AGENDA

Traffic Committee Meeting

June 18, 2014 – 7:30 P.M.

Lower Level Conference Room – Troy City Hall

500 West Big Beaver Road

1. Roll Call

2. Minutes – April 16, 2014

REGULAR BUSINESS

3. Speeding Issues – Beach Road, south of Wattles Road

4. Traffic Calming Measures

5. Public Comment

6. Other Business

7. Adjourn

cc: Item 3: Heather Carr, 2504 Avonhurst
Jelena Tafelski, 2505 Oxford
Properties within 300'

Traffic Committee Members
Captain Robert Redmond & Sgt. Mike Szuminski, Police Department
Lt. Eric Caloia, Fire Department
William J. Huotari, Deputy City Engineer/Traffic Engineer

TRAFFIC COMMITTEE

MESSAGE TO VISITORS, DELEGATIONS AND CITIZENS

The Traffic Committee is composed of seven Troy citizens who have volunteered their time to the City to be involved in traffic and safety concerns. The stated role of this Committee is:

a. To give first hearing to citizens' requests and obtain their input.

b. To make recommendations to the City Council based on technical considerations, traffic surveys, established standards, and evaluation of citizen input.

c. To identify hazardous locations and recommend improvements to reduce the potential for traffic crashes.

Final decisions on sidewalk waivers will be made by the Committee at this meeting.

The recommendations and conclusions arrived at on regular items this evening will be forwarded to the City Council for their final action. Any citizen can discuss these recommendations before City Council. The items discussed at the Traffic Committee meeting will be placed on the City Council Agenda by the City Manager. The earliest date these items might be considered by City Council would normally be 10 days to 2 weeks from the Traffic Committee meeting. If you are interested, you may wish to contact the City Manager's Office in order to determine when a particular item is on the Agenda.

Persons wishing to speak before this Committee should attempt to hold their remarks to no more than 5 minutes. Please try to keep your remarks relevant to the subject at hand. Please speak only when recognized by the Chair. These comments are made to keep this meeting moving along. Anyone wishing to be heard will be heard; we are here to listen and help in solving or resolving your particular concerns.

REGULAR BUSINESS

3. Speeding Issues – Beach Road, south of Wattles Road

Heather Carr of 2504 Avonhurst and Jelena Tafelski of 2505 Oxford request that traffic control be placed on Beach Road, south of Wattles Road to slow traffic down. Ms. Carr and Ms. Tafelski state that the lack of traffic control on Beach encourages speeding on this section of road.

4. Traffic Calming Meausres

General discussion of traffic calming measures.

5. Public Comment

6. Other Business

7. Adjourn

A regular meeting of the Troy Traffic Committee was held Wednesday, April 16, 2014 in the Lower Level Conference Room at Troy City Hall. Pete Ziegenfelder called the meeting to order at 7:30 p.m.

1. Roll Call

PRESENT: Sarah Binkowski
Tim Brandstetter
Ted Halsey
Richard Kilmer
Al Petrulis
Pete Ziegenfelder

ABSENT: Stevan Popovic

Also present: Martin & Shirley Mortensen, 3698 Finch
Robert Dona, 3680 Finch
Mark Abdal, 908 Huntsford
Mike Wullaert, 860 Huntsford
Daved Dietze, 1900 Witherbee
Eric Esshaki, 1914 Witherbee
Dianne Poulton, 1432 Madison
Bradley Reynolds, 373 Coachman, Apt. 3c
Sgt. Mike Szuminski, Police Department
Bill Huotari, Deputy City Engineer/Traffic Engineer

2. Minutes – March 19, 2014

RESOLUTION # 2014-04-14

Moved by Binkowski
Seconded by Halsey

To approve the March 19, 2014 minutes as printed.

YES: 6 (Binkowski, Brandstetter, Halsey, Kilmer, Petrulis, Ziegenfelder)
NO: None
ABSENT: 1 (Popovic)

MOTION CARRIED

REGULAR BUSINESS

3. Request for Traffic Control – Ogden at Keats

Dianne Poulton of 1432 Madison Drive requests that traffic control be placed at the

intersection of Ogden and Keats. Ms. Poulton states that the lack of traffic control at the intersection creates a hazardous situation.

Ms. Poulton was in attendance at the meeting and discussed her concerns as a representative of the homeowners association. She stated that the homeowners association supports the installation of a Yield sign. During the winter months the intersection was difficult to navigate and the intersection had many close calls. Ms. Poulton believes that drivers are not yielding or stopping to allow vehicles to pass through the intersection safely.

Mr. Petrulis would recommend a Stop sign as he believes they are more effective at assigning right-of-way.

Sgt. Szuminski agreed and stated that Stop signs are more enforceable.

RESOLUTION # 2014-04-15

Moved by Binkowski
Seconded by Kilmer

RESOLVED, that the intersection of Ogden and Keats be modified from NO Traffic Control to a STOP sign on the Keats southbound approach to Ogden.

YES: 6 (Binkowski, Brandstetter, Halsey, Kilmer, Petrulis, Ziegenfelder)
NO: None
ABSENT: 1 (Popovic)

MOTION CARRIED

4. Request for Removal of No Parking Zone – 1914 Witherbee

Eric Esshaki of 1914 Witherbee requests that the No Parking restrictions adjacent to 1914 Witherbee be removed. The south side of Witherbee, between Eton and Graefield, is posted No Parking on school days only between 8:15 – 9:15 AM and 3:15 – 4:15 PM. The north side of Witherbee is posted No Parking as the fire hydrant side of the street. Mr. Esshaki states that the current No Parking restriction places an undue burden on residents.

Mr. Esshaki was present at the meeting and provided input on his request. He has four (4) vehicles at his home. There is currently no parking on the north side of the street due to fire hydrants. The south side is posted no parking during the AM and PM arrival and dismissal times, school days only. There is also no parking on the west side of Eton. His property is the corner parcel at Witherbee and Eton. He has to go out twice a day, when home, to move cars based on the posted signs. He feels this is a major inconvenience to him and his neighbors. Ms. Esshaki stated that the police department needs to enforce the current no parking zones as parents “stand” or wait along Eton and Witherbee to drop

off or pick up their children. He further stated that the original Traffic Committee minutes, from 2006, stated that the No Parking signs on the south side of Witherbee were placed based on lack of parking when Pembroke Elementary was constructing improvements. These improvements have long been done and the parking available at the school has sufficient capacity to hold all vehicles.

Mr. Dave Dietz of 1900 Witherbee spoke about lack of communication between the school and residents. Changes to the site were made and no input was requested or provided by residents. He stated that buses do not have issues with pulling out of the school site when cars are parked on the south side of Witherbee. Mr. Dietz stated that when the signs were placed the residents were told that they would still be able to park along the south side of the street. He further stated that the signs were placed to prohibit Pembroke Elementary employees from parking along the south side of the road during the construction back in 2006. A compromise was made at the 2006 Traffic Committee meeting to post the signs but limit it to the AM arrival and PM dismissal time. He reiterated that it is a major inconvenience to residents as they have to go out and move their vehicles to avoid enforcement action from the police. Mr. Dietz also stated that there are paid crossing guards at this school.

Mr. Kilmer asked about the No Parking zone on the north side [posted No Parking due to the fire hydrants]. He supports leaving it the way it is as the majority of school sites in the city have no parking zones established limiting parking during the AM arrival and PM dismissal periods. He recognized that at other school locations, No Parking signs are not very effective without enforcement due to the large volume of traffic to and from the school sites.

Ms. Binkowski understands the resident's frustrations since parents park or stand along both sides of the road. This situation is very common at all school sites.

Mr. Petrulis asked about the current time limits on the signs [current signs restrict parking from 8:15 – 9:15 AM and 3:15 – 4:15 PM].

Sgt. Szuminski responded to the resident concerns about lack of enforcement. He explained that there are 22 schools and virtually every school has parking issues. There are not sufficient staff to patrol each school during the AM and PM hours as higher priority calls for service take precedence. Troy Police officers are not looking to issue tickets to residents but have been to this location and talked to residents. Sgt. Szuminski said that there are just too many parents dropping off/picking up students. The time is short but there is a very intense amount of traffic during these times.

Mr. Brandstetter asked about vehicles parking or standing on both sides of the road as well as the ability of buses to enter/exit the site. Mr. Esshaki stated that parents do stand or park along both sides of the road. Mr. Esshaki further stated that buses do not have an issue pulling out of the site when cars are parked on the south side of the road.

Traffic Engineering did receive two (2) emails regarding this request. Principal Susan

Crocker of Pembroke Elementary states that Witherbee is a narrow road already and vehicles parking on the south side of the road will increase congestion and decrease safety during the AM arrival and PM dismissal. She understands the residents' concerns but supports no changes to the current parking restrictions.

The second email received was from Casey Marhefka of 3467 Witherbee (east of Eton) and supported making no changes to the current parking restrictions.

RESOLUTION # 2014-04-16

Moved by Binkowski
Seconded by Petrulis

RESOLVED, that the No Parking restrictions, along the south side of Witherbee, between Graefield and Eton, be REMOVED.

YES: 4 (Binkowski, Brandstetter, Petrulis, Ziegenfelder)
NO: 2 (Halsey, Kilmer)
ABSENT: 1 (Popovic)

MOTION CARRIED

5. Request for Traffic Control – Huntsford at Finch

Raimonda Abdal of 908 Huntsford Drive requests that the existing Yield signs at the intersection of Huntsford and Finch be replaced with Stop signs on the northbound and southbound Finch approaches to Huntsford . Mr. Abdal states that motorists do not yield at the intersection creating a hazardous situation.

Mr. Abdal was in attendance at the meeting and stated that drivers are not paying attention to the existing Yield sign. Drivers do not yield the right-of-way and there have been some close calls at the intersection. He recommends that the Yield signs be changed to Stop signs. Mr. Abdal stated that traffic has increased in the past few years and more drivers are cutting through from Wattles to Crooks.

Martin Mortensen of 3698 Finch does not believe there is a significant problem at the intersection and supports no changes to the current signage. He has not seen drivers ignoring or disobeying the existing signs.

Bob Dona of 3680 Finch also does not believe there is an issue at the intersection. He acknowledged that traffic has increased but he stated that the current traffic does not warrant a Stop sign. He stated that he does see drivers stopping or yielding at the intersection to other vehicles and pedestrians.

Shirley Mortensen of 3698 Finch reiterated that there is not a problem at the intersection. She said that there is a playground near the intersection but that children are watched very

closely. She believes that the current signage is appropriate and that no changes should be made.

Mr. Ziegenfelder is in favor of changing all Yield signs to Stop signs.

Mr. Brandstetter discussed the use of Stop signs where warranted. Use of Stop signs in locations where they are not warranted breed a false sense of security for drivers and pedestrians. Unwarranted Stop signs can create a safety issue if people assume that a vehicle is going to stop.

Mr. Halsey stated that Yield signs do not require a full or complete stop if there is no opposing traffic or pedstrians.

Ms. Binkowski reiterated Mr. Brandstetter's concerns about the use of Stop signs at locations where they are not warranted.

Traffic Engineering received one (1) email from Bob Beauchamp of 880 Huntsford recommending that the Yield sign be replaced with a Stop sign. He states that he has had several close calls at the intersection and a Stop sign would be more effective in protecting neighbors who have small children.

RESOLUTION # 2014-04-17

Moved by Binkowski
Seconded by Brandstetter

RESOLVED, that NO changes be made at the intersection of Huntsford and Finch.

YES: 4 (Binkowski, Brandstetter, Halsey, Ziegenfelder)
NO: 2 (Kilmer, Petrulis)
ABSENT: 1 (Popovic)

MOTION CARRIED

6. Public Comment

Ms. Dianne Poulton of 1432 Madison Drive discussed a parking issue on Crimson near John R. A home owner parks two (2) cars very close to the intersection which creates a hazard for drivers at the intersection. Troy Police will investigate and enforce as necessary.

7. Other Business

Information on the "TroyRoadsRock" program was distributed to the members. A discussion of the plan, anticipated schedule, etc. followed.

The Amber apartment complex was discussed as it is adjacent to the City Hall complex.

The DMC site was also discussed as it is also adjacent to the City Hall complex.

The skilled nursing and rehabilitation facility, proposed on the south end of the Zion church site, was discussed.

8. Adjourn

The meeting adjourned at 8:38 p.m.

Pete Ziegenfelder, Chairperson	Bill Huotari, Deputy City Engineer/Traffic Engineer

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ITEM #3

TRAFFIC COMMITTEE REPORT

May 30, 2014

TO: Traffic Committee

FROM: Bill Huotari, Deputy City Engineer/ Traffic Engineer

SUBJECT: Speeding Issues
Beach Road, South of Wattles Road

Background:

Heather Carr of 2504 Avonhurst and Jelena Tafelski of 2505 Oxford request that traffic control be placed on Beach Road, south of Wattles Road to slow traffic down. Ms. Carr and Ms. Tafelski state that the lack of traffic control on Beach encourages speeding on this section of road.

A speed study was conducted and it does show that for northbound Beach, south of Oxford that there is a speed issue. The 85th percentile speed is 34 mph and is primarily an issue during AM and PM peak hours. The other locations studied did not show speeds that would be considered outside of the normal.

The speed study was shared with Troy Police and they responded by placing the radar trailer on Beach the week of May 19th and May 26th. Additional enforcement is planned when officers are not on higher priority calls.

This section of Beach is somewhat unique in that it is more akin to a collector street than a residential street. The existing right-of-way is 86' wide and the existing pavement width varies between 28'-30' wide. The right-of-way is primarily open with minimal roadside obstacles. The other local streets in this area are within 60' right-of-way and are generally 20'-22' wide pavement sections.

Parking is prohibited on the east side of Beach due to fire hydrants. Stop signs are located at each intersection between Wattles and Palmerston (near Schroeder Park) but Beach only stops at Palmerston and at Cheswick. At all of the other intersections, Beach is the through street and Stop signs are on the intersecting streets. For northbound traffic on Beach, there are no Stop signs after the All-Way Stop at Cheswick until the driver reaches Wattles Road. This is the section where speeds are the highest.

Beach is the primary access from Wattles Road but volumes are under 1,000 vehicles per day (vpd). There does not appear to be a cut-through problem as volumes are fairly consistent from day-to-day, Beach ends at Hampton and does not provide a convenient route to another major road.

In the past, a request like this would have been addressed by direct enforcement with the Traffic Safety Unit assigning officers to patrol the area as most of the drivers are consistent from day-to-day and educating drivers through enforcement is a powerful tool. With the downturn in the economy, just

a few years ago, the Traffic Safety Unit was eliminated. Concentrated direct enforcement is no longer available even though Troy Police was able to provide a radar speed trailer and provide some level of enforcement recently. Enforcement now is provided by officers when they are not on higher priority calls so the level of enforcement available is significantly less than what was customary in the past.

Traffic Calming measures can take many forms. Typically, education is the first stage, then enforcement and finally physical measures which can vary from signs, pavement markings to actual physical changes to the road.

To date, only one location in the City has a physical measure in place. A speed hump was placed on Walnut Hill, just north of Wattles and east of Adams. The speed hump was paid for by the residents. Feedback on this location in the past has not been positive as it was a singular installation and issues associated with the existing speed hump have included: additional noise; it does not slow traffic down; and inconvenient for residents.

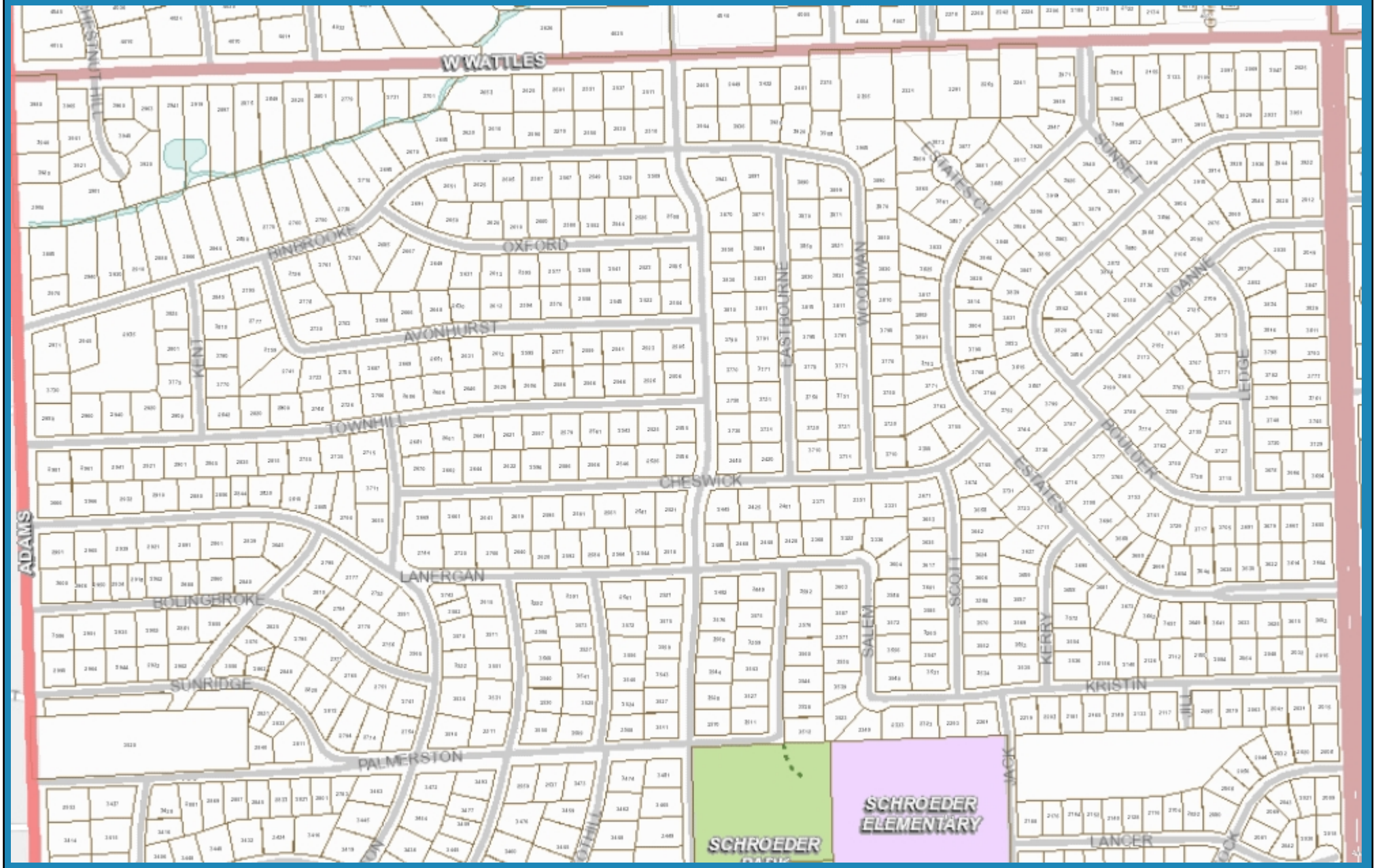
Short of making a physical change in the road or the ability to provide significant targeted enforcement, some suggestions for discussion include:

1. **Additional speed limit signs** – placement of additional speed limit signs to reinforce the speed can be placed to enhance driver recognition of the residential area. Effectiveness is generally assumed to be minimal as most drivers proceed at a speed that they believe is "reasonable and prudent" for the conditions they encounter regardless of a posted speed limit.
2. **Longitudinal pavement markings** – mark the centerline of the road with a solid, double yellow marking and solid, white edge lines. Pavement markings have shown some effectiveness in reducing speeds due to a perceived narrowing of the traveled way. Other studies show an increase in speed due to the pavement markings making the driver's task of tracking the roadway easier.
3. **In street speed limit markings** – large overlay cold plastic or painted "25 MPH" markings are placed on the pavement to remind motorists of the residential speed limit. Long term studies on the use of in street markings alone have shown little impact.
4. **Permanent radar speed sign** – these signs show drivers their speed as they approach the sign. Speed boards are effective initially, but results over longer periods of time are inconclusive without intermittent enforcement.

Stop signs are not recognized as a traffic calming device. Stop signs are intended to assign right-of-way at intersections and are to be placed based on guidance from the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). Studies have shown that Stop signs are not effective in reducing speeds and in many instances increase speeds due to drivers attempting to make up time due to a stop that they believe was not necessary. In addition, unwarranted Stop signs have the potential to reduce safety by creating a false sense of security for other drivers, children or pedestrians assuming a motorist will stop at a Stop sign.

A survey could be conducted of area residents to determine their level of support for various levels of traffic calming and brought back to the Traffic Committee for further discussion. Any physical improvement would require support by a majority of residents as the cost for the changes are paid for by the residents under a Special Assessment District (SAD). Traffic Calming measures are further discussed in Item 4 on the agenda.

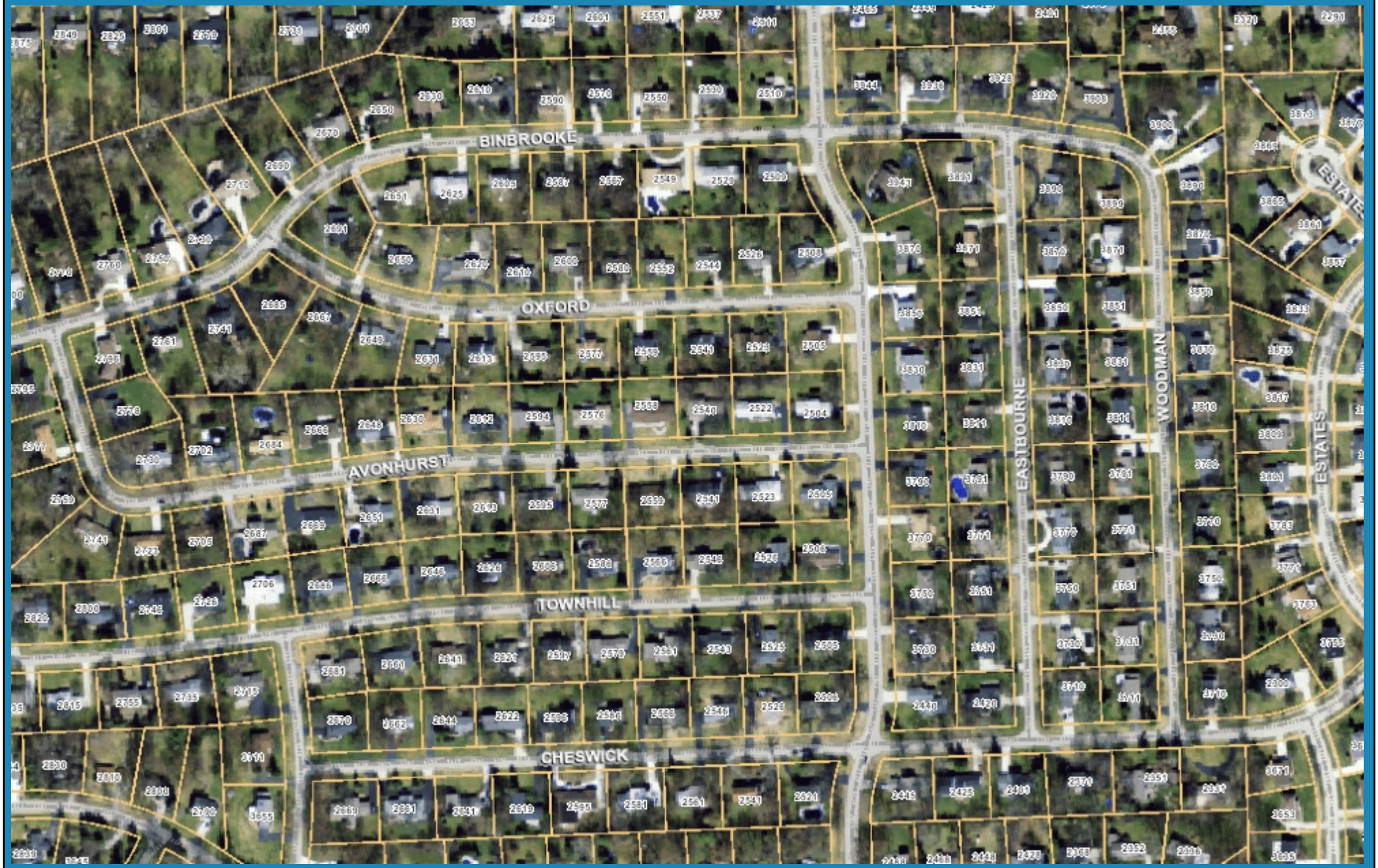
City of Troy GIS Online



1,412 0 706 1,412 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

City of Troy GIS Online



762 0 381 762 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities™

memorandum

Date: May 19, 2014

To: Bill Huotari
cc: Steven Loveland
From: Morgan Hoxsie

Re: Beach Road Speed Study

As requested, we have placed counters on Beach Road to help define a time for Troy PD to patrol the area. Speed data was collected at two locations along Beach Road. The first location was south of Wattles, between Binbrooke Drive and Oxford Drive and the other location was to the south of Oxford Drive, between Oxford Drive and Avonhurst Drive. Table 1 shows speed data for each direction at both locations. The existing speed limit on Beach Road is 25 mph.

Table 1 - Overall Speed Results

	North of Oxford		South of Oxford	
	Northbound	Southbound	Northbound	Southbound
85th Percentile (MPH)	28	28	34	29
Mean Speed (average) (MPH)	22	22	26	23
10 MPH Pace Speed (MPH)	21-30	20-29	25-34	21-30
Percent in Pace (%)	58.6	55.3	48.4	55.1

Based on Table 1:

- All four locations showed an 85th percentile higher than the posted speed limit.
- The average speed was higher than the speed limit for northbound traffic (South of Oxford).
- Northbound traffic (South of Oxford) had the highest pace speed of the four locations.

From the data collected, high pace time frames can be defined. To do this, we looked primarily at the northbound traffic (South of Oxford), which was the highest speed location. Table 2 shows a breakdown of the highest pace speeds for each day of data collected at this location.

Table 2 - Speed data for northbound Beach Road (South of Oxford)

	AM		PM	
	Time	Pace Speed	Time	Pace Speed
5/8/2014			16:00	24-33
			17:00	25-34
			18:00	26-35
5/9/2014	7:00	24-33	16:00	25-34

OHM Advisors
34000 PLYMOUTH ROAD
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OHM-Advisors.com

	8:00	24-34	17:00	26-35
	9:00	26-35	18:00	26-35
5/10/2014	7:00	24-33	16:00	25-34
	8:00	28-37	17:00	25-34
	9:00	26-35	18:00	24-33
5/11/2014	8:00	26-35	11:00	22-31
	9:00	26-35	12:00	26-35
	10:00	25-34	13:00	24-33
5/12/2014			16:00	26-35
			17:00	24-34
			18:00	26-35
5/13/2014	7:00	28-37	15:00	27-36
	8:00	27-36	16:00	28-37
	9:00	27-36	17:00	28-37
5/14/2014	7:00	27-36	15:00	27-36
	8:00	27-36	16:00	26-35
	9:00	25-34	17:00	25-34

The cells left blank in Table 2 are times when the data was not collected or the data showed errors. The pace speeds were chosen based on the maximum speed and the number of vehicles within the pace speed. Based on the data in Table 2, the following are recommended times to patrol the area.

- AM - 7:00-9:00
- PM- 16:00-18:00

The speed and volume data is attached.

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/08/14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	4	3	9	11	1	0	0	0	0	0	0	0	0	0	28	22-31	15
14:00	1	5	18	8	1	**1**	0	0	0	0	0	0	0	0	34	19-28	23
15:00	1	3	12	11	2	0	0	0	0	0	0	0	0	0	29	21-30	19
16:00	2	5	13	19	2	0	0	0	0	0	0	0	0	0	41	22-31	26
17:00	**5**	8	**25**	**28**	**7**	0	0	0	0	0	0	0	0	0	**73**	21-30	44
18:00	2	**9**	15	17	3	0	0	0	0	0	0	0	0	0	46	21-30	26
19:00	3	2	7	9	3	0	0	0	0	0	0	0	0	0	24	21-30	13
20:00	4	5	13	11	2	0	0	0	0	0	0	0	0	0	35	20-29	19
21:00	1	1	8	2	1	0	0	0	0	0	0	0	0	0	13	18-27	9
22:00	1	1	1	1	4	0	0	0	0	0	0	0	0	0	8	25-34	4
23:00	2	1	3	1	1	0	0	0	0	0	0	0	0	0	8	20-29	3
Total	26	43	124	118	27	1	0	0	0	0	0	0	0	0	339		
Percent	7.7%	12.7%	36.6%	34.8%	8.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.																	
PM Peak Vol.	17:00 5	18:00 9	17:00 25	17:00 28	17:00 7	14:00 1									17:00 73		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/09/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
05:00	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3	26-35	2
06:00	4	2	4	4	1	0	0	0	0	0	0	0	0	0	15	19-28	6
07:00	0	0	8	**20**	**3**	0	0	0	0	0	0	0	0	0	31	22-31	26
08:00	1	3	**15**	14	1	0	0	0	0	0	0	0	0	0	**34**	21-30	24
09:00	0	6	15	11	1	0	0	0	0	0	0	0	0	0	33	20-29	22
10:00	11	13	6	2	1	0	0	0	0	0	0	0	0	0	33	9-18	17
11:00	**14**	**14**	5	0	0	0	0	0	0	0	0	0	0	0	33	9-18	18
12 PM	12	10	9	1	0	0	0	0	0	0	0	0	0	0	32	8-17	15
13:00	6	11	5	1	0	0	0	0	0	0	0	0	0	0	23	10-19	13
14:00	10	10	5	1	0	0	0	0	0	0	0	0	0	0	26	10-19	13
15:00	6	7	2	0	0	0	0	0	0	0	0	0	0	0	15	11-20	8
16:00	**17**	**26**	11	2	0	0	0	0	0	0	0	0	0	0	**56**	11-20	31
17:00	9	5	**21**	**13**	**3**	0	0	0	0	0	0	0	0	0	51	20-29	26
18:00	1	4	10	9	1	0	0	0	0	0	0	0	0	0	25	20-29	16
19:00	1	2	13	5	2	0	0	0	0	0	0	0	0	0	23	19-28	16
20:00	1	0	8	2	1	0	0	0	0	0	0	0	0	0	12	19-28	9
21:00	1	1	5	3	1	0	0	0	0	0	0	0	0	0	11	20-29	7
22:00	2	2	4	5	0	0	0	0	0	0	0	0	0	0	13	20-29	7
23:00	0	0	3	1	0	0	0	0	0	0	0	0	0	0	4	19-28	4
Total	96	117	150	98	16	0	0	0	0	0	0	0	0	0	477		
Percent	20.1%	24.5%	31.4%	20.5%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	11:00	08:00	07:00	07:00										08:00		
Vol.	14	14	15	20	3										34		
PM Peak	16:00	16:00	17:00	17:00	17:00										16:00		
Vol.	17	26	21	13	3										56		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/10/14	1	1	1	3	0	0	0	0	0	0	0	0	0	0	6	22-31	3
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	8-17	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
05:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
06:00	0	1	5	3	1	0	0	0	0	0	0	0	0	0	10	20-29	7
07:00	1	2	2	8	0	0	0	0	0	0	0	0	0	0	13	23-32	8
08:00	**9**	4	11	13	0	0	0	0	0	0	0	0	0	0	37	21-30	17
09:00	1	3	**18**	**14**	**2**	**1**	0	0	0	0	0	0	0	0	**39**	21-30	27
10:00	6	2	13	7	0	0	0	0	0	0	0	0	0	0	28	20-29	15
11:00	5	**7**	13	9	1	0	0	0	0	0	0	0	0	0	35	20-29	17
12 PM	1	**10**	10	**13**	1	0	0	0	0	0	0	0	0	0	35	19-28	19
13:00	3	0	20	10	2	0	0	0	0	0	0	0	0	0	35	20-29	25
14:00	**8**	7	11	9	1	0	0	0	0	0	0	0	0	0	36	19-28	15
15:00	8	9	11	1	0	0	0	0	0	0	0	0	0	0	29	14-23	14
16:00	3	3	10	8	**4**	0	0	0	0	0	0	0	0	0	28	20-29	15
17:00	2	3	**22**	9	1	0	0	0	0	0	0	0	0	0	**37**	20-29	26
18:00	1	2	9	10	0	0	0	0	0	0	0	0	0	0	22	21-30	16
19:00	2	4	9	3	1	0	0	0	0	0	0	0	0	0	19	17-26	11
20:00	3	1	9	5	0	0	0	0	0	0	0	0	0	0	18	19-28	11
21:00	0	1	1	3	0	0	0	0	0	0	0	0	0	0	5	24-33	3
22:00	1	1	5	4	1	0	0	0	0	0	0	0	0	0	12	22-31	7
23:00	2	0	4	0	0	0	0	0	0	0	0	0	0	0	6	20-29	3
Total	57	62	184	133	16	1	0	0	0	0	0	0	0	0	453		
Percent	12.6%	13.7%	40.6%	29.4%	3.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	11:00	09:00	09:00	09:00	09:00									09:00		
Vol.	9	7	18	14	2	1									39		
PM Peak	14:00	12:00	17:00	12:00	16:00										17:00		
Vol.	8	10	22	13	4										37		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/11/14	1	0	0	0	0	0	**1**	0	0	0	0	0	0	0	2	5-14	1
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
02:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
04:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
05:00	1	0	0	0	0	**1**	0	0	0	0	0	0	0	0	2	5-14	1
06:00	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4	12-21	3
07:00	1	1	4	2	0	0	0	0	0	0	0	0	0	0	8	18-27	5
08:00	2	3	5	12	1	0	0	0	0	0	0	0	0	0	23	21-30	14
09:00	1	1	8	10	**3**	0	0	0	0	0	0	0	0	0	23	22-31	16
10:00	**5**	6	**13**	**17**	1	1	0	0	0	0	0	0	0	0	**43**	21-30	23
11:00	2	**8**	12	7	3	0	0	0	0	0	0	0	0	0	32	17-26	17
12 PM	2	**4**	10	12	**6**	0	0	0	0	0	0	0	0	0	34	21-30	19
13:00	1	3	13	5	1	0	0	0	0	0	0	0	0	0	23	19-28	16
14:00	1	0	12	13	2	0	0	0	0	0	0	0	0	0	28	21-30	22
15:00	0	3	5	**17**	2	0	0	**1**	0	0	0	0	0	0	28	22-31	20
16:00	3	2	**19**	9	2	0	0	0	0	0	0	0	0	0	**35**	20-29	23
17:00	2	4	9	8	2	0	0	0	0	0	0	0	0	0	25	20-29	14
18:00	2	2	10	15	0	0	0	0	0	0	0	0	0	0	29	22-31	20
19:00	**5**	4	7	10	0	0	0	0	0	0	0	0	0	0	26	21-30	13
20:00	2	2	7	4	0	0	0	0	0	0	0	0	0	0	15	19-28	9
21:00	3	3	6	2	0	0	0	0	0	0	0	0	0	0	14	16-25	7
22:00	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3	17-26	2
23:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
Total	35	48	145	148	24	2	1	1	0	0	0	0	0	0	404		
Percent	8.7%	11.9%	35.9%	36.6%	5.9%	0.5%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	11:00	10:00	10:00	09:00	05:00	00:00								10:00		
Vol.	5	8	13	17	3	1	1								43		
PM Peak	19:00	12:00	16:00	15:00	12:00			15:00							16:00		
Vol.	5	4	19	17	6			1							35		

OHM Advisors

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/12/14	1	0	2	1	0	0	0	0	0	0	0	0	0	0	4	22-31	2
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	27-36	1
05:00	**2**	1	0	0	0	0	0	0	0	0	0	0	0	0	3	2-11	2
06:00	2	2	3	7	2	0	0	0	0	0	0	0	0	0	16	24-33	8
07:00	1	2	11	17	**6**	0	0	0	0	0	0	0	0	0	**37**	22-31	25
08:00	2	1	**14**	15	0	0	0	0	0	0	0	0	0	0	32	21-30	24
09:00	1	2	14	**18**	1	0	0	0	0	0	0	0	0	0	36	21-30	27
10:00	2	3	12	8	0	0	0	0	0	0	0	0	0	0	25	20-29	16
11:00	2	**4**	9	8	0	0	0	0	0	0	0	0	0	0	23	20-29	14
12 PM	0	0	9	5	1	0	0	0	0	0	0	0	0	0	15	21-30	12
13:00	**3**	2	7	8	2	0	0	0	0	0	0	0	0	0	22	20-29	12
14:00	2	2	9	9	1	0	0	0	0	0	0	0	0	0	23	21-30	15
15:00	1	2	10	7	1	0	0	0	0	0	0	0	0	0	21	21-30	14
16:00	1	**4**	**26**	**17**	3	0	0	0	0	0	0	0	0	0	**51**	20-29	37
17:00	2	3	11	8	**7**	0	0	0	0	0	0	0	0	0	31	22-31	16
18:00	1	0	15	14	2	**1**	0	0	0	0	0	0	0	0	33	21-30	25
19:00	2	0	8	6	1	0	0	0	0	0	0	0	0	0	17	22-31	11
20:00	0	0	3	3	0	0	0	0	0	0	0	0	0	0	6	22-31	5
21:00	1	3	2	3	1	0	0	0	0	0	0	0	0	0	10	20-29	4
22:00	0	1	3	0	0	0	0	0	0	0	0	0	0	0	4	19-28	3
23:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	29-38	1
Total	26	32	169	154	29	2	0	0	0	0	0	0	0	0	412		
Percent	6.3%	7.8%	41.0%	37.4%	7.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	05:00	11:00	08:00	09:00	07:00										07:00		
Vol.	2	4	14	18	6										37		
PM Peak	13:00	16:00	16:00	16:00	17:00	18:00									16:00		
Vol.	3	4	26	17	7	1									51		

OHM Advisors

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/13/14	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	19-28	3
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
05:00	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3	20-29	2
06:00	**2**	1	5	5	1	0	0	0	0	0	0	0	0	0	14	20-29	8
07:00	1	2	**14**	16	3	0	0	0	0	0	0	0	0	0	36	21-30	26
08:00	1	**3**	10	**28**	**4**	0	0	0	0	0	0	0	0	0	**46**	22-31	34
09:00	1	0	10	14	2	**1**	0	0	0	0	0	0	0	0	28	21-30	21
10:00	0	2	3	10	2	0	0	0	0	0	0	0	0	0	17	22-31	12
11:00	1	1	9	17	1	1	0	0	0	0	0	0	0	0	30	22-31	22
12 PM	2	2	9	5	0	0	0	0	0	0	0	0	0	0	18	20-29	11
13:00	0	**3**	11	12	8	0	0	0	0	0	0	0	0	0	34	21-30	21
14:00	1	1	10	13	2	0	0	0	0	0	0	0	0	0	27	21-30	20
15:00	1	0	16	15	3	0	0	0	0	0	0	0	0	0	35	21-30	27
16:00	0	1	**17**	**24**	**10**	0	0	0	0	0	0	0	0	0	**52**	22-31	38
17:00	**4**	2	13	22	4	**1**	0	0	0	0	0	0	0	0	46	22-31	29
18:00	3	3	15	9	2	1	0	0	0	0	0	0	0	0	33	20-29	20
19:00	1	2	6	13	0	0	0	0	0	0	0	0	0	0	22	21-30	16
20:00	1	0	2	3	3	0	0	0	0	0	0	0	0	0	9	26-35	5
21:00	1	0	6	2	0	0	0	0	0	0	0	0	0	0	9	19-28	7
22:00	1	1	2	1	0	0	0	0	0	0	0	0	0	0	5	22-31	2
23:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
Total	21	25	165	212	45	4	0	0	0	0	0	0	0	0	472		
Percent	4.4%	5.3%	35.0%	44.9%	9.5%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	08:00	07:00	08:00	08:00	09:00									08:00		
Vol.	2	3	14	28	4	1									46		
PM Peak	17:00	13:00	16:00	16:00	16:00	17:00									16:00		
Vol.	4	3	17	24	10	1									52		

OHM Advisors

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/14/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
05:00	1	1	1	0	0	0	0	0	0	0	0	0	0	0	3	18-27	1
06:00	**4**	2	4	7	1	0	0	0	0	0	0	0	0	0	18	22-31	8
07:00	1	2	9	17	5	0	0	0	0	0	0	0	0	0	34	23-32	23
08:00	2	2	**15**	**22**	4	0	0	0	0	0	0	0	0	0	**45**	22-31	32
09:00	1	1	12	17	**7**	0	0	0	0	0	0	0	0	0	38	23-32	26
10:00	0	1	11	9	2	0	0	0	0	0	0	0	0	0	23	21-30	18
11:00	0	**6**	12	9	4	0	0	0	0	0	0	0	0	0	31	20-29	18
12 PM	0	1	9	7	2	0	0	0	0	0	0	0	0	0	19	21-30	14
13:00	1	3	8	14	4	0	0	0	0	0	0	0	0	0	30	22-31	19
14:00	1	2	7	13	3	0	0	0	0	0	0	0	0	0	26	23-32	17
15:00	0	0	9	13	3	0	0	0	0	0	0	0	0	0	25	22-31	20
16:00	**2**	**4**	25	**17**	2	0	0	0	0	0	0	0	0	0	**50**	21-30	35
17:00	0	2	**26**	14	4	0	0	0	0	0	0	0	0	0	46	21-30	35
18:00	2	2	20	16	3	0	0	0	0	0	0	0	0	0	43	21-30	30
19:00	2	2	7	6	**6**	0	0	0	0	0	0	0	0	0	23	24-33	11
20:00	1	2	10	5	0	0	0	0	0	0	0	0	0	0	18	19-28	13
21:00	0	0	6	6	0	0	0	0	0	0	0	0	0	0	12	21-30	11
22:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
23:00	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	17-26	5
Total	18	33	199	194	50	0	0	0	0	0	0	0	0	0	494		
Percent	3.6%	6.7%	40.3%	39.3%	10.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	11:00	08:00	08:00	09:00										08:00		
Vol.	4	6	15	22	7										45		
PM Peak	16:00	16:00	17:00	16:00	19:00										16:00		
Vol.	2	4	26	17	6										50		

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/15/14	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	5-14	1
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
05:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	8-17	1
06:00	2	1	5	6	0	0	0	0	0	0	0	0	0	0	14	21-30	9
07:00	2	2	**19**	15	0	0	0	0	0	0	0	0	0	0	38	21-30	28
08:00	**3**	1	16	**26**	**5**	**1**	0	0	0	0	0	0	0	0	**52**	22-31	36
09:00	0	1	9	11	4	0	0	0	0	0	0	0	0	0	25	22-31	18
10:00	0	1	6	13	1	0	0	0	0	0	0	0	0	0	21	21-30	17
11:00	1	**5**	8	9	2	0	0	0	0	0	0	0	0	0	25	19-28	14
12 PM	1	1	**13**	2	0	0	0	0	0	0	0	0	0	0	17	19-28	14
13:00	**2**	2	9	**11**	2	0	0	0	0	0	0	0	0	0	**26**	22-31	16
14:00	0	**3**	10	8	**5**	0	0	0	0	0	0	0	0	0	26	20-29	16
15:00	0	1	9	9	1	0	0	0	0	0	0	0	0	0	20	21-30	16
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	12	19	104	112	20	1	0	0	0	0	0	0	0	0	268		
Percent	4.5%	7.1%	38.8%	41.8%	7.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	11:00	07:00	08:00	08:00	08:00									08:00		
Vol.	3	5	19	26	5	1									52		
PM Peak	13:00	14:00	12:00	13:00	14:00										13:00		
Vol.	2	3	13	11	5										26		
Total	291	379	1240	1169	227	11	1	1	0	0	0	0	0	0	3319		
Percent	8.8%	11.4%	37.4%	35.2%	6.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	12 MPH
50th Percentile :	23 MPH
85th Percentile :	28 MPH
95th Percentile :	31 MPH

Stats

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	1945
Percent in Pace :	58.6%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	22 MPH

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/08/14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	**9**	7	5	9	3	0	0	0	0	0	0	0	0	0	33	8-17	12
14:00	0	4	14	14	3	0	0	0	0	0	0	0	0	0	35	21-30	24
15:00	5	7	**21**	19	1	0	0	0	0	0	0	0	0	0	**53**	20-29	32
16:00	3	4	15	18	**5**	0	0	0	0	0	0	0	0	0	45	22-31	27
17:00	4	1	18	**21**	3	**1**	0	0	0	0	0	0	0	0	48	22-31	32
18:00	7	**8**	12	13	2	1	0	0	0	0	0	0	0	0	43	20-29	19
19:00	7	6	16	15	3	0	0	0	0	0	0	0	0	0	47	20-29	24
20:00	6	8	17	12	3	0	0	0	0	0	0	0	0	0	46	20-29	23
21:00	3	1	11	8	1	0	0	0	0	0	0	0	0	0	24	21-30	15
22:00	0	2	4	6	2	0	0	0	0	0	0	0	0	0	14	21-30	9
23:00	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4	21-30	4
Total	44	48	135	137	26	2	0	0	0	0	0	0	0	0	392		
Percent	11.2%	12.2%	34.4%	34.9%	6.6%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.																	
PM Peak Vol.	13:00 9	18:00 8	15:00 21	17:00 21	16:00 5	17:00 1									15:00 53		

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Site Code: 2
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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/09/14	0	0	4	2	0	0	0	0	0	0	0	0	0	0	6	21-30	5
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	19-28	3
06:00	0	0	4	2	0	0	0	0	0	0	0	0	0	0	6	21-30	5
07:00	0	7	5	8	2	**1**	0	0	0	0	0	0	0	0	23	17-26	11
08:00	2	5	**25**	10	3	0	0	0	0	0	0	0	0	0	**45**	20-29	30
09:00	0	3	12	**12**	**5**	0	**1**	0	0	0	0	0	0	0	33	22-31	21
10:00	**17**	6	7	1	0	0	0	0	0	0	0	0	0	0	31	6-15	17
11:00	9	**8**	5	2	0	0	0	0	0	0	0	0	0	0	24	7-16	12
12 PM	9	13	5	1	0	0	0	0	0	0	0	0	0	0	28	12-21	15
13:00	6	6	3	0	0	0	0	0	0	0	0	0	0	0	15	6-15	8
14:00	19	12	2	1	0	0	0	0	0	0	0	0	0	0	34	7-16	20
15:00	16	**23**	7	0	0	0	0	0	0	0	0	0	0	0	46	11-20	26
16:00	**21**	18	8	2	0	0	0	0	0	0	0	0	0	0	49	7-16	26
17:00	5	8	**20**	**19**	2	0	0	0	0	0	0	0	0	0	**54**	20-29	31
18:00	1	4	9	11	**3**	0	0	0	0	0	0	0	0	0	28	21-30	17
19:00	3	3	11	11	2	0	0	0	0	0	0	0	0	0	30	21-30	18
20:00	2	2	9	4	1	0	0	0	0	0	0	0	0	0	18	19-28	11
21:00	0	2	11	2	2	0	0	0	0	0	0	0	0	0	17	19-28	12
22:00	1	0	5	5	0	0	0	0	0	0	0	0	0	0	11	22-31	8
23:00	0	0	7	4	0	0	0	0	0	0	0	0	0	0	11	20-29	10
Total	111	120	162	97	20	1	1	0	0	0	0	0	0	0	512		
Percent	21.7%	23.4%	31.6%	18.9%	3.9%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	11:00	08:00	09:00	09:00	07:00	09:00								08:00		
Vol.	17	8	25	12	5	1	1								45		
PM Peak	16:00	15:00	17:00	17:00	18:00										17:00		
Vol.	21	23	20	19	3										54		

OHM Advisors

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Beach Speed Study
South of Wattles

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/10/14	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	5-14	1
01:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
02:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	24-33	3
07:00	2	2	5	3	1	0	0	0	0	0	0	0	0	0	13	21-30	6
08:00	**9**	8	8	10	1	0	0	0	0	0	0	0	0	0	36	20-29	13
09:00	3	3	10	8	1	0	0	0	0	0	0	0	0	0	25	21-30	14
10:00	3	6	**17**	10	1	0	0	0	0	0	0	0	0	0	37	20-29	22
11:00	5	**10**	14	**11**	**2**	**2**	0	0	0	0	0	0	0	0	**44**	20-29	20
12 PM	5	6	18	8	1	0	0	0	0	0	0	0	0	0	38	19-28	21
13:00	3	8	**23**	**17**	**4**	0	0	0	0	0	0	0	0	0	**55**	20-29	33
14:00	**11**	9	12	7	0	0	0	0	0	0	0	0	0	0	39	18-27	15
15:00	5	**11**	9	4	0	0	0	0	0	0	0	0	0	0	29	13-22	15
16:00	4	6	14	10	2	0	0	0	0	0	0	0	0	0	36	20-29	19
17:00	7	8	11	10	0	0	0	0	0	0	0	0	0	0	36	18-27	16
18:00	0	4	17	11	1	0	0	0	0	0	0	0	0	0	33	20-29	24
19:00	2	5	12	7	3	0	0	0	0	0	0	0	0	0	29	18-27	16
20:00	2	5	10	4	1	**1**	0	0	0	0	0	0	0	0	23	19-28	12
21:00	1	0	9	5	0	0	0	0	0	0	0	0	0	0	15	20-29	12
22:00	0	1	4	2	0	0	0	0	0	0	0	0	0	0	7	21-30	5
23:00	3	0	7	5	0	0	0	0	0	0	0	0	0	0	15	21-30	9
Total	66	92	204	134	20	3	0	0	0	0	0	0	0	0	519		
Percent	12.7%	17.7%	39.3%	25.8%	3.9%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	11:00	10:00	11:00	11:00	11:00									11:00		
Vol.	9	10	17	11	2	2									44		
PM Peak	14:00	15:00	13:00	13:00	13:00	20:00									13:00		
Vol.	11	11	23	17	4	1									55		

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/11/14	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4	21-30	4
01:00	0	0	1	4	0	0	0	0	0	0	0	0	0	0	5	22-31	5
02:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	13-22	1
07:00	1	1	0	1	0	**1**	0	0	0	0	0	0	0	0	4	8-17	2
08:00	2	2	3	4	0	0	0	0	0	0	0	0	0	0	11	22-31	5
09:00	2	0	7	6	0	0	0	0	0	0	0	0	0	0	15	22-31	10
10:00	**4**	**3**	13	5	**2**	0	0	0	0	0	0	0	0	0	27	19-28	15
11:00	4	2	**14**	**17**	0	0	0	0	0	0	0	0	0	0	**37**	21-30	25
12 PM	4	5	10	11	3	0	0	0	0	0	0	0	0	0	33	21-30	17
13:00	6	**8**	13	12	3	0	0	0	0	0	0	0	0	0	42	20-29	20
14:00	7	3	**21**	8	4	0	0	0	0	0	0	0	0	0	**43**	20-29	23
15:00	4	5	15	9	4	0	0	0	0	0	0	0	0	0	37	20-29	20
16:00	**12**	3	5	**14**	**5**	0	0	0	0	0	0	0	0	0	39	23-32	15
17:00	5	2	12	10	2	0	0	0	0	0	0	0	0	0	31	21-30	17
18:00	4	4	10	10	0	0	0	0	0	0	0	0	0	0	28	21-30	15
19:00	3	6	9	5	1	0	0	0	0	0	0	0	0	0	24	16-25	12
20:00	4	3	12	10	0	0	0	0	0	0	0	0	0	0	29	20-29	17
21:00	0	1	9	7	1	0	0	0	0	0	0	0	0	0	18	20-29	14
22:00	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3	19-28	3
23:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
Total	62	49	163	137	25	1	0	0	0	0	0	0	0	0	437		
Percent	14.2%	11.2%	37.3%	31.4%	5.7%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	10:00	11:00	11:00	10:00	07:00									11:00		
Vol.	4	3	14	17	2	1									37		
PM Peak	16:00	13:00	14:00	16:00	16:00										14:00		
Vol.	12	8	21	14	5										43		

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/12/14	0	0	4	1	0	0	0	0	0	0	0	0	0	0	5	19-28	5
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	13-22	1
06:00	0	2	2	3	1	0	0	0	0	0	0	0	0	0	8	23-32	4
07:00	0	0	5	5	**5**	0	0	0	0	0	0	0	0	0	15	22-31	10
08:00	1	**4**	**11**	10	3	0	0	0	0	0	0	0	0	0	29	20-29	18
09:00	2	2	6	**18**	4	0	0	0	0	0	0	0	0	0	**32**	24-33	21
10:00	**6**	1	11	8	0	0	0	0	0	0	0	0	0	0	26	20-29	14
11:00	0	1	8	5	3	0	0	0	0	0	0	0	0	0	17	20-29	12
12 PM	**1**	**5**	10	8	0	0	0	0	0	0	0	0	0	0	24	19-28	15
13:00	1	0	8	7	0	0	0	0	0	0	0	0	0	0	16	21-30	13
14:00	1	2	9	8	2	0	0	0	0	0	0	0	0	0	22	21-30	14
15:00	0	3	21	13	**4**	**2**	0	0	0	0	0	0	0	0	**43**	20-29	30
16:00	1	3	17	17	2	0	0	0	0	0	0	0	0	0	40	21-30	29
17:00	1	1	**22**	17	1	0	0	0	0	0	0	0	0	0	42	21-30	34
18:00	0	2	6	**18**	2	0	0	0	0	0	0	0	0	0	28	22-31	22
19:00	1	5	15	6	4	0	0	0	0	0	0	0	0	0	31	19-28	19
20:00	1	1	6	9	0	0	0	0	0	0	0	0	0	0	17	22-31	12
21:00	0	2	9	4	4	0	0	0	0	0	0	0	0	0	19	19-28	12
22:00	0	0	2	3	2	0	0	0	0	0	0	0	0	0	7	24-33	5
23:00	0	0	2	2	1	0	0	0	0	0	0	0	0	0	5	21-30	4
Total	16	35	175	163	38	2	0	0	0	0	0	0	0	0	429		
Percent	3.7%	8.2%	40.8%	38.0%	8.9%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	08:00	08:00	09:00	07:00										09:00		
Vol.	6	4	11	18	5										32		
PM Peak	12:00	12:00	17:00	18:00	15:00	15:00									15:00		
Vol.	1	5	22	18	4	2									43		

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/13/14	0	0	1	2	1	0	0	0	0	0	0	0	0	0	4	24-33	3
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2	5-14	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	2	1	0	1	0	0	0	0	0	0	0	0	0	0	4	8-17	2
06:00	0	2	1	3	2	0	0	0	0	0	0	0	0	0	8	26-35	4
07:00	0	1	7	10	1	0	0	0	0	0	0	0	0	0	19	21-30	15
08:00	**3**	**3**	**12**	11	5	0	0	0	0	0	0	0	0	0	34	21-30	19
09:00	3	1	7	12	2	**1**	0	0	0	0	0	0	0	0	26	22-31	16
10:00	2	0	5	5	2	0	0	0	0	0	0	0	0	0	14	22-31	8
11:00	2	2	12	**16**	**6**	0	0	0	0	0	0	0	0	0	**38**	22-31	24
12 PM	**7**	4	6	7	2	0	0	0	0	0	0	0	0	0	26	22-31	9
13:00	5	2	9	10	5	0	0	0	0	0	0	0	0	0	31	22-31	15
14:00	1	2	16	9	2	0	0	0	0	0	0	0	0	0	30	21-30	21
15:00	1	2	21	**25**	3	**1**	0	0	0	0	0	0	0	0	**53**	21-30	40
16:00	1	**6**	**22**	19	4	0	0	0	0	0	0	0	0	0	52	20-29	35
17:00	1	4	19	21	4	0	0	0	0	0	0	0	0	0	49	21-30	34
18:00	2	5	15	10	**6**	1	0	0	0	0	0	0	0	0	39	21-30	21
19:00	1	5	10	6	1	1	0	0	0	0	0	0	0	0	24	18-27	14
20:00	1	3	4	8	0	0	0	0	0	0	0	0	0	0	16	21-30	10
21:00	1	0	2	6	1	0	0	0	0	0	0	0	0	0	10	23-32	7
22:00	0	2	7	2	0	0	0	0	0	0	0	0	0	0	11	19-28	8
23:00	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3	19-28	2
Total	34	46	179	183	47	4	0	0	0	0	0	0	0	0	493		
Percent	6.9%	9.3%	36.3%	37.1%	9.5%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	08:00	11:00	11:00	09:00									11:00		
Vol.	3	3	12	16	6	1									38		
PM Peak	12:00	16:00	16:00	15:00	18:00	15:00									15:00		
Vol.	7	6	22	25	6	1									53		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/14/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	2	4	1	0	0	0	0	0	0	0	0	0	0	7	15-24	5
07:00	1	1	9	4	**7**	0	0	0	0	0	0	0	0	0	22	20-29	12
08:00	**2**	**5**	7	11	4	**1**	0	0	0	0	0	0	0	0	**30**	21-30	15
09:00	1	1	**10**	6	2	0	0	0	0	0	0	0	0	0	20	20-29	14
10:00	1	2	3	10	1	0	0	0	0	0	0	0	0	0	17	23-32	11
11:00	1	2	9	**13**	3	0	0	0	0	0	0	0	0	0	28	21-30	19
12 PM	0	4	10	13	1	0	0	0	0	0	0	0	0	0	28	22-31	19
13:00	1	2	12	13	2	0	0	0	0	0	0	0	0	0	30	21-30	21
14:00	0	0	15	8	2	0	0	0	0	0	0	0	0	0	25	20-29	21
15:00	0	1	16	20	3	0	0	0	0	0	0	0	0	0	40	21-30	32
16:00	**4**	1	22	18	**4**	0	0	0	0	0	0	0	0	0	49	21-30	33
17:00	2	**7**	**30**	**24**	2	0	0	0	0	0	0	0	0	0	**65**	21-30	45
18:00	2	3	23	10	1	0	0	0	0	0	0	0	0	0	39	20-29	28
19:00	1	7	22	6	0	0	0	0	0	0	0	0	0	0	36	18-27	26
20:00	2	3	12	10	3	0	0	0	0	0	0	0	0	0	30	21-30	18
21:00	0	1	6	9	0	0	0	0	0	0	0	0	0	0	16	21-30	13
22:00	0	2	1	2	2	**1**	0	0	0	0	0	0	0	0	8	29-38	3
23:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
Total	18	44	212	179	37	2	0	0	0	0	0	0	0	0	492		
Percent	3.7%	8.9%	43.1%	36.4%	7.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	08:00	09:00	11:00	07:00	08:00									08:00		
Vol.	2	5	10	13	7	1									30		
PM Peak	16:00	17:00	17:00	17:00	16:00	22:00									17:00		
Vol.	4	7	30	24	4	1									65		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Wattles

Site Code: 2
Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/15/14	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	8-17	1
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
06:00	1	3	2	1	0	1	0	0	0	0	0	0	0	0	8	10-19	4
07:00	0	1	4	6	**3**	0	0	0	0	0	0	0	0	0	14	24-33	9
08:00	**3**	3	13	**13**	0	**2**	0	0	0	0	0	0	0	0	**34**	20-29	21
09:00	0	**4**	**15**	8	3	1	0	0	0	0	0	0	0	0	31	20-29	20
10:00	0	3	3	5	0	0	0	0	0	0	0	0	0	0	11	20-29	7
11:00	1	3	7	4	1	0	0	0	0	0	0	0	0	0	16	20-29	9
12 PM	**2**	**5**	7	6	2	0	0	0	0	0	0	0	0	0	22	19-28	11
13:00	1	1	11	7	2	0	0	0	0	0	0	0	0	0	22	21-30	15
14:00	0	4	9	9	3	0	0	0	0	0	0	0	0	0	25	22-31	15
15:00	1	3	**16**	**11**	**5**	0	0	0	0	0	0	0	0	0	**36**	21-30	23
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	9	31	88	71	20	4	0	0	0	0	0	0	0	0	223		
Percent	4.0%	13.9%	39.5%	31.8%	9.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	09:00	08:00	07:00	08:00									08:00		
Vol.	3	4	15	13	3	2									34		
PM Peak	12:00	12:00	15:00	15:00	15:00										15:00		
Vol.	2	5	16	11	5										36		
Total	360	465	1318	1101	233	19	1	0	0	0	0	0	0	0	3497		
Percent	10.3%	13.3%	37.7%	31.5%	6.7%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	11 MPH
50th Percentile :	22 MPH
85th Percentile :	28 MPH
95th Percentile :	31 MPH

Stats

10 MPH Pace Speed :	20-29 MPH
Number in Pace :	1935
Percent in Pace :	55.3%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	22 MPH

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/08/14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	2	3	10	6	4	0	0	0	0	0	0	0	0	0	25	21-30	13
14:00	4	3	14	11	4	**1**	0	0	0	0	0	0	0	0	37	21-30	20
15:00	0	**9**	**19**	17	1	0	0	0	0	0	0	0	0	0	**46**	20-29	30
16:00	4	6	10	18	6	0	0	0	0	0	0	0	0	0	44	23-32	23
17:00	3	1	15	18	6	1	0	0	0	0	0	0	0	0	44	22-31	28
18:00	**7**	2	7	12	**7**	1	0	0	0	0	0	0	0	0	36	24-33	16
19:00	4	2	9	**19**	4	1	0	0	0	0	0	0	0	0	39	22-31	24
20:00	1	2	11	15	3	0	0	0	0	0	0	0	0	0	32	22-31	22
21:00	3	1	6	10	0	0	**1**	0	0	0	0	0	0	0	21	22-31	12
22:00	0	1	4	8	2	0	0	0	0	0	0	0	0	0	15	21-30	11
23:00	0	1	1	0	1	0	0	0	0	0	0	0	0	0	3	14-23	2
Total	28	31	106	134	38	4	1	0	0	0	0	0	0	0	342		
Percent	8.2%	9.1%	31.0%	39.2%	11.1%	1.2%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.																	
PM Peak Vol.	18:00 7	15:00 9	15:00 19	19:00 19	18:00 7	14:00 1	21:00 1								15:00 46		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/09/14	0	0	4	1	1	0	0	0	0	0	0	0	0	0	6	19-28	5
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	1	3	0	0	0	0	0	0	0	0	0	0	0	4	19-28	3
06:00	**2**	0	3	2	0	0	0	0	0	0	0	0	0	0	7	20-29	4
07:00	0	3	7	5	4	**1**	0	0	0	0	0	0	0	0	20	20-29	11
08:00	2	7	**24**	**14**	4	1	0	0	0	0	0	0	0	0	**52**	20-29	32
09:00	2	5	12	11	**5**	1	0	0	0	0	0	0	0	0	36	21-30	19
10:00	2	**9**	7	9	1	0	0	0	0	0	0	0	0	0	28	19-28	13
11:00	2	2	14	4	4	0	0	0	0	0	0	0	0	0	26	19-28	16
12 PM	**6**	3	8	8	2	0	0	0	0	0	0	0	0	0	27	20-29	12
13:00	4	2	8	1	2	0	0	0	0	0	0	0	0	0	17	17-26	8
14:00	2	**10**	12	10	3	**2**	0	0	0	0	0	0	0	0	39	17-26	19
15:00	2	5	15	16	2	1	0	0	0	0	0	0	0	0	41	21-30	26
16:00	3	5	17	**20**	1	1	0	0	0	0	0	0	0	0	47	21-30	30
17:00	4	3	**18**	17	**5**	1	0	0	0	0	0	0	0	0	**48**	21-30	29
18:00	0	5	5	13	5	1	0	0	0	0	0	0	0	0	29	23-32	17
19:00	2	2	12	8	4	1	0	0	0	0	0	0	0	0	29	20-29	17
20:00	1	1	6	4	2	1	0	0	0	0	0	0	0	0	15	22-31	8
21:00	0	2	6	5	2	0	0	0	0	0	0	0	0	0	15	21-30	10
22:00	0	0	5	6	0	0	0	0	0	0	0	0	0	0	11	21-30	10
23:00	0	1	2	6	2	0	0	0	0	0	0	0	0	0	11	23-32	8
Total	34	66	188	160	49	11	0	0	0	0	0	0	0	0	508		
Percent	6.7%	13.0%	37.0%	31.5%	9.6%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	06:00	10:00	08:00	08:00	09:00	07:00									08:00		
Vol.	2	9	24	14	5	1									52		
PM Peak	12:00	14:00	17:00	16:00	17:00	14:00									17:00		
Vol.	6	10	18	20	5	2									48		

OHM Advisors

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Livonia, MI 48150

Beach Speed Study
South of Oxford

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Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/10/14	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	5-14	1
01:00	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	15-24	2
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	19-28	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	24-33	3
07:00	4	3	3	5	1	0	0	0	0	0	0	0	0	0	16	6-15	6
08:00	**10**	4	7	7	**6**	0	0	0	0	0	0	0	0	0	34	6-15	12
09:00	3	**12**	6	**8**	0	0	0	0	0	0	0	0	0	0	29	12-21	15
10:00	6	7	12	8	2	0	0	0	0	0	0	0	0	0	35	18-27	16
11:00	9	9	**15**	6	2	**1**	0	0	0	0	0	0	0	0	**42**	17-26	18
12 PM	6	**14**	6	9	5	0	0	0	0	0	0	0	0	0	40	12-21	18
13:00	4	10	**15**	**16**	**9**	**1**	0	0	0	0	0	0	0	0	**55**	20-29	26
14:00	**7**	4	10	9	1	0	0	0	0	0	0	0	0	0	31	20-29	14
15:00	6	5	8	4	2	0	0	0	0	0	0	0	0	0	25	15-24	10
16:00	2	7	7	13	2	0	0	0	0	0	0	0	0	0	31	21-30	16
17:00	3	7	7	4	3	0	0	0	0	0	0	0	0	0	24	14-23	11
18:00	4	3	11	8	4	0	0	0	0	0	0	0	0	0	30	21-30	15
19:00	1	2	10	12	0	1	0	0	0	0	0	0	0	0	26	21-30	18
20:00	0	8	6	3	2	1	0	0	0	0	0	0	0	0	20	15-24	11
21:00	0	2	1	7	2	0	0	0	0	0	0	0	0	0	12	23-32	8
22:00	0	0	5	2	0	0	0	0	0	0	0	0	0	0	7	21-30	6
23:00	0	0	8	3	2	0	0	0	0	0	0	0	0	0	13	20-29	10
Total	66	98	140	127	44	4	0	0	0	0	0	0	0	0	479		
Percent	13.8%	20.5%	29.2%	26.5%	9.2%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	11:00	09:00	08:00	11:00									11:00		
Vol.	10	12	15	8	6	1									42		
PM Peak	14:00	12:00	13:00	13:00	13:00	13:00									13:00		
Vol.	7	14	15	16	9	1									55		

OHM Advisors

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Beach Speed Study
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Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/11/14	1	1	4	0	0	0	0	0	0	0	0	0	0	0	6	16-25	4
01:00	0	0	0	2	2	0	0	0	0	0	0	0	0	0	4	26-35	4
02:00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	19-28	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
05:00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*	1
06:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	8-17	1
07:00	1	1	1	0	2	**1**	0	0	0	0	0	0	0	0	6	32-41	2
08:00	**6**	0	0	5	2	0	0	0	0	0	0	0	0	0	13	5-14	6
09:00	2	**2**	1	4	**3**	0	0	0	0	0	0	0	0	0	12	26-35	5
10:00	1	2	**8**	8	1	1	0	0	0	0	0	0	0	0	21	21-30	13
11:00	1	2	6	**19**	2	0	0	0	0	0	0	0	0	0	**30**	23-32	22
12 PM	**4**	**1**	**8**	**6**	**4**	**1**	0	0	0	0	0	0	0	0	**24**	22-31	11
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
19:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
20:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
21:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Total	17	10	30	45	16	3	0	0	0	0	0	0	0	0	121		
Percent	14.0%	8.3%	24.8%	37.2%	13.2%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	08:00	09:00	10:00	11:00	09:00	07:00									11:00		
Vol.	6	2	8	19	3	1									30		
PM Peak	12:00	12:00	12:00	12:00	12:00	12:00									12:00		
Vol.	4	1	8	6	4	1									24		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/12/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
06:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
11:00	0	**2**	**2**	**9**	**3**	0	0	0	0	0	0	0	0	0	**16**	23-32	11
12 PM	0	**4**	6	8	4	0	0	0	0	0	0	0	0	0	22	23-32	12
13:00	1	1	3	9	2	0	0	0	0	0	0	0	0	0	16	22-31	11
14:00	0	1	9	8	2	0	0	0	0	0	0	0	0	0	20	20-29	15
15:00	2	4	**18**	9	**10**	0	0	0	0	0	0	0	0	0	**43**	20-29	24
16:00	0	2	13	**16**	6	0	0	0	0	0	0	0	0	0	37	22-31	26
17:00	**3**	3	15	15	3	0	0	0	0	0	0	0	0	0	39	21-30	25
18:00	0	0	8	12	6	0	0	0	0	0	0	0	0	0	26	23-32	19
19:00	2	1	12	13	1	**1**	0	0	0	0	0	0	0	0	30	21-30	21
20:00	0	2	5	4	4	0	0	0	0	0	0	0	0	0	15	23-32	8
21:00	2	2	5	4	5	0	0	0	0	0	0	0	0	0	18	21-30	8
22:00	0	0	3	2	1	0	0	0	0	0	0	0	0	0	6	21-30	5
23:00	0	0	0	3	2	0	0	0	0	0	0	0	0	0	5	27-36	4
Total	10	22	99	112	49	1	0	0	0	0	0	0	0	0	293		
Percent	3.4%	7.5%	33.8%	38.2%	16.7%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak		11:00	11:00	11:00	11:00										11:00		
Vol.		2	2	9	3										16		
PM Peak	17:00	12:00	15:00	16:00	15:00	19:00									15:00		
Vol.	3	4	18	16	10	1									43		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
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Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/13/14	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2	19-28	2
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	**1**	0	1	0	0	0	0	0	0	0	0	0	0	0	2	5-14	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	1	1	0	1	0	0	0	0	0	0	0	0	0	0	3	13-22	1
06:00	0	2	2	1	2	0	0	0	0	0	0	0	0	0	7	18-27	3
07:00	0	1	4	9	4	0	0	0	0	0	0	0	0	0	18	23-32	13
08:00	0	2	**9**	14	**9**	0	0	0	0	0	0	0	0	0	34	24-33	22
09:00	0	**3**	6	**15**	5	**1**	0	0	0	0	0	0	0	0	30	23-32	20
10:00	0	3	1	7	4	0	0	0	0	0	0	0	0	0	15	25-34	9
11:00	1	3	8	15	7	1	0	0	0	0	0	0	0	0	**35**	24-33	21
12 PM	**7**	4	3	10	0	0	0	0	0	0	0	0	0	0	24	22-31	9
13:00	0	2	7	11	4	**1**	0	0	0	0	0	0	0	0	25	23-32	16
14:00	0	0	10	16	2	0	0	0	0	0	0	0	0	0	28	22-31	23
15:00	0	4	**19**	17	7	1	0	0	0	0	0	0	0	0	**48**	21-30	32
16:00	2	**5**	12	18	**10**	1	0	0	0	0	0	0	0	0	48	22-31	27
17:00	2	3	11	**21**	8	0	0	0	0	0	0	0	0	0	45	22-31	29
18:00	3	4	10	12	5	1	0	0	0	0	0	0	0	0	35	22-31	18
19:00	0	1	7	12	1	1	0	0	0	0	0	0	0	0	22	21-30	17
20:00	2	3	3	7	0	0	0	0	0	0	0	0	0	0	15	21-30	8
21:00	0	3	3	5	0	1	0	0	0	0	0	0	0	0	12	20-29	7
22:00	0	2	1	5	0	0	0	0	0	0	0	0	0	0	8	22-31	5
23:00	1	0	2	0	1	0	0	0	0	0	0	0	0	0	4	16-25	2
Total	20	46	120	197	69	8	0	0	0	0	0	0	0	0	460		
Percent	4.3%	10.0%	26.1%	42.8%	15.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	02:00	09:00	08:00	09:00	08:00	09:00									11:00		
Vol.	1	3	9	15	9	1									35		
PM Peak	12:00	16:00	15:00	17:00	16:00	13:00									15:00		
Vol.	7	5	19	21	10	1									48		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

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Station ID:

Latitude: 0' 0.0000 Undefined

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/14/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
05:00	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	1	*	1
06:00	1	0	2	2	1	0	0	0	0	0	0	0	0	0	6	23-32	3
07:00	1	1	8	4	6	**2**	0	0	0	0	0	0	0	0	22	20-29	11
08:00	1	**3**	6	**11**	6	1	0	0	0	0	0	0	0	0	**28**	23-32	16
09:00	1	2	**9**	8	5	1	0	0	0	0	0	0	0	0	26	21-30	15
10:00	1	2	5	7	2	0	0	0	0	0	0	0	0	0	17	22-31	10
11:00	1	2	7	10	**7**	0	0	0	0	0	0	0	0	0	27	22-31	16
12 PM	1	4	4	17	1	0	0	0	0	0	0	0	0	0	27	22-31	18
13:00	2	1	10	12	5	0	0	0	0	0	0	0	0	0	30	22-31	19
14:00	0	0	9	9	1	1	0	0	0	0	0	0	0	0	20	20-29	16
15:00	1	4	12	16	6	0	0	0	0	0	0	0	0	0	39	22-31	24
16:00	0	1	17	18	5	**2**	0	0	0	0	0	0	0	0	43	22-31	31
17:00	**6**	**8**	**20**	**26**	**8**	0	0	0	0	0	0	0	0	0	**68**	21-30	38
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	17	28	110	140	53	7	0	0	0	0	0	0	0	0	355		
Percent	4.8%	7.9%	31.0%	39.4%	14.9%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	05:00	08:00	09:00	08:00	11:00	07:00									08:00		
Vol.	1	3	9	11	7	2									28		
PM Peak	17:00	17:00	17:00	17:00	17:00	16:00									17:00		
Vol.	6	8	20	26	8	2									68		
Total	192	301	793	915	318	38	1	0	0	0	0	0	0	0	2558		
Percent	7.5%	11.8%	31.0%	35.8%	12.4%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

15th Percentile :	13 MPH
50th Percentile :	23 MPH
85th Percentile :	29 MPH
95th Percentile :	33 MPH

Stats

10 MPH Pace Speed :	21-30 MPH
Number in Pace :	1410
Percent in Pace :	55.1%
Number of Vehicles > 55 MPH :	0
Percent of Vehicles > 55 MPH :	0.0%
Mean Speed(Average) :	23 MPH

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/08/14	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	2	3	4	7	8	2	0	0	0	0	0	0	0	0	26	27-36	12
14:00	0	3	11	7	11	1	0	0	0	0	0	0	0	0	33	24-33	17
15:00	3	4	3	15	6	2	1	0	0	0	0	0	0	0	34	24-33	18
16:00	2	3	8	13	14	4	0	0	0	0	0	0	0	0	44	25-34	24
17:00	**6**	**8**	9	**27**	**24**	**7**	**2**	0	0	0	0	0	0	0	**83**	26-35	42
18:00	6	8	**14**	14	7	7	0	0	0	0	0	0	0	0	56	20-29	23
19:00	2	6	6	10	8	1	0	0	0	0	0	0	0	0	33	25-34	15
20:00	3	4	3	13	11	2	0	0	0	0	0	0	0	0	36	26-35	19
21:00	0	0	3	4	6	0	0	0	0	0	0	0	0	0	13	26-35	9
22:00	0	1	1	0	1	1	2	**1**	0	0	0	0	0	0	7	35-44	3
23:00	0	2	2	2	1	1	0	0	0	0	0	0	0	0	8	17-26	4
Total	24	42	64	112	97	28	5	1	0	0	0	0	0	0	373		
Percent	6.4%	11.3%	17.2%	30.0%	26.0%	7.5%	1.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak Vol.																	
PM Peak Vol.	17:00 6	17:00 8	18:00 14	17:00 27	17:00 24	17:00 7	17:00 2	22:00 1							17:00 83		

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/09/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2	24-33	2
05:00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	24-33	3
06:00	0	1	0	4	2	1	0	0	0	0	0	0	0	0	8	26-35	5
07:00	1	1	6	**14**	10	3	0	0	0	0	0	0	0	0	**35**	24-33	22
08:00	0	2	5	10	8	**7**	0	0	0	0	0	0	0	0	32	25-34	17
09:00	1	2	2	11	**13**	1	0	0	0	0	0	0	0	0	30	26-35	20
10:00	**2**	**5**	3	13	6	0	0	0	0	0	0	0	0	0	29	24-33	16
11:00	1	3	**9**	8	4	1	0	0	0	0	0	0	0	0	26	21-30	15
12 PM	**5**	2	4	8	7	2	0	0	0	0	0	0	0	0	28	24-33	12
13:00	1	2	3	10	7	0	**2**	0	0	0	0	0	0	0	25	25-34	15
14:00	0	2	7	10	8	2	0	0	0	0	0	0	0	0	29	24-33	17
15:00	1	0	5	8	3	0	0	0	0	0	0	0	0	0	17	22-31	12
16:00	1	1	**10**	**21**	**15**	2	2	0	0	0	0	0	0	0	**52**	25-34	33
17:00	1	**4**	5	19	15	2	1	0	0	0	0	0	0	0	47	26-35	29
18:00	0	4	7	7	10	**3**	1	0	0	0	0	0	0	0	32	26-35	15
19:00	0	2	6	10	4	2	1	0	0	0	0	0	0	0	25	22-31	15
20:00	0	1	2	5	5	1	0	0	0	0	0	0	0	0	14	25-34	9
21:00	0	1	3	4	3	2	0	0	0	0	0	0	0	0	13	22-31	7
22:00	0	2	5	4	3	0	0	0	0	0	0	0	0	0	14	19-28	8
23:00	0	0	0	3	1	0	0	0	0	0	0	0	0	0	4	24-33	4
Total	14	35	82	172	128	29	7	0	0	0	0	0	0	0	467		
Percent	3.0%	7.5%	17.6%	36.8%	27.4%	6.2%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	10:00	10:00	11:00	07:00	09:00	08:00									07:00		
Vol.	2	5	9	14	13	7									35		
PM Peak	12:00	17:00	16:00	16:00	16:00	18:00	13:00								16:00		
Vol.	5	4	10	21	15	3	2								52		

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/10/14	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5	26-35	4
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
05:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
06:00	0	0	2	3	3	1	0	0	0	0	0	0	0	0	9	24-33	6
07:00	0	0	3	4	4	0	0	0	0	0	0	0	0	0	11	24-33	8
08:00	4	**10**	6	6	**12**	3	0	0	0	0	0	0	0	0	41	28-37	14
09:00	4	8	8	**12**	10	**4**	0	0	0	**1**	0	0	0	0	**47**	26-35	18
10:00	4	6	**9**	5	2	0	0	0	0	0	0	0	0	0	26	16-25	12
11:00	**7**	8	8	6	5	0	**1**	0	0	0	0	0	0	0	35	17-26	12
12 PM	**2**	3	**11**	5	**12**	2	**1**	0	0	0	0	0	0	0	36	26-35	15
13:00	1	6	4	13	9	3	0	0	0	0	0	0	0	0	36	26-35	18
14:00	2	8	8	12	6	**5**	1	0	0	0	0	0	0	0	**42**	22-31	17
15:00	2	**9**	6	5	8	0	0	0	0	0	0	0	0	0	30	16-25	12
16:00	2	1	7	10	9	2	1	0	0	0	0	0	0	0	32	25-34	17
17:00	2	3	4	**16**	10	1	1	0	0	0	0	0	0	0	37	25-34	22
18:00	0	4	9	4	9	1	0	0	0	0	0	0	0	0	27	24-33	12
19:00	0	3	5	6	3	1	1	0	0	0	0	0	0	0	19	21-30	10
20:00	0	2	3	8	5	0	0	0	0	0	0	0	0	0	18	24-33	12
21:00	0	0	1	3	3	0	0	0	0	0	0	0	0	0	7	27-36	5
22:00	0	1	2	5	3	1	0	0	0	0	0	0	0	0	12	26-35	7
23:00	0	0	0	2	2	0	0	0	0	0	0	0	0	0	4	26-35	4
Total	30	72	98	127	118	25	6	0	0	1	0	0	0	0	477		
Percent	6.3%	15.1%	20.5%	26.6%	24.7%	5.2%	1.3%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%			
AM Peak	11:00	08:00	10:00	09:00	08:00	09:00	11:00			09:00					09:00		
Vol.	7	10	9	12	12	4	1			1					47		
PM Peak	12:00	15:00	12:00	17:00	12:00	14:00	12:00								14:00		
Vol.	2	9	11	16	12	5	1								42		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
Station ID:

Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/11/14	0	0	0	0	0	0	0	0	**1**	0	0	0	0	0	1	44-53	1
01:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	29-38	1
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
03:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	25-34	2
04:00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	24-33	3
05:00	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	1	34-43	1
06:00	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3	19-28	2
07:00	0	1	3	2	0	1	0	0	0	0	0	0	0	0	7	21-30	4
08:00	0	4	2	4	6	3	0	0	0	0	0	0	0	0	19	26-35	9
09:00	0	0	4	7	7	2	0	0	0	0	0	0	0	0	20	26-35	13
10:00	**2**	1	**9**	**12**	**11**	**5**	1	0	0	0	0	0	0	0	**41**	25-34	21
11:00	0	**6**	9	7	7	2	1	0	0	0	0	0	0	0	32	22-31	14
12 PM	0	**3**	**6**	**9**	**9**	3	1	0	0	0	0	0	0	0	**31**	26-35	16
13:00	5	1	3	6	5	**4**	1	0	0	**1**	0	0	0	0	26	24-33	9
14:00	**13**	0	1	0	0	0	**2**	0	0	0	**1**	**1**	0	**4**	22	3-12	12
15:00	4	0	1	0	0	0	0	0	0	1	0	0	0	0	6	2-11	4
16:00	7	0	0	1	0	0	0	0	0	0	0	0	0	0	8	2-11	6
17:00	8	0	2	0	0	0	0	0	0	0	0	0	0	0	10	4-13	7
18:00	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	3-12	6
19:00	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	6-15	3
20:00	5	2	0	0	0	0	0	0	0	0	0	0	0	0	7	4-13	5
21:00	1	3	3	4	2	0	0	0	0	0	0	0	0	0	13	19-28	6
22:00	0	1	1	0	1	0	0	0	0	0	0	0	0	0	3	14-23	2
23:00	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	13-22	1
Total	56	24	46	54	52	22	7	0	1	2	1	1	0	4	270		
Percent	20.7%	8.9%	17.0%	20.0%	19.3%	8.1%	2.6%	0.0%	0.4%	0.7%	0.4%	0.4%	0.0%	1.5%			
AM Peak	10:00	11:00	10:00	10:00	10:00	10:00	05:00		00:00						10:00		
Vol.	2	6	9	12	11	5	1		1						41		
PM Peak	14:00	12:00	12:00	12:00	12:00	13:00	14:00			13:00	14:00	14:00		14:00	12:00		
Vol.	13	3	6	9	9	4	2			1	1	1		4	31		

OHM Advisors

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Livonia, MI 48150

Beach Speed Study
South of Oxford

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Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/12/14	0	1	2	0	1	0	0	0	0	0	0	0	0	0	4	19-28	2
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2	13-22	1
05:00	0	0	1	0	0	0	**1**	0	0	0	0	0	0	0	2	14-23	1
06:00	0	0	2	1	1	1	0	2	0	**3**	2	0	0	0	12	57-66	4
07:00	7	0	1	2	2	0	0	**5**	**2**	3	3	**4**	**2**	**10**	**41**	3-12	9
08:00	13	1	0	0	1	0	1	0	1	3	**4**	0	0	7	31	5-14	13
09:00	**16**	0	1	0	0	0	0	0	0	2	0	0	2	5	26	3-12	15
10:00	9	1	**5**	4	5	0	0	0	0	0	0	0	0	0	24	5-14	10
11:00	0	**2**	3	**6**	**8**	**3**	0	0	0	0	0	0	0	0	22	27-36	13
12 PM	0	0	2	5	7	0	**1**	0	0	0	0	0	0	0	15	25-34	11
13:00	**1**	0	0	6	8	1	0	0	0	0	0	0	0	0	16	26-35	12
14:00	0	0	3	9	6	3	0	0	0	0	0	0	0	0	21	25-34	14
15:00	0	**3**	3	10	2	3	1	0	0	0	0	0	0	0	22	22-31	12
16:00	0	0	5	**20**	**22**	3	1	**1**	0	0	0	0	0	0	**52**	26-35	38
17:00	1	1	**7**	9	8	**6**	1	0	0	0	0	0	0	0	33	25-34	16
18:00	0	0	3	11	9	6	0	0	0	0	0	0	0	0	29	26-35	19
19:00	0	0	5	5	6	0	0	0	0	0	0	0	0	0	16	24-33	11
20:00	1	0	3	2	3	0	0	0	0	0	0	0	0	0	9	22-31	5
21:00	0	0	2	1	3	1	0	0	0	0	0	0	0	0	7	24-33	4
22:00	0	1	1	1	0	1	0	0	0	0	0	0	0	0	4	13-22	2
23:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	29-38	1
Total	48	11	49	92	92	30	6	8	3	11	9	4	4	22	389		
Percent	12.3%	2.8%	12.6%	23.7%	23.7%	7.7%	1.5%	2.1%	0.8%	2.8%	2.3%	1.0%	1.0%	5.7%			
AM Peak	09:00	11:00	10:00	11:00	11:00	11:00	05:00	07:00	07:00	06:00	08:00	07:00	07:00	07:00	07:00		
Vol.	16	2	5	6	8	3	1	5	2	3	4	4	2	10	41		
PM Peak	13:00	15:00	17:00	16:00	16:00	17:00	12:00	16:00							16:00		
Vol.	1	3	7	20	22	6	1	1							52		

OHM Advisors

34000 Plymouth Road
Livonia, MI 48150

Beach Speed Study
South of Oxford

Site Code: 1
Station ID:

Latitude: 0' 0.0000 Undefined

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/13/14	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3	24-33	3
01:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
02:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	24-33	1
05:00	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	25-34	2
06:00	0	**3**	0	1	7	0	0	0	0	0	0	0	0	0	11	27-36	7
07:00	**2**	2	**10**	6	12	4	0	0	0	0	0	0	0	0	36	28-37	16
08:00	1	2	5	11	**19**	**6**	**2**	0	0	0	0	0	0	0	**46**	27-36	27
09:00	1	3	2	8	10	3	1	0	0	0	0	0	0	0	28	27-36	15
10:00	0	1	2	8	5	2	0	0	0	0	0	0	0	0	18	25-34	12
11:00	0	2	6	**12**	9	2	1	0	0	0	0	0	0	0	32	25-34	19
12 PM	**4**	3	3	6	4	2	0	0	0	0	0	0	0	0	22	22-31	8
13:00	0	1	4	8	11	5	1	0	0	0	0	0	0	0	30	26-35	18
14:00	0	0	**7**	6	13	3	0	0	0	0	0	0	0	0	29	27-36	18
15:00	1	2	7	7	14	4	0	0	0	0	0	0	0	0	35	27-36	19
16:00	3	3	4	**15**	16	**10**	**4**	0	0	0	0	0	0	0	**55**	28-37	27
17:00	1	0	5	10	**20**	9	3	0	0	0	0	0	0	0	48	28-37	29
18:00	0	4	4	12	8	4	1	0	0	0	0	0	0	0	33	25-34	18
19:00	0	**5**	5	4	7	2	0	0	0	0	0	0	0	0	23	28-37	9
20:00	1	3	0	5	3	2	0	0	0	0	0	0	0	0	14	27-36	6
21:00	0	0	0	8	0	0	0	0	0	0	0	0	0	0	8	22-31	8
22:00	0	2	1	1	0	0	0	0	0	0	0	0	0	0	4	18-27	2
23:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
Total	14	36	66	132	163	58	13	0	0	0	0	0	0	0	482		
Percent	2.9%	7.5%	13.7%	27.4%	33.8%	12.0%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	06:00	07:00	11:00	08:00	08:00	08:00								08:00		
Vol.	2	3	10	12	19	6	2								46		
PM Peak	12:00	19:00	14:00	16:00	17:00	16:00	16:00								16:00		
Vol.	4	5	7	15	20	10	4								55		

OHM Advisors

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Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
05/14/14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	20-29	2
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	19-28	1
05:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	14-23	1
06:00	1	1	3	3	4	1	0	0	0	0	0	0	0	0	13	26-35	6
07:00	1	1	5	8	10	4	**2**	0	0	0	0	0	0	0	31	27-36	16
08:00	0	1	4	**15**	**16**	**7**	0	0	0	0	0	0	0	0	**43**	27-36	28
09:00	**2**	1	5	14	9	7	1	0	0	0	0	0	0	0	39	25-34	21
10:00	0	**3**	3	5	12	2	0	0	0	0	0	0	0	0	25	27-36	15
11:00	0	0	**6**	10	10	1	2	0	0	0	0	0	0	0	29	25-34	19
12 PM	0	**2**	2	6	6	2	0	0	0	0	0	0	0	0	18	27-36	10
13:00	**1**	1	4	7	9	**4**	**3**	0	0	0	0	0	0	0	29	28-37	14
14:00	0	0	1	8	11	2	1	0	0	0	0	0	0	0	23	27-36	17
15:00	1	0	3	8	9	4	0	0	0	0	0	0	0	0	25	27-36	15
16:00	1	2	**9**	16	**20**	4	1	0	0	0	0	0	0	0	**53**	26-35	32
17:00	1	0	9	**19**	15	2	1	**1**	0	0	0	0	0	0	48	25-34	31
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	8	12	55	122	131	40	11	1	0	0	0	0	0	0	380		
Percent	2.1%	3.2%	14.5%	32.1%	34.5%	10.5%	2.9%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	10:00	11:00	08:00	08:00	08:00	07:00								08:00		
Vol.	2	3	6	15	16	7	2								43		
PM Peak	13:00	12:00	16:00	17:00	16:00	13:00	13:00	17:00							16:00		
Vol.	1	2	9	19	20	4	3	1							53		
Total	194	232	460	811	781	232	55	10	4	14	10	5	4	26	2838		
Percent	6.8%	8.2%	16.2%	28.6%	27.5%	8.2%	1.9%	0.4%	0.1%	0.5%	0.4%	0.2%	0.1%	0.9%			

15th Percentile :	14 MPH
50th Percentile :	27 MPH
85th Percentile :	34 MPH
95th Percentile :	38 MPH

Stats		
	10 MPH Pace Speed :	25-34 MPH
	Number in Pace :	1361
	Percent in Pace :	48.4%
	Number of Vehicles > 55 MPH :	59
	Percent of Vehicles > 55 MPH :	2.1%
	Mean Speed(Average) :	26 MPH

TRAFFIC COMMITTEE REPORT

June 3, 2014

TO: Traffic Committee

FROM: Bill Huotari, Deputy City Engineer/ Traffic Engineer

SUBJECT: Traffic Calming Measures

Background:

Traffic Engineering performed an informal survey in May of 2013 of neighboring and similar communities relative to their use of Traffic Calming measures and specifically speed humps. One of the primary criteria for determining the use of speed humps is 85th percentile speeds (the speed at which 85% of traffic is travelling at or below). Listed are the 85th percentile speeds that are one factor as part of the minimum criteria for consideration of speed hump installation for those agencies that have a program in place.

- Rochester Hills – 85th percentile speeds exceed the posted speed by 6 mph or greater
- Farmington Hills – 85th percentile speeds of 35 mph or greater
- Road Commission for Oakland County – 85th percentile speed greater than or equal to 35 mph

Rochester Hills is by far the most aggressive in promoting and implementing speed humps and have placed them at several locations throughout their city. The feedback they have received has been mostly positive and they have found that the speed humps have been effective in reducing vehicle speeds. Attached are a few post installation surveys that they conducted as well as a summary of Pro's and Con's that they have experienced.

The Road Commission for Oakland County has placed speed humps at two (2) locations in the County and also found that speeds were reduced, but in one case traffic volume increased.

Farmington Hills has installed speed humps in seven (7) locations and found that speeds in general have decreased but there have been some resident concerns relative to noise and aesthetics.

Agencies that do not have Traffic Calming programs in place:

- Novi
- Clawson
- Madison Heights
- Birmingham
- Sterling Heights

One large area of concern with speed humps is their impact on emergency vehicle response time. The City of Los Angeles has over 3,700 speed humps installed and in February 2013 recommended that their program be stopped and that a ban be placed on the installation of new and replacement of existing speed humps. This recommendation was not acted on at that time and it is still under review.

There are numerous other types of traffic calming measures and a summary of various options is detailed in the attached document titled “Speed Control in Residential Areas”. This document was written by traffic engineers in the southeast Michigan area so it has a local emphasis to it. Many other examples are available which cover many of the same topics but provide user experiences outside of Michigan and are a valuable resource when considering traffic calming measures.

The City of Troy previously had the “Neighborhood Traffic Harmonization Program” (NTHP) available for interested residents. This program was very similar to the programs in Rochester Hills and Farmington Hills. The program was used for the installation of the speed hump on Walnut Hill but there have been no other physical traffic calming measures placed as a result of this program.

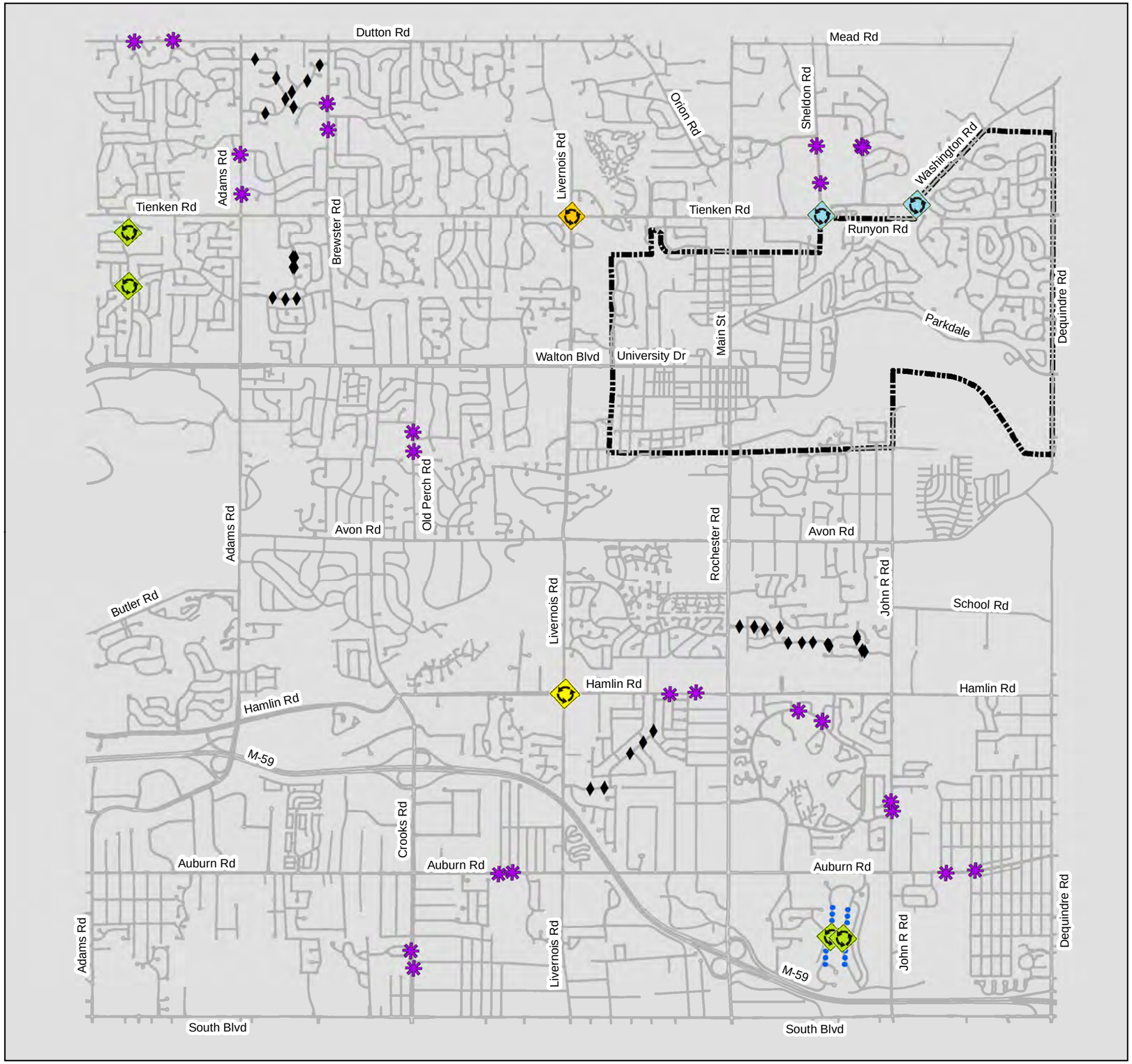
The NTHP program was eliminated during the economic downturn corresponding with a reduction in staff. The Traffic Engineer position was eliminated and absorbed by the Deputy City Engineer. One (1) part-time traffic technician and one (1) intern position were also eliminated. The Traffic Engineering Department is currently staffed by the Deputy City Engineer/Traffic Engineer and one (1) part-time traffic technician.

If a “Traffic Calming Program” were to be reinstated, additional staff or consultant time would be required. The programs are very labor intensive as most, if not all, contain significant efforts to educate residents prior to enforcement. Enforcement requires a significant commitment of police resources which were also reduced significantly during the economic downturn.

Engineering is commonly recognized as the final step and includes the design and construction of physical control devices. The cost to install physical measures is paid for by residents under the City’s Special Assessment District (SAD) procedures except support must be at least 70% as opposed to a typical road SAD where a simple majority is needed.

At this time, staffing levels in Traffic Engineering and Police Departments are not at a level that would be needed to effectively implement and maintain a full-blown NTHP. A more simple method may be to follow the lead of the RCOC and develop “Guidelines for Speed Hump Installation” that sets minimum criteria for which a speed hump can be considered. These guidelines would also need to establish or outline: City Council approval requirements, support criteria, payment, maintenance responsibilities, removal requests, etc.

A copy of Troy’s former NTHP program is attached along with information on Rochester Hills, Farmington Hills and RCOC programs.



City Traffic Calming Map for Speed Humps, Roundabouts, Radar Speed Signs and Mid-Block Slow Points

Legend

- Mid Block Slow Point
- Radar "Your Speed" Sign
- Roundabout - Single Lane
- Roundabout - Dual Lane
- Roundabout - Dual Lane, Proposed
- Roundabout - Residential
- Speed Hump
- Proposed Speed Hump
- City Boundary
- Road Centerline

Map published and data maintained by:
Departmentof Public Services/Transportation
Revised: 8/8/2013

Although the information provided by this map is believed to be reliable, its accuracy is not warranted in any way. The City of Rochester Hills assumes no liability for any claims arising from the use of this map.

N W E S

0 1,750 3,500

1 Inch = 3,500 Feet

ROCHESTER HILLS MICHIGAN

Path: N:\GIS\Workarea\ReadytoSync\Department\pub\Projects\Transportation\City Traffic Calming.mxd

DEPARTMENT OF PUBLIC SERVICE

Roger H. Rousse
Director

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(248) 656-4688

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General Information
(248) 656-4600

Pat Somerville
Mayor
(248) 656-4664

Marc A. Ott
City Administrator
(248) 656-4664

CITY OF ROCHESTER HILLS

I. SPEED HUMPS – ADVANTAGES:

- Traffic speeds are decreased at the humps and at locations between properly spaced successive humps. Speeds of the fastest drivers are affected, as well as those of average drivers. The speed distribution generally narrows with the greatest effect on higher vehicle speeds.

- A single hump will only act as a point speed control. To reduce speeds along an extended section of street, a series of humps is usually needed.

- Speed humps will often divert traffic to other streets, especially in those situations where a significant amount of traffic is using the street as a shortcut, detour, or overflow from a congested collector or arterial roadway. Volume reductions are also affected by the number and spacing of humps and the availability of alternative routes.

- Speed and volume modifications caused by humps tend to remain constant over time.

- Speed humps have not been found to pose a traffic safety hazard when properly designed and installed at appropriate locations. In fact, accident experience generally remains stable or decreases due to reduced speeds and volume, thereby improving the inherent safety of a particular street or residential area.

- Where humps are successful at reducing speeds, there is probably little net change in road noise or possibly even a reduction in noise levels. Traffic noise will generally decrease with fewer vehicles and lower speeds, but noise may increase at the hump, particularly if significant numbers of trucks use the street.

- Adequate signing and marking of each speed hump is essential to warn roadway users of the hump's presence and guide the user's subsequent action.

- Large trucks, buses, and emergency vehicles can safely pass over humps but must travel at relatively low speeds or significant jolts to the vehicle, discomfort or injury to occupants, and jostling of cargo will be experienced. Speed humps have been used to deter trucks and larger vehicles from using particular streets.

- The majority of local street residents will normally support speed hump installations and endorse their continued use.

II. SPEED HUMPS - DISADVANTAGES:

- Residents' dissatisfaction over the gentle hump design (as opposed to the more drastic bump) and its perceived inability to dramatically slow vehicles or reduce traffic volumes to a desired level.

- Local policy decisions to favor traffic circulation needs over residents' quality of life concerns.

- Undesired traffic diversion to other residential streets.

- Aesthetics of the humps and associated signs and markings.

- Increased noise level at the hump caused by vehicle rocking and acceleration/deceleration.

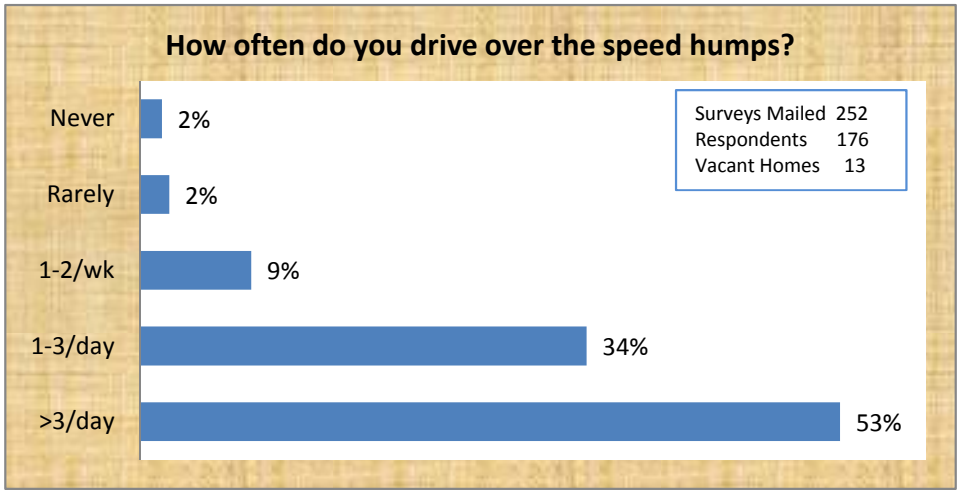
- Impact on snow-plowing and other street maintenance functions.

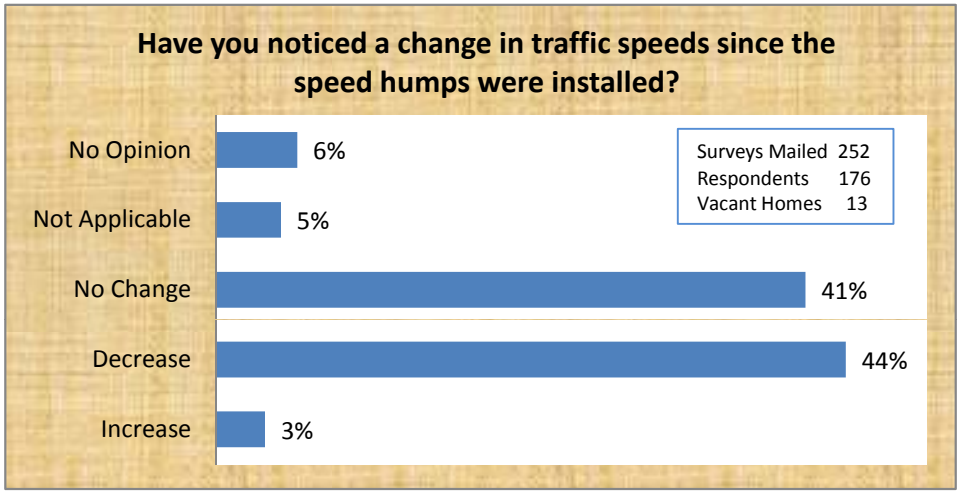
- Concerns over impact to emergency vehicle response time.

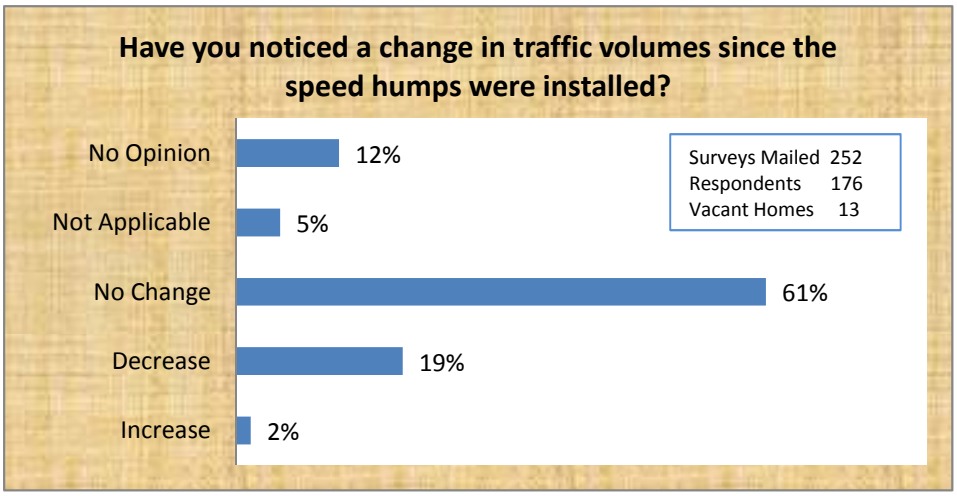
- Concerns with liability for personal injury and damage claims.

- Inadequate funding for the initial and/or continued maintenance costs of the hump and its traffic control devices.

Hawthorn Speed Hump Survey Results







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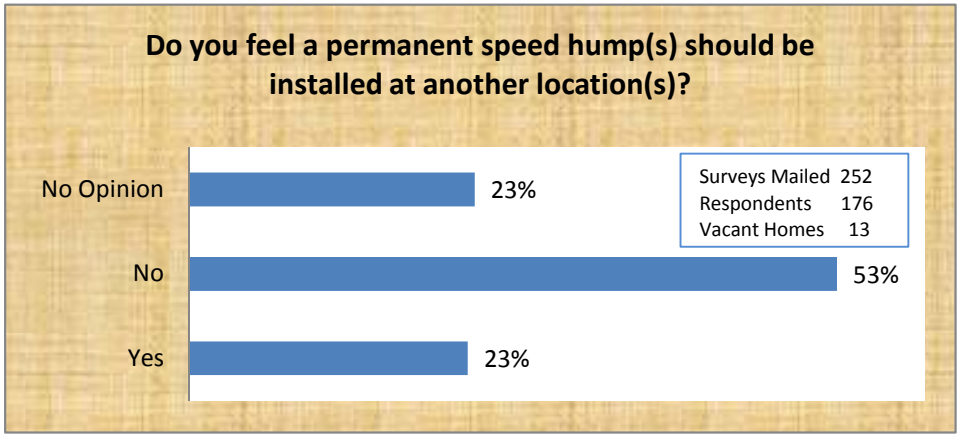
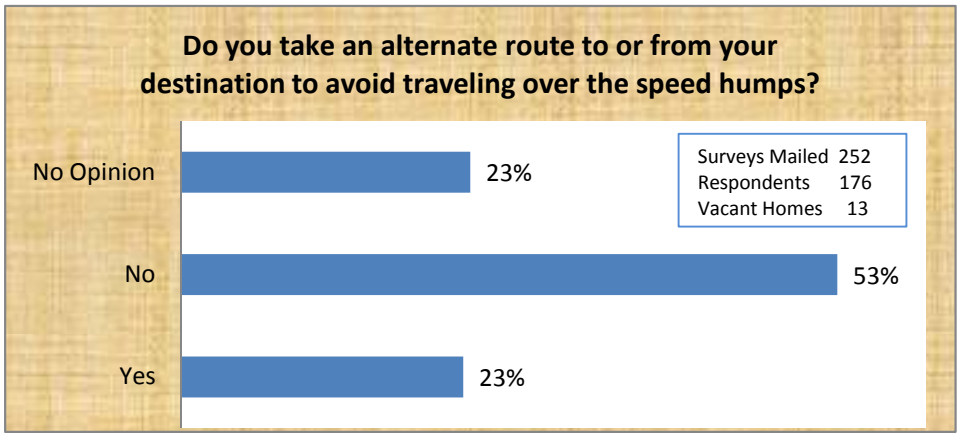
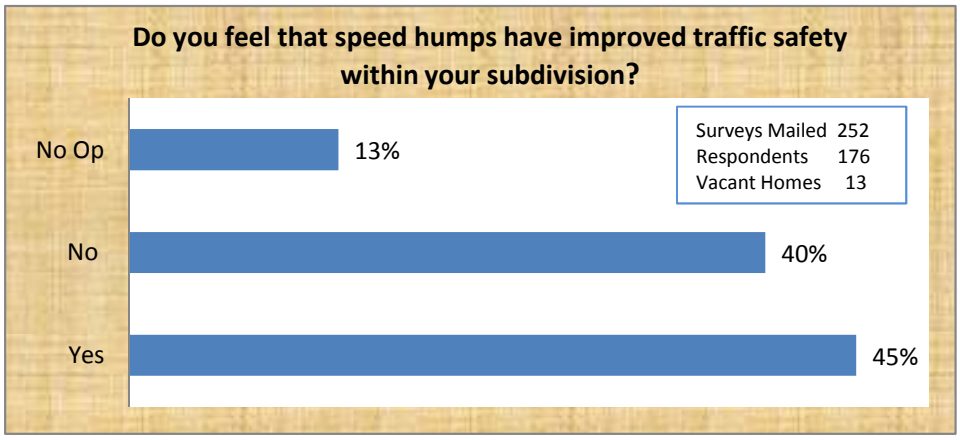
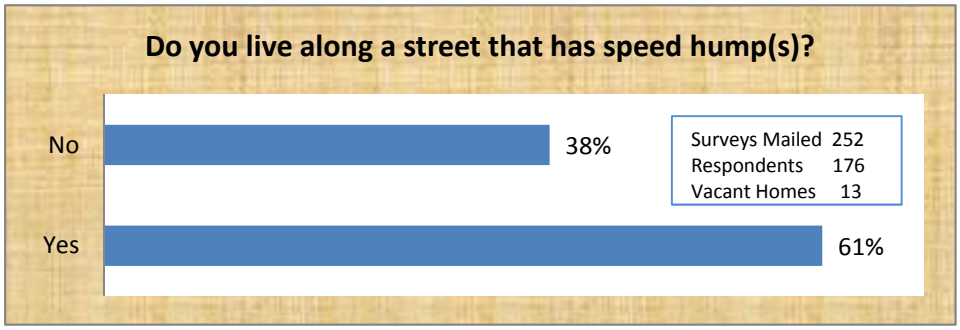
Hawthorn Speed Hump Survey Results









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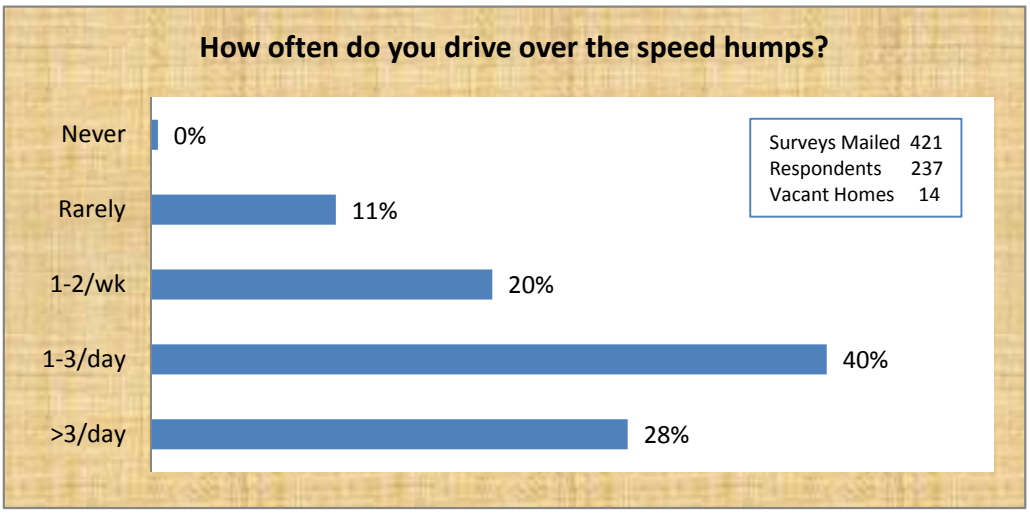
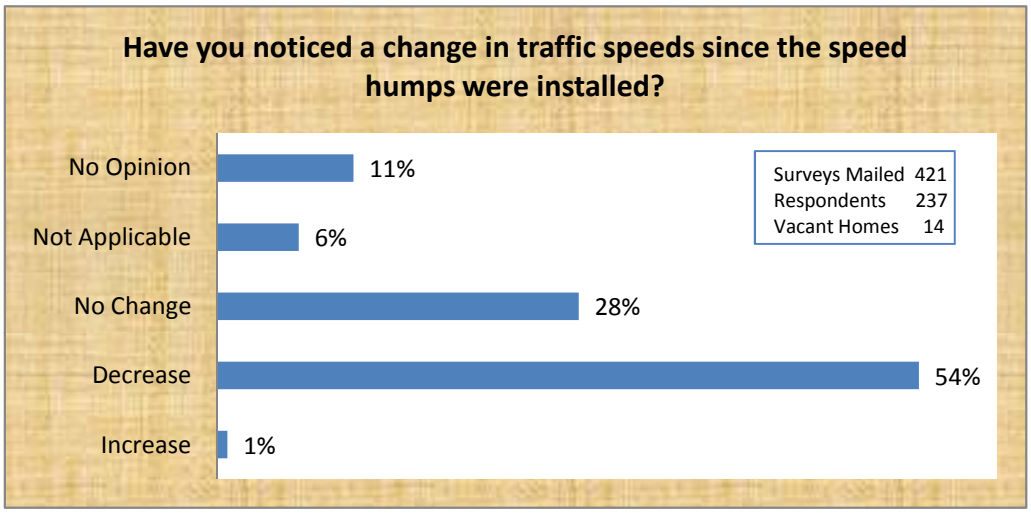
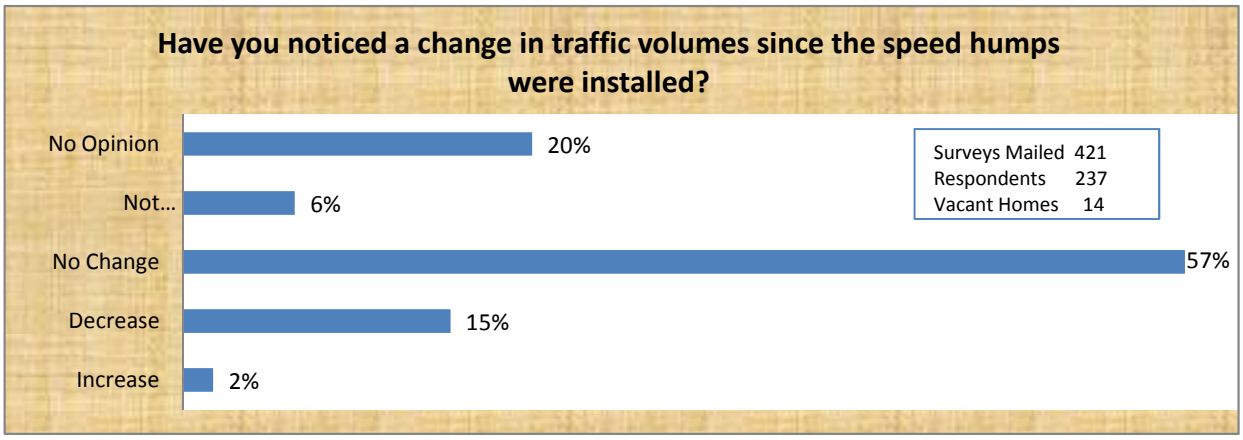
Shadow Woods Speed Hump Survey Results







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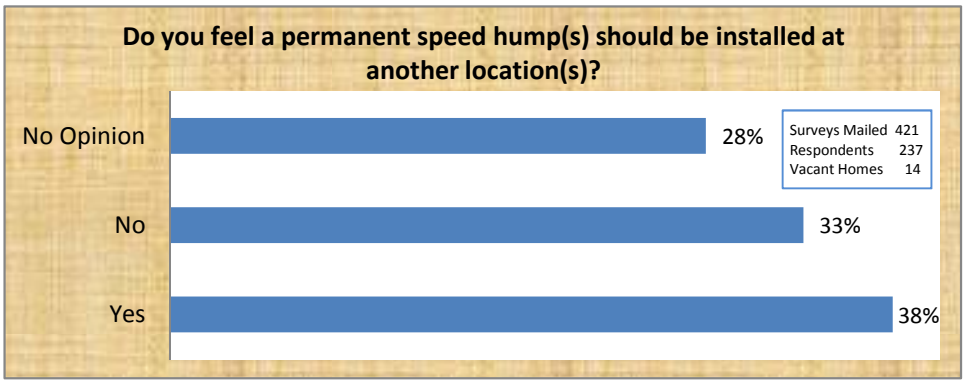

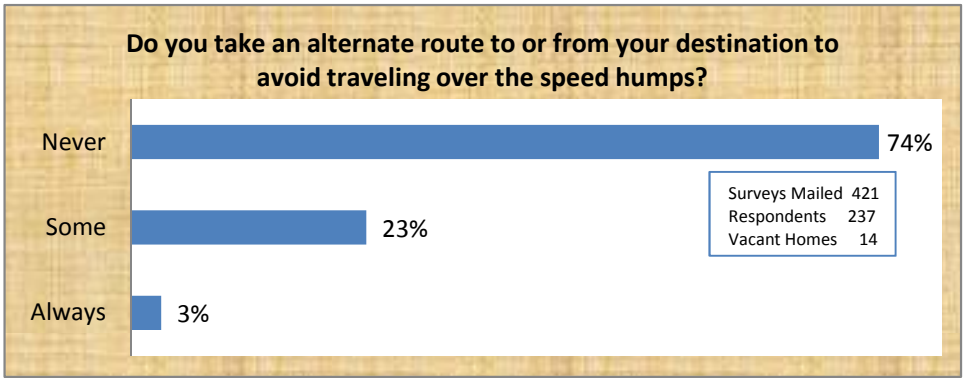

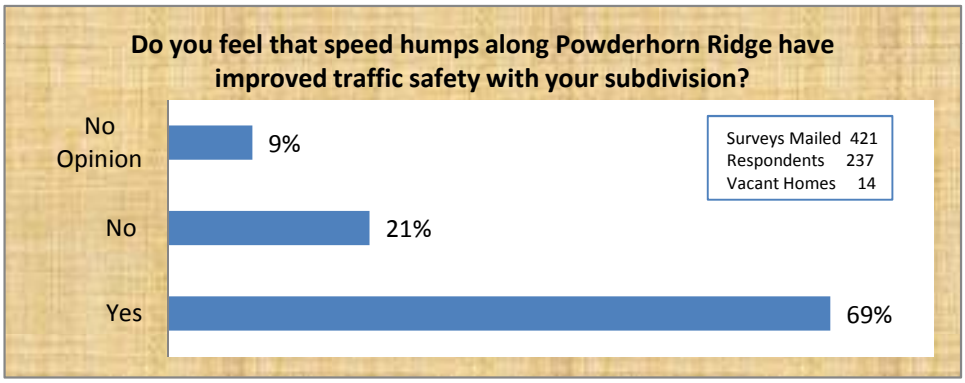

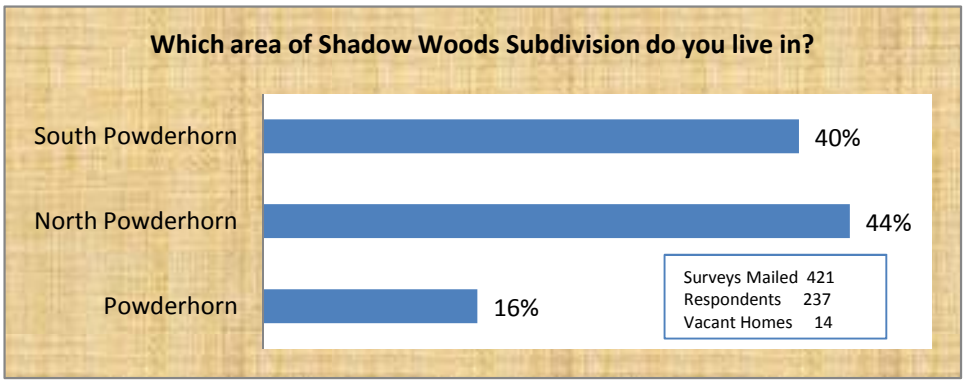

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CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

Date: February 11, 2013

To: The Honorable City Council
c/o City Clerk, Room 395
Attention: Honorable Bill Rosendahl, Chair, Transportation Committee

From: Jaime de la Vega, General Manager
Department of Transportation

Subject: **SPEED HUMP POLICY/IMPACTS ON EMERGENCY VEHICLE RESPONSE TIMES**

SUMMARY

The Los Angeles Department of Transportation (LADOT) recommends that the Council and Mayor ban the installation of new and replacement of existing speed humps in order to eliminate negative impacts on emergency response times.

RECOMMENDATION

That the Council, subject to concurrence by the Mayor:

1. ADOPT a ban on the installation of new speed humps and on the replacement of existing speed humps.

2. DIRECT the Los Angeles Department of Transportation and all other cities agencies to comply with the ban.

ALTERNATIVE

The Council has the option of prioritizing neighborhood traffic management over delays to emergency response times. If the Council wants to adopt such a policy, LADOT recommends the following policies:

That the Council, subject to concurrence by the Mayor:

1. DIRECT the Los Angeles Department of Transportation to only accept requests for the installation or removal of speed humps if the project is financially supported by city budget appropriations or private interests that can fund all costs, including public outreach, project coordination, traffic studies, engineering design, construction, inspections, and administrative services.

2. DIRECT the Los Angeles Department of Transportation to ensure that the location and conceptual plan for a speed hump installation be reviewed and accepted by Los Angeles Fire Department prior to project initiation.

3. AUTHORIZE the General Manager of the Los Angeles Department of Transportation to develop and administer guidelines for the installation and removal of speed humps based on traffic safety considerations, industry practices and input from emergency response agencies.

DISCUSSION

LADOT has reviewed the available research related to the impact of traffic speed humps on the travel times of emergency response vehicles. LADOT also reviewed the department's records and policies, and met with senior management from the Los Angeles Fire Department (LAFD).

Emergency response times and neighborhood speeding both are important policy issues that the city should seek to address. Speed humps are highly effective at reducing vehicle speeds and addressing neighborhood concerns over speeding, but also pose the unintended consequence of compromising emergency response times and the stability of sensitive on-board equipment. This report recommends prioritizing emergency response times as a citywide policy, therefore new speed humps should not be installed and existing speed humps should not be replaced when removed as part of street resurfacing or reconstruction work.

Speed Hump Characteristics

A speed hump is a geometric pavement design feature that is installed across the width of one or more traffic lanes to reduce vehicle speed and traffic volume. It has the appearance of a rounded mound with a measurement of 2-5/8 to 3 inches in height and 12 to 22 feet in length. Speed humps are usually spaced at distances of 300 to 600 feet apart.

A driver must slow down when passing over a speed hump to avoid potential damage to the vehicle or feeling the discomfort from a jolt. Research has shown that vehicle speeds can be significantly reduced when traversing speed humps. Lower speeds reduce the probability of fatal and serious injury car crashes. Although many residents welcome speed humps, others complain of the aesthetics, inconvenience, vehicle wear and tear, and increased noise level as cars pass each hump throughout the day.

Emergency Response Times

Comprehensive studies[1] published by cities and transportation organizations around the world indicate that emergency service vehicles can be delayed by speed humps. Delays typically range from two to 10 seconds per speed hump. The time of delay varies depending on the vehicle type, weight, horsepower, wheel-base, onboard equipment, and driver discretion. In live test cases, the greatest delays were experienced by emergency vehicles with long wheel-bases and stiff suspensions, and vehicles with sensitive equipment on board. Smaller and lighter vehicles are generally less affected by speed humps.

In Los Angeles, emergency vehicles with activated sirens already reduce speeds at signalized intersections and stop signs while in route to and from an incident. Speed reduction is a safety precaution to avoid potential conflicts with other motorists and pedestrians. If an emergency responder encounters one or two speed humps along the way, travel time impacts may be relatively minor and considered to be within acceptable limits. However, a series of speed humps could disrupt moderate cruising speeds and measurably extend the overall travel time. For example, accelerations and decelerations over 4 or more speed humps on a stretch of roadway can delay travel time in one direction by more than a minute. Time delays can be further compounded by inclement weather and heavy traffic conditions.

Because future incidents and the exact route used by LAFD cannot be predicted, it is impossible to quantify the exact emergency response delay related to the presence of speed humps.

Public Health and Safety

The American Heart Association reports that sudden cardiac arrest is a leading cause of death in the United States. It is estimated that 95% of cardiac arrest victims die before they reach the hospital. Statistics show that the survivability of sudden cardiac arrest directly correlates to the timeliness of medical intervention.

The National Trauma Institute ranks trauma as the leading cause of death among persons ages 1 to 44 and the third cause of death across all age groups. According to

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[1] Institute of Transportation Engineers (various reports from online library). Retrieved from http://www.ite.org/traffic/search.asp?whichpage=14&pagesize=10&terms=&keywords=

Jaeger, R. (2009), Traffic Calming – Speed Humps Effect on Emergency Response Times.

Robertson, T. (October 2000), Speed Hump Impacts on Emergency Response Times Eugene Fire and Emergency Medical Services

the Center for Disease Control, severely injured patients who receive care at a Level I trauma center rather than a non-trauma center have a 25% greater chance of survival. The ability to reach the right level of care as fast as possible is critical to receiving necessary treatment.

The survival rates from cardiac arrest and severe trauma diminish for every minute that passes without appropriate medical intervention. Similarly, safety threats and damage caused by fire can expand rapidly if emergency response is delayed. The proliferation of speed humps throughout the City may have already contributed to a cumulative slowing effect on emergency response time goals.

BACKGROUND

The Transportation Committee requested a report back on the issue of speed humps and potential impacts on emergency response times on January 23, 2013.

On October 20, 1993, LADOT submitted a report to Mayor Richard Riordan recommending the implementation of a citywide speed hump program to reduce traffic speeds in select residential areas (Attachment). The report identified relevant traffic studies, funding considerations, Los Angeles Police Department and LAFD concerns, legal issues, and street maintenance impacts.

Council adopted the program in 1994 and over the next 15 years more than 3,700 speed humps were constructed at roughly 1,450 requested locations. The program was special funded by annual budget appropriations that ranged from $330,000 to $1.1 million. In 2009, the program was discontinued as a result of permanent budget reductions in the city's Fiscal Year 2008-09 Adopted Budget. The lack of funding support led to the elimination of dedicated staff and related contractual services.

FISCAL IMPACT

LADOT's recommendation to ban the installation of new speed humps has no financial impacts. However, if Council prefers the proposed alternative, speed hump projects must be financially supported by city budget appropriations or private interests that can fully fund all costs.

Attachment

c: Brian Cummings, Fire Chief

2 copies

SPEED CONTROL IN RESIDENTIAL AREAS

ite

DRIVE MICHIGAN SAFELY

FORWARD

This document is a revision of the "Speed Control in Residential Areas" booklet original written by the Residential Area Speed Control Ad-Hoc Committee. This revision represents the latest information and findings of the Institute of Transportation Engineers (ITE) Michigan Section's Technical Project Committee. The makeup of the Technical Project Committee is as follows:

Lori Swanson, Chair	Hubbell, Roth & Clark, Inc.
John Abraham	City of Troy
Matthew Smith	McNamee, Porter & Seeley, Inc.
Mshadoni Smith	Hubbell, Roth & Clark, Inc.
Eric Tripi	Barton-Aschman Associates, Inc. of Michigan

The information presented in this document represents the findings of the authors and does not necessarily reflect the views of the Michigan Office of Highway Safety Planning.

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I. INTRODUCTION

The perception of speeding on local streets is probably the most persistent problem facing residents and traffic officials, alike. Although local or residential streets carry the lowest traffic volumes and suffer the fewest traffic crashes, they are the single largest consumer of a traffic engineer's time and energy. Residents observe vehicles being driven at speeds they perceive are too fast and conclude that the speeds would decrease if stop signs were installed. Speeds considered excessive by residents are considered reasonable by these same persons when they are driving in another neighborhood. Every traffic engineer has been shaken by these same residents who announce "if something is not done about the traffic problem on my street, someone is going to be killed and it will be your fault." This is usually followed by a demand for various traffic control measures and often backed up with petitions from residents. Traffic officials then must focus their attention on responding to these pressures, often diverting resources that could be dedicated to solving major capacity and traffic crash problems on other streets.

Residents' complaints are usually accompanied by a proposed solution to the speeding problem...stop signs. Traffic officials respond that stop signs installed to control speeding: (a) don't work, (b) are frequently violated, (c) are detrimental to safety, (d) are not warranted in the Manual* and, (e) actually increase speeds between stop signs. When residents are told that stop signs are not the answer to the speeding problem, they feel they must fight city hall to get them installed. A confrontational relationship is established between residents and traffic officials and the stop sign becomes a "trophy" which is awarded to the winner of the confrontation. Solving the speeding problem becomes secondary to winning the "trophy". The end results of this process are: (1) unhappy citizens, (2) continued complaints and requests for more stop signs, (3) increased political pressure and, (4) often, approval of stop sign installations to bring the controversy, temporarily, to an end. However, experience shows the

* The "Manual" refers to the *Michigan Manual of Uniform Traffic Control Devices* (MMUTCD that specifically states that stop signs should not be used for speed control).

speeding problem is usually not solved. Before and after studies show that stop signs usually increase mid-block speeds and create violators of the stop controls.

This booklet introduces traffic engineers, law enforcement officers, elected officials and community leaders to the concept of traffic calming which may help alleviate speeding in residential areas. Traffic calming is the combination of physical controls and community support to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized users. Some objectives of traffic calming include: reducing speeds for motor vehicles, reducing crash frequency and severity, increasing safety, reducing the need for police enforcement, and reducing cut-through motor vehicle traffic.

Traffic calming measures are typically installed as part of an area wide traffic management scheme rather than on a single street to avoid shifting the problem from one street to another. A successful traffic calming program must include enforcement, education, engineering and community involvement. Community support and participation is an integral part of a successful traffic calming program. This booklet will give guidance on how to set up a successful traffic calming program in your community.

This booklet provides alternatives that may help decrease speeds on residential streets. It discusses the advantages and disadvantages of each alternative. It points out that there is no single, simple solution to all speeding problems that satisfies residents, is effective, and meets good engineering practices and standards. It also stresses that there may not be a tool to reduce speeds. Regardless of the approach used, there are certain criteria that should be followed:

- All devices must meet Michigan Manual of Uniform Traffic Control Devices requirements.

- The integrity of streets classified as Major under the provisions of Public Act 51 must be preserved.

- Permanent traffic control devices should be used to the minimum extent required to achieve the objectives.

- Access to all properties must be accommodated.
- Access from the nearest arterial to the destination should be as direct as practical.
- Local access to neighborhood facilities must be accommodated.
- All permanently installed devices must be designed to allow emergency vehicle access.
- Consideration must be given to circulation, parking and needs of customers and business owners.
- Consideration should be given to the access needs of essential commercial services such as garbage pickup, snow plowing, student busing, etc.
- Changes must not unduly impact adjacent areas.

It states that residents and local officials must work together with a full understanding of each other's problems, limitations and concerns for the common goal of safety on residential streets. One of the best ways to accomplish this is to have citizens involved in standing or ad hoc community traffic safety committees.

This booklet is intended to be used as a traffic safety tool by traffic engineers, law enforcement officers, elected officials, and community leaders in their day-to-day traffic control responsibilities.

References: 40, 41, 42

II. COMMUNITY INVOLVEMENT

An important component of any traffic calming program is community involvement. If citizens are involved, the chance for problem resolution and a successful traffic calming program is greatly improved. Often the problem cited is one of perception and not fact, and the solution proposed could be ineffective or even counter-productive. One way to avoid the knee-jerk approach to traffic engineering is to develop a process that involves the community. While there are many ways to accomplish public involvement, this section will describe two that have been successful.

Approaches to Citizen Involvement

Standing Committee

Some communities have successfully employed a standing committee, normally referred to as the "Citizen Traffic Committee," to deal with traffic control issues. The makeup, function and authority of the committee are described below:

a. The committee is appointed by the mayor or council. It should consist of an odd number of members who serve staggered terms.

b. Non-voting staff experts (police and engineers) are available to prepare agendas, collect data, provide input and send recommendations to the city council.

c. Efforts should be undertaken to make committee members as knowledgeable as possible about traffic engineering and enforcement principles. This can be realized by providing technical materials and training for committee members.

d. The Committee reviews citizen requests for traffic control devices and staff analysis of those requests, and makes recommendations to the city council.

The Committee should hold monthly, evening meetings. The standing committee offers several advantages; acts as a buffer between the council and citizens; lessens the pressure to install unwarranted devices; may be perceived as more objective than staff; provides technical and citizen input to the council; and dampens the adversary relationship that often develops between citizens and staff. On the other hand, there are some drawbacks: the committee can become politically motivated; one strong member can have too much influence; it can slow the process; and it requires some staff time.

Ad hoc committee

In this approach, an *ad hoc* or advisory committee is formed when a community seeks help in dealing with a specific traffic control problem. While the governmental agency has the ultimate responsibility, it is highly desirable that the committee and agency work through the process and arrive at a consensus. This process works as follows:

a. A working committee of neighborhood residents should be selected to represent different parts of the neighborhood. If the neighborhood has an organized association it should be asked to assist with the appointments; otherwise, volunteers are sought.

b. Committee members should identify the problem brought to their attention.

c. Staff collects the appropriate data and presents it to the committee. The committee sets goals which are quantifiable, e.g., reduce the average speed by a certain percentage, etc.

d. Options should be identified and alternatives presented, listing the pros, cons, cost, etc. of each.

e. Committee and staff reach agreement on the alternative to be recommended.

f. Committee with staff support presents the plan to the larger community through a large meeting or several small meet-

ings. One large meeting is enough if the plan is not controversial; the number of meetings should be directly related to the complexity of the plan. The purpose of the meetings is to obtain community support.

g. Once community support is achieved the plan is implemented. If possible, it is best to install temporary measures to determine the impact. This allows for adjustments and even removal if it is obvious that the measures will not produce the desired results.

The advantages of using advisory committees are that they will help develop neighborhood concerns and determine what, if anything, should be done; it builds a relationship between staff and residents to work through future problems; and the process creates a better understanding of traffic engineering and enforcement principles among lay people. Conversely, this process consumes considerable time and effort of staff. If consensus is not reached, the neighborhood can become divided. If not handled deftly by staff, the process can become unwieldy.

References: 19, 25, 28

III. PROBLEM IDENTIFICATION

The first step in a traffic calming program is to identify the problem. When a resident contacts their City, Village or County, a complaint is recorded. The resident will be directed to discuss their concerns with the other residents or an established traffic advisory committee. If an advisory committee has not been established, the public agency will give guidance on how to start one. Residents will assist the public agency in the identification of the problem.

These residents will also assist the public agency in the collection of data. Speed studies, traffic volume studies and license plate surveys, depending on need, will be performed at locations identified by the residents. The data collected will be analyzed to determine if there is a problem. If a problem is not identified, a letter with the supporting data will be sent to the residents explaining the findings and that no further action is required. If a problem is identified, then the public agency will move to the next steps of the program which include enforcement and education.

References: 42

IV. EDUCATION AND ENFORCEMENT

Once a speeding problem has been identified, the next steps in a traffic calming program is to initiate education and enforcement campaigns. Both of these steps should be conducted at the same time since many times a speeding problem can be reduced through effectively enforcing the traffic ordinances and educating the residents. From past enforcement activities, the City of Farmington Hills, Michigan found that most traffic violators within a residential area were the residents who live in the area. Therefore, it is critical to educate the residents of an area where a traffic problem is occurring.

Reference: 42

A. EDUCATION

1. Public Information And Education

An effective way to educate residents is through public information and education campaigns. Public information and education campaigns should be carried out through the mass media by law enforcement members of safety oriented groups. These campaigns "spread the word" about current enforcement emphasis and encourage voluntary compliance with the law. The perception that violators will be apprehended is essential to develop compliance with the law. Selecting the right media for your message is important. Clearly define the reason for the change; i.e., to reduce traffic crash casualties. The size of the audience and project will be a controlling factor in the media you select. An enforcement effort must be coordinated with the information and education campaign.

Reference: 5

2. Neighborhood Speed Watch Program

Another educational tool is the Neighborhood Speed Watch Program whereby residents can help control speeds with minimal police support.

A Neighborhood Speed Watch Program must involve law enforcement personnel and residents working as a team. Law enforcement's role is to provide the educational material and, if necessary traffic law enforcement. An effective tool used for education is speed radar trailers. The trailers are unmanned and equipped with radar equipment to detect the speed of vehicles. The trailer clocks the speed of an approaching vehicle and displays the speed on a display board that is visible to the motorist. This shows the motorist the actual speed at which they are traveling.

The neighbors must educate each other, establish their goals, and police themselves. Neighbors identify the speeders, the police make personal contact for the purpose of educating the speeder, and involve law enforcement as a last resort.

This program has the benefit of bonding the neighborhood together. The off-shoots of this are invaluable. The reduction of negative contacts with law enforcement enhances its image. The time involvement will depend on the individual's role and the size of neighborhood or community that is targeted. The media relationship involvement relates to the target area.

Neighborhood Speed Watch Programs rely on peer pressure and community spirit to increase awareness in a subdivision that may experience speeding traffic. It considers the fact that in a self-contained subdivision, the drivers involved are neighbors and friends of the people complaining of speeding. Neighborhood Speed Watch Programs have little or no effect on "through" traffic problems.

Typically, to be included in a Neighborhood Speed Watch Program, a street must (1) be a local street, (2) experience 85th percentile speeds in excess of 10 MPH greater than the posted speed, and (3) receive support from most of the households.

Once established, the following actions are taken:

a) A personal letter is sent to all households explaining the Program.

b) Neighborhood Speed Watch Program signs are posted.

c) Committee members call each household in the specific area to explain the program and appeal for cooperation.

d) Radar speed observations are made by local traffic personnel and personal letter are sent by the Chief of Police to drivers or owners of vehicles observed speeding.

e) Periodic speed studies are made to determine the Program's effectiveness.

f) Neighborhood organizations are involved as necessary.

Reference: 9, 42

B. ENFORCEMENT

1. Surveillance/Enforcement

Selective traffic law enforcement is the process of assigning police officers to a specific area at specific times to enforce traffic laws relating to a specific problem. The allocation of officers to the area is usually for a limited period.

When a police agency becomes aware of a particular traffic safety problem, officers can be assigned to the problem area to enforce related laws. Decisions must be made as to enforcement strategy, number of officers, time of day or any combination thereof, depending on the variables related to the location, type of violations, available officers, etc.

This type of activity tends to only solve the problem in the presence of the officer. The more officers assigned, the more effective this method. This is a costly process especially when it involves overtime or diverting officers from other assignments.

2. Automated Speed Enforcement Device

The newest tool in speed enforcement is the Automated Speed Enforcement Device, which is currently being tested at selected locations throughout the U.S. This device consists of a speed radar device and a 35 mm camera interfaced through a computer. It is located in an unmarked vehicle parked on the side of a road. As each vehicle comes within radar range its speed is determined. If that speed is over the preset threshold speed, the camera takes a photograph of the vehicle and its license plate.

The owner of the vehicle is then informed by either a warning letter or ticket of the date, time location, posted speed and travel speed of the vehicle. Currently, Michigan law does not permit the issuance of a ticket.

V. ENGINEERING

When the education and enforcement campaigns prove to be ineffective, the location qualifies for further analysis to determine what traffic engineering measure, if any at all, should be installed to effectively reduce speeds. In certain situations, vehicle speeds can only be effectively reduced by physical diversion of the traffic on the travelway. The application of traffic control devices, such as signs, alone normally are not effective in reducing vehicle speeds through residential neighborhoods. However, when used in conjunction with traffic calming devices, the proper use of traffic control signs can be an effective traffic management tool.

A. TRAFFIC CONTROL DEVICES

1. Stop Signs

The basic purpose of stop signs is to assign right-of-way to vehicles at intersections. There are Stop Sign Warrants outlined in the MMUTCD which must be satisfied before a stop sign can be installed. Stop signs are requested by residents more than any other traffic control device for the reduction of vehicle speeds and traffic volumes. Unfortunately, studies have shown that stop signs are largely ineffective in meeting the residents' requests for speed control.

a. Two-Way Stop

This is used to assign right-of-way to traffic on one of two intersecting streets by requiring traffic on one street to come to a complete stop. It is suitable where:

- one street is a major street;
- sight distances approaching the intersection are substandard, and traffic approaching under the general rules for uncontrolled intersections would run a strong risk of being involved in collisions;

- there is a history of a crash pattern that could be corrected by right-of-way controls, yet conditions do not require traffic on both streets to stop.

b. Four-Way Stop

This type of intersection control is intended primarily where two collector or major streets intersect and do not warrant a traffic signal. Its purpose is to assign right-of-way to traffic on both intersecting streets by requiring all approaching vehicles to come to a complete stop.

c. Effect on Traffic Volumes

When local streets offer significant savings in time over congested parallel major and collector routes, or allow avoidance of congestion points, traffic control devices, including stop signs, will do little to reduce traffic volumes. However, when the local streets offer only a slight savings in travel time over other routes, the time lost at stop signs may be enough to keep traffic off of local residential streets.

Stop signs may be installed at uncontrolled intersections in residential neighborhoods with a street network arranged in a grid pattern. Traffic would be stopped on every other block throughout the entire residential neighborhood. With no continuous "through" streets in the neighborhood, an even distribution of traffic would be encouraged.

d. Effect on Traffic Speed

Numerous studies have shown that stop signs are relatively ineffective as a speed control measure, except within 150 feet of the intersection. At the point of installation, speeds are reduced, but the effect on traffic approaching or leaving the stop-controlled intersection is negligible. In fact, some motorists actually increase their speed to make up for the "inconvenience" of stopping or disregard the stop signs. Studies show that more than 50% do not stop.

A study conducted in Boulder, Colorado, demonstrated that the 85th percentile speed and mean speeds on 25 mph and 35 mph roads were greater in areas that were controlled by stop signs.

Studies in various California cities showed a slight increase, or no change, in vehicle speeds after the installation of stop signs.

While the request for stop sign installation leads all resident requests for speed control measures, it must be emphasized that studies have proven there is little or no effect on vehicle speeds in residential road networks after installation.

e. Warrants/Compliance

Warrants for stop sign installations are included in the Michigan Manual of Uniform Traffic Control Devices (MMUTCD). These warrants relate to right-of-way assignment and respond to site safety consideration.

A stop sign observance study of unwarranted four-way stops in Troy, Michigan, found that the percentage of "no" or "roll" stops to be significant after installation of unwarranted stop signs, while there was no significant change in 85th percentile speeds.

Many studies have been conducted to determine the degree to which stop signs are obeyed. When not required to stop by cross street traffic, only 5 to 20 percent of all drivers come to a complete stop; 40 to 60 percent will come to a "rolling" stop below 5 MPH, and 20 to 40 percent will pass through at higher speeds. High-volume, four way stop-controlled intersections have demonstrated the highest compliance levels, while three-way stop controlled intersections have shown the lowest.

In Star City, West Virginia, before and after studies showed an increase in "no-stops" from 14.1% to 25.1% when two-way stop intersections were converted every summer to four-way stops for pedestrian safety. Mean Speed was not significantly affected by the presence of the four-way stops. The recommendation of this particular study was to end the practice of using four-way stops for speed control.

Studies have shown that when a driver does not believe that a stop sign appropriately reflects the actual traffic conditions, the driver often disregards it. The use of unwarranted stop signs not only decreases the compliance levels of motorists, but has the unintended effect of decreasing compliance at intersections where stop signs have been installed for warranted operation and collision reduction.

f. Effect on Traffic Safety

While no study has proven the effectiveness of stop signs as traffic safety measures, general engineering belief is that the unwarranted use of stop signs increases the safety hazard at the intersection. This is shown in the studies of the compliance rates at stop-controlled intersections. In addition, motorists disregard for unwarranted stop signs presents a significant hazard to crossing pedestrians.

Effects of unwarranted stop signs on driver behavior and safety at stop signs throughout a community are difficult to substantiate. Evidence to date on the safety effects of individual stop signs placed for volume and speed reduction purposes is mixed. At some intersections where a degradation in safety was measured, placement of the signs in poor visibility positions and lack of supplementary markings may account for the crash experience. Cases where safety experience was reportedly improved may include instances where traditional warrants for stop sign installation were actually met, or were close to being met.

g. Environmental Effects

Stop signs affect the environment around the intersection, and the use of unwarranted stops signs could unnecessarily add to this problem. Stopping and idling at intersections increases the amount of automobile exhaust in the area. In addition, tire noise and engine noise increase with the braking and acceleration associated with stop signs. Automobile fuel consumption is increased with the stopping, accelerating, and idling of vehicles at stop-controlled intersections.

h. Community Reaction

Residents often see stop signs as a solution to "near miss", as well as actual crashes. They are also viewed as being effective at controlling vehicle speeds. Suggestions that unwarranted stop signs have very poor compliance and that they might be detrimental to safety are generally discounted by residents. Residents also dismiss concerns over a community's exposure to tort liability for unwarranted use of traffic control devices. By disregarding the warrants presented in the MMUTCD, this presents potential liability concerns for the responsible jurisdiction. If a stop sign installation could be considered irresponsible or in clear contradiction to accepted standards, liability suits could result.

Objections to stop signs come mainly from residents at the intersections who are subjected to additional noise and pollution which come from decelerating and accelerating vehicles, and from motorists who think they are being stopped needlessly.

It should be the goal of the traffic engineer and local policy makers to explain to the public why unwarranted stop signs are ineffective at controlling vehicle speeds. Special attention should be given to explaining the adverse effects on the environment, motorist safety, and pedestrian safety.

A community's policy of installing 4-way stops at school crossings should be reviewed in light of the above items. Stops at these locations are only useful about 2% of the time. Therefore, 98% of the time, they can be serious traffic safety hazards.

References: 1, 2, 3, 4, 36, 37, 38, 39, 40

2. Speed Limit Signs

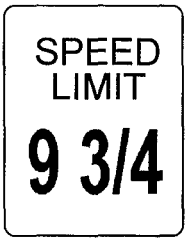
a. Speed Limit Signs/Speed Zoning

The speed limit sign is a regulatory device that informs drivers of the speed limit imposed by the governing agency. Some signs merely remind drivers of the limits applicable to the type of highway and area. Where the speed

limit is not applicable to specific sites because of special hazards, a deviation from that limit is shown by posting advisory speed signs. A new speed limit is determined by an engineering and traffic study of the street section involved. Special attention is given to the character of the street (sidewalks, driveways, and sight obstructions), horizontal and vertical alignment, pedestrian activities, and hazards which may not be easily detected by drivers. If no unusual safety problems are detected, the 85th percentile speed of traffic on a street is usually taken as an indication of the speed limit which could be implemented.

Studies that tested the effect of speed limit signs on speeds have been largely confined to major streets and expressways. Performance on these highways is not considered relevant to the local street situation. Studies have shown that speed limit signs have very little impact on drivers' speeds on major streets. Motorists drive at speeds that they consider reasonable, comfortable, convenient and safe under existing conditions. Drivers appear not to operate their vehicles by the speedometer, but by roadway conditions.

Speed limit signs, other than the standard 5 MPH increment (i.e., 28 MPH), are not standard and may be illegal. The desired effect of posting a non-standard speed limit sign is to gain compliance by capturing the driver's attention with a unique number. If drivers are consciously aware of the speed limit, they are more likely to comply with it. While the signs are inexpensive, they do not conform to the MMUTCD. Initially, the signs would be noticed and make drivers aware of their speed. Once drivers became used to the signs, they have no further effect on drivers' speeds.



If posted speed limits are significantly lower than prevailing traffic speed, residents normally place some hope in them or in subsequent enforcement. However, if the posted limits are within a few miles per hour of the previously prevailing traffic speed, they are not addressing the residents' problem.

b. Speed Limit Signs With Other Devices

Speed limit signs with flashing beacons have been shown to have a minor effect in reducing vehicular speeds. Such signs have been shown to be most effective in school zones. Other traffic activated signs with variable messages and warnings may also have minor effectiveness in reducing speeds.

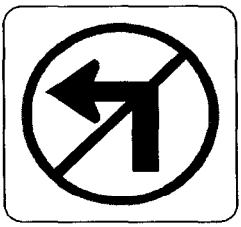
One such device is a trailer-mounted variable message sign with a radar speed gun which displays the posted speed limit and the approaching driver's speed. The intent is to increase the motorists' awareness of both posted speed limit and their own travel speed.

Observations show that most motorists reduce their speed when they see the device. In addition to reducing motorists' speeds, other advantages of the equipment include the creation of positive public relations, better acceptance of speeding tickets, and its ability to act as a teaching device. The disadvantages include potential vandalism to the equipment if left unattended, and it may encourage speeding by those who wish to "test" it. Its speed reduction effectiveness is isolated to the immediate area and time of its use, and this likely will diminish over time. However, effectiveness can be improved with the use of visible speed enforcement.

References: 5, 6, 7

3. Turn Prohibitions

Turn prohibitions will reduce traffic volumes, noise, and, in some cases, speeds on streets where they are applied. They may also improve traffic safety on streets to which they are applied. However, volumes, noise and speeds will increase on alternate routes. They are difficult to enforce, and reduce access for residents. In some cases, speeds may increase, and traffic safety may decrease, when motorists are forced to take alternate routes.



Turn prohibitions can be used to reduce traffic volumes on local streets by installing them on major/collector streets to prevent traffic from entering local streets. Such controls are usually in effect during peak traffic volume hours, when motorists are seeking less congested, alternate routes.

Although turn prohibitions have been in use for some time, very little quantitative research was found, and it was related to the number of violations. Violations in the range of 10% to 15% of the original turning volume can be expected.

Reference: 8

4. <u>One-Way Streets</u>

The use of one-way streets has mixed results. They are not useful in reducing speeds on local streets. In fact, the use of one-way signs may increase speeds in the permitted direction, and may increase the amount of cut-through traffic on other residential streets.

One-way streets can be used to make travel through a neighborhood difficult by creating a maze effect in the internal street pattern, which may discourage through traffic. However, the amount of traffic on other residential streets may be increased.

Reference: 8

5. <u>Commercial Vehicle Prohibitions</u>

It is a common practice in communities to prohibit commercial vehicles from most, if not all, local streets in residential areas. This is done to protect the pavements and eliminate nuisances. However, commercial vehicles are normally allowed to travel on any street when engaged in pickup and delivery. Such regulations are unlikely to affect vehicle speeds, but they will reduce truck traffic volume and noise.

Reference: 8

6. Special Warning Signs

Special warning signs such as "Children at Play", "Watch for Children", or others that warn of normal conditions are not effective in reducing speeds in residential areas. It is also likely that such signs encourage parents to believe that there is an added degree of protection, which is not the case. These signs suggest that it is acceptable for children to play in the street. The Michigan Vehicle Code prohibits the use of signs not deemed standard by the MMUTCD.

The MMUTCD provides standards for signs warning drivers that they are approaching recreational facilities such as parks and playgrounds. However, there is not enough evidence to determine the effect of these warning signs on vehicle speeds.

Reference: 40

7. Portable Signs

One growing trend in many communities is the use of portable stop signs placed in the street between crosswalks, to protect pedestrians. This has actually turned out to be a very controversial issue in many areas.

Municipalities feel that these signs are very effective in forcing traffic to stop for pedestrians in crosswalks. However, some state departments of transportation have banned the use of these portable signs, citing reports that the signs, when hit by vehicles, have caused injuries to nearby pedestrians. The MMUTCD states "As noted herein or for emergency purposes, portable or part-time STOP signs shall not be used". The exceptions refer to hand-held STOP signs used by construction flaggers and school crossing guards.

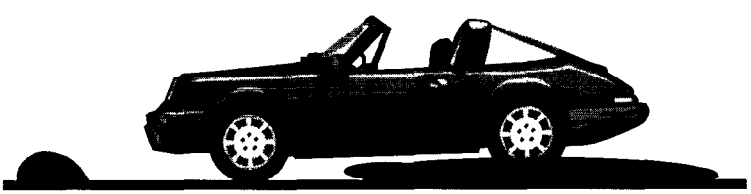
B. TRAFFIC CALMING DEVICES

1. Speed Humps and Bumps

The speed hump is generally 3 to 4 inches high, rounded section of pavement, approximately 12 feet in length. A speed bump is approximately 12" to 18" long, causing a more severe "bump" to be felt by the driver.

The speed hump was developed in the Transportation Road Research Laboratories (TRRL) in Great Britain and has been tested in closed test areas and on public roads. Tests in the United States and in various countries around the world, have shown speed humps to be effective in controlling vehicle speeds and in reducing traffic volumes in the immediate area of the hump or bump.

Studies in Australia, the United Kingdom, and the United States have shown reductions in 85th percentile speeds ranging from 3 MPH to 14 MPH between speed humps and from 6 MPH to 27 MPH at the speed hump location. Recent experience in a Michigan community indicated a 5 mph reduction in the 85th percentile speed. Volumes were found to be reduced from 1 to 55 percent.



SPEED BUMP **SPEED HUMP**

Another type of speed hump is the flat top hump or speed table. These humps are typically 22 inches long with a 10 foot flat

section and can be used on collector roads with more than 12,000 vehicles per day. This type of speed hump can serve as pedestrian crossings. Studies have shown these humps not only greatly reduce the 85th percentile speed of mainstream traffic but also have shown that, unlike speed humps, the speed between the humps and at the humps are essentially the same as before hump or bump installation.

Some of the negative effects of speed humps are an increase in noise level from individual vehicles near the humps caused by braking and acceleration, but not due to the sound of vehicles striking the humps. Studies have shown that speed humps have a more severe impact on longer wheel base vehicles and should not be used on neighborhood collectors, major fire and ambulance routes, or on routes frequently used by large trucks or buses. They are a major hindrance to snowplowing efforts.

Often the implementation of such traffic calming measures bring up liability issues. A recent survey of a number of communities using different traffic calming devices found that most had no legal problems at all while the remainder had mostly experienced threats and no action. As more and more traffic calming devices are installed, the question of the legality of these measures are becoming irrelevant.

The reports on speed humps have shown that both the design and location/spacing of speed humps are critical. For typical residential streets the most widely used design is the circular, parabolic speed hump. A series of speed humps is more effective than a single installation. The spacing of speed humps ranges from 200 feet to 750 feet, depending upon the desired 85th percentile speed between speed humps. Formulas have been developed to determine the optimal spacing of humps, depending on the use of either a 3 inch or a 4 inch high hump. Adequate pavement markings and traffic signs are important to warn drivers of speed humps. Speed humps can be installed on roadways carrying 3,000-8,000 vehicles per day. The cross-section design of humps or bumps is critical to their effectiveness.

The speed hump should not be confused with the speed bump that is 3 to 5 inches in height and 1 to 1 ½ feet in length. Because speed bumps are abrupt, they are considered to be potentially hazardous for motor vehicles. The main use of the speed bump

has been in private parking lots and on private roads. They are generally considered to be inappropriate by traffic engineers because they are not included in design guides.

As of September 10, 1997, The Institute of Transportation Engineers (ITE) plans to publish the recommended practices for Guidelines for the Design and Application of Speed Humps.

References: 10, 11, 12, 13, 14, 15, 16, 32, 33

2. Rumble Strips

Rumble strips are a series of either bumps or depressions in the pavement. They are intended to alert drivers of a special situation, such as a speed reduction or stop ahead condition. They are typically ½ to 1 ½ inches high or deep, 3 to 4 inches wide and placed 90° to traffic flow.

Rumble strips produce both an audible rumble and a vibration that creates an awareness of a condition for which a driver must react. They are used most frequently on shoulders of high-speed roadways to alert drivers that they are not driving in the travel lanes of a road. They are also commonly used to alert drivers in rural or high speed areas of an unexpected stop-ahead condition.

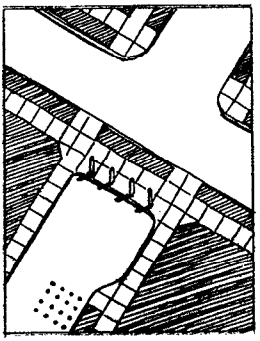
Many states now use 'portable' rumble strips, which are basically high density rubber sheets with a series of undulations. Though these are popularly used near construction zones, these may be used as a temporary measure in residential areas before installing permanent rumble strips.

Little research has been performed in residential areas for their use as a speed control device. A study in the City of Rochester Hills showed speed reductions of up to 2 MPH, whereas another study showed reductions of up to 15 MPH. Rumble strips can produce an annoying noise, cause vibration in nearby homes and be snow removal obstructions. One study suggests they should not be used where there is significant bus or truck activity or where traffic volumes exceed 2,500 vehicles per day. Due to the adverse effects, their installation must be carefully considered.

References: 4, 17, 18

3. Street Closures

The primary effect of street closures is to eliminate through traffic rather than to reduce speed. There may be some speed reduction because higher speed through traffic is discouraged from using the neighborhood streets. This is true particularly where a pattern of closures is carefully designed to accomplish this end. Street closures can be constructed at an intersection or at midblock. The midblock application can be effectively used where it is desired to restrict traffic in a residential section while allowing access to a high traffic generator adjacent to the residential area. Generally, whenever a street closure is used, a cul-de-sacs should be constructed so as not to "trap" a vehicle. Cul-de-sacs often require the purchase of right-of-way and often are constructed in a resident's front yard.



Among the disadvantages of street closures are:

- Restricted access to the neighborhood by service and emergency vehicles.
- Problems with vandalism and maintenance.
- Traffic is often transferred to neighboring streets, generating new problems and complaints.

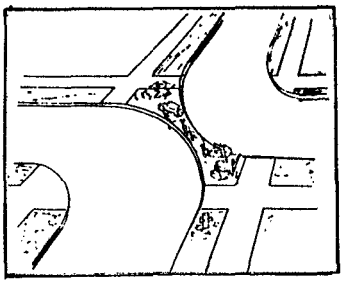
Street closures are difficult to apply to existing roadways and are better suited for newly developing subdivisions.

When cul-de-sacs are used, adequate turnaround areas must be provided at the end of the street. Proper signs must be installed to warn drivers of the end of the street.

Reference: 8, 28

4. Traffic Diverters

a. Diagonal Diverters



Diagonal diverters are barriers placed diagonally across an intersection. This converts a normal four-legged intersection into two separate roadways, each with a 90° turn. The purpose is to discourage "through" traffic by requiring it to take a circuitous route through the neighborhood.

Speeds of vehicles are only affected in the immediate vicinity of the diverter because drivers must make a 90° turn. Diverters may discourage drivers from using the street as a short-cut route. However, some drivers will simply move to another residential street, thus moving the problem. Since they create formidable barriers in the intersection, they must be marked similar to one-way streets and have appropriate lights so they can be seen at night.

References: 8, 9, 19

b. Semi-Diverters

A semi-diverter is a barrier placed transverse to traffic at the beginning of a block. It prohibits traffic from entering the block, but allows two-way traffic within the block. Since they create formidable barriers in the intersection, they must be marked similar to one-way streets and have appropriate lights so they can be seen at night.

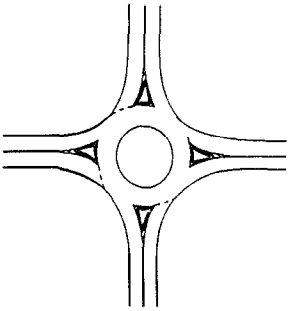
Semi-diverters have no effect on speeds other than in the immediate vicinity of the barrier. They can reduce traffic volumes, but only at the end of the block at which they are placed. The violation incidence can be quite high.

Reference: 8, 19

5. Traffic Islands

a. Traffic Roundabout

Modern roundabouts are different from traditional traffic circles, in that all approaching traffic yields right of way to circulating traffic. This is reinforced through the use of yield signs on the approaches. Other characteristics of roundabouts include deflection and flared approaches. Use of deflection helps slow entering vehicles, leading to safer merges with the circulating traffic stream. The use of splitter islands helps drivers perceive a change in the roadway geometry and enter the roundabout safely. Benefits of roundabouts realized in the states of California, Florida, Maryland and others include slowing of traffic, reducing delay and emissions when compared to stop/signal controlled intersections, improving safety and aesthetics.



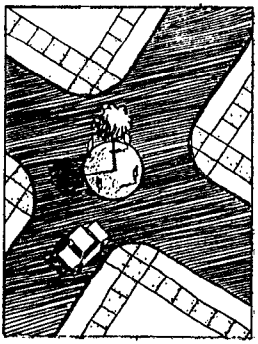
Its primary use is to reduce crash frequency at residential intersections. These roundabouts also have an effect on traffic volume and speeds.

At ten study locations, average speeds were reduced 4 MPH (from 27.5 MPH to 23.3 MPH) downstream from the circles, but only for short distances. Speed reductions can be even more significant near the circle, similar to speeds near stop signs.

One study shows a significant 77% decrease in crashes. Traffic volumes on the higher volume street at twenty study locations decreased an insignificant 2%. The construction cost of a roundabout is quite high ($10,000 - $30,000).

References: 4, 8, 19, 20, 30

b. Traffic Islands



A traffic island is a defined area, painted or raised, included in highway design for the primary purposes of controlling and directing traffic movements. They also provide refuge for pedestrians, reduce excessive pavement areas, and can be used to indicate proper use of an intersection or to locate traffic control devices.

Painted/striped islands do not affect speeds significantly; raised islands reduce vehicle speeds in some instances, mostly in combination with narrow lanes, which can create hazards.

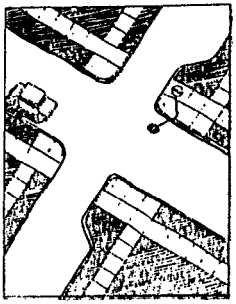
Improper islands make roadways unsafe. If an island is not large enough to command attention, motorists will drive over it. Curbed islands are sometimes difficult to see at night due to oncoming headlights or other light sources, thus causing crashes.

Islands do not reduce traffic volume by any significant amount, but can be an effective treatment for traffic movement and safety. If a traffic island is used, it might be beneficial to plan an island initially, then observe the effect and change the layout arrangement accordingly. The same process can be repeated until an optimum arrangement is established and a permanent raised island can be installed.

6. Chokers and Road Narrowing

Chokers are narrowed roadway widths using landscaped areas between the sidewalk and street. The pavement width between chokers can be constructed for one or two lanes of traffic. The choker can be constructed parallel to the traveled way or twisted to the direction of travel.

Road narrowing is a method used mostly in residential areas to control vehicle speeds and reduce traffic volume to improve safety. Another road narrowing technique can be found by the use of medians. In one community in Maryland, medians 20 to 50 feet or more in length have been constructed in advance of intersections. It was found to effectively reduce speeds though, it was necessary to construct bulb-outs to force drivers to shift over inconveniently. Once implemented, the 85th percentile speeds were reduced by 2-5 mph.



Chokers and road narrowing can control the speeds of vehicles efficiently and can increase safety and reduce traffic flow if properly installed. However, they should not be used on high volume streets, and sudden road narrowing should always be avoided. Curbside parking may have to be sacrificed to implement these methods. Proper signs should be installed to warn drivers of the chokers.

Reference: 4, 32

7. On-Street Parking

On-street parking is parking that is allowed on a street in the curb lane and is commonly permitted in residential areas.

Drivers of through vehicles generally reduce their speed in anticipation of conflict situations with parked vehicles or pedestrians. A study was done in Dallas where parking was removed in four central business districts. A 60-day study showed an increase of 26.7% in vehicle speed. In another study, only peak period prohibitions were reported which increased average speeds by 27%.

A clear relationship exists between crashes and vehicles parked on-street. One study in a community of 65,000 people found that 43% of all local and collector-street crashes involved on-street parking.

The angle of on-street parking has an affect on safety. Although angle parking allows for more parking spaces per unit of curb length than parallel parking, it requires more space for maneuvering, increases the amount of time a car is exposed to oncoming traffic, and can create a visibility problem for drivers when backing out into traffic. Therefore, angle parking has a substantially higher crash rate than parallel parking. Many studies have found that eliminating angle parking and replacing it with parallel parking reduces crashes 19 to 63 percent. A study in Maine found that parallel parking had a crash rate 12 percent lower than angle parking. A study in Nebraska concluded that parking should be of parallel rather than angle type to improve safety by reducing traffic crashes.

Several studies have been conducted that show the safety concerns of on-street parking. Primary hazards are:

1. Parked vehicles make the road width narrower and significantly restrict the flow of traffic. Parked vehicles can easily increase rear-end or side-swipe crashes due to hazardous maneuvers by drivers avoiding parked vehicles or drivers entering or leaving parking stalls.

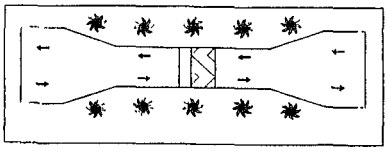
2. Drivers or rear-seat passengers getting out of parked vehicles on the side street present an added obstacle in the roadway. This produces both rear-end and side-swipe collisions.

3. Reduced sight distances involving pedestrians, especially children, attempting to cross the street from between parked vehicles or at intersections.

It is advisable to avoid on-street parking especially on residential streets because of the crash hazard, traffic volume/capacity/flow reduction, etc. It does, however, reduce speeds by restricting sight distances.

References; 21, 22, 23, 24, 34, 35

8. Combination of Physical Control Measures



Various combinations of traffic control and traffic calming measures can be used to enhance effectiveness. The combinations are governed by the major objectives or purpose for which the installation is planned. For example, the objective of reducing speeds and cut through traffic may be achieved by using a combination of a speed hump and street narrowing. The illustration presents such a combination. This combines the installation of a speed hump as well as street narrowing within the vicinity of the speed hump. The street narrowing helps to reduce speeds over a longer distance than a conventional speed hump.

References: 31

C. ROADWAY MARKINGS

1. Transverse Markings

Transverse pavement markings consist of a series of painted lines placed across the road. The spacing between the lines gradually decreases as the hazard is approached. The paint pattern is intended to give the illusion of high speed and causes drivers to reduce their speeds. In Maine, transverse pavement markings used in conjunction with standard speed limit signs, when entering a small town, increased the number of vehicles traveling below the speed limit by 10 percent. In Scotland, similar

success occurred when yellow transverse markings were applied in advance of a traffic circle. Initial results showed a 30 percent reduction in 85th percentile speeds. which were later reduced to 16 percent after one year. Crashes were reduced at the Scotland site from 14 crashes in the year prior to the installation to only 2 crashes in the 16 months following the installation.

A study in Great Britain showed that speeds were influenced by the existence or non-existence of a hazard following the transverse markings. If no hazard exists at the first location with transverse markings, the driver would not slow down at the second location even if a hazard existed.

It appears from the various studies that if transverse markings are used at locations in advance of potentially hazardous locations or in addition to normal speed limit signing when entering small towns, that speed reductions will occur at both types of locations and crashes will be reduced at the hazardous locations. However, it does not appear from the literature reviewed that reductions in speeds should be anticipated by applying transverse pavement markings in the middle of a typical residential area.

Reference: 27

2. Longitudinal Markings

Longitudinal pavement markings for speed control is intended to give drivers the impression of a narrow lane through which the vehicle must be guided. One study involved the striping of two residential streets to nine foot wide lanes. It was found that speeds changed in a range of a decrease of 1.4 MPH to an increase of 3.2 MPH. It was theorized that the narrowing by striping was ineffective because it actually made the drivers task of tracking the roadway easier.

3. Crosswalks

The use of painted crosswalks is to provide improved pedestrian safety by guiding them across the street and to notify drivers of the possibility of the presence of pedestrians. When painted

crosswalks are used, sidewalks on both sides of the road should also be provided. There is no indication in the literature that crosswalks result in lower vehicular speeds.

Reference: 16

D. PLANNING-RELATED ALTERNATIVES

1. Adequate Arterial Capacity

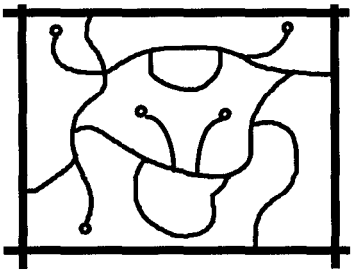
By providing adequate capacity on the surrounding major street network, the amount of through traffic using residential streets can be reduced. Although not specifically a speed regulating method, reducing the traffic volume can decrease the number of speed complaints on residential streets and can improve safety.

Though this is a costly means of reducing residential speeding complaints, improved traffic flow and crash reduction can be realized on residential streets.

Reference: 26

2. Subdivision Planning

Residential street design can influence the speed of vehicles through a neighborhood. Designs that feature curvilinear alignment, a narrow cross-section, short block length, reduced building setback and roadside tree planting can create a feeling of restriction and result in a speed reduction and may increase traffic crashes. Conversely, local streets built to high standards, in an attempt to improve safety, create an environment that allows increased vehicle speeds.



New subdivision streets can be designed to discourage cut-through traffic, which will reduce speeding complaints.

Care must be taken in the design process to ensure adequate sight distances along the roadway and at intersections, to provide the highest level of safety possible.

Reference: 26, 29

VI. CONCLUSIONS

An effective traffic calming program can be implemented by following the guidelines in this booklet. The key to a successful program is **community involvement**. Local officials and residents must work together for the common goal of improving safety on residential streets. This booklet provides alternatives that may help decrease speeds and/or reduce through traffic on residential streets. It also gives direction for developing a traffic calming program in those communities that currently use only traffic law enforcement to control speeds.

Whenever traffic calming devices are used, special care must be taken to advise drivers of the device by installing adequate warning signs and/or permanent markings.

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#OHSP 701 (2/98)

Troy Neighborhood Traffic Harmonization Program

INFORMATION BROCHURE

What is the Troy Neighborhood Traffic Harmonization Program?

The Troy Neighborhood Traffic Harmonization Program was created to address neighborhood traffic safety concerns while enabling citizens and/or community groups to become actively involved in the improvement process. This program allows City staff and the community to work together to create safe and pleasant conditions in our residential areas for motorists, bicyclists, pedestrians and residents.

What types of issues can the program address?

- Traffic crashes / safety
- Speeding
- Pedestrian safety
- Cut-through traffic
- Sight distance

How does the program work?

The program is divided into three phases that must occur in order.

PHASE I - INFORMATIONAL MEETING / PROBLEM IDENTIFICATION

Phase I identifies the problem, provides for a complete explanation of the Program, gains the support of a Core Group of residents, and collects data in the form of speed studies and field review.

Residents with a traffic safety concern can contact the City at the numbers/e-mail provided in this brochure. In return they receive a Traffic Information Survey Form. You are requested to discuss traffic concerns with your neighbors and/or the neighborhood association. If there is interest, the City will host an informational meeting and present the program.

From the informational meeting, a group of residents or Core Group will be formed to work with the City to gather information. Speed studies will be performed at locations identified by the residents. In addition, traffic counts will be taken and other operational areas will be studied. All of the data gathering will be done in partnership; City employees and resident volunteers working together. This information, jointly collected, will establish base data from which Phase II and Phase III of the program will stem.

PHASE II - PROBLEM SOLVING

Phase II is the development of a plan combining elements of educational, enforcement and engineering measures. Based on the specific findings of the field review, a plan will be agreed upon. Past enforcement activities in the City have found that most violations of traffic ordinances within a residential area are the residents of that area. Therefore, much of the following activities will be directed towards friends and neighbors.

EDUCATION

Three educational programs are currently proposed. City staff and the Core Group will determine the extent to which each will be used. They are:

A. THE NEIGHBORHOOD TRAFFIC SAFETY CAMPAIGN

This involves the distribution of brochures describing techniques that pedestrians and parents can use to help address speeding issues and to become better aware of their driving habits.

B. USE OF THE SMART TRAILER (Speed Monitoring Awareness Radar Trailer)

This program consists of a portable, unmanned trailer equipped with radar speed detection equipment. The unit obtains speeds of oncoming vehicles and displays them on a digital display board visible to the passing motorist. The intent is to show motorists their actual travel speed. The program can be combined with the Troy Police Department enforcement activity.

C. THE OWNERSHIP LETTER CAMPAIGN

This program involves citizens collecting speed data for vehicles in their neighborhood with City Staff assistance. After recording the speed and vehicle information, the City obtains the registered owner's name and address through Michigan's Secretary of State's system. City staff then sends letters to these motorists explaining the community's desire for a safe neighborhood and encouraging them to drive 25 mph. This program actively involves citizens in addressing the speeding concerns in their neighborhood.

ENFORCEMENT

The enforcement plan includes the selective enforcement of specific traffic controls and vehicle movements by our Police Department. Following current practice, the Core Group identifies specific time periods and locations that the Police can target for specific ordinance enforcement (i.e. speeding, disobeying stop signs, improper parking, etc.)

Once these measures are taken, the effectiveness is monitored and a re-evaluation of the location is completed. If the measures prove to be effective and the speeding problem is reduced to an acceptable level, the Core Group will notify the neighborhood of their success and encourage the continuation of safe driving. If, however, these measures prove ineffective, the location then qualifies for consideration of Phase III of the program.

ENGINEERING

In conjunction with the other components discussed above, the City staff will conduct a complete engineering review of the neighborhood. The review will include consideration of placing new or modifying existing traffic controls.

PHASE III - CONSTRUCTION

Phase III involves the installation of actual physical control devices in the roadway. These devices are designed to make it less comfortable for the motorist to speed and/or inhibit cut through traffic. But they are expensive and involve a measure of liability to the City and may impact the ability of emergency services to respond to the area, potentially resulting in an elevated level of risk to the residents. So it is extremely important that these devices only be installed after exhausting the alternatives provided in Phase I and II. There are specific criteria for the installation of each type of device, and their use is determined by traffic engineering analysis.

The devices include: speed humps, traffic circles, slow points, and entrance/ exit barriers. Once the Core Group and City staff have determined a plan for physical devices, it is presented to residents at a community meeting. Input from the residents is incorporated into the plan. Neighborhood support is absolutely essential during the entire process, even more so if physical traffic control devices are to be installed.

The cost to install physical traffic control devices will be borne by the neighborhood, shared by way of the City's Special Assessment District procedures. Support for installation must be by petition of at least 70% of residents in the effected area. After petitions have been received and verified, the City Council will be notified of the recommended project. Implementation of the plan is based on acceptance by City Council. Following this approval step, the device(s) will be designed, bids taken and constructed.

How do we get started?

1. Identify traffic concerns in your neighborhood.
2. Discuss possible solutions with your neighbors or the neighborhood association.
3. Fill out the attached "Traffic Information Survey" Form and mail to the City's Traffic Engineering Services Division.
4. Attend the Informational Meeting to hear more about the Neighborhood Traffic Harmonization Program.
5. Form a Core Group of residents who will be advocates for the safety improvements.

Is the Program successful?

This type of program has proven successful in many communities that are very similar to Troy.

Let's begin....

We want to work with you and your neighbors to make your neighborhood streets safer. Please take the first step in achieving this by filling out the enclosed Traffic Information Survey providing us with your concerns and indicating what solutions you feel would be appropriate for your neighborhood.

The City takes its role in solving traffic concerns very seriously, yet the ultimate burden of safety rests on you, the motorist in the City of Troy. We will respond to every traffic concern you may have. Since we receive in excess of 1200 traffic concerns per year, we may not be able to investigate your request as quickly as we would like to. We appreciate your patience and understanding in this matter.

NEIGHBORHOOD TRAFFIC HARMONIZATION PROGRAM

INFORMATION BROCHURE

TRAFFIC ENGINEERING DIVISION
TROY POLICE DEPARTMENT
500 W. BIG BEAVER ROAD
TROY, MI 48084
www.troymi.gov

PHONE: 248.524.3383

FAX: 248.524.1838

e-mail: huotariwj@troymi.gov
livingstdg@troymi.gov

-City of Rochester Hills

SPEED HUMP REQUEST POLICY

Staff Evaluation – An engineering and safety evaluation for any speed hump request will be made to determine that the guidelines listed below are met. Since speed humps might have a wide ranging impact not only on the vehicles crossing them but also on the residents living on the immediate and nearby streets, their installation will be evaluated within the context of an overall neighborhood traffic management study. Speed hump requests will be handled in the order in which they are received.

Streets – Speed humps will be considered for installation only on residential, local, and collector streets. A local or collector street is defined as one whose abutting land use is at least 85% residential when considered in segments of one-quarter mile.

Speed – Speed humps will be considered on local or collector streets where the posted speed does not exceed 30 mph. Speed humps may be considered when speeds on these streets exceed the posted speed by 6 mph or more and by at least 85% of those vehicles using the street.

If the speed requirements are not met at the time of the initial study, a second study can be obtained 6 months later to determine if the street meets this qualification.

Traffic Volumes – Each individual street location should be evaluated to justify installing speed humps. Streets with volumes less than 400 vehicles per day will not be considered for speed humps. However, if a study identifies a cut-through problem, speed humps may be installed regardless of speeds or volumes.

Impacts on City Services - Prior to approving locations for speed hump installations, staff will review the proposed locations with respect to the potential impact on City services. If the proposed installation of speed humps has a significant impact, the request for installation of speed humps may be denied.

Resident Surveys - City staff will determine a petition area and coordinate petition circulation in order to determine support for speed hump installation. Where proposed speed hump locations are determined, 100% of signatures of the owners of adjacent properties are required. The subdivision homeowner's association is required to submit a board approved resolution indicating support for the installation of speed humps.

Speed Hump Installation – After obtaining all studies, approvals, and appropriate neighborhood surveys, the City will arrange to have its contractor install the speed humps. Along local residential streets, the neighborhood

homeowner's association would be required to pay for 100% of the installation cost. Along major collector residential streets, the neighborhood homeowner's association would be required to pay for 50% of the installation cost. If residents choose to pay the full cost, it is with the understanding that speed humps will be installed under City contract meeting City requirements. Appropriate signs and striping will also be installed by the City.

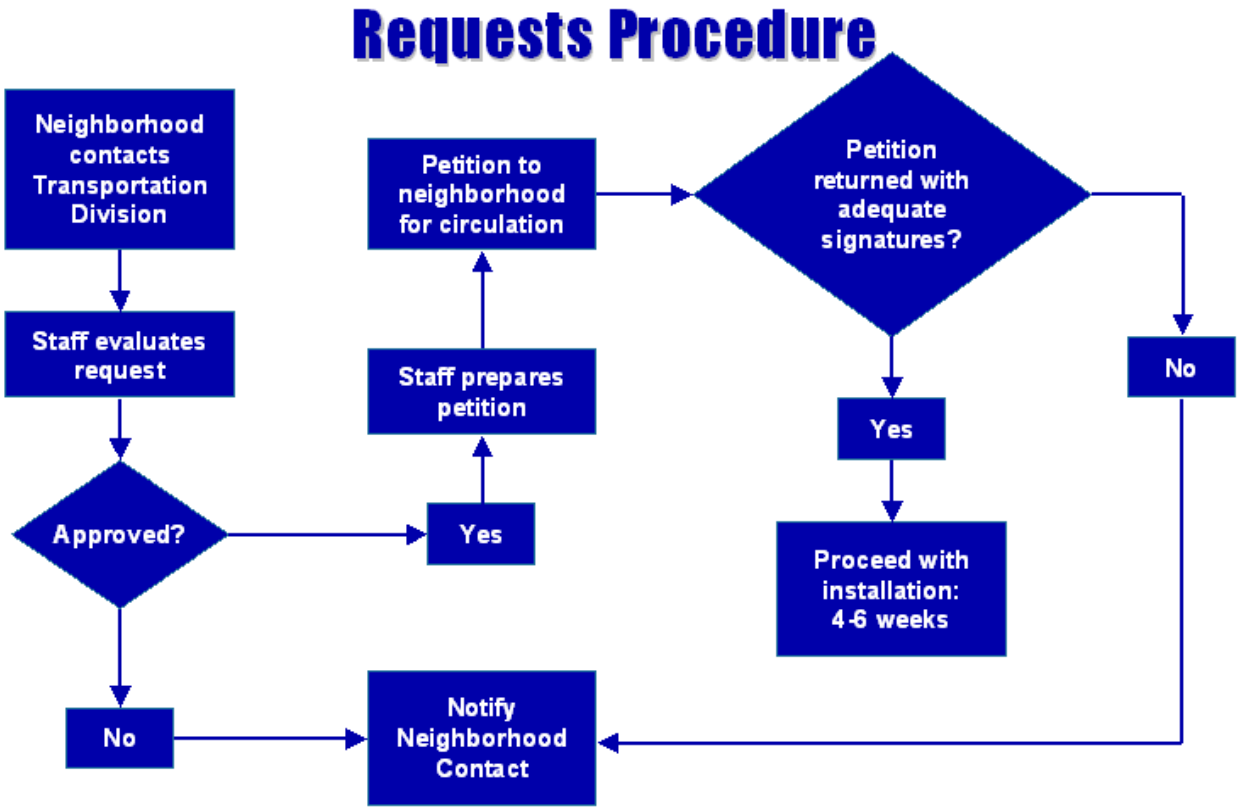
Speed Hump Removal – Speed humps may be removed at any time due to lack of public support. All petitioners originally requesting the installation of speed humps will be given the opportunity to comment on the removal of speed humps. This would occur after considerable time (approx. 1 year) has passed to adequately evaluate the impact and the performance of the speed humps. In order to have a speed hump removed, 100% support from those properties directly adjacent to proposed speed humps along with a homeowner association board resolution. The neighborhood would be required to pay for 100% of the removal installation cost.

SPEED HUMP REQUEST PROCEDURE

Any questions or requests regarding the Speed Hump Program can be addressed to City of Rochester Hills Department of Public Services at (248) 656-4640 or e-mail to: ***www.dps@rochesterhills.org***

1. If it has been determined that criteria set forth in the attached policy has been met for the potential speed hump installation, then a petition will be sent to a neighborhood representative who will coordinate obtaining the necessary signatures. The Transportation Division will provide a petition with a list of names and addresses of affected homeowners or renters.
2. After appropriate signatures have been obtained and returned to the City, one of the following actions will be taken:
    a. If the necessary signatures are obtained for the installation of speed humps, then the City will proceed with the installation of speed humps per City requirements;
    b. If the necessary signatures for the installation of speed humps are not obtained, then no further action will be taken and no speed humps will be installed.
3. Whether the speed hump installation has been denied or approved, each neighborhood will be informed as to the outcome resulting from the signatures obtained on the petition.
4. When speed humps are approved, they are generally installed under the City's next contractor road project in order to achieve economies of scale and reduce construction costs.

SPEED HUMP REQUEST FLOWCHART



Safety Awareness For Everyone
Through Education, Enforcement and Engineering

INFORMATION BROCHURE

What is the Traffic SAFE-TE^3 Program?

Traffic SAFE-TE^3 is an acronym for "Safety Awareness for Everyone Through Education, Enforcement, and Engineering." The Farmington Hills Traffic SAFE-TE^3 Program was created to address neighborhood traffic safety concerns while enabling citizens and/or community groups to become actively involved in the improvement process. This program allows City staff and the community to work together to create safe and pleasant conditions in our residential areas for motorists, bicyclists, pedestrians and children.

What types of issues can the program address?

- Speeding
- Cut-through traffic
- Collisions
- Pedestrian safety
- Sight distance

How does the program work?

The program is divided into three phases that <u>must</u> occur in order.

Phase I - PROBLEM IDENTIFICATION/INFORMATIONAL MEETING

Phase I identifies the problem, provides for a complete explanation of the Traffic SAFE-TE^3 Program, gains the support of a Core Group of residents, and collects benchmark data in the form of speed studies or other traffic engineering information.

Residents with a traffic safety concern can contact the City. In return they receive a Program Information Brochure and a Traffic Information Survey Form. Information in the brochure directs the resident to discuss traffic concerns with neighbors and/or the neighborhood association. If there is interest, the City hosts an informational meeting to present the program.

From the informational meeting, a sub-group of residents or Core Group will be formed to work with the City to gather information. Speed studies will be performed at locations identified by the residents. In addition, traffic counts may be taken and other operational areas studied. All of the data gathering will be done in partnership; City employees and resident volunteers working together. This information, jointly collected, will establish baseline data from which Phase II and Phase III of the program will stem.

Phase II - EDUCATION AND ENFORCEMENT

Phase II is the development of an education and enforcement plan based on the specific findings of the field review. Past enforcement activities in the City have found that most violations of traffic ordinances within a residential area are the residents of that area. Therefore, much of the following activities will be directed towards neighbors and possibly friends.

EDUCATION

Currently, two educational programs are in use. **City staff and the Core Group will determine the extent to which each will be used.** They are:

1. **THE NEIGHBORHOOD TRAFFIC SAFETY CAMPAIGN**

   This involves the distribution of a brochure or letter describing the findings of the data collection, providing techniques that pedestrians and parents can use to create a safer neighborhood and encourage motorists to become better aware of their driving habits.

2. **USE OF THE SPEED MONITORING AWARENESS RADAR TRAILER**

   This program consists of a portable, unmanned trailer equipped with radar speed detection equipment. The unit obtains speeds of oncoming vehicles and displays them on a digital display board visible to the passing motorist. The intent is to show motorists their actual travel speed. This program can be combined with Police Department enforcement activity.

ENFORCEMENT

The enforcement plan includes the selective enforcement of specific traffic controls and vehicle movements by our Police Department. Following current practice, the Core Group would identify specific time periods and locations from the collected data and field review that the Police will target for strict traffic ordinance enforcement. (i.e. speeding, disobeying stop signs, improper parking, etc.)

After implementation of the education and enforcement measures, the effectiveness is monitored, re-measured, and re-evaluated. If the measures prove to be effective and the speeding situation is reduced, the Core Group will notify the neighborhood of their success and encourage the continuation of safe driving. If however, these measures prove ineffective, the location then qualifies for consideration of Phase III of the program.

Phase III – ENGINEERING

Phase III involves the installation of actual physical speed control devices in the roadway. Because the devices are designed to make it less comfortable for the motorist to speed, <u>it is extremely important that these devices only be installed after exhausting the alternatives provided in Phase I and II.</u> Installation is determined by traffic engineering analysis and four main factors:

1. Residential street must be functionally classified as a local roadway.
2. 85th percentile speeds of 35 mph or greater (the speed at which 85% of the traffic is traveling at or below).
3. Topography (i.e. hills, curves and intersections).
4. Presence of existing traffic controls (i.e. traffic signals, stop signs).

Proper engineering analysis and judgement must be included prior to installation of any physical devices. These devices can include, speed humps, traffic circles, slow points, entrance/exit barriers, pavement markings and traffic control signing.

Once the Core Group and City staff has determined the best traffic control plan, it is presented to residents at a community meeting. Input from the residents is incorporated into the plan. Neighborhood support is absolutely essential during the entire process, but especially if traffic control devices are to be installed. Before implementation, 75% support from residents on the segment of roadway being considered is required, through petitions. After petitions have been received and verified, the City Council will be notified of the recommended project. Funds can only be allocated based on acceptance by City Council, after review of budget limitations. Following this approval step, the device(s) will be designed and constructed.

How do we get started?

1. Identify traffic concerns in your neighborhood.

2. Discuss possible solutions with your neighbors and the neighborhood association.

3. Fill out the attached "Traffic Information Survey" Form and mail to the City's Engineering Division.

4. Attend the Informational Meeting to hear more about the Traffic SAFE-TE^3 Program.

5. Form a Core Group of residents who will be advocates for the safety improvements.

Let's begin...

We want to work with you and your neighbors to make your neighborhood streets safer. Please take the first step in achieving this by filling out the enclosed Traffic Information Survey providing us with your concerns and indicating what solutions you feel would be appropriate for your neighborhood.

City of Farmington Hills
TRAFFIC INFORMATION SURVEY

Contact Name: _____ Phone: _____

Address: _____ Date: _____

Neighborhood/Subdivision: _____

List names & phone numbers of interested neighbors:

_____

_____

_____

Location(s) of Concern:

_____

What concerns have you identified with the above location?

_____

_____

_____

Please identify the specific time periods that the traffic concern takes place
(For example form 4:00 p.m. to 6:00 p.m.) _____

_____

What solutions do you feel would address your concerns? (Check one or more)

__ Brush trimming/Corner clearing
__ Signing
__ Pavement markings
__ Police Enforcement
__ Speed reduction devices
__ Other

Thank you for taking the time to fill out the Traffic Information Survey. Once we receive this Survey, you will be contacted by City staff to establish a meeting date and location.

FOR OFFICE USE ONLY
Date Received: _____ Initial Meeting Date: _____

ROAD COMMISSION for OAKLAND COUNTY BOARD OF COUNTY ROAD COMMISSIONERS OAKLAND COUNTY	**ROAD COMMISSION** OPERATING INSTRUCTION	EFFECTIVE DATE: DECEMBER 8, 2008	NUMBER: 12, REV # 1
		PREPARING ORGANIZATION: TRAFFIC SAFETY DEPARTMENT	SUPERSEDES NUMBER 12 DATED 11-1-2006

SUBJECT:

INSTALLATION OF SPEED HUMPS

I. PURPOSE:

To establish guidelines for the installation of speed humps on subdivision streets.

II. INFORMATION:

There have been an increasing number of instances where vehicular traffic utilizes subdivision streets, in order to bypass congested intersections, avoid gravel roads or take advantage of a short cut. In addition, this same traffic, as well as residents that reside within the subdivision, often travels at speeds that significantly exceed the residential speed limit.

The installation of speed humps is increasingly being used as a method to deter speeding and "cut through" traffic. Speed humps are raised pavement sections that are between 3 to 4 inches in height and approximately 14 feet in length. When designed properly and installed in warranted locations, speed humps have been proven to reduce vehicle speeds and/or "cut through" traffic on subdivision streets.

In order for speed humps to be warranted, the 85th percentile speed must be equal to or greater than 35 miles per hour. In addition, the following criteria should be considered:

1. Traffic volumes in excess of 1000 vehicles a day, which includes a minimum of 25% "cut through" traffic.
2. Acceptable vertical and horizontal curvature.
3. Pavement width less than or equal to 40 feet.

In order to ensure consistency for speed humps which are installed on subdivision streets under its jurisdiction, the Road Commission for Oakland County establishes the following procedure:

III. PROCEDURE:

Responsibility	Action
Traffic-Safety Department Staff	**1.** Upon receipt of a written request from the homeowners association or interested residents of the area, shall meet with representatives from the subdivision, the Township, and local law enforcement, for the purpose of discussing the traffic concerns, along with the various countermeasures available, including the requirements for the installation of speed humps.
Traffic-Safety Department Staff	**2.** If it is agreed that speed humps are a potential countermeasure of interest, shall conduct the necessary traffic studies to determine whether or not the traffic speeds, volumes and "cut through" traffic, meet the above criteria for the installation of speed humps.
Traffic-Safety Department Staff	**3.** Shall hold a follow-up meeting with the representatives from the previous meeting to discuss the results of the traffic studies and whether or not the speed humps are warranted. **Note:** If speed humps are warranted, the RCOC shall also provide cost estimates and proposed acceptable locations for the speed humps.
Traffic-Safety Department Staff	**4.** Shall inform the residents and the Township that to move forward with the installation of warranted speed humps, the following must be submitted to the Road Commission: **a.** A Petition agreeing to the installation, to be signed by at least 75% of the homeowners on the subject segment of street(s) with the proposed speed humps; and **b.** An appropriate Township Board Resolution supporting the installation of the speed humps.

Note: The "subject segment" of street(s) shall be the segment determined by the Traffic-Safety Department staff as being significantly impacted by the proposed speed humps.

Traffic-Safety Department Staff

5. Upon receipt of the above information, shall give the subdivision/homeowners authorization to proceed to have the speed humps designed by a consultant and constructed by a contractor, subject to review and approval by the RCOC Traffic-Safety and Permits & Environmental Concerns Departments, through the RCOC permit process.

Note: At its option, the RCOC may elect to construct the speed humps. In either event, the cost of installation (which includes signs and pavement markings as necessary) and, as appropriate, the removal of speed humps, will be at the subdivision's expense.

Traffic-Safety Department Staff

6. Future maintenance costs of the speed humps, including the pavement markings, will be the responsibility of the subdivision. The RCOC will be responsible for the maintenance of the associated signs.

Traffic-Safety Department Staff

7. Following installation, shall conduct follow-up traffic studies to determine the effectiveness of the speed humps.

Approved by: _____ 12/2/08
Managing Director Date