

MEMORANDUM

To: Steve Parkinson, Director of Public Works, City of Portsmouth, NH
 From: Dirk Grotenhuis, P.E.; Ben Swanson
 Subject: Woodbury Avenue Traffic Monitoring and Stop Control Analysis
 Date: 15 January 2013

1.0 Introduction

To determine if existing traffic conditions warrant the addition of all-way stop control along Woodbury Avenue in Portsmouth, NH, Resource Systems Group (RSG) performed continuous traffic counts at 8 locations on and around Woodbury Avenue from Rockingham Avenue through Echo Avenue.

Figure 1 presents the 8 count locations along with the 5 study intersections examined in this analysis.

Figure 1: Study Intersections



2.0 All-Way Stop Control Guidance

The 2009 Manual on Uniform Traffic Control Devices (MUTCD)¹ provides industry standardization on the appearance, placement, and implementation of traffic control devices including signage and intersection control, and also provides warrant thresholds and guidance on when certain traffic control elements should be installed.

Section 2B.04 (Right-of-Way at Intersections) of the MUTCD presents three instances in which stop or yield control should be applied at an intersection:

03 YIELD or STOP signs should be used at an intersection if one or more of the following conditions exist:

- A. *An intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;*
- B. *A street entering a designated through highway or street; and/or*
- C. *An unsignalized intersection in a signalized area.*

In the case of all five study area intersections, Woodbury Avenue is the designated through street and all minor legs are stop controlled (corresponding with item B above). This section of the MUTCD goes on to state:

05 YIELD or STOP signs should not be used for speed control.

In specifically discussing all-way stop control, section 2B.07 (Multi-Way Stop Applications) states that multi-way stop control should be used at intersections “where the volume of traffic on the intersecting roads is approximately equal.” This section goes on to provide the following guidance on when multi-way stop control should be considered:

04 The following criteria should be considered in the engineering study for a multi-way STOP sign installation:

- A. *Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*
- B. *Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
- C. *Minimum volumes:*
 1. *The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
 2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*
 3. *If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*
- D. *Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

¹ American Traffic Safety Services Association (ATSSA), ITE, and AASHTO, *Manual on Uniform Traffic Control Devices*, 2009 Edition (Washington DC: FHWA, 2009).

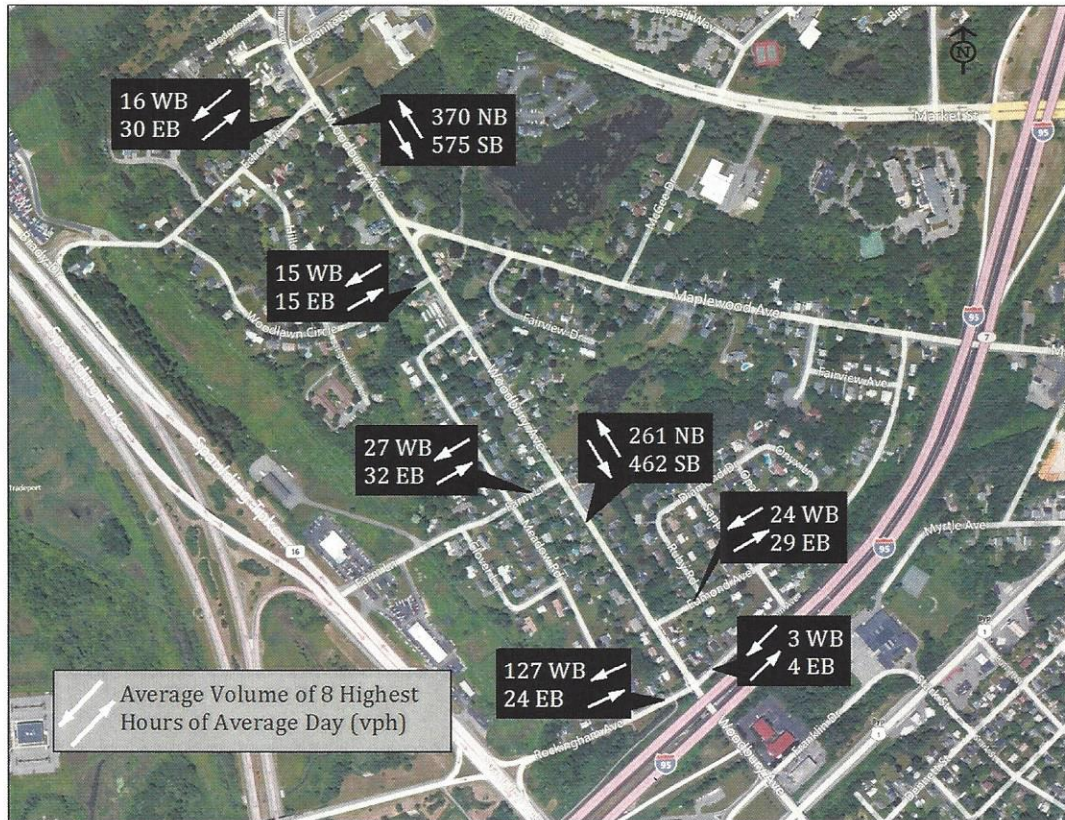


3.0 Traffic Volume Data

Continuous directional traffic data were collected at the 8 count stations from Saturday, November 3rd 2012 through Sunday, November 11th 2012. To compare study area traffic volumes with the minimum volumes presented in MUTCD 2B.07 04 C, noted above, we have calculated average daily traffic volumes and have further calculated average volumes from the 8 busiest hours of the average day at each site. Additionally, as presented in Section 4.0, the 85th percentile speeds observed along Woodbury Avenue were found to be less than 40 mph, and as such, the reduced volume thresholds do not apply.

Figure 2 presents the average volume of the 8 highest hours of the average day at each study area count location. As can be seen below, the volumes on Woodbury Avenue are disproportionately larger than all minor leg volumes. Additionally, while the volumes along Woodbury Avenue exceed the 300 vehicles per hour (vph) minimum set forth in MUTCD Section 2B.07 04 C, all minor leg traffic volumes are significantly below the 200 vehicles per hour minimum volumes for all minor leg approaches entering the study area intersections, indicating that none of the study intersections are good candidates for all-way stop control.

Figure 2: Average Volume of the 8 Highest Hours of the Average Day



4.0 Traffic Speed Data

Speed data was also collected along with volume data at all count locations. Figure 3 and Figure 4 present the speed profiles observed on Woodbury Avenue north and south of Maplewood Avenue, respectively. As can be seen below, the majority of traffic at both locations travels between 30 and 35 mph, with slightly higher speeds south of Maplewood Avenue.

The 85th percentile speeds north and south of Maplewood Avenue were calculated to be 34 mph and 35 mph, respectively. The 50th percentile speeds north and south of Maplewood Avenue were calculated to be 28 mph and 30 mph, respectively.¹

Figure 3: Speed Profile on Woodbury Avenue North of Maplewood Avenue

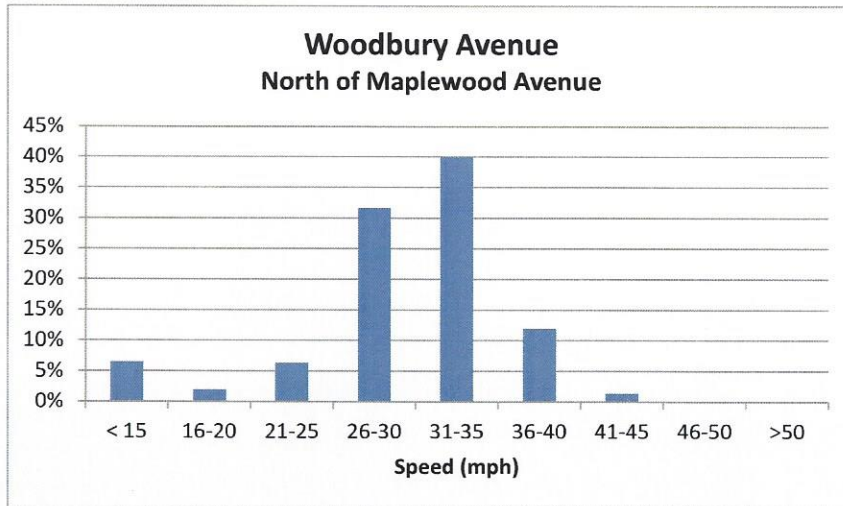
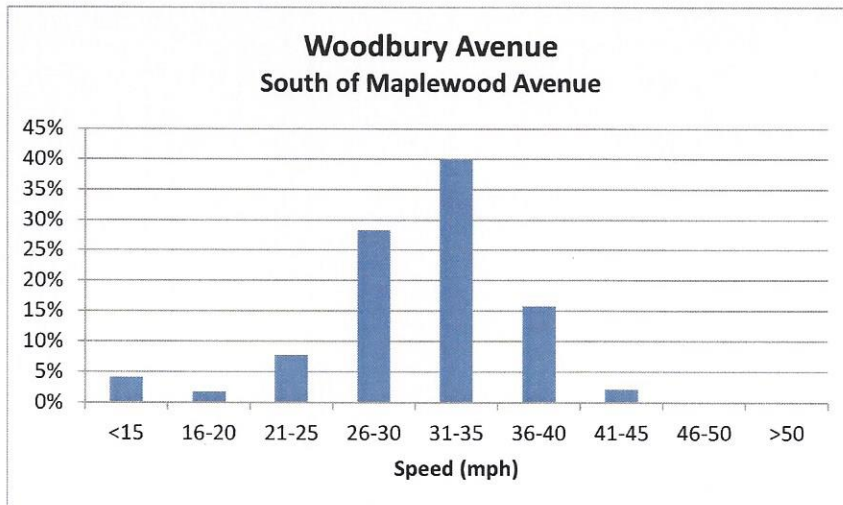


Figure 4: Speed Profile on Woodbury Avenue South of Maplewood Avenue



¹ The 85th percentile speed is the speed at which 85% of all traffic is travelling at or below, and is commonly used in traffic engineering as a design speed. The 50th percentile speed, or median speed, is the speed at which 50% of all traffic is travelling at or below.



5.0 Safety Assessment

In addition to traffic volume and delay considerations, stop control may be warranted in situations where adding a stop sign would likely improve safety at an intersection. As noted above, MUTCD section 2B.07 04 B states that multi-way stop control should be considered if:

- B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*

To investigate this possibility, we obtained historic crash data from the City of Portsmouth for years from 2009 to 2012. From this data we found that none of the five study area intersections experienced 5 or more crashes within this entire time period, let alone during any single year, regardless of crash type.

Similarly stop signs may be necessary in locations where sight lines between vehicles on different approaches are obstructed such that no clear lines of sight exist between the uncontrolled approach (through street) and stopped vehicles on minor legs of the intersection. While visiting the site in November 2011, we observed sight lines at all five study area intersections and found adequate sight distance at all five study area intersections.

6.0 Conclusions

After performing detailed and thorough traffic counts to characterize current traffic conditions along Woodbury Avenue, and considering traffic count volumes, vehicle speeds, crash histories, and intersection sight distances, we believe the current intersection configurations are appropriate at all five study areas and do not recommend multi-way stop control be pursued at any of the five study area intersections.

Please feel free to contact us with any questions.

