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Background

This traffic study was initiated by the City of Fort Mitchell in response to concerns from citizens about traffic operations of Beechwood School and Beechwood Road. This traffic study included a general overview of traffic conditions on Beechwood Road from Dixie Highway to Deauville Court. Included in the study were observation of Beechwood School's arrivals and dismissals and the internal vehicular circulation at the school.

The following data was obtained and reviewed for the study:

- Crash reports for the years 2011-2013
- Traffic citations for the years 2010 -2012
- Stealth radar, speed and volume
- Traffic survey mailed to residents
- Field reviews along Beechwood Road
- Observation of school arrivals and dismissals
- Review of schools internal vehicular flow
- Interview with crossing guard, school principal, and staff

Crash Reports

Crash reports were reviewed for 2011 through 2013. In the study area there were a total of 10 crashes. Three of the crashes where rear end involving stopped vehicles at Dixie Highway; three crashes involved vehicles backing out of residential driveways on Beechwood. One involved one vehicle striking another backing vehicle, one backing vehicle struck a parked car, and one backing vehicle struck a moving vehicle. Two crashes involved vehicles exiting the school driveway, one during school hours and one outside school hours. One crash involved a vehicle parked facing the wrong direction on Beechwood and one crash occurred on Beechwood at Page when motorists was turning right, lost control and struck the stop sign.

Traffic Citations

Traffic citations were reviewed for the years 2011 to 2013. For this time period in the study area there were three citations issued: One for stop sign violation Beechwood at Ashton, and two regarding red light violations Beechwood at Dixie.

Stealth Radar

Stealth radar was used by the City Police to record speeds at 26 Beechwood for two time periods:

- 9:45 AM Thursday August 15, 2013 to 12:15 PM Friday, August 16, 2013.
  - > The speeds of 3,782 vehicles were recorded. The average speed was 24.91 MPH, the 85th percentile speed was 30 MPH and the maximum speed was 44 MPH.

- 7:30 AM Saturday August 17, 2013 to 3:00 AM Monday August 18, 2013.

  > The speeds of 2,034 vehicles were recorded. The average speed was 26.65 MPH, the 85th percentile speed was 27 MPH and the maximum recorded speed was 51 MPH.

Stealth radar was also set up to record speeds at 54 Beechwood from:

- 8:45 AM Tuesday October 22, 2013 to 10:45 AM Friday October 25, 2013.

  > The speeds of 21,023 vehicles were recorded. The average speed was 23.32 MPH, the 85th percentile speed was 29 MPH and the maximum speed was 45 MPH.

Traffic Survey

The City desired the input of the residents of Beechwood Road in the study area regarding their traffic issues and concerns: A Traffic Study Questionnaire was developed and mailed to residents. The questionnaire provided five topics:

1. Parking
2. Pedestrian activity
3. Vehicular speeds
4. Sight distance
5. Other

The survey was mailed to Beechwood residents within the survey limits; the City received 23 responses. The responses were varied, some respondents taking time to provide lengthy narratives of their ideas and concerns. Some of the respondents did not address all of the topics. There was no consensus with the exception of speeding.

Speeding

The overwhelming consensus was that speeding is the major traffic concern on Beechwood as indicated by 70% of the respondents while two respondents indicated speeding was not a problem.

Speed humps

While questions about speed humps were not specifically included in the survey, three survey respondents wanted speed humps, one no and one maybe.

Sidewalks

Specific questions or issues about sidewalks were not included on the survey but five respondents indicated, “keep the existing sidewalks”. One referenced sidewalks should be added and one indicated sidewalk is located too close to the road.

Parking

Six respondents indicated that parking was not a problem on Beechwood, two recommended removing all parking, three indicated parking was difficult during special events. One person indicated that more people should be directing traffic during special events.

Pedestrians

Five respondents indicated pedestrian activity not a problem, with one indicating teens do not use crosswalk during non-school hours.

Sight Distance

Six respondents indicated sight distance was not an issue while two referenced vegetation was an issue and one specifically referenced the area from Deauville to Page.

Cut-through Traffic

Two respondents thought cut-through traffic should be reduced

Traffic signing/pavement marking comments:

- School zone sign not prominent, too close to 25 MPH sign
- More markings for school zone
- More visible speed limit signs/more tickets
- No left turn into school – enforce or remove

Dixie at Beechwood

- More police presence
- Modify signal timing at Dixie
- Poor visual of crosswalk at Dixie
- Need wider area to turn onto Beechwood at Dixie

Additional survey comments;

- More crosswalks
- More guards
- Better pick up drop off at school
- Another way out of school
- Do not like seeing cars stopped on Beechwood waiting for dismissal
- Make Beechwood one-way from Pleasant Ridge to either Royal or Grandview.

All completed surveys are on file at the City of Fort Mitchell offices.

School Traffic Circulation

CDS personnel observed traffic both during opening and closing hours of school and non-school hours: October 8 during arrival and dismissal of school and October 15 during AM school arrival. Observation indicated significant congestion during the arrival and dismissal times which is consistent with many schools where pedestrians and parents (dropping off/picking up students) converge on the school in very short time periods just prior to the beginning/ending of classes.

There are four access locations to the school, see Figure 1. At the eastern limits of the school property there is an 'In only' access referenced in this report as Access A. All westbound school traffic is designed to enter at this access only. Traffic enters and circles the site, green arrows, drops off students at the curb at the perimeter of the building and then exits onto Beechwood Road. Westbound traffic is prohibited from turning right into Ashton Road. There is a school staff monitoring/enforcing this prohibition during the arrival and dismissal times.

Eastbound school traffic is not permitted to turn into Access A. There is a regulatory NO LEFT TURN sign with the prohibited times installed on Beechwood road by Access A. This prohibition is routinely violated by eastbound school traffic. During CDS's observation periods, school staff was not stationed at this location.

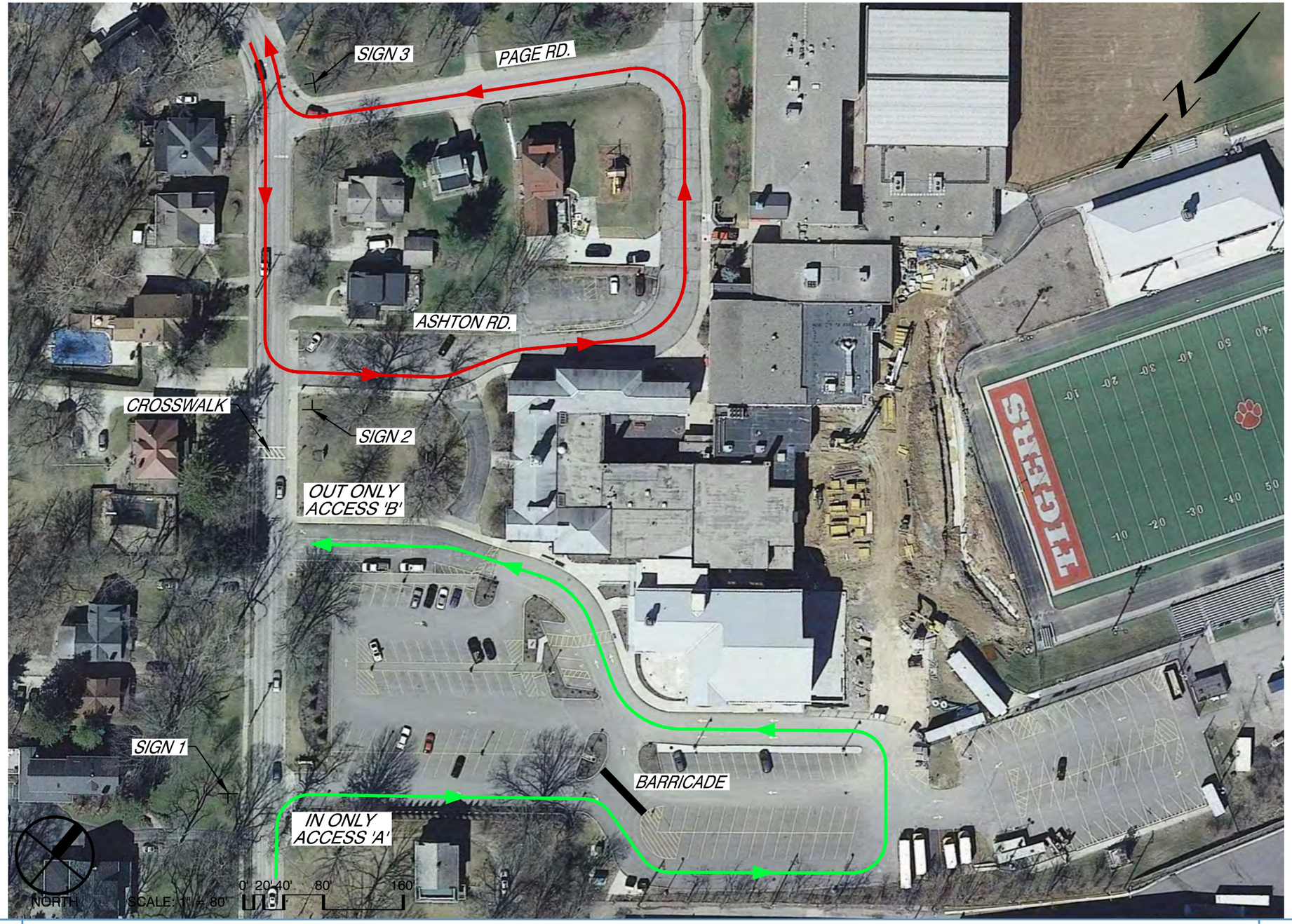
Eastbound school traffic turns left onto Ashton Road, see red arrows, and exits by turning left onto Page and turning right only onto Beechwood. There are regulatory NO LEFT TURN prohibitions with the specific times of the day posted on Page Road. During the AM arrival school staff is present to ensure traffic does not turn left. During the PM dismissal school staff is not present and the prohibition is not respected as reported by school staff.

School Crosswalk

There is a midblock crosswalk located between Ashton and the school's exit driveway, see Figure 1. A school crossing guard is present during the arrival and dismissal times, wearing highly visible safety vest and using appropriate signing. Based on observations students and parents approaching the school used the crosswalk and did not jay walk.

Safety Concerns with crosswalk

CDS observed eastbound traffic queueing back to/through the crosswalk. This was directly related to eastbound traffic ignoring the turn prohibition at Access A. This creates a danger for both the crossing guard and students as sight distance is restricted by vehicles backed to or through the crosswalk.



SIGN 2

SIGN 1
SIGN 3

EASTBOUND TRAFFIC
SCHOOL DROP
OFF/PICK UP

WESTBOUND TRAFFIC
SCHOOL DROP
OFF/PICK UP

CDS ASSOCIATES, INC
Knowledge ▪ Expertise ▪ Innovation

11120 Kenwood Road
Cincinnati, Ohio 45242-1818
(p) 513.791.1700
(f) 513.791.1936

7000 Dixie Highway
Florence, Kentucky 41042
(p) 859.525.0544
(f) 859.525.0561

www.cds-assoc.com

VEHICLE TRAFFIC FLOW - AM ARRIVAL AND PM DISMISSAL

BEECHWOOD HIGH SCHOOL - FIGURE 1

Recommendations Related To School Access

The following photos illustrate non-standard signs and pavement markings that are located on school property. While the school property is not a public road, utilizing standard signing and pavement markings on non-public roads, commercial property etc. provides increased emphasis, excellent visibility under day and night driving conditions and quick readability/recognition.

All signing and pavement marking recommendations listed in this report and references to sign sizes, code numbers etc. are from the ***Manual of Uniform Traffic Control Devices*** (MUTCD). Selected pages from this manual are included in Appendix B.

Photo 1, Access A
Viewing westbound at School Entrance

For school arrivals and dismissals, this is Beechwood's only entrance for westbound oriented traffic. The driveway is two lanes wide and is inbound only, see Photo 2. The designation for one-way in is indicated with small pavement markings which are only visible upon entering.

It would be desirable to install ONE WAY ARROW signs (R6-2) 24" x 30" (vertical rectangle), two signs mounted back to back on one support post on the east side of the driveway;, and two signs mounted back to back on the west side of the driveway. If the school ever experiences traffic attempting to exit this driveway, (R5-1A) WRONG WAY signs could be installed on the back of the sign posts and the ONE WAY ARROWS could be changed to horizontal arrows similar to arrows on Photo 65.

Photo 2, Access A
School Entrance

School entrance. Not recognizable that this is an entrance only until turning maneuver is made.

Photo 3, Access B
Exit Driveway

Pavement markings are non-standard in color and size. All pavement markings should be white for both channelizing line and arrows, see Photo 4. The size of the arrows should be 6 feet in length.

Photo 4, Access B
Exit Driveway

Existing arrows are small and wrong color. Exit pavement r necessary if correct size arrows are used.

Also recommend the installation of a 24" stop bar behind the sidewalk to extend across both exit lanes.

Photo 5, Access B
Exit Driveway

STOP sign is non-standard, non-reflectorized, mounted too low. A secondary STOP sign assembly identical to the one in the photo is located on the east side of the driveway.

On the back of the STOP sign is a non-standard DO NOT ENTER. See Photo 6 for full description.

Photo 6, Access B
Exit Driveway

ONE WAY directional sign installed in front of the STOP/DO NOT ENTER sign with a small non-standard EXIT ONLY sign.

The ONE WAY sign is used correctly; however, the typical application includes the STOP sign and DO NOT ENTER sign installed back to back below the ONE WAY ARROW. The STOP/DO NOT ENTER signs are mounted at a height of 7' measured from the bottom of the STOP sign. This signing application is highly visible in both day/night conditions for traffic exiting the school and traffic traveling on Beechwood Road. Due to the very wide pavement of this access, we would recommend one set, one each side of the driveway.

Photo 7, Access B
Across from Exit Driveway

Turn prohibition across from exit access which applies to opening and closing hours; however, this prohibition was from a previous time during construction and is no longer applicable. Sign should be removed.

Photo 8
Viewing Eastbound

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The LEFT TURN PROHIBITION is to prohibit left turns into the inbound school driveway during school arrival and dismissal times.

- The sign is located too far from the driveway;
- From AM and PM observations and report from school crossing guard, this sign is routinely violated;
- Due to motorists stopping to turn left into the school, traffic queues back into the crosswalk.
- This prohibition should be enforced with either school staff and/or the placement of traffic cones on the centerline during the opening and closing times only. Since this movement is routinely violated, once the enforcement begins, some additional congestion can be anticipated to occur on a temporary basis as eastbound traffic adapts to the prohibition. This could include motorists driving past the school and turning around in residential driveway.

Photo 9
Viewing Westbound Crosswalk

The SCHOOL CROSSING sign (S1-1) should be fluorescent yellow-green background with black legend and increased in size to 36" x 36". A downward pointing diagonal arrow plaque (W16-7P) 24" x 12" should be installed below the crossing sign.

Photo 10
Viewing Eastbound Crosswalk

Sign located too far from crosswalk. Sign should be removed and a new fluorescent yellow-green sign installed at the crosswalk as described in Photo 9 narrative.

Photo 11
Viewing Eastbound

The existing NO LEFT TURN sign located at the crosswalk should be removed and replaced with the SCHOOL CROSSING sign referenced in Photo 10.

Subsequent to the installation of the NO LEFT TURN sign, the school's driveway traffic flow was modified and this sign no longer applies to the adjacent driveway, which is now an exit only.

Photo 12
Crosswalk

1. All crosswalk lines should be white.
2. The crosswalk is not lighted. Recommend the installation of a street light over the crosswalk.
3. When Beechwood is resurfaced, modify curb ramps to current ADA standards.

Photo 13
Viewing Westbound on Beechwood at Page

This sign assembly is somewhat confusing as it indicates the driveway is one-way inbound and also right turns are not permitted during school days opening and closing times.

The prohibition times are indicated on blue plaques and the legend SCHOOL DAYS is indicated on a small non-standard plaque.

School staff currently enforce the no right turn prohibition during school arrival and dismissal times.

To reduce confusion and increase readability, CDS recommends removing the ONE WAY ARROW. In addition, replace the prohibition times plaque with a larger regulatory plaque (S4-1P) 24" x 10" black letters on white background and increase the size of the SCHOOL DAYS plaque using a modified (S$-4P) plaque, 24" x 10".

Photo 14
Viewing Southbound on Ashton at Beechwood

During morning arrival and afternoon dismissal, all traffic exiting Page Road must turn right. In the morning, only a school staff member directs traffic at this location. In the PM, staff is not present and violations occur.

Recommendations Related to School Zone

The posted speed limit on Beechwood is 25 MPH and 20 MPH during restricted hours. Below are photos depicting signing and pavement markings on the westbound approach to Beechwood School.

Photo 15
Viewing Westbound, just West of Dixie

KRS 189.336 (3) states, "…Flasher lights shall be placed one-eighth (1/8) of a mile on each side of the principle school building where practical…"

The existing location is approximately 1,250 feet from the school building almost twice the distance.

CDS recommends relocating the speed limit assembly to the appropriate location and install the SCHOOL pavement marking adjacent to the flasher.

Photo 16
Viewing Westbound Adjacent to School Flasher

Small 25 MPH pavement marking located next to the school flasher.

Recommend removing the non-standard 25 MPH pavement marking.

Photo 17
Viewing Eastbound from Deauville Court

School speed limit assembly flasher. Recommend installing standard SCHOOL pavement marking adjacent to flasher.

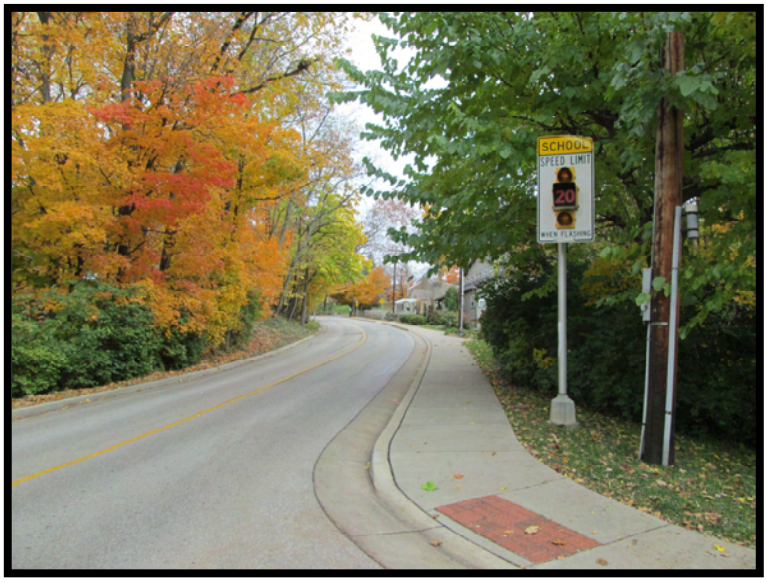

Photo 18
Viewing Eastbound East of Photo 17

STOP AHEAD warning sign should be replaced with a (W3-1) STOP AHEAD, 36" x 36".

Photo 19
Viewing Eastbound from Deauville

Mixed message, non standard 25 MPH pavement marking next to a SCHOOL pavement marking.

Recommend removing the 25 MPH pavement marking. Install a SCHOOL pavement marking adjacent to the school flasher.

Beechwood at Page
Three-Way Stop Intersection Recommendations

Photo 20
Eastbound on Approach to Page Road

STOP signs not visible due to combination of vegetation and road geometry.

Photo 21
Viewing Eastbound West of Ashton

STOP sign on the northeast corner of intersection just visible:

- Installing a STOP sign on the street name sign support (located on the northwest corner) significantly increases the distance the STOP sign can be seen in advance of the intersection.

Photo 22
Viewing Westbound from Page

This photo taken at the street name sign support on the northwest corner of Page at Beechwood. Referenced and seen in Photo 21 above. This illustrates the increased sight distance for the stop if the STOP sign is located on the street name support.

Speed Limit Sign Size and Placement Recommendations

Photo 23
Speed Limit Sign

The sizes of the speed limit signs on Beechwood are 18" x 24". This size is considered 'Minimum' as described in the ***Manual of Uniform Traffic Control Devices.*** Minimum size signs are acceptable for low volume roads; however, Beechwood Road is not a low volume Road. Given the nature of the traffic on this road, CDS recommends that 'Conventional Road' size signs should be used for all signs on Beechwood. Conventional size speed limit signs are 24" x 30". Recommend installing a 24" x 30 speed limit sign approximately 200 feet west of Dixie for westbound traffic. Across from the relocated school flashed install a 25 MPH speed limit, and END SCHOOL ZONE.

Vegetation

There are many locations in the study area where plantings and tree limbs over hang the road which can impact sight distance and reduce the effect of street lighting. All places are not pictured but the photos below illustrate some examples:

Photo 24, Viewing West Across from School Entrance

Photo 25, Viewing East by School Entrance

Photo 26
Viewing East from Deauville

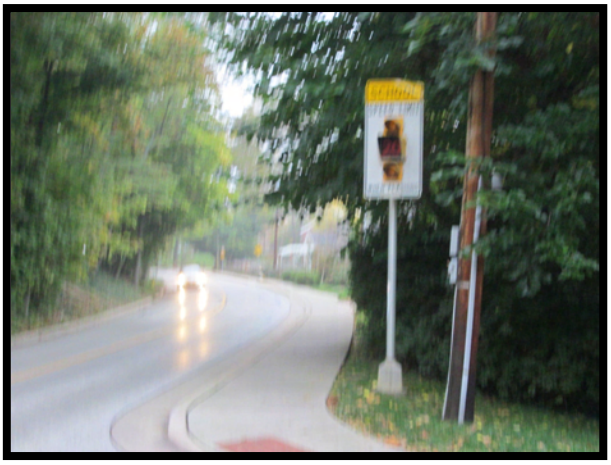

Photo 27
Viewing East from Deauville

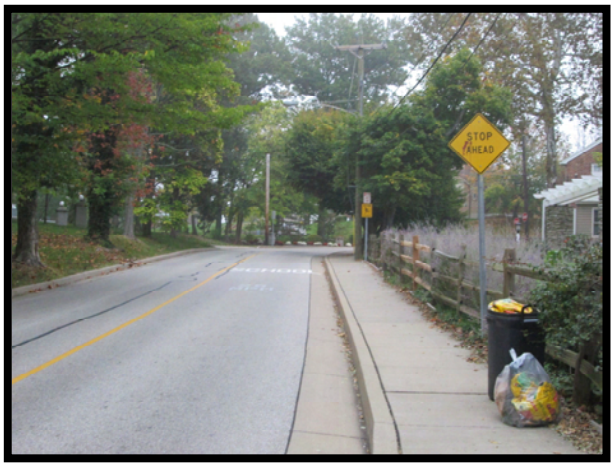

Photo 28
Viewing East on Approach to Page

Photo 29
Viewing West, West of Dixie

Vehicular Speeds

As described on Page 1, Fort Mitchell Police recorded the speeds of vehicles at two locations on Beechwood Road on August 15, August 17, and October 22 to October 25. The results of the radar indicate that the 85th percentile speeds for those periods were 30 MPH, 27 MPH and 29 MPH respectively. The posted speed limit during non-school hours is 25 MPH. 85th percentile speeds in these ranges are typical speeds found in residential streets. The results indicated, for the periods recorded, that 85 percent of the traffic did not exceed the referenced speeds – a majority of motorists are traveling at reasonable speeds on Beechwood Road; however, the results show a small percentage of motorists traveling at speeds that are not reasonable for Beechwood Road. We believe that the stealth radar can be used to see time periods when speeding occurs and schedule target enforcement.

Speed Humps

The question of the use of speed humps was raised by a few of the survey respondents and discussion with some school staff and other citizens.

Engineered speed humps can impact the operation of a road in two ways: 1) bring about an overall reduction in travel speeds; and, 2) can reduce cut-through traffic where it exists.

The City of Fort Mitchell has an ordinance entitled “Speed Hump Traffic Control Installation Criteria”. It is beyond the scope of this study to complete an analysis for speed humps; however, one of the criteria that must be satisfied is that the 85th percentile speed must be 5 or more miles per hour above the posted speed limit. The posted speed limit is 25 MPH and two of the survey’s 85th percentile speeds are below 30 and one was 30 MPH.

Summary

Many traffic sign and pavement marking modifications have been made in this report based on a review of all referenced data and field observations which include installing a street light over the crosswalk; sight distance can be improved by trimming trees and vegetation.

The overall school plan for internal circulation appears to be good, but all of the turn prohibitions should be enforced. This is especially critical to ensure traffic does not queue back to/through the crosswalk.

The stealth radar indicates the majority of motorists are traveling at reasonable speeds on Beechwood, however, there are a minority of motorists traveling at speeds unreasonable for Beechwood Road and the stealth data can be used to schedule target enforcement; this is especially important for Beechwood Road as the volumes are composed of both residential school traffic during both school and non-school hours

Safety can be improved by establishing good sight distance for motorists and pedestrians, providing the ability to clearly see warning, regulatory signs, and crosswalks under both day and night driving/walking conditions.

It is important to note there will always be congestion with arrival and dismissal times at Beechwood School. Part of this is due to the nature of school traffic – pedestrian and vehicles arriving at school property in a very short time period prior to the beginning of classes - and part is the specific location of the school building, road geometry and limited access to the site.

Good sight distance, clear signing and enforcement of speed limits and turn prohibitions can create the conditions for improved safety.