

MEMORANDUM

TO: Homayoon Pirooz, PE

FROM: Patrick Cawley, PE, PTOE

DATE: December 12, 2011

SUBJECT: Pedestrian Crossing Improvements – Plymouth near Beal and Washtenaw near Tappan Middle School

Concerns regarding pedestrian crossings on Plymouth Road and Washtenaw Avenue (BL-94) are present as both are challenging corridors to cross. Recent enforcement and advertisement of the pedestrian ordinance have renewed interest in improving features at these crosswalks.

A Council resolution sponsored by the Mayor on October 24, 2011 directed staff to analyze and design appropriate tools to enhance the pedestrian crossings. This memorandum summarizes the findings and recommendations.

Background Information

Plymouth Road is a five (5) lane facility approximately 61 feet wide. The cross section includes four travel lanes, a two way center turn lane and two bicycle lanes. The posted speed limit is 35 mph and average daily traffic volumes are approximately 22,000. The University of Michigan's north campus is on the southern part of the roadway with several pedestrian attractors/ generators located on the north side of the roadway. These include shopping, apartments, a business center, UM academic offices and religious facilities.

Near Beal Avenue, a mid-block pedestrian crossing island exists, which provides a primary crossing point to the Ann Arbor Islamic Center. This location has street lighting, ground mounted signage, illuminated overhead signage with down lights on the crosswalk. An AATA bus stop is located near the crosswalk for both directions. The westbound bus stop is on the far side and at a proper spacing from the crosswalk. The eastbound bus stop is coincident with the crosswalk and is confusing for drivers to know if bus patrons intend to cross the roadway.

Recently observed crossing activity at the crosswalk counted 27 pedestrian crossings during a time period of 24 minutes. This would equate to an average hourly flow of 68 per hour. The maximum flow presented in the 2004 Plymouth Road Pedestrian Crossing Improvement Study indicated during Ramadan a flow of 170 pedestrians per hour.

Washtenaw Avenue (BL-94) is a four lane facility between Brockman and Stadium Boulevard with a posted speed of 45 mph and a school zone limit of 30 mph. Average daily traffic volumes are 19,500 vehicles. A mid-block marked crosswalk exists providing a connection between the path on the north side of the roadway and the athletic fields behind Tappan Middle school. The path on the northside connects to a

residential neighborhood via Adare Court. School crossing warning signs are in place and street lighting is adjacent to the crosswalk. Prior to the completion of the Washtenaw Avenue non motorized path the AATA bus stops were coincident to the crosswalk. Under the current layout they are far side of the crossing for both directions. Cursory observations of the site indicate pedestrian crossings of less than 5 per hour.

Crash History

The crash history for the three year period 2008-2010 was examined for this evaluation. This period is the most current for which full year crash data exists. At Plymouth Road near Beal Avenue there were no reported pedestrian crashes for the period. One (1) rear end crash was reported in April 2010 near this location. Recent crash history (incomplete) indicates 0 rear crashes have occurred since July 2011 (placement of in-street signs). It should be noted the Plymouth Road location experienced two (2) pedestrian fatalities in 2003 and a pedestrian crash in 2002. These were prior to the installation of the pedestrian crossing islands and overhead lighted signage.

There were no reported crashes at the Washtenaw Avenue location during the time period.

Improvement Options

Following the adoption of the pedestrian crossing ordinance more focus has been placed on pedestrian crossing treatments. The current rate of vehicle yielding to pedestrians is improving but not at a level that would provide for pedestrian comfort or good driver expectancy. It is desirable that increased awareness and enhancement of crosswalks is put in place.

For midblock crossings there are several treatments which may be used. The options examined here will include those most applicable and previously suggested by the public or others. Some potential options to increase conspicuity and improve vehicle yielding behaviors changes include :

- 1) Rectangular Rapid Flashing Beacons (RRFB)
- 2) Pedestrian Hybrid Signal or HAWK signal
- 3) Flashing beacon sign combinations (ped actuated with traditional beacons in wig-wag flash)
- 4) Flashing signs with LEDs in border
- 5) Flashing in pavement crosswalk lights
- 6) Street lighting improvements
- 7) Flags carried by pedestrian

Rectangular rapid flashing beacons (RRFBs) consist of two (2) rectangular stutter flash beacons below pedestrian warning signage. They are push button actuated by the pedestrian and can include audible messages. The beacons are similar in nature to the light bars on the top of emergency vehicles. The unique nature of the strobe seems to increase awareness. Although they



are relatively new devices, in use for less than 5 years, they have been thoroughly tested in the last couple of years. Average yielding compliance rates of 77-85% are reported in recent studies and yielding rates do not diminish over time based on a two year study of effectiveness. Costs for solar powered installations are approximately **\$10,000 - \$15,000 per location**. Annual operation and maintenance cost are estimated to be \$160 per crossing. These devices are being incorporated in the Thurston Safe Routes to School project for locations on Green Road which is being federally funded.

Pedestrian hybrid beacons or HAWK signals are alternatives to traditional traffic signal installations. The signals are pedestrian actuated signals with a unique signal head configuration and phasing sequence. Upon actuation the vehicular signal indication flashes yellow, followed by a solid yellow, then a solid red then a flashing red state. The devices experience yielding rates of above 90%. Cost for the device vary based on the installation. Simple installations with lower technology controllers, span wire mountings and basic features are reported to cost under \$50,000. Presently in place at the Huron / Third / Chapin intersection the City has experience with this type of device. The installation on Huron Street cost in excess of \$100,000 due to the complexity of the installation (advance flashers, full function controller, mast arms).

The Plymouth Road crossings at Beal Avenue and Bishop Street both experience pedestrian and vehicular volumes above the warranting levels for a Pedestrian Hybrid signal. The Manual on Uniform Traffic Control Devices (MUTCD) is the federal version of the manual, which provides criteria for traffic control installation. Per Figure 4F-1 and 4F-2 from 2009 MUTCD the warrants are met. The cost of installation at these locations would be less than a complete system. Due to the existing mast arm supports that are in place for the overhead signage and can be retrofit for the Pedestrian Hybrid signal. The cost to retrofit the existing devices and utilize full traffic signal controllers is \$50,000 per location.



Flashing beacon sign combinations are another possible treatment. Overuse is a problem with beacons, with continuous operation they tend to blend in to the roadside and lose effectiveness. In this instance actuated operation would be used to only operate when pedestrian present. Costs would depend on the type of installation. Hardwired, conventionally installed signs with beacons would cost approximately \$15,000. There would be an additional cost of \$100 per year for power and maintenance. Solar powered LED flashers are a possibility and estimated cost of \$10,000 for a pair of signs is expected with annual maintenance of \$160.



Flashing signs with LEDs imbedded in the border of the sign are a relatively new device. The ring road at Briarwood Mall has them in place as do the roadways around Beaumont Hospital. The manufacturer's report a yielding rate of 80% with the signs in place. They conform with the MUTCD but do not have a interim approval and do not appear to be used on any public streets in the area. The cost for the installations is estimated to be \$6,000 per location.

Flashing in pavement lights have been adopted in the MUTCD. They are modeled after in runway airport lighting and are low profile LED strobes that emit light towards oncoming traffic from the crosswalk surface. Studies have shown they are effective in providing increased awareness of the crossing and improved yielding to pedestrian in the crosswalk. Estimated costs would exceed \$40,000 depending on actuation and power options. Locally these are present in Brighton and Detroit.



Visibility and Lighting

Night time awareness of pedestrians near the crosswalk is important. The current lighting on Plymouth Road provides for down lights at the crosswalks and street lighting at the island. Street lighting is important for pedestrian safety and particularly to identify pedestrians intending to cross. Street lighting along the corridor appears to provide adequate luminance but may not be optimally placed according to current best practices. Current design guidance places the street lighting in front of the crosswalk to provide proper contrast.

Proper location of Bus stops

To eliminate confusion of people standing at a crosswalk it is preferable to locate bus stops away from the crosswalk. The AATA has stops before the crosswalk, at the crosswalk or far side of the crossing. The far side configuration is the optimal location and the City is coordinating to relocate stops particularly along Plymouth Road.

In Street Signage

In street Stop for Pedestrian signage is already in place across the city at all median locations. The in street sign is compliant with the MMUTCD and is fairly effective in promoting yielding to pedestrians. It is important to note the signage we have in place is the standard sign from the MMUTCD and the uniform size, color and message is vital component of proper guidance. In Michigan the version of the sign should include local law (no state law is in place) on the top and display either stop or yield symbol with the pedestrian symbol. The "Within Crosswalk" is the text message which is consistent with state / national signage. This is subtle difference from ordinance language and once ordinance language is modified any changes can be explored.

Additional Locations of Interest

The focus of this memorandum is to explore possible improvements at Plymouth near Beal and Washtenaw near Tappan middle school. As a part of our review, other midblock crossings that are of interest to the public and merit discussion as well.

Plymouth Road

Along Plymouth Road three (3) other pedestrian crossing islands exist. These are located near Bishop, near Traver Village shopping center and near Georgetown Boulevard. The pedestrian activity at each varies and rear end crashes have recently occurred near Bishop and Traverwood Village. Pedestrian crossing flows appear to exceed 20 peds per hour at these two locations as well.

Liberty Street

Liberty at Crest is one of the highest volume school crossings in the City. Concerns regarding crossing at this location due to the speeds experienced on Liberty Road have been raised presently and in years past. A crossing guard is located there and in 2006 the crossing was upgraded to include overhead crossing signs.

Packard Road

On Packard Road near Woodmanor a pedestrian crossing island exists. This was installed in 2009 as a part of a citywide pedestrian safety project. The site was the scene of a previous pedestrian injury crash. A recent rear end crash occurred at the location.

Washtenaw Avenue

Washtenaw Avenue (BL-94) west of Platt Road has an existing crosswalk that serves the County Rec Center. The speed and volume of traffic at the location make it difficult and very uncomfortable to cross. Future improvements are planned to signalize the Platt Road intersection and likely consolidate this crossing to the intersection.

Based on the high volume of pedestrian traffic at these locations is appropriate to utilize enhanced devices. There are a variety of treatments with a range of possible costs and effectiveness for each case. The Plymouth Road locations due to the proximity to the Beal location are candidates to receive a similar treatment.

Recommended Improvements

The relocation of the bus stops at the Beal location has already been initiated. Final placement is being coordinated with AATA.

Plymouth Road

The use of Rectangular Rapid Flashing Beacons (RRFB) is recommended for all four Plymouth Road locations. RRFBs provide a high rate of yield compliance and are inexpensive compared to signalization options. The solar panels used to power the devices lowers the ongoing O&M cost of the device as well. It is highly desirable to treat all the crossing in the corridor in a uniform manner. As volumes at the Plymouth / Traverwood and Plymouth / Georgetown would not exceed warranting levels RRFBs would be the most advanced treatment. Furthermore the existing conditions with the crossing islands, overhead signage and markings compliment the installation of RRFBs.

The proposed improvement would be to add RRFBs at the four (4) crossing locations on Plymouth and augment the pavement markings to include advance stop bars to best locate the place to stop and not impede the ability of the pedestrian to see or be seen by traffic in the other lane. The estimated cost of the improvements is \$65,000.

Washtenaw Avenue

The Washtenaw Avenue location is under the jurisdiction of the Michigan Department of Transportation. The City of Ann Arbor has requested the MDOT examine the site for possible improvements. The request letter is attached and follow up conversations with MDOT provided the guidance documents they will use. Based on the pedestrian volumes witnessed by City staff a advanced treatment (i.e HAWK signal) is likely not warranted. MDOT will conduct a thorough data collection effort and analysis for the determination.

Budget and Schedule

As the improvements were not previously included in our financial plan or Capital Improvements process, there is no ready funding source. It is recommended that to quickly implement improvements, the use of fund balance from the ACT 51 major streets be utilized. In addition to the installation costs, future operation and maintenance costs for any traffic control devices will impact the budget of field operations. Energy costs, knockdowns and service life replacements will all contribute to costs going forward.

A lead time of approximately 3-4 weeks is required for the ordering of equipment. The anticipated start of installation is early February (dependent on material delivery) with complete installation by March 31.

Comparison of Pedestrian Crossing Treatments

Treatment	Cost	MUTCD Compliant	Yield Compliance Rate	Issues
Signing and Markings	\$ 1,200	Yes		
In road signing	\$ 400	Yes	Up to 87%	Knockdowns frequent- slower speed roadways
Overhead signing	\$ 15,000	Yes		High costs
Refuge Island	\$ 60,000	n/a	n/a	Requires modification to road geometry
In pavement Flashers	\$ 40,000	Yes	50-90%	Snow plow may damage, high maintenance cost, varying effectiveness
Flashing Beacon	\$ 10,000	Yes	Varies	Continuous operation is ineffective, overuse diminishes effect over time
Rectangular Rapid Flashing Beacons	\$ 15,000	Yes-interim	80%+	
Traffic Signal	\$120,000	Warranted	99%	High installation cost, difficult to meet warrants, energy cost, adds traffic delay, false actuations by pedestrians
Pedestrian Hybrid Signal or HAWK	\$ 75,000	Warranted	90%+	Energy cost, disrupts traffic progression, false actuations by pedestrians
Street Lighting	\$ 3,000	n/a	n/a	On going energy cost
Blinker Sign	\$ 6,000	-	80%	Not included in 2009 MUTCD
Pedestrian Flags	\$ 1,000	n/a	65%	Flags can be stolen, unclear message

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

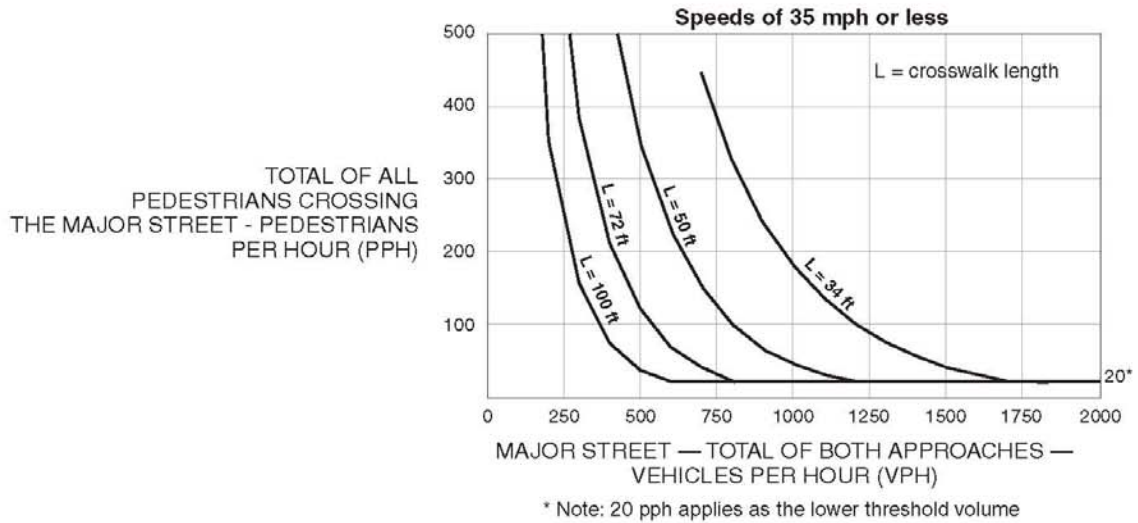
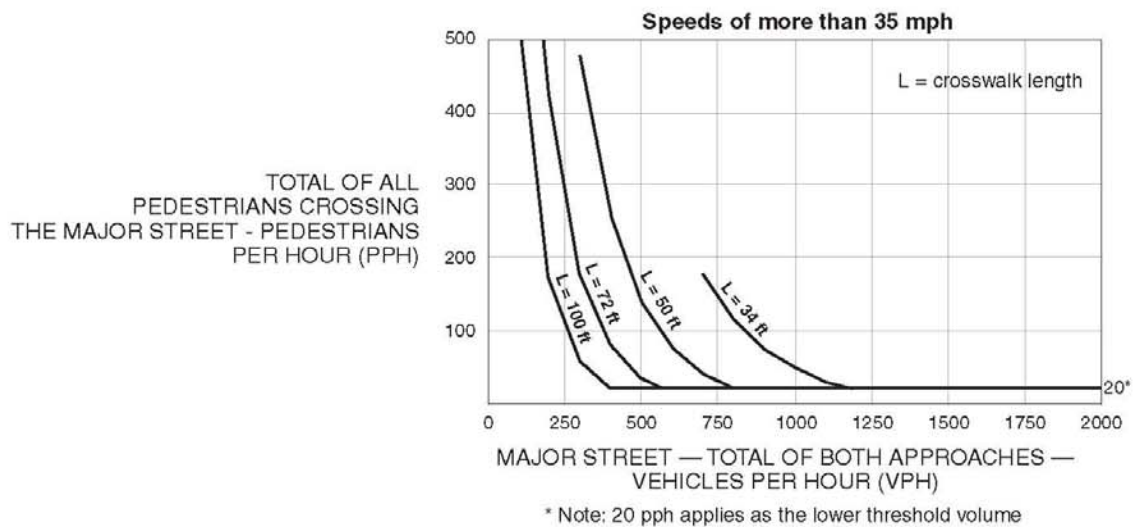


Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways





CITY OF ANN ARBOR, MICHIGAN

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Public Services Area
Project Management Unit
November 4, 2011

Larry Dropiewski

Michigan Department of Transportation
10321 E. Grand River
Suite 500
Brighton, MI 48116

Re: Pedestrian Crossing Improvement at I94-BL near Ann Arbor Tappan Middle School

Dear Mr. Dropiewski:

I would like to continue our earlier conversation with a request for the review of the existing marked pedestrian crosswalk at the MDOT's I-94 BL (Washtenaw Ave), west of Bedford Dr in the City of Ann Arbor. This location with the newly constructed side path on the north, the proximity to the Tappan Middle School and the high speed multi lane nature of the roadway is of special interest to us.

The City of Ann Arbor believes in the "Complete Street" philosophy and continues to strive for excellence in its transportation facilities for all modes of travel, including a citywide safe and dependable system for its ever increasing foot traffic. MDOT has been our partner in that effort, and demonstrated its commitment to the pedestrian safety in Ann Arbor by the installation of the first HAWK signal in the City at I-94 BL (Huron Street), near Chapin St and Third Street.

Upon completing your analysis, we hope for your consideration for a new HAWK signal or an equally effective mechanical system at Washtenaw Ave. near the Tappan Middle School. If we can be of any assistance or provide additional data, please let me know. We look forward to hearing from you.

Sincerely,

Project Management

Homayoon Pirooz, P.E.
Manager

CC: Patrick Cawley, P.E., Senior Project/Traffic Engineer
Eli Cooper, Transportation Program Manager

