Movement Count on August 19th, 2017 from 6AM to 6PM capturing AM, Midday, & PM Peak Periods.



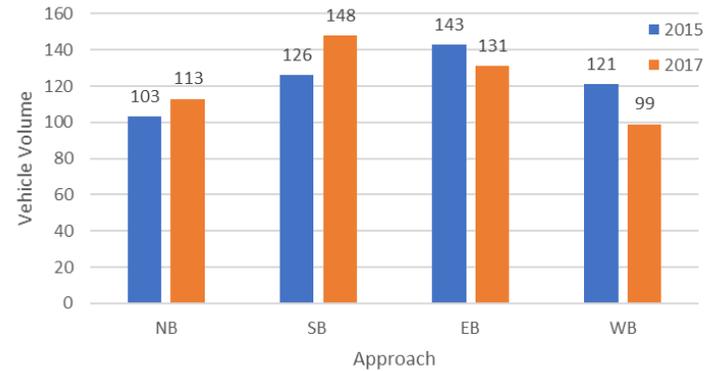
Traffic Volume Trends

Traffic Volume Trends were Evaluated for the Intersection as part of the All Way Stop Control Conversion.

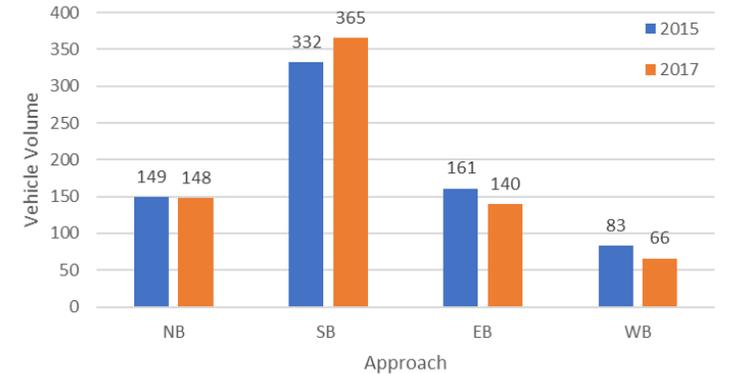
AM Peak Hour Volumes



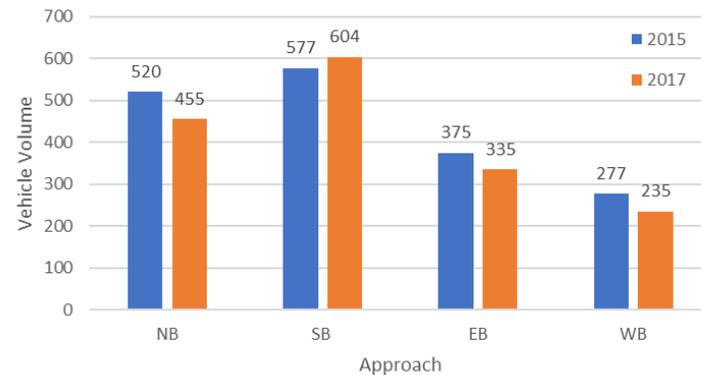
Mid-day Peak Hour Volumes



PM Peak Hour Volumes



Total Peak Hour Count Volumes



All-Way Stop Control Conversion provides Operational Benefits compared to the Existing Signal.

2015 Turning Movement Count Data

Signal Control LOS and Delay (s/veh)										
Peak Hour		Approach								Intersection
		Eastbound Delaware Street		Westbound Delaware Street		Northbound SR9 6th Street (N378)		Southbound SR9 6th Street (N387)		
		Concurrent		Concurrent		Concurrent		Concurrent		
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	
AM Peak Hour (7:00AM-8:00AM)	B	15.5	B	15.3	B	14.7	B	12.9	B	14.5
Midday Peak Hour (1:00PM-2:00PM)	B	16.2	B	15.8	B	12.3	B	12.7	B	14.5
PM Peak Hour (4:30PM-5:30PM)	B	16.6	B	15.3	B	13.0	B	15.4	B	15.2



All Way Stop Control LOS and Delay (s/veh)										
Peak Hour		Approach								Intersection
		Eastbound Delaware Street		Westbound Delaware Street		Northbound SR9 6th Street (N378)		Southbound SR9 6th Street (N387)		
		Stop-Controlled		Stop-Controlled		Stop-Controlled		Stop-Controlled		
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	
AM Peak Hour (7:00AM-8:00AM)	A	8.8	A	8.6	B	10.2	A	8.5	A	9.4
Midday Peak Hour (1:00PM-2:00PM)	A	8.6	A	8.4	A	8.3	A	8.5	A	8.5
PM Peak Hour (4:30PM-5:30PM)	B	10.2	A	9.2	A	9.5	B	11.9	B	10.7

2017 Turning Movement Count Data

Signal Control LOS and Delay (s/veh)											
Peak Hour		Approach								Intersection	
		Eastbound		Westbound		Northbound SR9		Southbound SR9			
		Concurrent		Concurrent		Concurrent		Concurrent			
		LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)		
Friday 08/2017	PM Peak Hour (4:30AM-5:30PM)	B	15.8	B	16.2	B	13.6	B	17.5	B	16.2
Saturday 08/2017	Peak Hour (2:15PM-3:15PM)	B	15.9	B	15.5	B	15.5	B	13.8	B	15.1
Weekday 08/2017	AM Peak Hour (7:30AM-8:30PM)	B	15.1	B	15.2	B	13.5	B	12.4	B	13.8
	Midday Peak Hour (12:30PM-1:30PM)	B	15.9	B	15.4	B	12.6	B	13.0	B	14.1
	PM Peak Hour (4:15PM-5:15PM)	B	16.2	B	15.2	B	13.1	B	16.3	B	15.5



All Way Stop Control LOS and Delay (s/veh)											
Peak Hour		Approach								Intersection	
		Eastbound		Westbound		Northbound SR9		Southbound SR9			
		Stop-Controlled		Stop-Controlled		Stop-Controlled		Stop-Controlled			
		LOS	Delay (s/veh)								
Friday 08/2017	PM Peak Hour (4:30AM-5:30PM)	B	10.4	B	11.0	B	10.9	C	17.2	B	14
Saturday 08/2017	Peak Hour (2:15PM-3:15PM)	A	9.8	A	9.5	B	12.3	B	10.3	B	11
Weekday 08/2017	AM Peak Hour (7:30AM-8:30PM)	A	8.2	A	8.2	A	8.9	A	8.2	A	8.5
	Midday Peak Hour (12:30PM-1:30PM)	A	8.6	A	8.4	A	8.5	A	8.7	A	8.6
	PM Peak Hour (4:15PM-5:15PM)	A	10.0	A	9.3	A	9.6	B	13.1	B	11.4

Note: Capacity analysis software results are found to represent observed field conditions, and can be verified by completion of stopped-time delay studies as part of the all-way stop control conversion process.

Intersection Control Comparison

All-Way Stop Control Conversion provides Safety Benefits and Improved Operations compared to the existing signal.

The results of the traffic engineering study show that the signal at the intersection of DE Route 9 / 6th Street and Delaware Street is **not warranted** under existing conditions (using both 2015 and 2017 volumes), and that an *all-way stop control (AWSC) condition will satisfy safety concerns, operational expectations, and field condition considerations.*

Overview

All-Way Stop Control Condition matches other locations along Traffic Corridor, meeting Driver Expectations.



E 6th St. & Harmony St.



W 6th St. & Tremont St.



6th St. & Delaware St.



E 6th St. & Chestnut St.



W 6th St. & South St.

Overview

All-Way Stop Control Condition matches other locations along Traffic Corridor, meeting Driver Expectations.



Delaware St. & W 7th St



Delaware St. & 6th St.



Delaware St & 5th St.



Delaware St. & W 7th St



Delaware St & 4th St.

All-Way Stop Control Conversion is Reversible.

- Low installation & removal cost
- Minimal installation/removal time
- Test Period – can easily turn signal back on



Follow-Up Questions

- **How is vehicular and pedestrian safety being addressed?**

The primary goal of the previously conducted traffic study is determining the most appropriate form of traffic control for the intersection holistically based on safety and operational considerations for both vehicular traffic and pedestrians. **The safety evaluations include the review of crash history data and conducting field observations. Pedestrian crosswalks have also been installed at the intersection since the original traffic study was completed.**

- **Would signal timing adjustments help with congestion on 6th Street?**

The analysis of the collected turning movement count data did not reflect an unacceptable level-of-service under signal control or stop control conditions, and **congestion was not reflect to be detrimental to operations.** A stopped-time delay study will be performed during the All-Way Stop Control Conversion, as well as observations of existing queues after the conversion. If the signal was to remain with maintenance / construction upgrades made, **signal timings would be implemented based on time of day and traffic demand.** Installing an extended green without engineering justification could lead to liability, ethical, and safety concerns at the intersection.

- **Are there any recommendations being made to address operational concerns on Fridays and Weekends?**

The collection of turning movement count data was completed to capture summer seasonal volumes for 12-hours during a typical summer weekday, 4-hours during a Friday evening, and 12-hours during summer Saturday. **The summer weekend count data was utilized for additional highway capacity analysis using HCS7, which reflected acceptable operations (i.e. LOS and Delay) under an all-way stop control condition.**

Follow-Up Questions

- **Would stop signs actually encourage motorists to stay on main roads or have no impact during gridlock conditions?**

As there are other intersections in proximity to DE Route 9 / 6th Street (N378) and Delaware Street that are currently operating under an all-way stop control condition, **the conversion to All-Way Stop Control is not anticipated to have significant impacts to volumes or traffic demands at this location.**

- **Can DeIDOT predict possible traffic diversions? Would it be Third street?**

The completed traffic engineering study for the All-Way Stop Control Conversion **did not include evaluation of possible diversion of traffic.** Additional data collection on Third Street was completed as part of the updated All-Way Stop Control Conversion. **Heavy percentages of diverted traffic is not anticipated, although observations can be made as part of the All-Way Stop Control Conversion process.**

- **When will the signal equipment be removed?**

We are proposing an extensive monitoring period after conversion to the all-way stop control that can be expanded or modified at any time. **The traffic signal equipment will not be removed immediately; the signals will be operated in flashing red mode on all approaches, typically for a period of 6 months to one year.** The conversion schedule can be modified that best suits activities occurring within the City. For example, we pushed the potential conversion date to start in Fall 2018 after summertime events. It is also important to note, if we observe safety or operational issues during the monitoring period, we will be able to quickly revert back to the signalized control.

All-Way Stop Control Conversion

- The City Council to provide documentation agreeing to initiation of monitoring effort timeline.
- A typical all-way stop conversion process follows this general framework and typically extends for a calendar year:

30 days Prior to Installation

- Installation of signs
- Press release

One Week Prior to Installation

- Installation of message boards

Day of Installation

- Stop signs installed or un-bagged
- Flash operation observed
- Observe queuing, stopped-time delay

One Week After Installation

- Observe queuing, stopped-time delay
- Observe intersection traffic operations

Two (2) Months After Installation

- Perform Crash Analysis
- Observe Intersection traffic operations

Six (6) Months After Installation

- Perform Crash Analysis
- Observe Intersection traffic operations

One Year After Installation

- Perform Crash Analysis
- Final decision made on AWSC at intersection

- Timeline may be adjusted as needed; may change as a result of discussions with city staff.
- The City Council provides documentation to reverse all-way stop control conversion to a signal at the conclusion of the monitoring effort, per requirements set forth by City Council.



To Proceed

Agreement from City of New Castle to proceed with development of an All-Way Stop Control Conversion Process Timeline and Checklist

To Collaborate

City of New Castle and DeIDOT to collaborate and agree on an All-Way Stop Control Conversion Process Timeline and Checklist

To Move Forward

Once an All-Way Stop Control Conversion Process Timeline and Checklist has been developed, DeIDOT will follow the timeline and checklist to continue to move forward with evaluating the intersection under an All-Way Stop Control Condition

DE Route 9 /

6th Street & Delaware Street

Thank You & Questions?

All-Way Stop Control Conversion

June 2018

