Intersections Improvements Study

January 2009

Prepared for the
City of Piqua, Ohio

by:

KLEINGERS & ASSOCIATES

www.kleingers.com
(513) 779-7851

Table of Contents

Introduction....2

Study Methodology....3

Study Intersections....5
- High Street Corridor....6
  - High & Broadway....7
  - High & Downing....12
  - High & Wayne....19
  - High / Market & Main....26
- College Street Corridor....30
  - College & North....31
  - College & Greene....38
  - College & Ash....45
  - College & High....52
  - College & Water....57
- Greene Street Corridor....63
  - Greene & Downing....64
  - Greene & Wayne....70
  - Greene & Main....77
- State Route 185 Corridor....85
  - Park at College & Nicklin....86
  - Park & Broadway....92
  - Broadway & North....98
  - Ash & Broadway....104
  - Ash & Downing....109
  - Ash & Main....116
- Isolated Intersections....124
  - South & Wayne....125
  - South & Downing....132
  - South & Roosevelt....136
  - Wood & Roosevelt....143
  - College & Wood....150
  - College & Young....155
  - South & Brice....160
  - McKinley & Grant....166
  - McKinley & Clark....172

Summary of Findings & Recommendations....178

Appendix

KLEINGERS & ASSOCIATES

Selected by *CE News* as one of "50 Best Civil Engineering Firms to Work For" in the U.S.

Contact:
Kleingers & Associates, Inc.
6305 Centre Park Drive
West Chester, Ohio 45069
www.kleingers.com
(513) 779-7851

Kleingers and Associates has performed this intersections improvements study project as the result of a recommendation from ***Plan it PIQUA***, the City's recent Comprehensive Plan Update, a section of which identified numerous intersections in the City as having "Unwarranted Signals". Many of the City's intersections were constructed in the early 1900's and have generally remained in their original configurations since that time. In general, the traffic control devices that have been used at many locations throughout the City have also been in place for a significant period of time. Although over the years, there have been changes in modes of travel, traffic patterns, and development characteristics that have impacted the traffic control needs at many of the City's intersections, the traffic control methods used at these intersections generally remain unchanged.

This study includes the review of 27 intersections within the City of Piqua. Of these intersections, 22 are controlled by traffic signals, 3 are four-way stop controlled, and 2 are two-way stop controlled. The purpose of the study as outlined in the Request for Proposals for this project is, "to fully assess the traffic control devices and physical characteristics of the improvements found at certain locations throughout the City." The listed goals for this study are as follows:

1. Conduct limited research of historical traffic and land development records to establish a "best guess" supposition regarding the rationale for the original installation of the current traffic control device being utilized at each intersection to determine how well the rationale measures up to the current standards and practices; and, compare and contrast the historical data to current and projected trends to establish changes that may have or are anticipated to occur, which may influence the recommendations of this study.
2. Positively identify the warrant status of the existing traffic control devices being utilized at each location and identify the traffic control device and incidental improvements that will enhance the functionality, level of service, and level of safety of each intersection.
3. Fully assess the existing design characteristics of the physical improvements found at each location, and identify any existing deficiencies or opportunities regarding the geometric configuration and functionality of the intersection.
4. Fully assess the physical characteristics of the built environment surrounding each location to identify any existing deficiencies or opportunities regarding coordination between the use of buildings, landscaping, public spaces, sidewalks, streets, bike lanes/trails, on-street and off-street parking, and the like.
5. Provide alternative recommendation for modifications specific to each intersection in consideration of the findings and determinations of items 1 through 4 above.
6. Estimate the cost to implement the alternative improvements for each intersection, including the demolition and or removal of existing improvements, and the construction and or installation of any new improvements. (*Note: This item was not included in the scope of this study.)*
7. Provide all documentation, completed forms, and analysis necessary, and a strategy for the implementation of the traffic control device removal, modification, or enhancement recommendation selected for each intersection by the City.

The study methodology and the list of study intersections are outlined in the pages to follow. A summary of recommendations for the study intersections is provided on Pages 178 and 179.

Study Methodology

The methodology used in this study includes three primary components: data collection, input/awareness, and traffic analyses. A description of each of these components is provided below.

Data Collection

In order to obtain the necessary information to perform the analyses for this study, various data was collected. Turning movement counts were performed at each of the study intersections. Tables showing the count data, as well as the dates and times each count was performed, are provided for each intersection. A minimum of four hours of count data was collected for each intersection. The counts were performed during the hours that traffic volumes were expected to be the highest. For typical intersections that were not expected to be impacted by school traffic, the hours of 7:00 to 9:00 am and 4:00 to 6:00 pm were counted. For intersections that were expected to be affected by school traffic, count times were established such that the peak traffic periods associated with the school were included. For some intersections, it was determined that up to four additional hours of count data were needed in order to fully determine the warrant status of the existing traffic control device. As with the base count data, these additional hours of traffic counts were scheduled such that the hours with the highest traffic volumes would be collected.

Geometric data was collected for each intersection. The collected information includes general intersection configuration, number of approach lanes, lane widths, type of traffic control, applicable traffic signal timing information, locations of any on-street parking, crosswalk locations, and existing development characteristics adjacent to the intersection.

Crash reports for the study intersections were provided by the City of Piqua. These reports were from crashes that occurred from January 2005 through June 2008. For intersections where crashes occurred, crash diagrams were performed to identify any recurring crash patterns. The crash data was also used to evaluate Warrant 7 (Crash Experience) in the traffic signal warrant analyses.

Input/Awareness

As part of this study, an Input/Awareness meeting was held on August 25, 2008. The purpose of the meeting was to introduce the project to City staff members, advisory board members and the general public, to discuss "best practices" in providing intersection traffic control, and to receive input from those in attendance regarding their specific concerns and observations at the intersections being studied.

This meeting was held in two separate sessions. The first session was held at 3:00 p.m. with City staff and advisory board members. The second session was held at 6:00 p.m. with members of the general public. Kleingers and Associates discussed various traffic control methods as well as issues considered by traffic engineers when determining the proper traffic control devices to be used for various types of intersections. Input was received from the session attendees regarding general concerns about traffic operations and safety as well as specific concerns about the intersections included in this study. A summary of the input received is included in the Appendix.

Traffic Analyses

Traffic signal warrant analyses were performed at each study intersection that is currently controlled by a traffic signal in accordance with the Ohio Manual on Uniform Traffic Control Devices (OMUTCD), 2005 edition. Warrant One is the Eight Hour Vehicular Volume Warrant. As indicated in the data collection discussion earlier in this section, only four hours of traffic count data was collected at some of the study intersections. In order to evaluate the Eight Hour Vehicular Volume Warrant where only four hours of traffic data were collected, it was assumed that if the traffic volumes for each of the hours counted fell below the thresholds outlined in this warrant, traffic volumes for all other hours throughout the day would be below those thresholds as well. If the traffic volumes from the original four hours that were counted met or nearly met the thresholds for the Eight Hour Vehicular Volume Warrant, additional traffic count data was collected.

Field observations and/or capacity analyses were used to evaluate the current operation of stop-controlled intersections. Capacity analyses were also performed at certain signalized intersections where it was necessary to evaluate alternate traffic control methods.

This report outlines recommendations for each intersection based on the data collected and the analyses performed as described above. These recommendations are provided in the detailed descriptions for each intersection as well as in the summary Pages 178 and 179.

Study Intersections

The intersections included for analysis in this study area listed below. The existing traffic control method currently in use at each intersection as well as the primary nature of issue / concern are also shown. Also shown is a description of each of the codes listed as the primary nature of issue / concern:

Intersection	Existing Traffic Control	Primary Nature of Issue/Concern
High at Broadway	Traffic Signal	W
High at Downing	Traffic Signal	W
High at Wayne	Traffic Signal	W
High/Market at Main	Two-Way Stop	W/T
College at North	Traffic Signal	W
College at Greene	Traffic Signal	W
College at Ash	Traffic Signal	W
College at High	Traffic Signal	C
College at Water	Traffic Signal	C
Greene at Downing	Traffic Signal	W
Greene at Wayne	Traffic Signal	W
Greene at Main	Traffic Signal	W/P/T
Park at College / Nicklin	Traffic Signal	W
Park at Broadway	Traffic Signal	W
Broadway at North	Traffic Signal	W
Ash at Broadway	Traffic Signal	W
Ash at Downing	Traffic Signal	W/C
Ash at Main	Traffic Signal	W/P/T
South at Wayne	Traffic Signal	W
South at Downing	Four-Way Stop	W
South at Roosevelt	Traffic Signal	W
Wood at Roosevelt	Traffic Signal	W
College at Wood	Four-Way Stop	W
College at Young	Four-Way Stop	W
South at Brice	Traffic Signal	W
McKinley at Grant	Traffic Signal	W
McKinley at Clark	Two-Way Stop	W

W = Warrant Status—Is this the most appropriate and most effective traffic control device for this intersection.

C = Coordination—Is the timing and/or operation of this signal optimal with reference to the movement of vehicular and pedestrian traffic through the intersection and surrounding area. Should this signal be connected to another nearby signal for coordinated operation.

P = Parking—Does the on-street parking layout on the approaches to this intersection interfere with the optimal movement of traffic through the intersection and surrounding area and/or inhibit the successful operation of nearby business ventures.

T = Turn Lane—Are the turn lanes at this intersection detrimental to achieving the optimal balance between meeting the demand for on-street parking and attaining the optimum movement of traffic through the intersection and surrounding area, in particular with reference to the impact on nearby business ventures.

The following sections outline the analyses performed at each of the study intersections. For simplicity, the intersections have been grouped based on their geographic locations. It should be noted that the intersection of McKinley at Grant was not included as a study intersection at the beginning of this project. Traffic data for this intersection was provided by the City of Piqua. Also, since this intersection was added to the project after the geometric characteristics were collected for each intersection, no existing conditions diagram is provided.

The High Street Corridor

Intersection of High Street and Broadway Street

Intersection of High Street and Downing Street

Intersection of High Street and Wayne Street

Intersection of Main Street and High Street/Market Street

High Street & Broadway Street

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of High Street with Broadway Street is signal controlled and has four approaches, with the north, west, and east legs intersecting at 90-degree angles. The south leg approaches the intersection at a skewed angle with an alley intersecting the south leg just south of the High Street intersection. There is a single lane on each approach. Each leg of the intersection carries two-way traffic with the exception of the south leg, which is designated as a one-way street carrying northbound traffic only. The close proximity of the buildings in the southeast and northeast corners of the intersection restrict sight distance from some of the stop locations at the intersection. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The existing conditions diagram also shows the existing development adjacent to the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its proximity to the central business district and may have been warranted when it was installed.

Public Comments

– "Traffic signal is not needed."

Analyses Results

– Traffic signal warrants are not met

– No reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

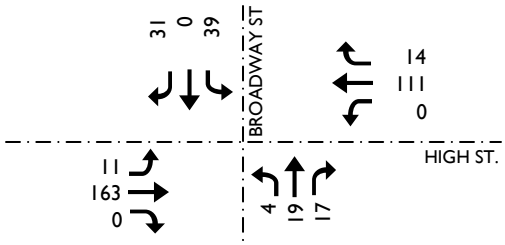
Due to the irregular intersection configuration and existing sight distance restrictions, it is recommended that the existing traffic signal control at this intersection be retained.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- South leg is one-way northbound
- Adjacent buildings restrict visibility

Counted Traffic Volumes (peak hour)



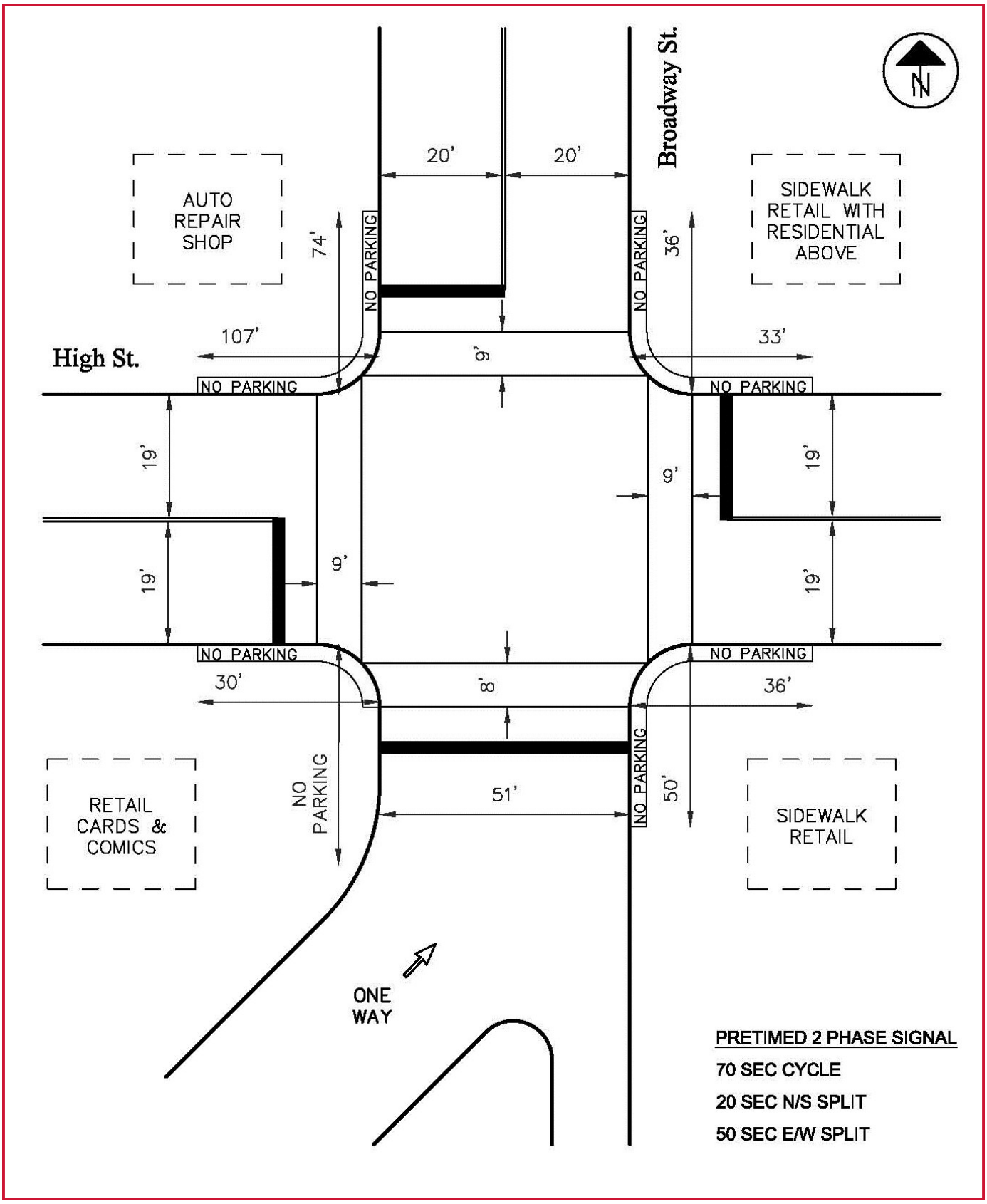
Crash History

- 0 reported crashes from 2005-2008

Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM



Turning Movement Counts Summary Table

Location: Broadway Street at High Street

Date of Counts: Thursday 8/7/2008

	SB Broadway St				WB High St				NB Broadway St				EB High St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	2	0	2	0	0	6	1	0	1	0	2	0	2	12	0	1			
7:15 to 7:30 am	4	0	3	0	0	3	0	1	0	1	1	0	1	15	0	0			
7:30 to 7:45 am	16	0	5	1	0	7	4	1	1	3	5	0	1	23	0	0			
7:45 to 8:00 am	14	0	5	0	0	9	2	1	2	4	5	0	1	34	0	0			
Total	36	0	15	1	0	25	7	3	4	8	13	0	5	84	0	1	121	51	25
8:00 to 8:15 am	6	0	5	0	0	9	1	0	1	0	3	2	1	16	0	0			
8:15 to 8:30 am	6	0	3	0	0	9	0	0	0	4	3	0	2	21	0	0			
8:30 to 8:45 am	6	0	0	0	0	7	1	0	0	3	2	0	0	16	0	2			
8:45 to 9:00 am	4	0	2	0	0	10	1	1	1	2	2	0	5	24	0	0			
Total	22	0	10	0	0	35	3	1	2	9	10	2	8	77	0	2	123	32	21
4:00 to 4:15 pm	6	0	5	1	0	31	2	0	0	2	6	0	3	39	0	0			
4:15 to 4:30 pm	10	0	4	0	0	31	3	1	2	4	7	0	2	34	0	3			
4:30 to 4:45 pm	8	0	9	0	0	27	5	3	1	7	1	4	2	52	0	0			
4:45 to 5:00 pm	15	0	13	0	0	22	4	0	1	6	3	1	4	38	0	2			
Total	39	0	31	1	0	111	14	4	4	19	17	5	11	163	0	5	299	70	40
5:00 to 5:15 pm	15	0	13	0	0	22	4	0	1	6	3	1	3	38	0	2			
5:15 to 5:30 pm	8	0	7	0	1	25	4	0	0	5	2	0	2	32	0	0			
5:30 to 5:45 pm	8	0	7	0	1	25	4	0	0	5	2	0	2	32	0	0			
5:45 to 6:00 pm	6	0	8	2	0	8	2	0	0	1	8	3	2	28	0	0			
Total	37	0	35	2	2	80	14	0	1	17	15	4	9	130	0	2	235	72	33
Grand Total	134	0	91	4	2	251	38	8	11	53	55	11	33	454	0	10			

SIGNAL WARANT ANALYSIS SUMMARY

Broadway Street /High Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	121	51	No	121	51	No	No
8 AM to 9 AM	123	32	No	123	32	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	299	70	No	299	70	No	No
5 PM to 6 PM	235	72	No	235	72	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

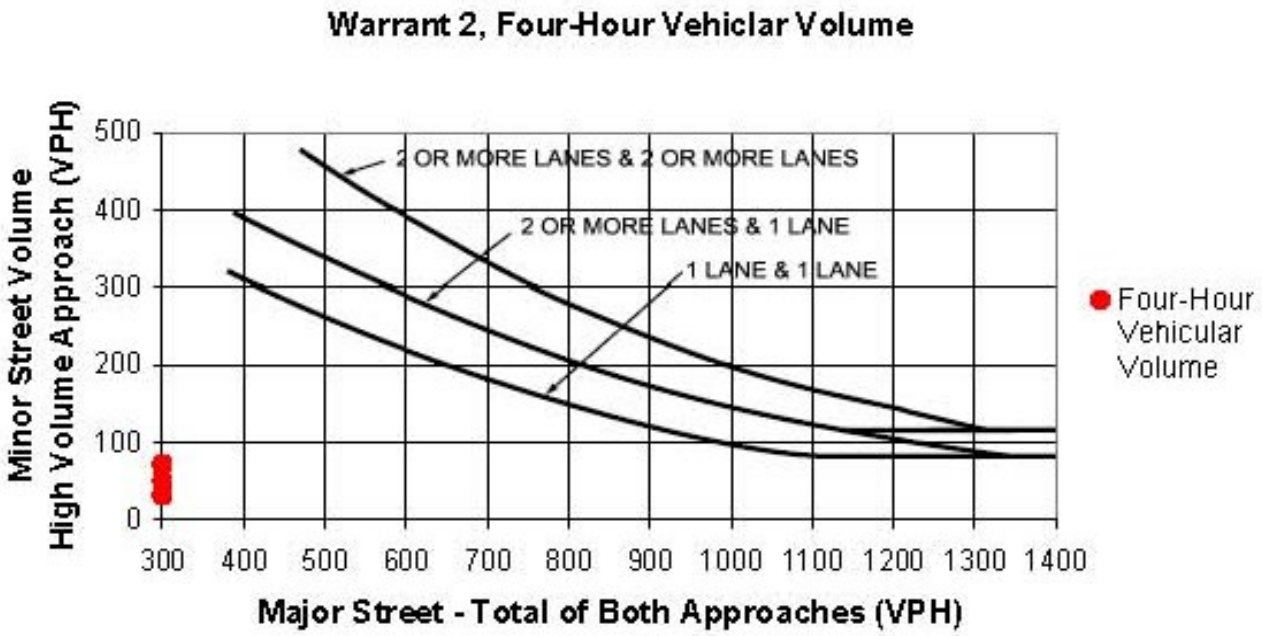
This intersection is not located at a critical point along a coordinated signal system.

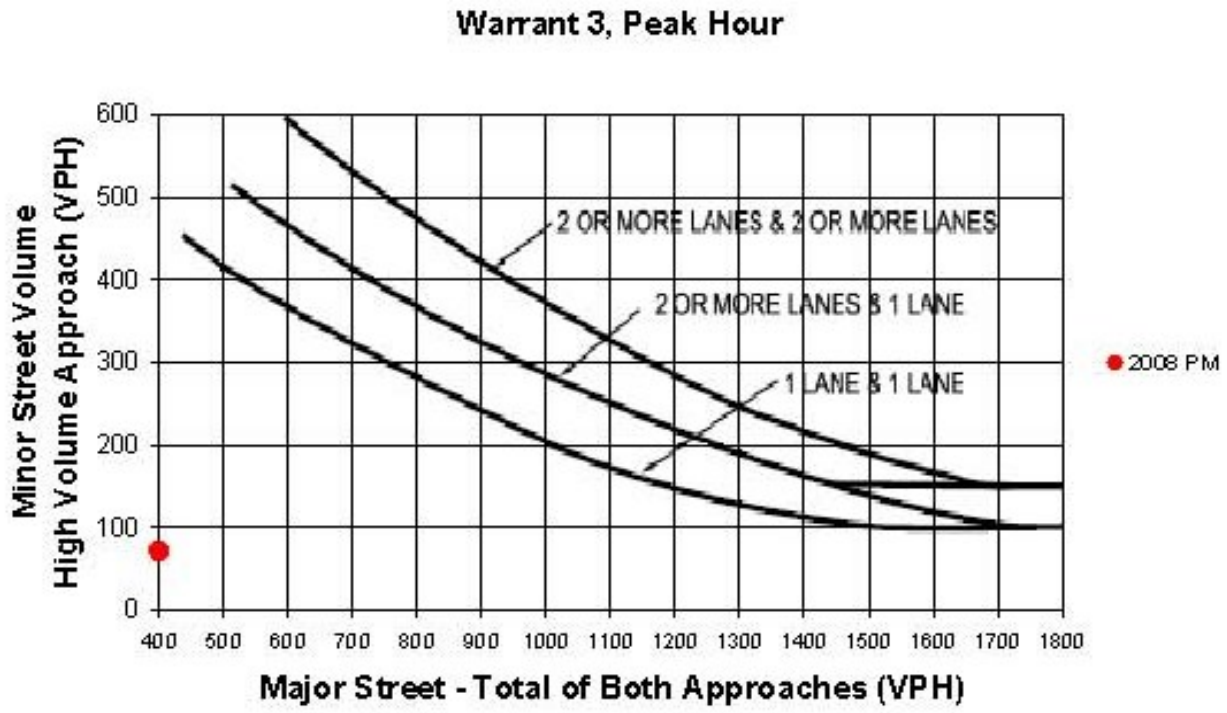
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has fewer than 410 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

High Street & Downing Street

Aerial Photo:

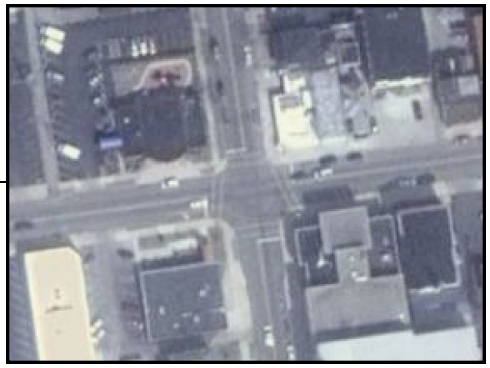


Photo: Looking East

Existing Conditions Discussion

The intersection of High Street with Downing Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach, with the exception of the west leg, which consists of a left-through shared lane and a right-turn only lane. There are YMCA facilities on three corners of this intersection. The locations of these facilities are shown on the existing conditions diagram. The close proximity of the buildings adjacent to the intersection restricts sight distance from some of the stop locations at the intersection. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location in the central business district and may have been warranted when it was installed.

Public Comments

- "Traffic signal is needed due to pedestrians."
- "There are a lot of kids that use the YMCA, but many cross the street mid-block rather than at the intersections."
- "Four-way stop may be appropriate."

Analyses Results

- Traffic signal warrants are not met
- Four reported crashes at the intersection from Jan. 2005 to June 2008
- All-way stop control provides adequate capacity

Recommendations

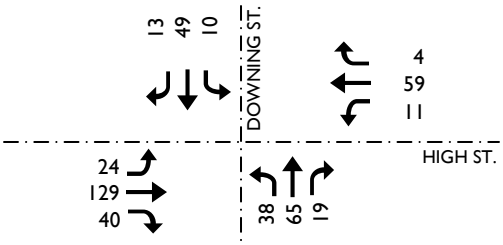
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Due to the number of pedestrians crossing in the area of this intersection and due to the sight distance restrictions resulting from the close proximity of the adjacent buildings to the intersection, four-way stop control is recommended, along with curb bump-outs to provide for shorter pedestrian crossings and adequate locations for stop sign visibility. If four-way stop control is implemented, it is recommended that the eastbound right-turn lane be removed.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Right-turn lane on west leg
- YMCA facilities adjacent to intersection
- Adjacent buildings restrict visibility

Counted Traffic Volumes (peak hour)



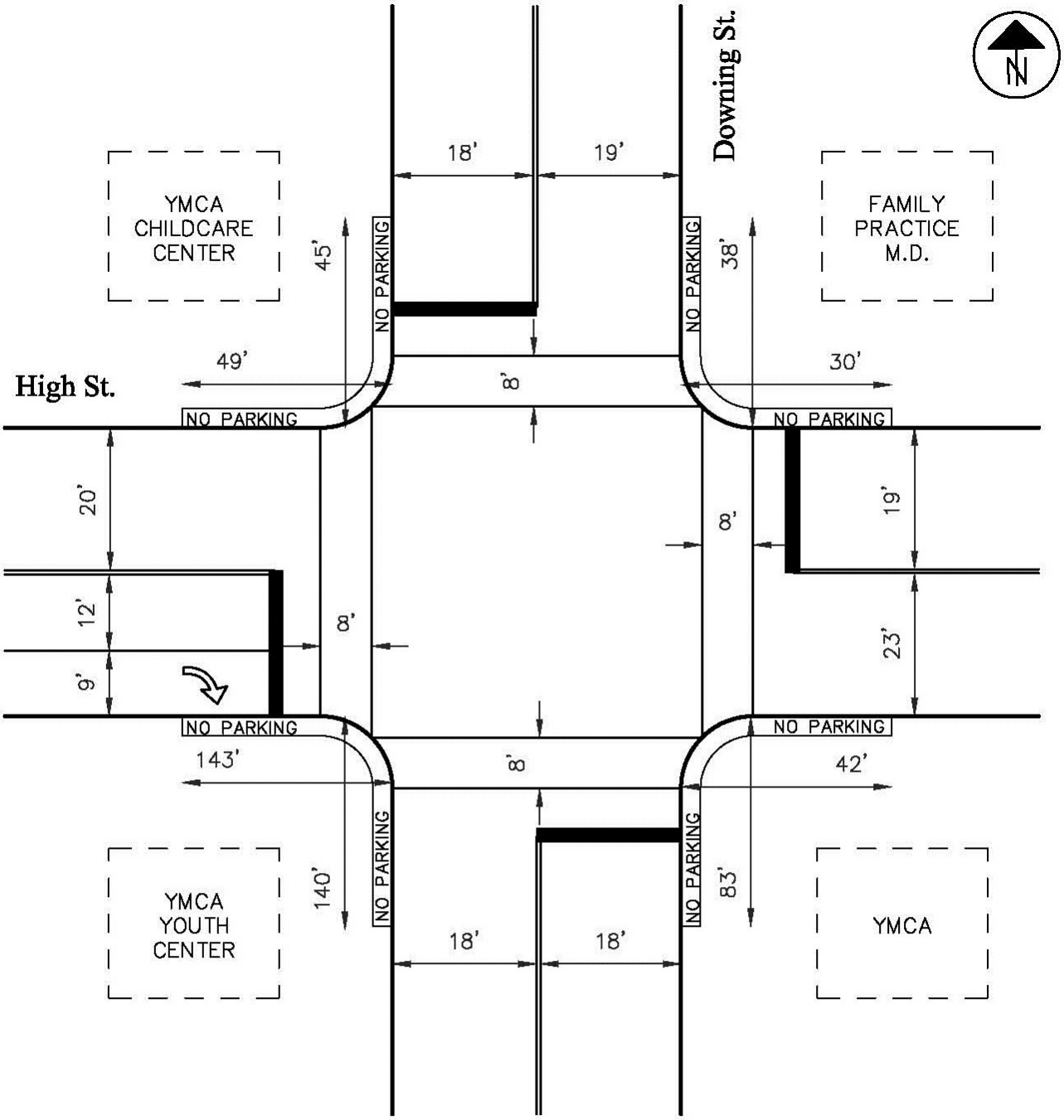
Crash History

- 4 reported crashes from 2005-2008
- Primarily angle-end type crashes

Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



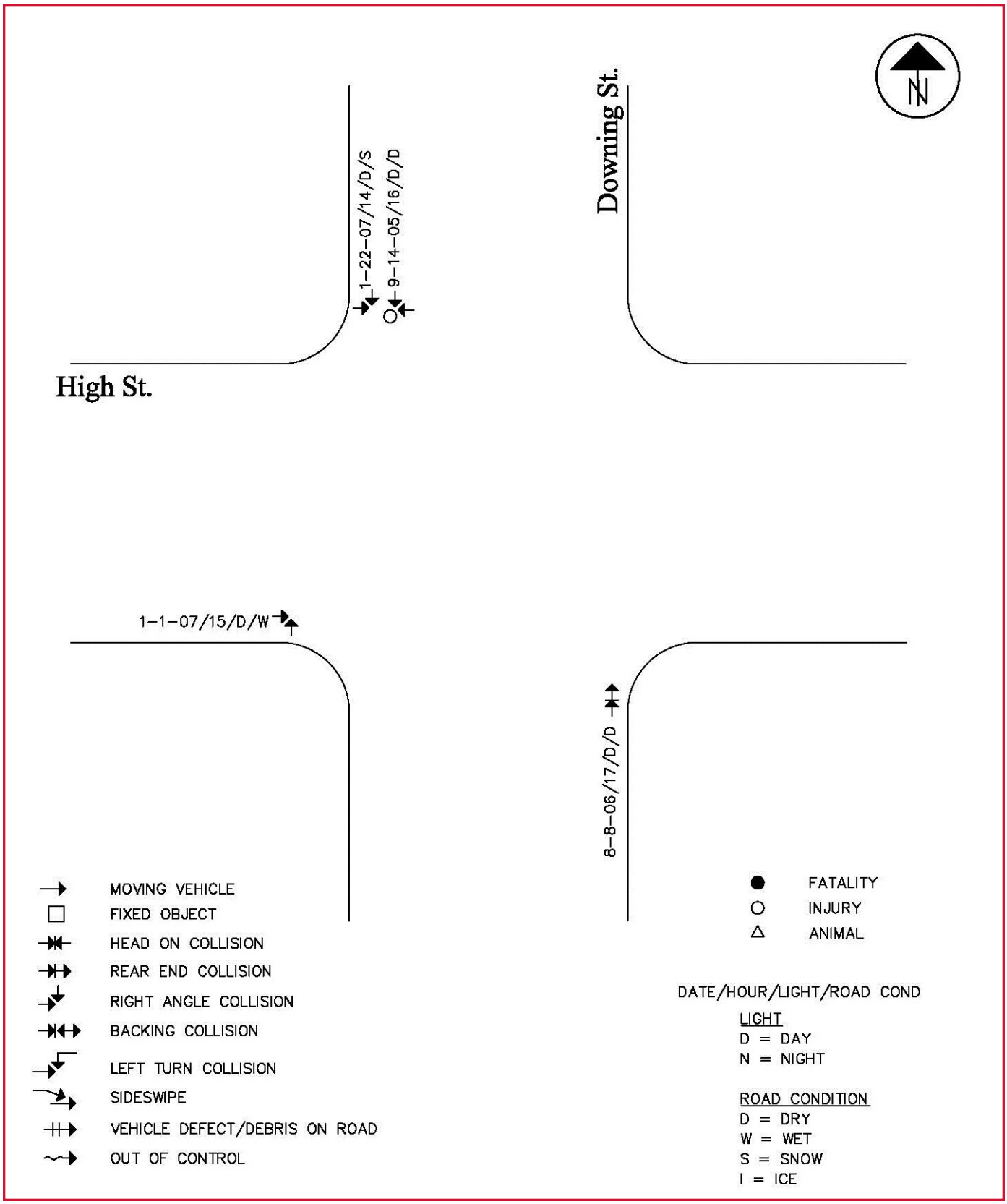
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT

35 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Downing Street at High Street

Date of Counts: Thursday 8/7/2008

	SB Downing St				WB High St				NB Downing St				EB High St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	1	6	2	0	0	2	1	2	1	5	1	2	1	8	1	1			
7:15 to 7:30 am	2	5	6	0	1	1	0	1	0	6	0	1	2	16	2	0			
7:30 to 7:45 am	0	6	3	0	0	4	0	1	2	8	0	2	0	15	16	1			
7:45 to 8:00 am	3	14	4	2	1	5	1	3	4	5	3	1	5	16	16	1			
Total	6	31	15	2	2	12	2	7	7	24	4	6	8	55	35	3	114	52	35
8:00 to 8:15 am	1	6	5	1	1	4	1	0	4	5	4	1	2	19	3	2			
8:15 to 8:30 am	3	8	3	1	0	5	0	2	5	6	5	5	4	18	3	3			
8:30 to 8:45 am	3	8	2	0	0	4	0	0	4	7	5	1	3	21	4	1			
8:45 to 9:00 am	1	7	2	1	3	4	0	0	3	8	5	1	2	19	6	3			
Total	8	29	12	3	4	17	1	2	16	26	19	8	11	77	16	9	126	49	61
4:00 to 4:15 pm	5	5	5	2	4	19	3	7	10	19	9	11	4	29	9	2			
4:15 to 4:30 pm	2	17	1	1	4	13	0	3	12	17	4	5	9	28	10	7			
4:30 to 4:45 pm	1	8	6	3	1	12	1	2	12	12	1	3	4	40	9	5			
4:45 to 5:00 pm	2	19	1	5	2	15	0	1	4	17	5	8	7	32	12	3			
Total	10	49	13	11	11	59	4	13	38	65	19	27	24	129	40	17	267	72	122
5:00 to 5:15 pm	2	19	1	5	2	15	0	1	4	17	5	8	7	32	12	3			
5:15 to 5:30 pm	1	10	3	3	1	16	1	1	10	9	1	2	5	18	11	3			
5:30 to 5:45 pm	1	10	3	3	1	16	1	1	10	9	1	2	5	18	11	3			
5:45 to 6:00 pm	3	11	3	2	1	4	1	0	5	9	3	2	3	28	3	3			
Total	7	50	10	13	5	51	3	3	29	44	10	14	20	96	37	12	212	67	83
Grand Total	31	159	50	29	22	139	10	25	90	159	52	55	63	357	128	41			

SIGNAL WARANT ANALYSIS SUMMARY

Downing Street / High Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	114	52	No	114	52	No	No
8 AM to 9 AM	126	61	No	126	61	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	267	122	No	267	122	No	No
5 PM to 6 PM	212	83	No	212	83	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

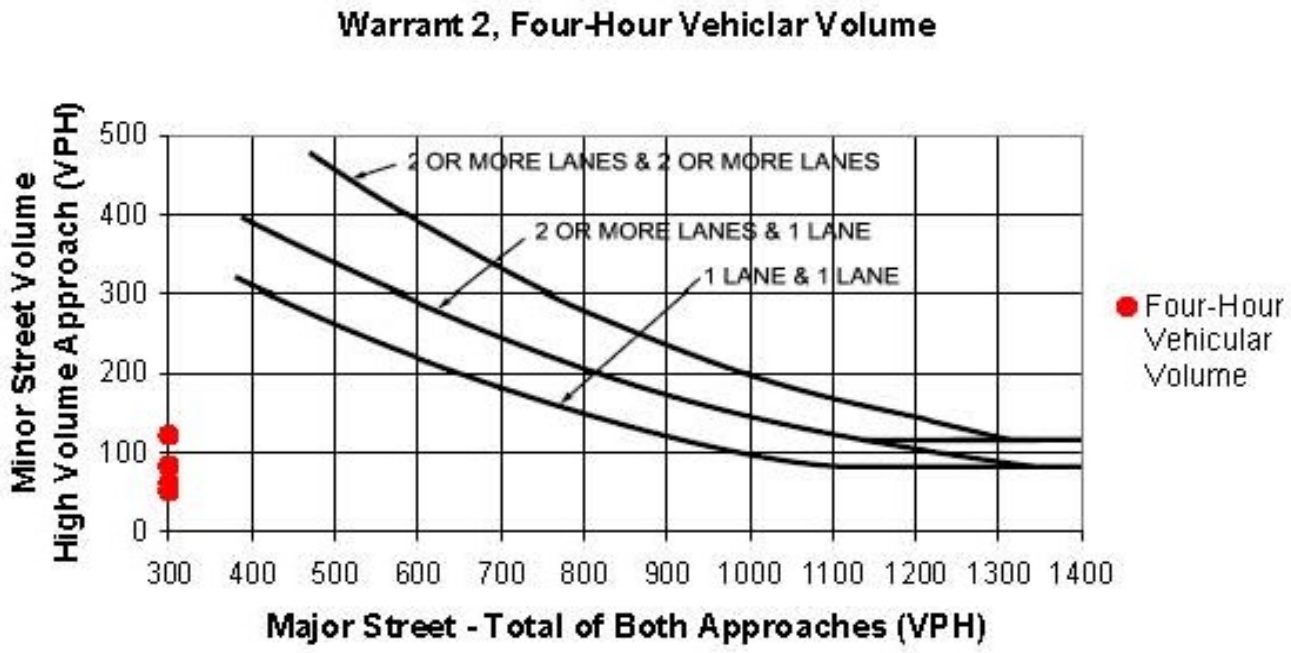
This intersection is located along a coordinated signal system (High Street). The coordination is being evaluated as part of this study.

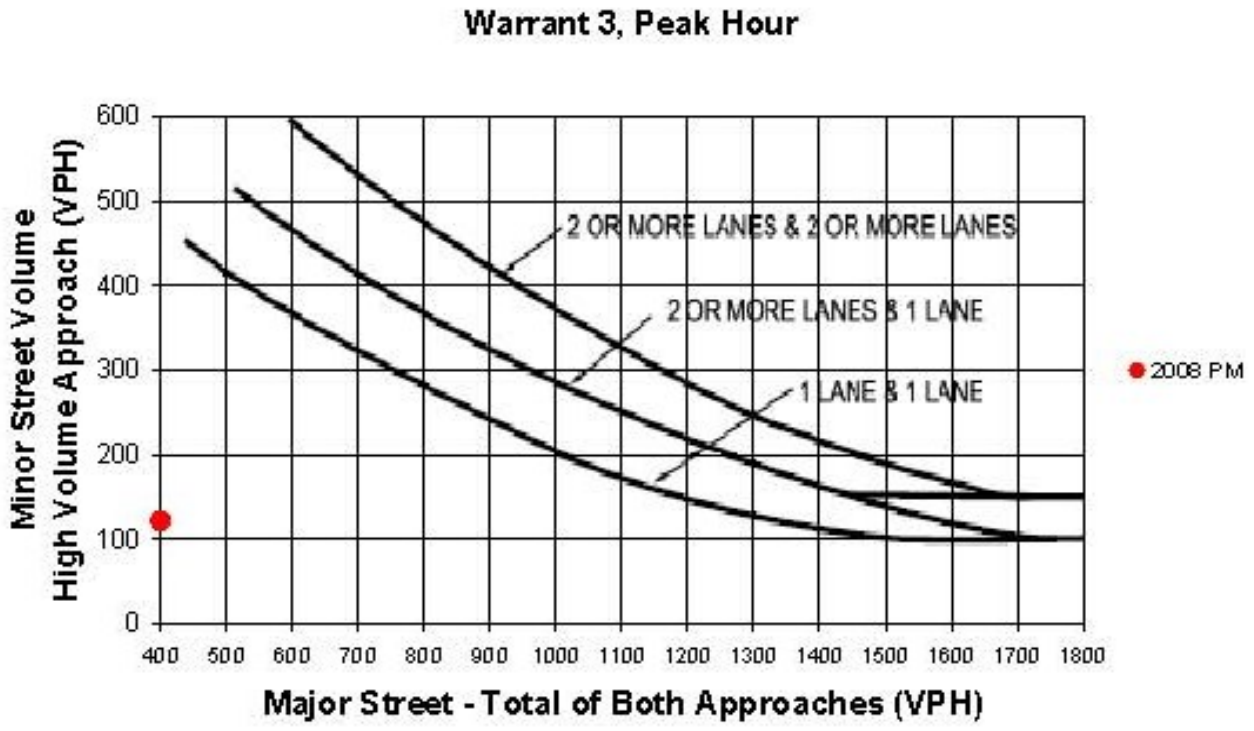
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, three right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has fewer than 300 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	Downing at High
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: *High Street*

North/South Street: *Downing Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	24	129	40	11	59	4
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	38	65	19	10	49	13
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	213		81		135		79	
% Heavy Vehicles	0		2		1		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1		0.1		0.3		0.1	
Prop. Right-Turns	0.2		0.0		0.2		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		0.0		-0.0		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.19		0.07		0.12		0.07	
hd, final value (s)	4.43		4.72		4.69		4.71	
x, final value	0.26		0.11		0.18		0.10	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.4		2.7		2.7		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	463		331		385		329	
Delay (s/veh)	9.00		8.27		8.68		8.25	
LOS	A		A		A		A	
Approach: Delay (s/veh)	9.00		8.27		8.68		8.25	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.68							
Intersection LOS	A							

Copyright © 2007 University of Florida, All Rights Reserved

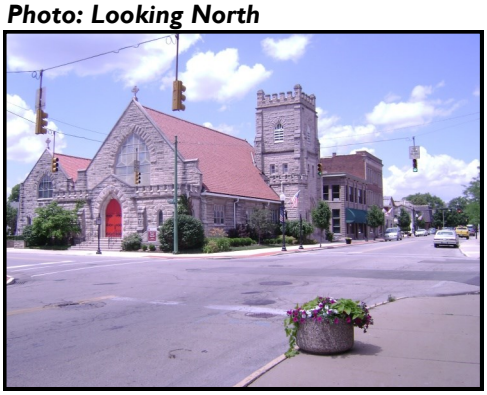
HCS+™ Version 5.3

Generated: 1/12/2009 6:14 PM

High Street & Wayne Street

Aerial Photo:

Photo: Looking North



Existing Conditions Discussion

The intersection of High Street with Wayne Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. A United States Post Office is located in the southwest corner of the intersection. The development that is located adjacent to this intersection is shown on the existing conditions diagram. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location in the central business district and may have been warranted when it was installed.

Public Comments

- No specific comments were discussed regarding this intersection.

Analyses Results

- Traffic signal warrants are not met
- Three reported crashes at the intersection from Jan. 2005 to June 2008
- All-way stop control provides adequate capacity

Recommendations

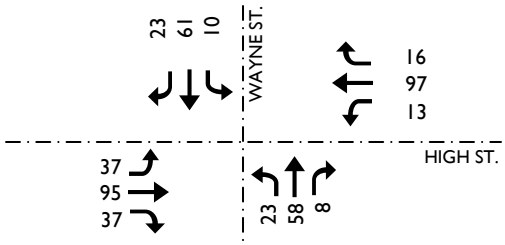
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Based on the relatively balanced traffic volumes on the intersection approaches, four-way stop control is recommended, along with curb bump-outs to provide for shorter pedestrian crossings and adequate locations for stop sign visibility. Particular attention needs to be given to the design of a curb bump-out on the northeast corner in order to provide for adequate access for vehicles exiting the bank parking lot due to the relatively short distance between Wayne Street and the bank driveway on High Street.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in central business district

Counted Traffic Volumes (peak hour)



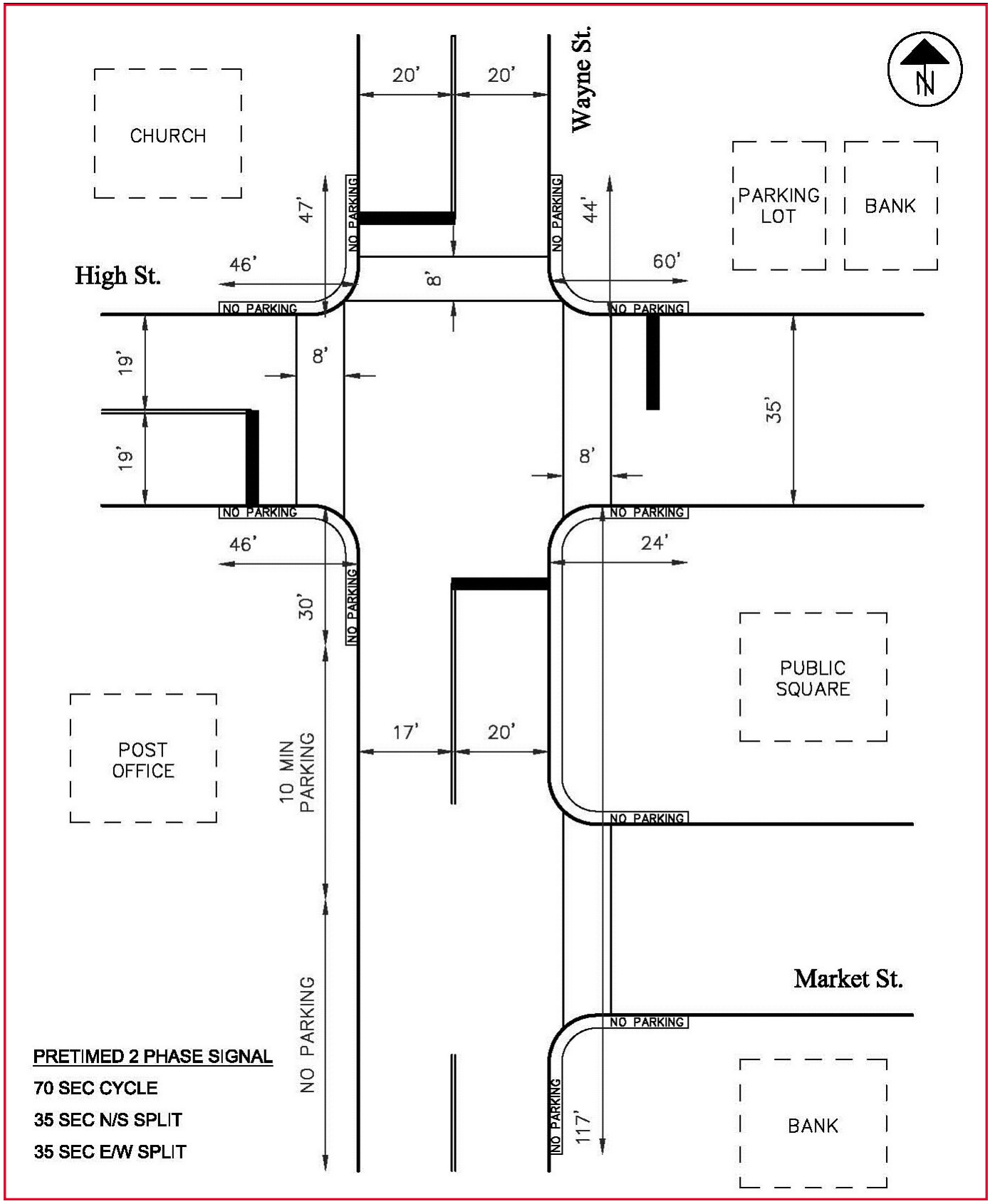
Crash History

- 3 reported crashes from 2005-2008
- 2 crashes involved left turns

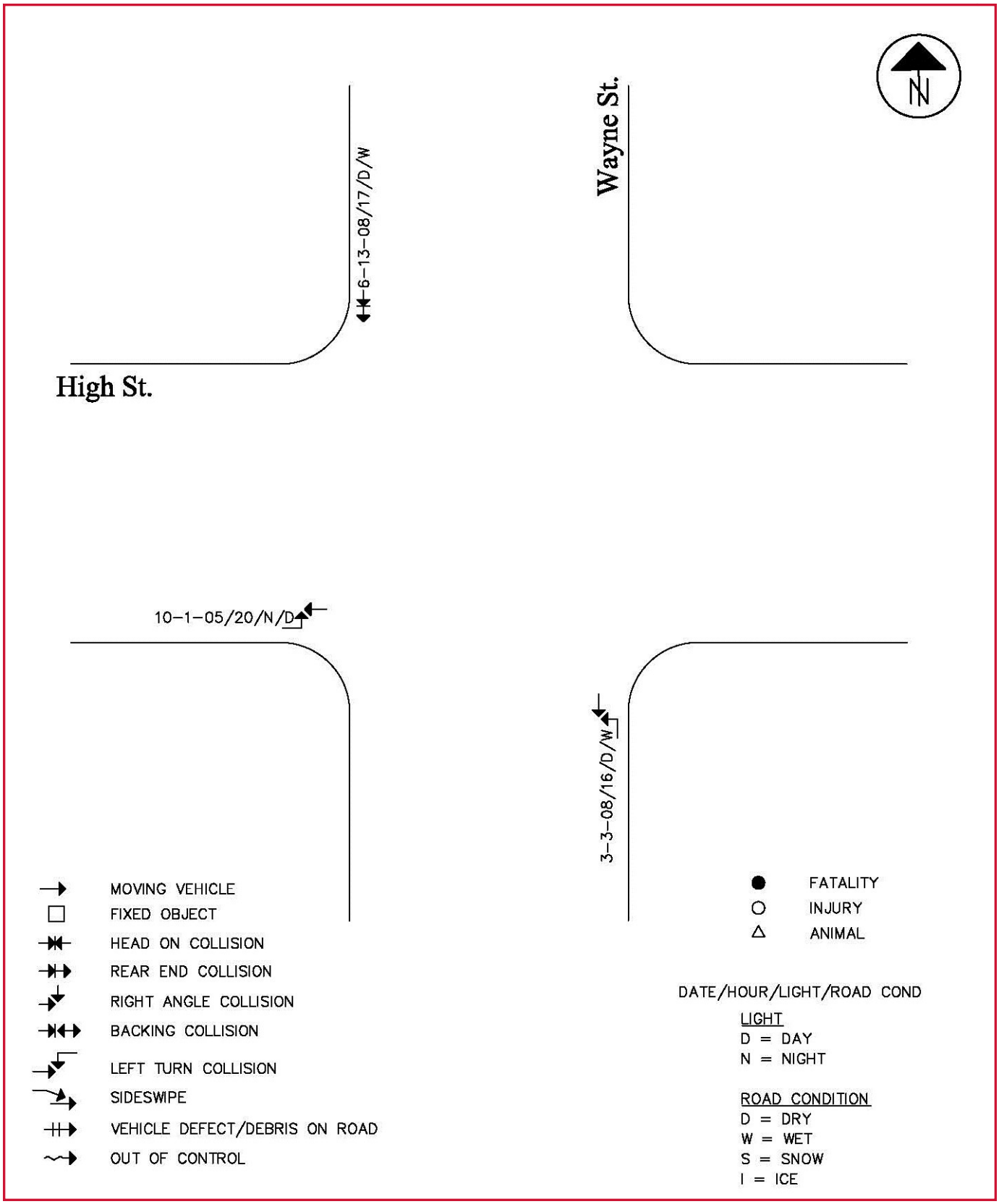
Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Wayne Street at High Street

Date of Counts: Wednesday 11/5/2008

	SB Wayne St				WB High St				NB Wayne St				EB High St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	6	2	0	0	4	1	0	2	9	0	0	4	13	6	0			
7:15 to 7:30 am	0	5	1	1	3	9	0	0	1	3	1	0	6	9	4	1			
7:30 to 7:45 am	0	13	1	0	3	2	0	0	2	8	0	0	1	5	8	0			
7:45 to 8:00 am	0	16	0	1	2	3	0	0	1	8	0	0	8	11	6	0			
Total	0	40	4	2	8	18	1	0	6	28	1	0	19	38	24	1	108	44	35
8:00 to 8:15 am	0	11	4	0	1	2	2	0	2	6	0	2	10	7	7	0			
8:15 to 8:30 am	0	7	4	1	5	7	2	1	6	11	2	0	9	9	7	0			
8:30 to 8:45 am	0	14	3	1	2	10	1	1	5	11	1	0	4	11	4	0			
8:45 to 9:00 am	1	14	2	2	4	9	2	1	6	8	0	1	13	13	7	1			
Total	1	46	13	4	12	28	7	3	19	36	3	3	36	40	25	1	148	60	58
4:00 to 4:15 pm	2	18	3	1	6	20	4	0	8	20	2	1	9	14	17	0			
4:15 to 4:30 pm	1	11	6	0	2	14	5	4	7	13	0	3	2	14	13	0			
4:30 to 4:45 pm	2	17	12	8	6	16	1	3	6	27	4	2	8	23	11	1			
4:45 to 5:00 pm	1	14	4	5	3	22	3	2	9	19	5	2	10	25	7	2			
Total	6	60	25	14	17	72	13	9	30	79	11	8	29	76	48	3	255	91	120
5:00 to 5:15 pm	3	15	8	3	1	29	4	1	7	19	3	0	12	20	6	3			
5:15 to 5:30 pm	2	16	3	0	3	27	4	2	7	16	1	0	4	23	7	1			
5:30 to 5:45 pm	4	19	6	4	6	21	5	2	4	10	3	2	11	25	11	4			
5:45 to 6:00 pm	1	11	6	0	3	20	3	6	5	13	1	0	10	27	13	2			
Total	10	61	23	7	13	97	16	11	23	58	8	2	37	95	37	10	295	94	89
Grand Total	17	207	65	27	50	215	37	23	78	201	23	13	121	249	134	15			

SIGNAL WARANT ANALYSIS SUMMARY

Wayne Street / High Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	108	44	No	108	44	No	No
8 AM to 9 AM	148	60	No	148	60	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	255	120	No	255	120	No	No
5 PM to 6 PM	295	94	No	295	94	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

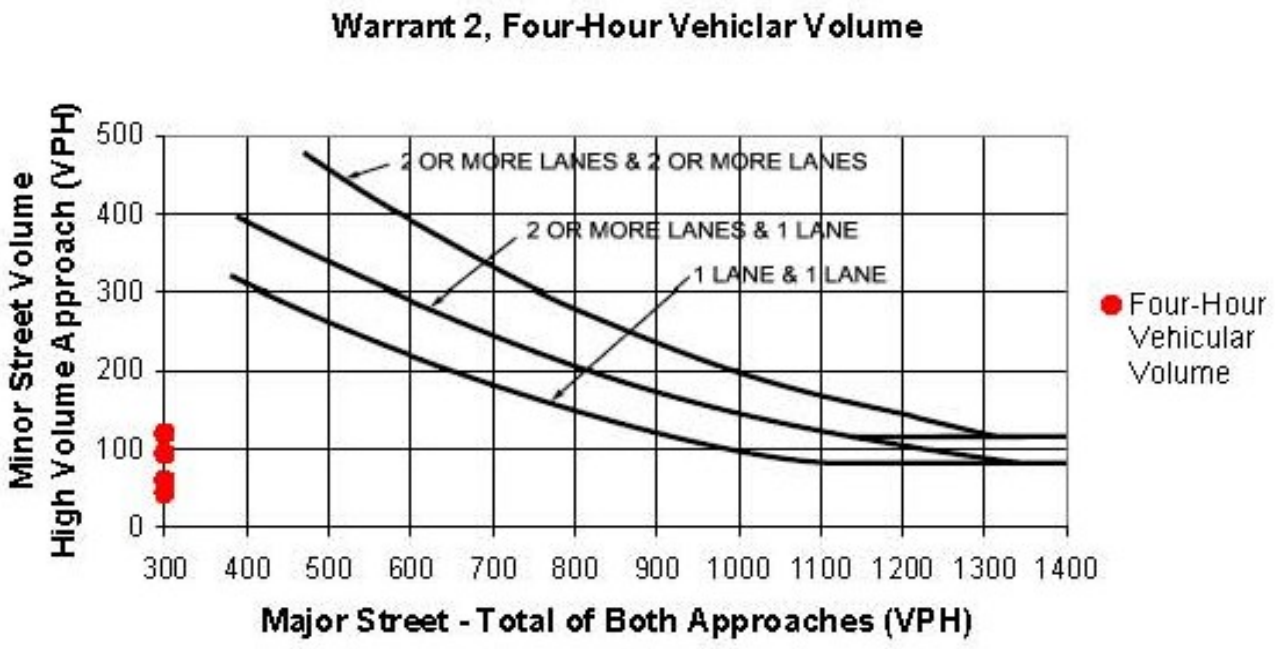
This intersection is not located at a critical point along a coordinated signal system.

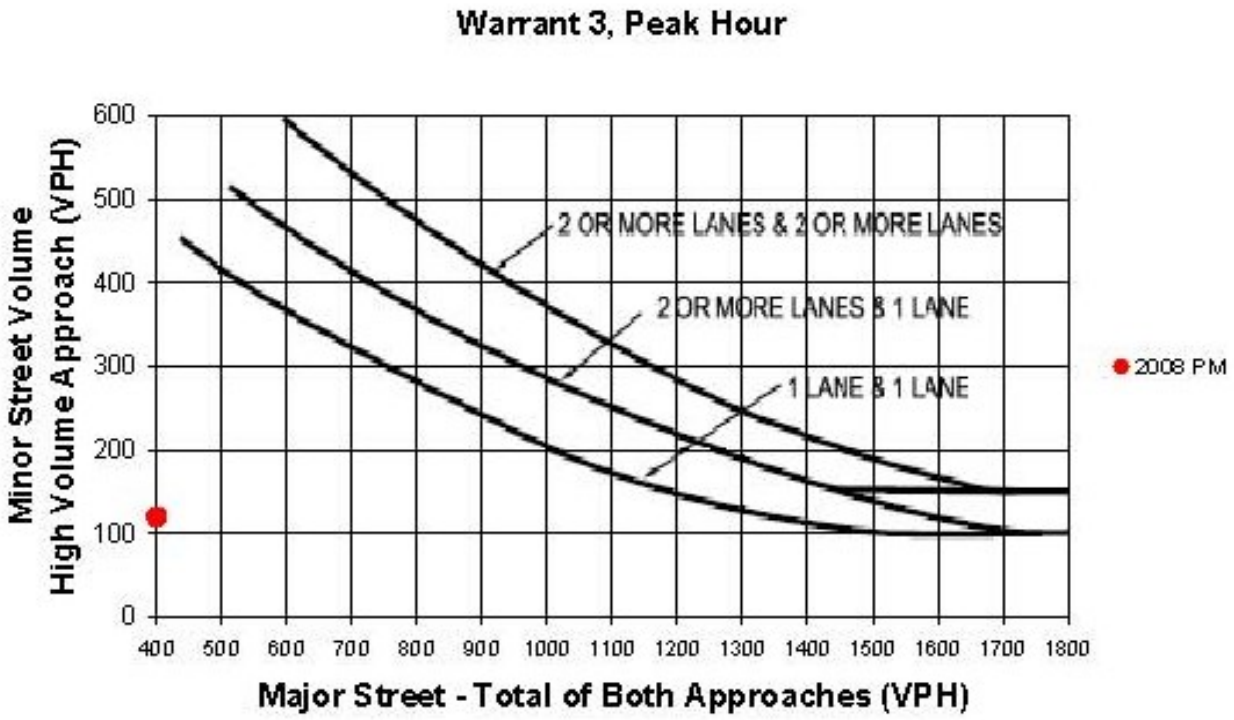
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two left-turn crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing left-turn crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has less than 500 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	Wayne at High
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: *High Street*

North/South Street: *Wayne Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	37	95	37	13	97	16
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	23	58	8	10	61	23
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	187		138		97		103	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2		0.1		0.3		0.1	
Prop. Right-Turns	0.2		0.1		0.1		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		-0.1		0.0		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.17		0.12		0.09		0.09	
hd, final value (s)	4.48		4.57		4.80		4.67	
x, final value	0.23		0.18		0.13		0.13	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.5		2.6		2.8		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	437		388		347		353	
Delay (s/veh)	8.83		8.53		8.52		8.39	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.83		8.53		8.52		8.39	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.61							
Intersection LOS	A							

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21

Generated: 11/14/2008 11:30 AM

Main Street at High Street & Market Street

Aerial Photo:

Photo: Looking West

Existing Conditions Discussion

The intersections of Main Street with High Street and Market Street are both stop controlled intersections. High Street intersects Main Street approximately 90 feet north of Main Street's intersection with Market Street. On the eastbound approach of Market Street, left-turns are prohibited due to the close proximity of the High Street and Market Street intersections. However, note that at the time of traffic count data collection, left turns were temporarily allowed due to construction associated with the Fort Piqua Hotel Restoration Project. The intersection layout and lane configurations are shown in detail in the existing conditions diagram. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The primary concern at this intersection is whether or not the existing traffic control is appropriate and to determine if there is an appropriate balance between the use of turn lanes and on-street parking in the area of this intersection.

Public Comments

- "Consider closing streets to create a parking lot."
- "Consider designating streets as one-way."

Analyses Results

- Signal warrants were checked at this location, and according to the analysis, signal warrant thresholds are not currently met.
- Observations and capacity analyses of the peak traffic periods indicate that the intersection is currently operating safely and appropriately.
- No reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

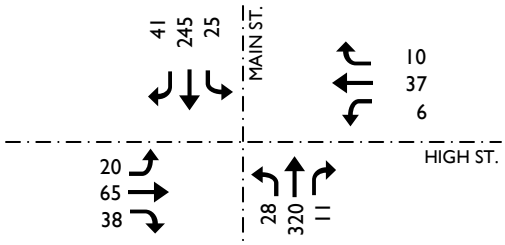
Based on the review and analysis of the intersection, it is recommended that the existing traffic control and lane configuration be retained.

Intersection at a Glance

Existing Conditions

- Two-way stop control
- Intersections are closely spaced
- Adequate traffic operations

Counted Traffic Volumes (peak hour)



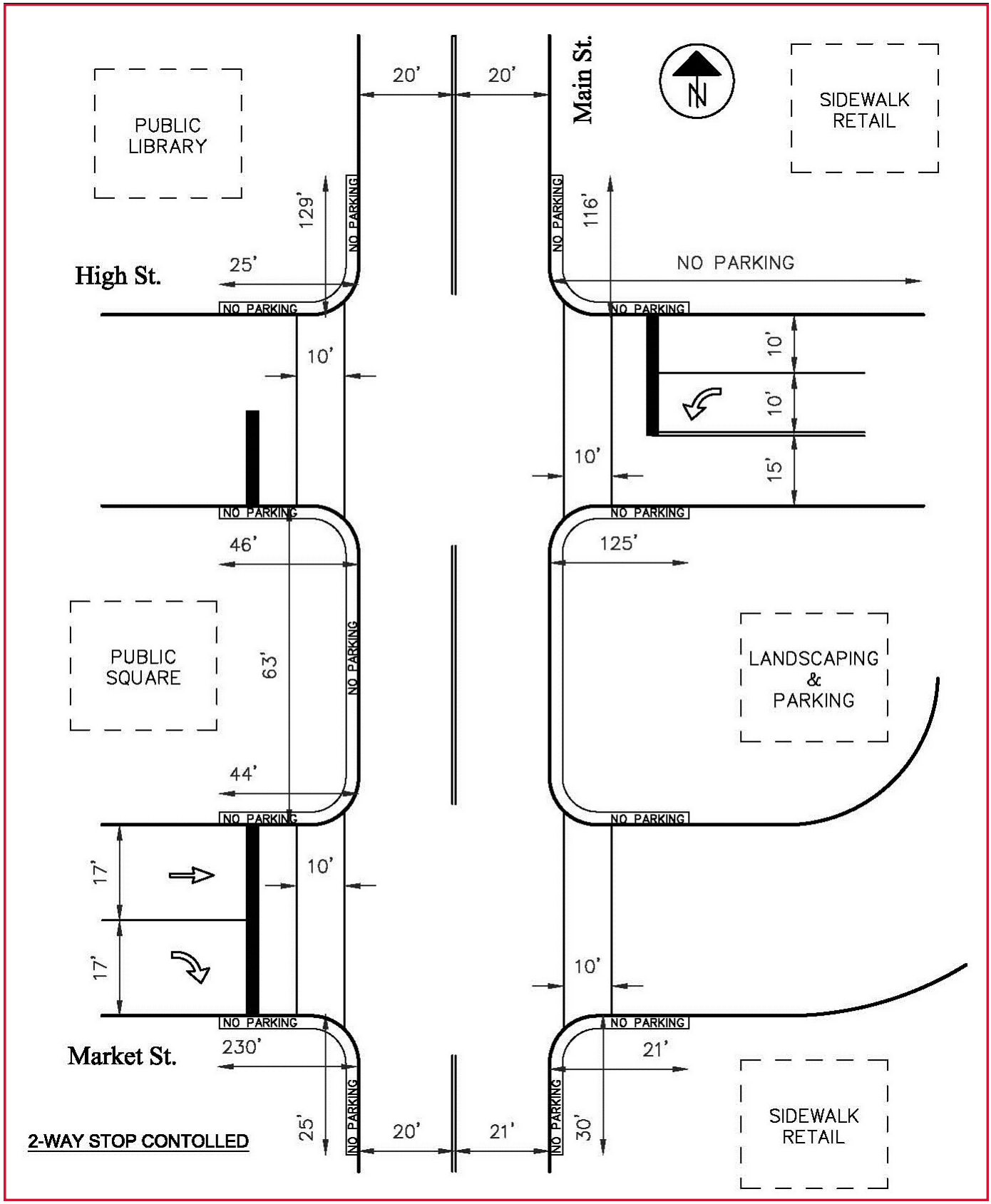
Crash History

- 0 reported crashes from 2005-2008

Recommendations

- Retain existing traffic control

INTERSECTION DIAGRAM



Turning Movement Counts Summary Table

Location: Main Street at High Street

Date of Counts: Wednesday 11/5/2008

	SB Main St				WB High St				NB Main St				EB High St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	2	55	2	0	0	1	0	0	2	34	1	0	3	7	2	0			
7:15 to 7:30 am	1	70	4	1	1	4	1	0	4	42	0	0	2	5	4	0			
7:30 to 7:45 am	3	78	3	0	1	1	0	0	0	50	1	2	3	1	2	0			
7:45 to 8:00 am	2	109	1	0	2	2	1	0	1	52	2	0	5	0	5	1			
Total	8	312	10	1	4	8	2	0	7	178	4	2	13	13	13	1	519	14	39
8:00 to 8:15 am	2	60	2	0	2	2	0	0	2	37	1	0	2	3	1	0			
8:15 to 8:30 am	1	45	6	1	0	1	0	0	5	48	1	0	3	2	5	0			
8:30 to 8:45 am	5	53	5	1	1	2	2	0	3	42	4	0	4	6	5	0			
8:45 to 9:00 am	3	46	7	1	2	4	1	0	3	44	1	0	6	4	1	1			
Total	11	204	20	3	5	9	3	0	13	171	7	0	15	15	12	1	426	17	42
4:00 to 4:15 pm	7	55	12	0	0	6	2	2	11	86	4	1	9	10	2	1			
4:15 to 4:30 pm	8	67	6	0	2	5	2	1	9	59	2	1	6	7	2	0			
4:30 to 4:45 pm	1	67	9	0	2	5	0	4	4	57	4	0	11	10	7	0			
4:45 to 5:00 pm	5	61	9	2	3	7	6	1	10	80	1	0	8	14	6	1			
Total	21	250	36	2	7	23	10	8	34	282	11	2	34	41	17	2	634	40	92
5:00 to 5:15 pm	4	69	9	0	2	10	1	0	10	97	2	3	1	14	11	3			
5:15 to 5:30 pm	10	71	13	2	1	9	4	4	6	88	5	1	5	15	11	0			
5:30 to 5:45 pm	4	48	12	1	1	5	3	0	8	64	2	3	9	16	6	2			
5:45 to 6:00 pm	7	57	7	2	2	13	2	1	4	71	2	2	5	20	10	1			
Total	25	245	41	5	6	37	10	5	28	320	11	9	20	65	38	6	670	53	123
Grand Total	65	1011	107	11	22	77	25	13	82	951	33	13	82	134	80	10			

Turning Movement Counts Summary Table

Location: Main Street at Market Street

Date of Counts: Wednesday 11/5/2008

	SB Main St				WB Market				NB Main St				EB Market St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0			
7:15 to 7:30 am	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0			
7:30 to 7:45 am	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	1			
7:45 to 8:00 am	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0			
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	3	7	1	0	0	10
8:00 to 8:15 am	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0			
8:15 to 8:30 am	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1			
8:30 to 8:45 am	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	0			
8:45 to 9:00 am	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total	0	0	0	0	0	0	0	0	0	0	0	0	3	6	4	1	0	0	13
4:00 to 4:15 pm	0	0	0	0	0	0	0	0	0	0	0	0	7	1	2	0			
4:15 to 4:30 pm	0	0	0	0	0	0	0	0	0	0	0	0	4	6	3	0			
4:30 to 4:45 pm	0	0	0	0	0	0	0	0	0	0	0	0	4	1	4	0			
4:45 to 5:00 pm	0	0	0	0	0	0	0	0	0	0	0	0	4	3	0	0			
Total	0	0	0	0	0	0	0	0	0	0	0	0	19	11	9	0	0	0	39
5:00 to 5:15 pm	0	0	0	0	0	0	0	0	0	0	0	0	6	1	11	0			
5:15 to 5:30 pm	0	0	0	0	0	0	0	0	0	0	0	0	4	3	6	0			
5:30 to 5:45 pm	0	0	0	0	0	0	0	0	0	0	0	0	3	5	6	0			
5:45 to 6:00 pm	0	0	0	0	0	0	0	0	0	0	0	0	4	3	5	0			
Total	0	0	0	0	0	0	0	0	0	0	0	0	17	12	28	0	0	0	57
Grand Total	0	0	0	0	0	0	0	0	0	0	0	1	39	32	48	2			

The College Street Corridor

Intersection of College Street and North Street

Intersection of College Street and Greene Street

Intersection of College Street and Ash Street

Intersection of College Street and High Street

Intersection of College Street and Water Street

College Street & North Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of College Street with North Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Shrubbery in the southwest corner partially obstructs sight distance at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to control traffic and pedestrian crossings associated with a school that used to be located near this intersection.

Public Comments

- "There are low traffic volumes."
- "There used to be a school located near the intersection."

Analyses Results

- Traffic signal warrants are not met
- Two reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control with stop signs on North Street provides adequate capacity

Recommendations

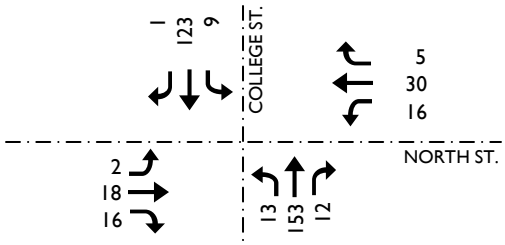
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Since the traffic volumes on College Street are significantly higher than those on North Street, two-way stop control with stop signs on North Street is recommended. Because the North Street approaches are relatively wide, it is recommended that curb bump-outs and/or a median island be considered to shorten the pedestrian crossing distance and to provide a visual indication to motorists on North Street of the need to stop.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



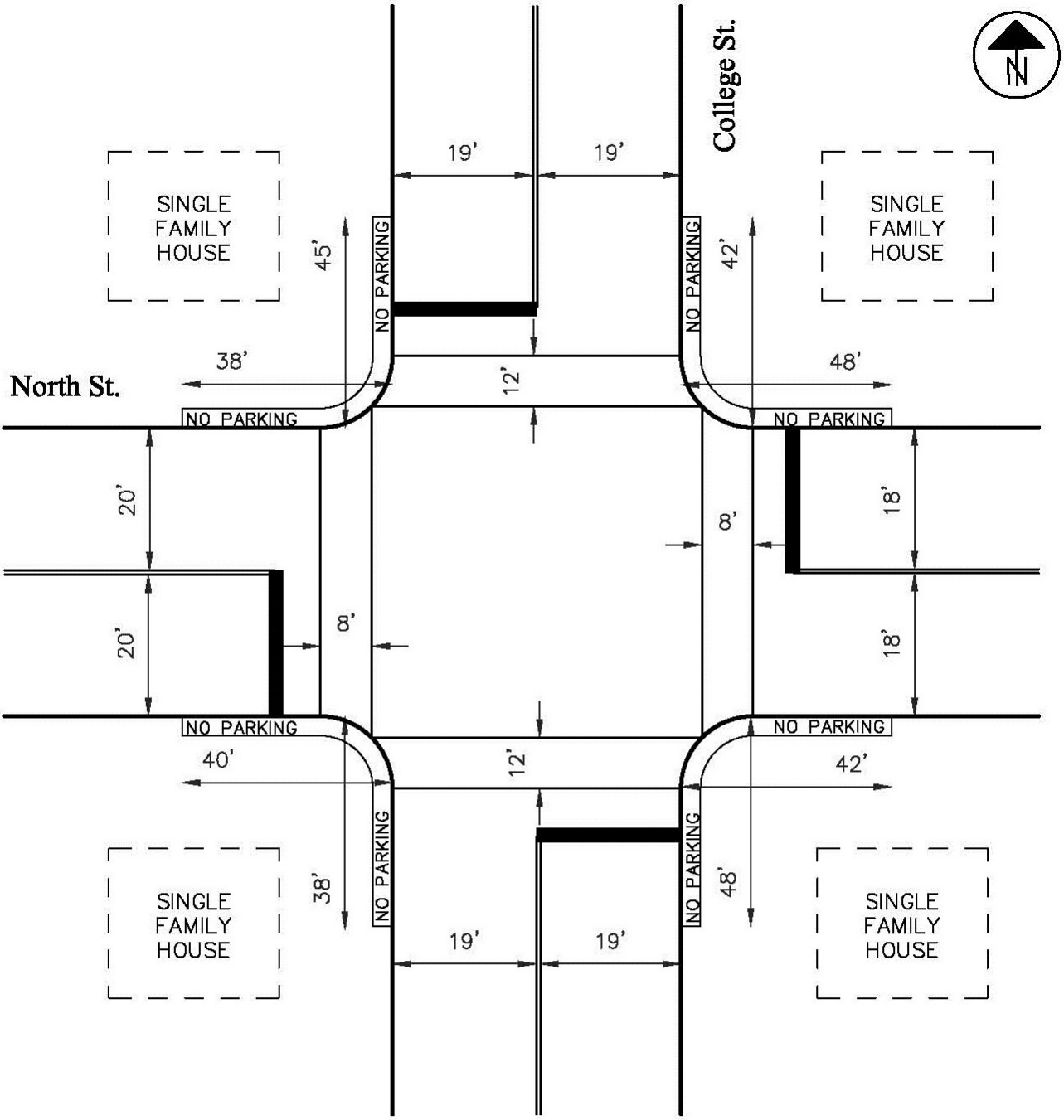
Crash History

- 2 reported crashes from 2005-2008
- Both crashes were angle-type

Recommendation

- Consider replacing traffic signal with two-way stop, with stop signs on North Street.

INTERSECTION DIAGRAM



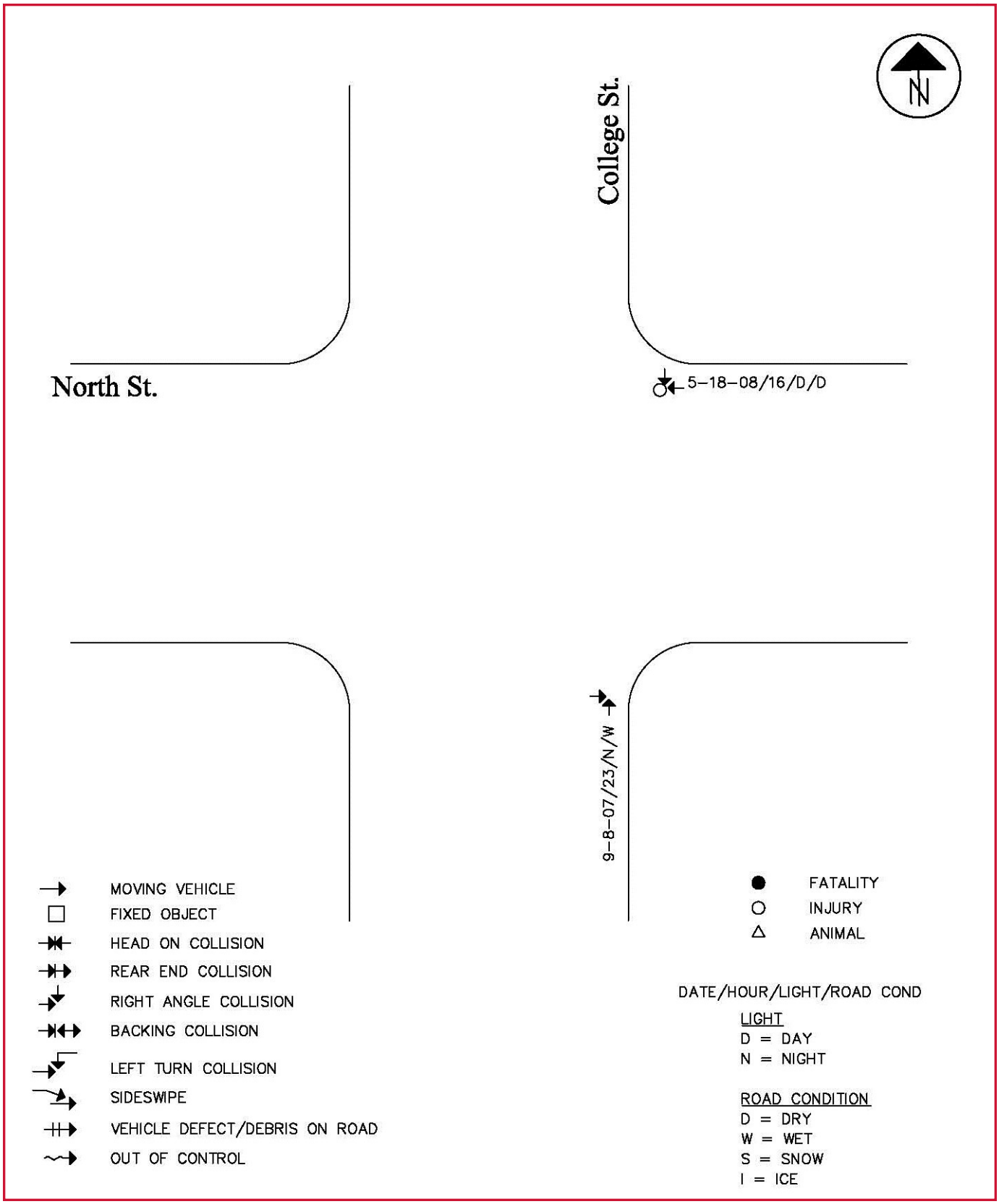
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

50 SEC N/S SPLIT

20 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at North Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB North St				NB College St				EB North St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	0	19	1	2	0	3	0	0	0	5	2	0	2	3	1	0			
7:15 to 7:30 am	0	19	1	2	0	3	0	0	0	5	2	0	2	3	1	0			
7:30 to 7:45 am	0	19	1	0	2	3	2	0	2	14	4	0	0	2	4	0			
7:45 to 8:00 am	0	21	1	0	0	2	1	0	1	9	4	1	1	3	1	1			
Total	0	78	4	4	2	11	3	0	3	33	12	1	5	11	7	1	130	16	23
8:00 to 8:15 am	1	12	1	1	4	3	1	0	1	15	1	0	0	3	2	0			
8:15 to 8:30 am	0	8	0	0	0	1	0	0	0	17	4	0	0	2	2	0			
8:30 to 8:45 am	1	11	1	1	2	3	0	1	0	8	3	0	0	0	4	0			
8:45 to 9:00 am	0	21	1	1	2	2	0	0	2	17	0	0	0	3	2	1			
Total	2	52	3	3	8	9	1	1	3	57	8	0	0	8	10	1	125	18	18
4:00 to 4:15 pm	1	24	0	0	6	7	2	0	2	34	2	0	2	3	4	0			
4:15 to 4:30 pm	0	28	1	0	3	11	4	0	3	33	3	1	0	4	2	1			
4:30 to 4:45 pm	0	25	0	0	3	8	0	0	2	31	0	0	0	4	5	0			
4:45 to 5:00 pm	5	34	0	8	3	3	2	0	1	38	6	0	1	6	2	1			
Total	6	111	1	8	15	29	8	0	8	136	11	1	3	17	13	2	273	52	33
5:00 to 5:15 pm	5	34	0	8	3	3	2	0	1	38	6	0	1	6	2	1			
5:15 to 5:30 pm	1	31	0	0	4	9	0	0	4	40	2	0	0	3	5	0			
5:30 to 5:45 pm	1	31	0	0	4	9	0	0	4	40	2	0	0	3	5	0			
5:45 to 6:00 pm	2	27	1	1	5	9	3	1	4	35	2	0	1	6	4	0			
Total	9	123	1	9	16	30	5	1	13	153	12	0	2	18	16	1	311	51	36
Grand Total	17	364	9	24	41	79	17	2	27	379	43	2	10	54	46	5			

SIGNAL WARANT ANALYSIS SUMMARY

College Street / North Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	130	16	No	130	16	No	No
8 AM to 9 AM	125	18	No	125	18	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	273	52	No	273	52	No	No
5 PM to 6 PM	311	51	No	311	51	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. A school was once located adjacent to this intersection but has since been converted to an apartment building. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

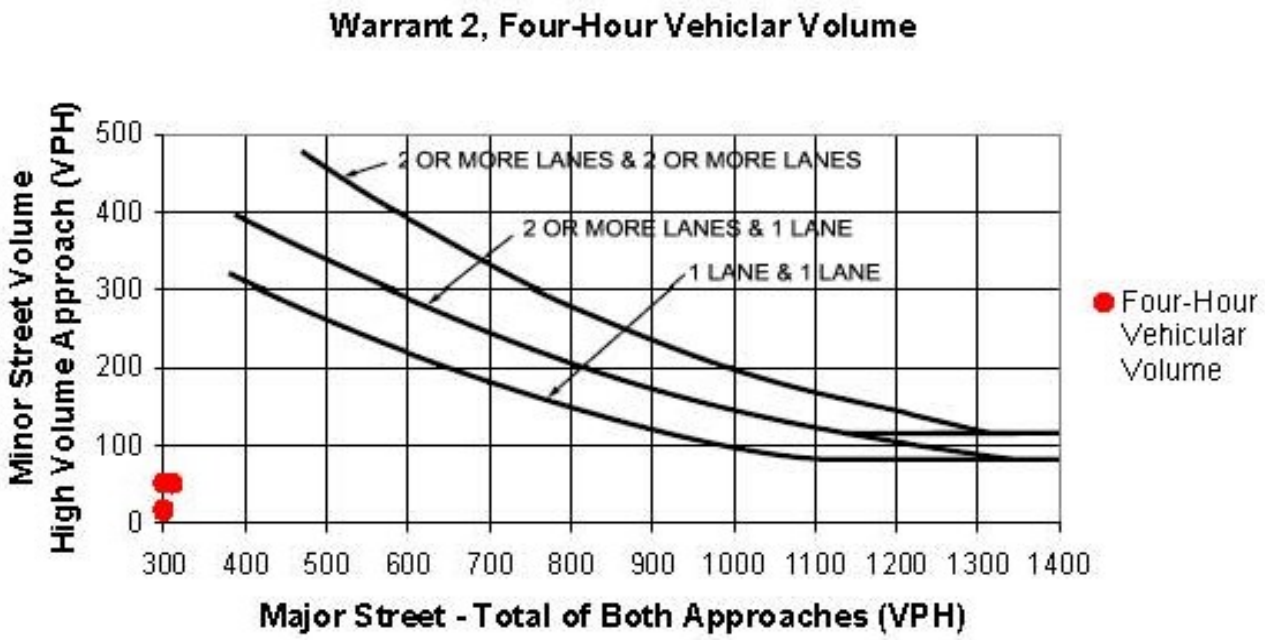
This intersection is located along a coordinated signal system. However, removal of the signal is not necessarily expected to impact progression along the College Street corridor.

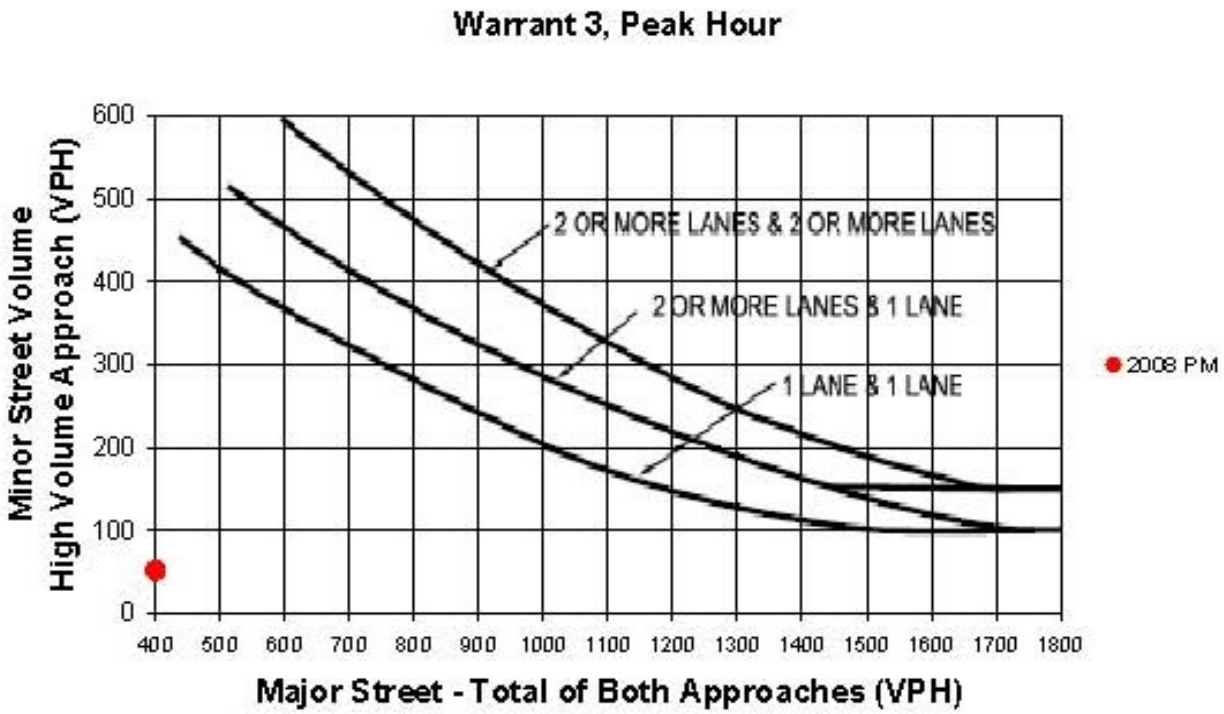
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has fewer than 400 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at North*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description

East/West Street: *North Street*	North/South Street: *College Street*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	13	153	12	9	123	1
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	14	170	13	10	136	1
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	2	18	16	16	30	5
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	2	20	17	17	33	5
Percent Heavy Vehicles	0	0	0	0	0	12
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	14	10		55			39	
C (m) (veh/h)	1457	1402		570			666	
v/c	0.01	0.01		0.10			0.06	
95% queue length	0.03	0.02		0.32			0.19	
Control Delay (s/veh)	7.5	7.6		12.0			10.7	
LOS	A	A		B			B	
Approach Delay (s/veh)	--	--	12.0			10.7		
Approach LOS	--	--	B			B		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 9:15 AM

College Street & Greene Street

Aerial Photo:

Photo: Looking West

Existing Conditions Discussion

The intersection of College Street with Greene Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Shrubbery in the northeast corner partially obstructs sight distance at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to control traffic and pedestrian crossings associated with a school that used to be located near this intersection.

Public Comments

- "There are low traffic volumes."
- "There used to be a school located near the intersection."

Analyses Results

- Traffic signal warrants are not met
- Two reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control with stop signs on Greene Street provides adequate capacity

Recommendations

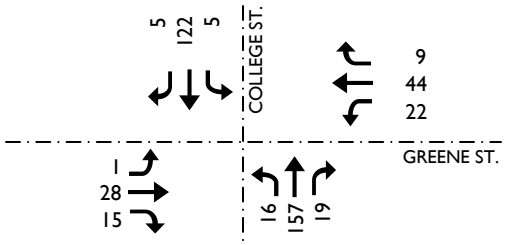
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Since the traffic volumes on College Street are significantly higher than those on Greene Street, two-way stop control with stop signs on Greene Street is recommended. Because the Greene Street approaches are relatively wide, it is recommended that curb bump-outs and/or a median island be considered to shorten the pedestrian crossing distance and to provide a visual indication to motorists on Greene Street of the need to stop.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



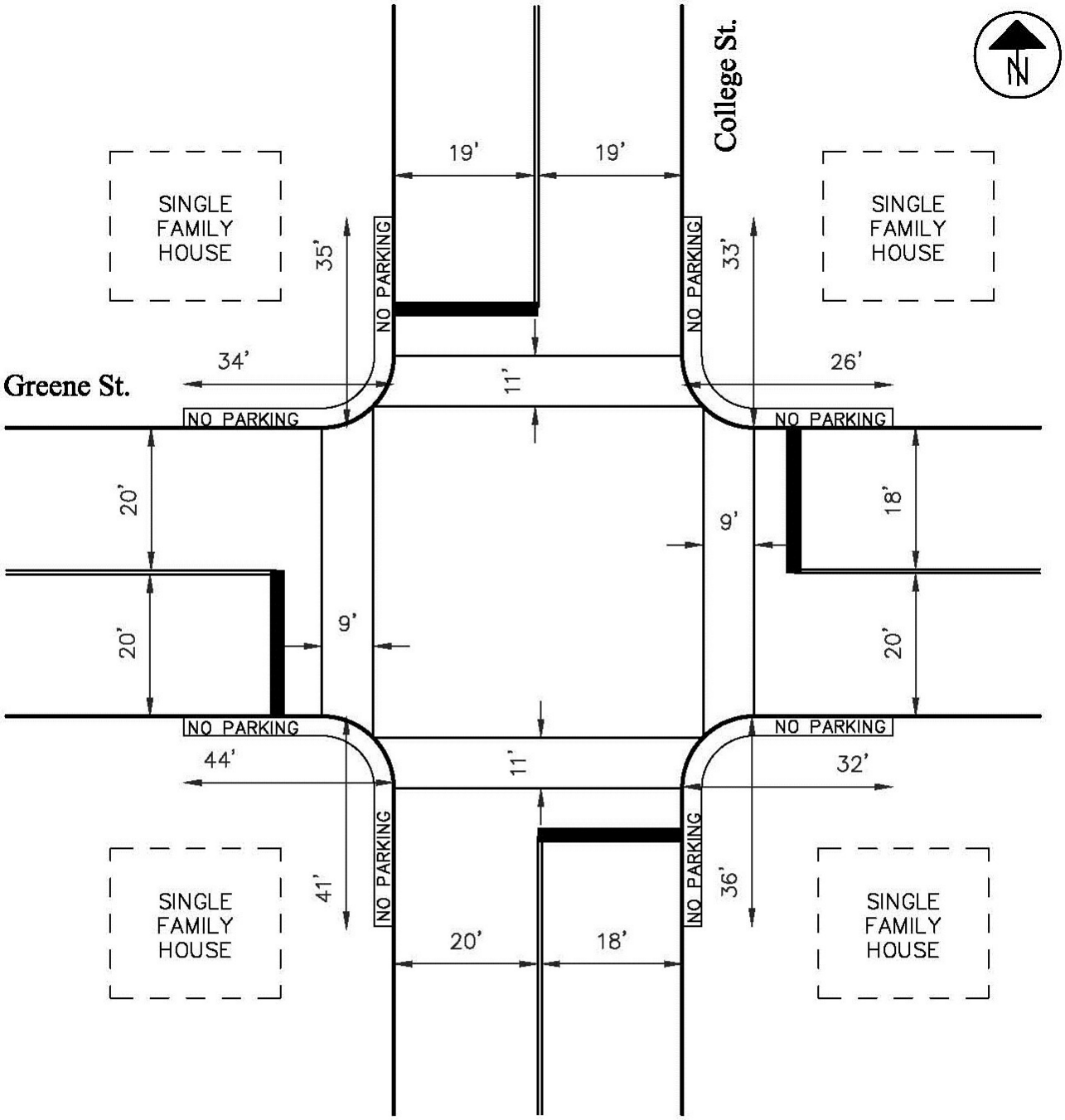
Crash History

- 2 reported crashes from 2005-2008
- No specific pattern

Recommendation

- Consider replacing traffic signal with two-way stop, with stop signs on Greene Street.

INTERSECTION DIAGRAM



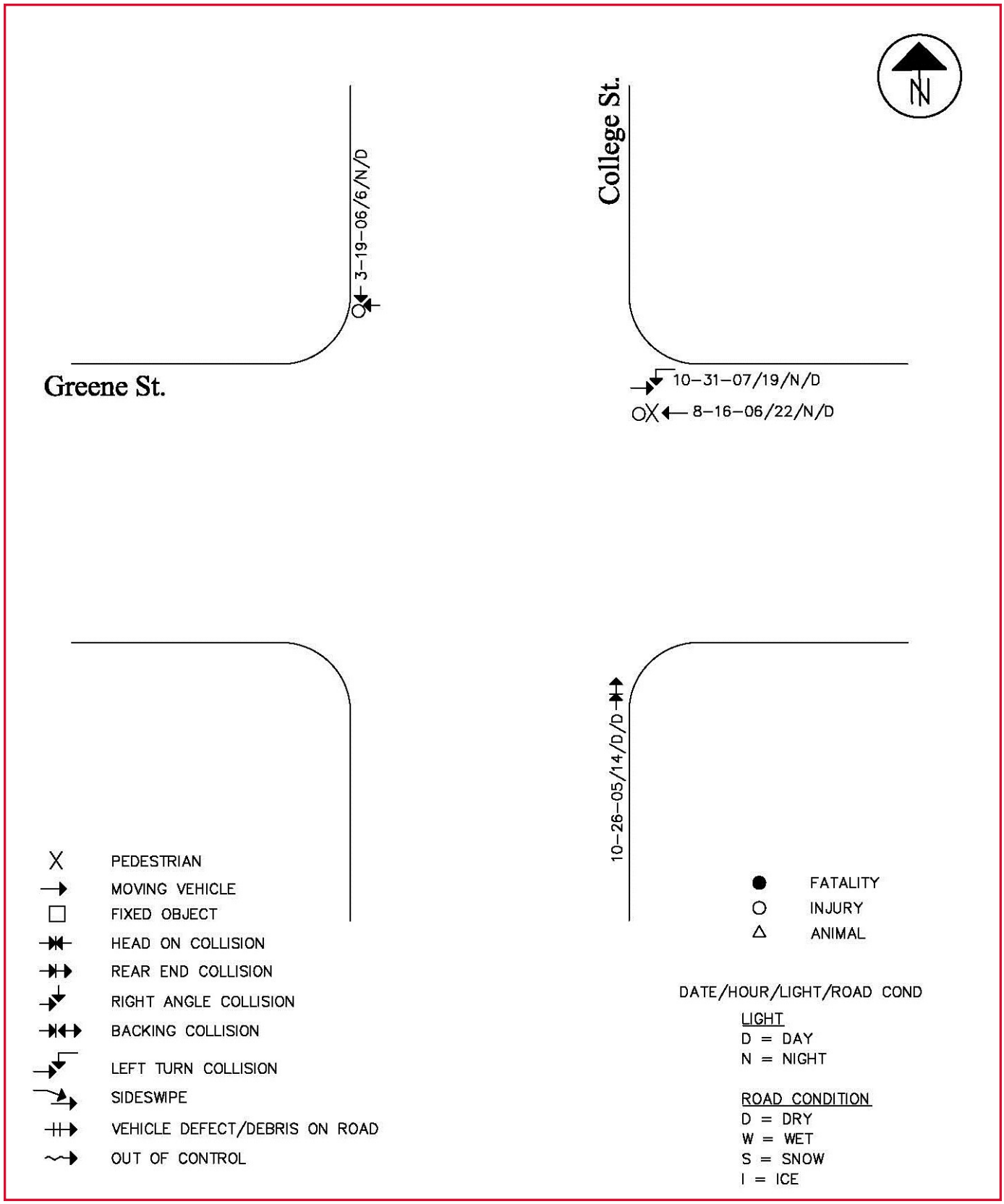
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

46 SEC N/S SPLIT

24 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at Greene Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB Greene St				NB College St				EB Greene St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	1	16	0	0	0	2	1	0	1	8	2	0	0	3	2	0			
7:15 to 7:30 am	1	19	0	0	1	2	0	0	1	13	2	1	0	7	3	0			
7:30 to 7:45 am	2	23	1	0	5	2	3	1	5	19	4	0	0	6	5	0			
7:45 to 8:00 am	0	28	0	2	2	4	1	0	1	8	5	0	0	13	5	0			
Total	4	86	1	2	8	10	5	1	8	48	13	1	0	29	15	0	160	23	44
8:00 to 8:15 am	2	39	0	0	1	5	0	0	2	11	2	2	0	4	2	0			
8:15 to 8:30 am	0	12	0	0	5	3	1	0	1	13	0	0	0	5	1	1			
8:30 to 8:45 am	1	28	2	1	2	5	1	0	0	12	2	1	0	7	3	1			
8:45 to 9:00 am	0	20	0	0	5	6	1	0	0	13	2	1	1	8	1	0			
Total	3	99	2	1	13	19	3	0	3	49	6	4	1	24	7	2	162	35	32
4:00 to 4:15 pm	1	33	2	0	8	9	2	0	3	41	4	1	0	7	5	0			
4:15 to 4:30 pm	0	26	2	2	2	6	1	1	4	40	4	0	0	6	3	3			
4:30 to 4:45 pm	2	34	0	1	7	14	2	1	6	39	6	3	1	8	4	1			
4:45 to 5:00 pm	2	29	1	1	5	15	4	0	3	37	5	0	0	7	3	0			
Total	5	122	5	4	22	44	9	2	16	157	19	4	1	28	15	4	324	75	44
5:00 to 5:15 pm	0	30	0	0	6	5	2	0	1	48	5	8	0	7	5	0			
5:15 to 5:30 pm	0	40	1	0	6	8	3	2	7	39	6	1	1	11	6	0			
5:30 to 5:45 pm	0	29	0	0	5	12	1	2	2	33	4	0	1	1	4	2			
5:45 to 6:00 pm	0	30	1	2	1	6	2	0	1	40	4	1	0	2	3	1			
Total	0	129	2	2	18	31	8	4	11	160	19	10	2	21	18	3	321	57	41
Grand Total	12	436	10	9	61	104	25	7	38	414	57	19	4	102	55	9			

SIGNAL WARANT ANALYSIS SUMMARY

College Street /Greene Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	160	23	No	160	23	No	No
8 AM to 9 AM	162	35	No	162	35	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	324	75	No	324	75	No	No
5 PM to 6 PM	321	57	No	321	57	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. A school was once located adjacent to this intersection but has since been converted to an apartment building. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

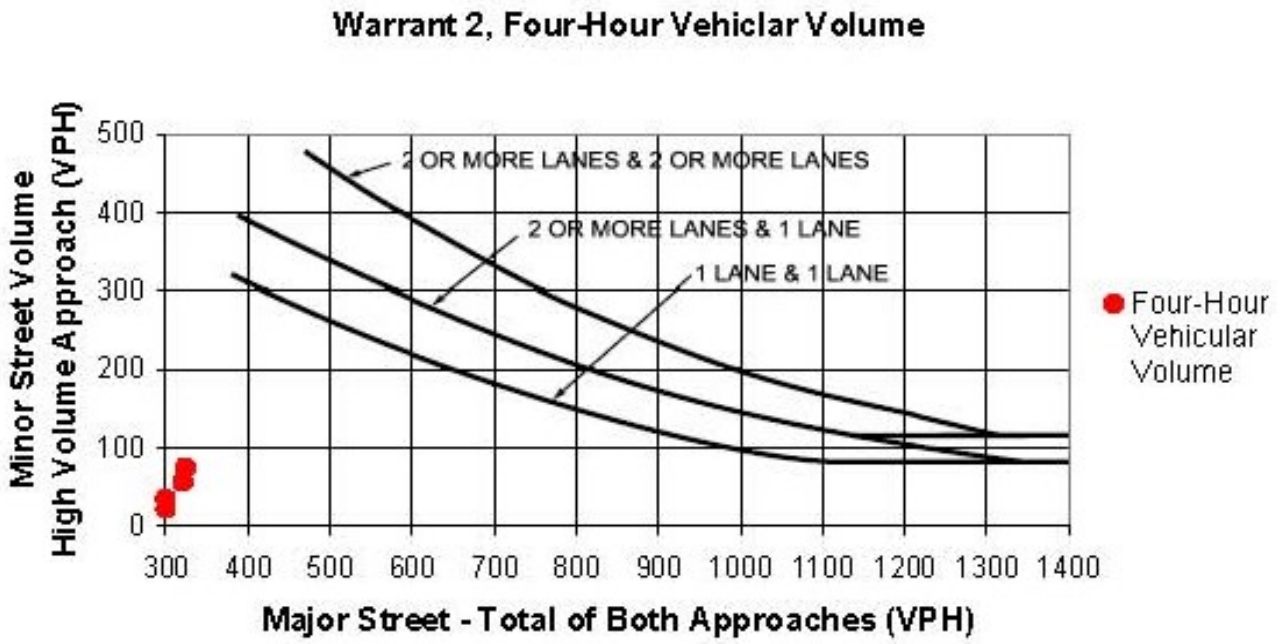
This intersection is located along a coordinated signal system. However, removal of the signal is not necessarily expected to impact progression along the College Street corridor.

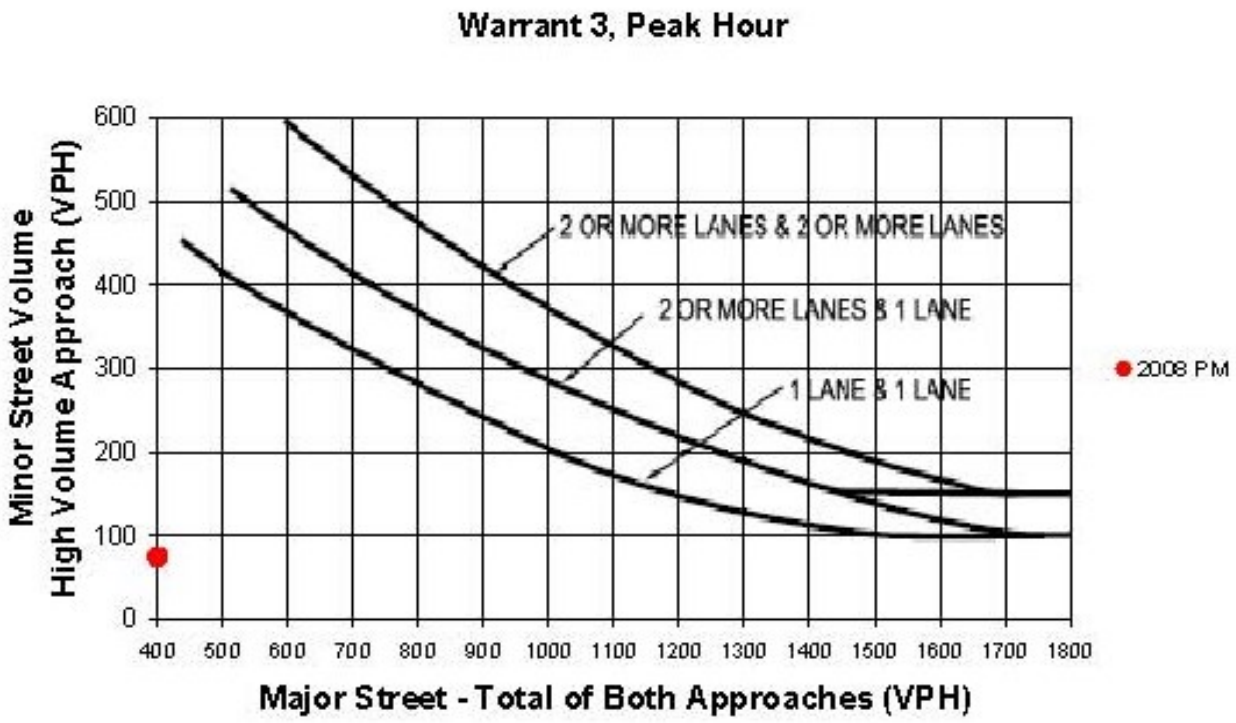
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has fewer than 450 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at Greene*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description	
East/West Street: *Greene Street*	North/South Street: *College Street*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*16*	*157*	*19*	*5*	*122*	*5*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*17*	*174*	*21*	*5*	*135*	*5*
Percent Heavy Vehicles	*3*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*1*	*28*	*15*	*22*	*44*	*9*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*1*	*31*	*16*	*24*	*48*	*10*
Percent Heavy Vehicles	*0*	*0*	*2*	*2*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*17*	*5*		*82*			*48*	
C (m) (veh/h)	*1427*	*1386*		*563*			*622*	
v/c	*0.01*	*0.00*		*0.15*			*0.08*	
95% queue length	*0.04*	*0.01*		*0.51*			*0.25*	
Control Delay (s/veh)	*7.6*	*7.6*		*12.5*			*11.3*	
LOS	*A*	*A*		*B*			*B*	
Approach Delay (s/veh)	--	--	*12.5*			*11.3*		
Approach LOS	--	--	*B*			*B*		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 8:43 AM

College Street & Ash Street

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of College Street with Ash Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Church building on southeast corner restricts visibility due to its close proximity to the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to control traffic and pedestrian crossings associated with a school that used to be located near this intersection.

Public Comments

- "There used to be a school adjacent to this intersection."
- "US Route 36 used to be routed through this intersection."
- "The nearby church has decreased in size."

Analyses Results

- Traffic signal warrants are not met
- Six reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control with stop signs on Ash Street provides adequate capacity

Recommendations

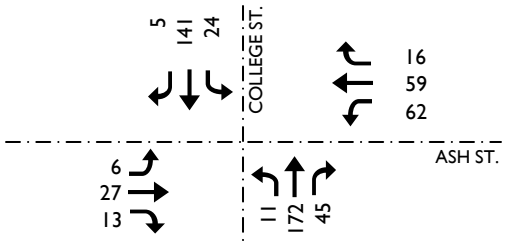
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Since the traffic volumes on College Street are higher than those on Ash Street, two-way stop control with stop signs on Ash Street is recommended. Because the Ash Street approaches are relatively wide, it is recommended that curb bump-outs and/or a median island be considered to shorten the pedestrian crossing distance and to provide a visual indication to motorists on Ash Street of the need to stop. Also, it is recommended that the east crosswalk be narrowed and the adjacent stop bar be relocated closer to the intersection to improve the intersection sight distance.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area
- Adjacent building restricts visibility

Counted Traffic Volumes (peak hour)



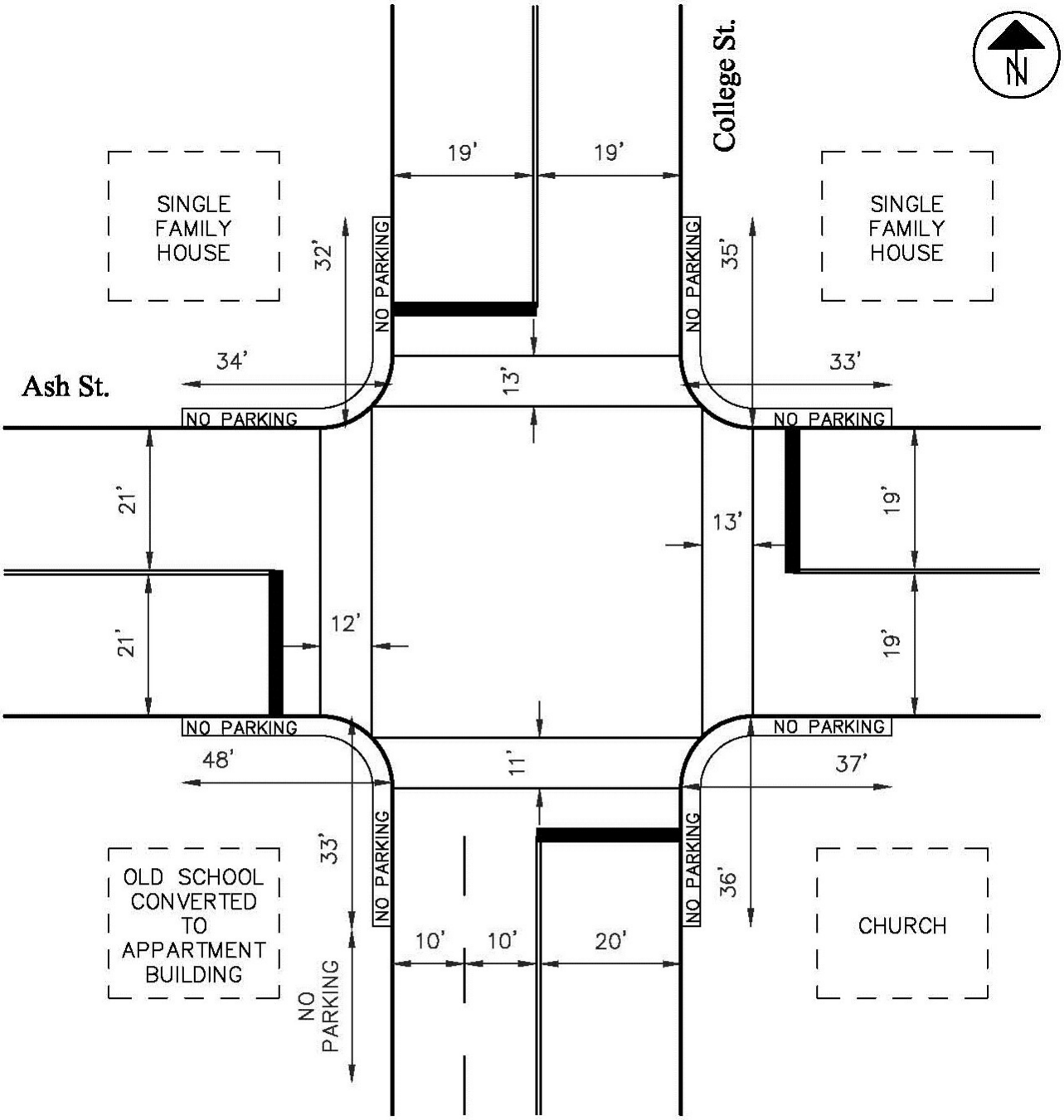
Crash History

- 6 reported crashes from 2005-2008
- No specific pattern

Recommendation

- Consider replacing traffic signal with two-way stop, with stop signs on Ash Street.

INTERSECTION DIAGRAM



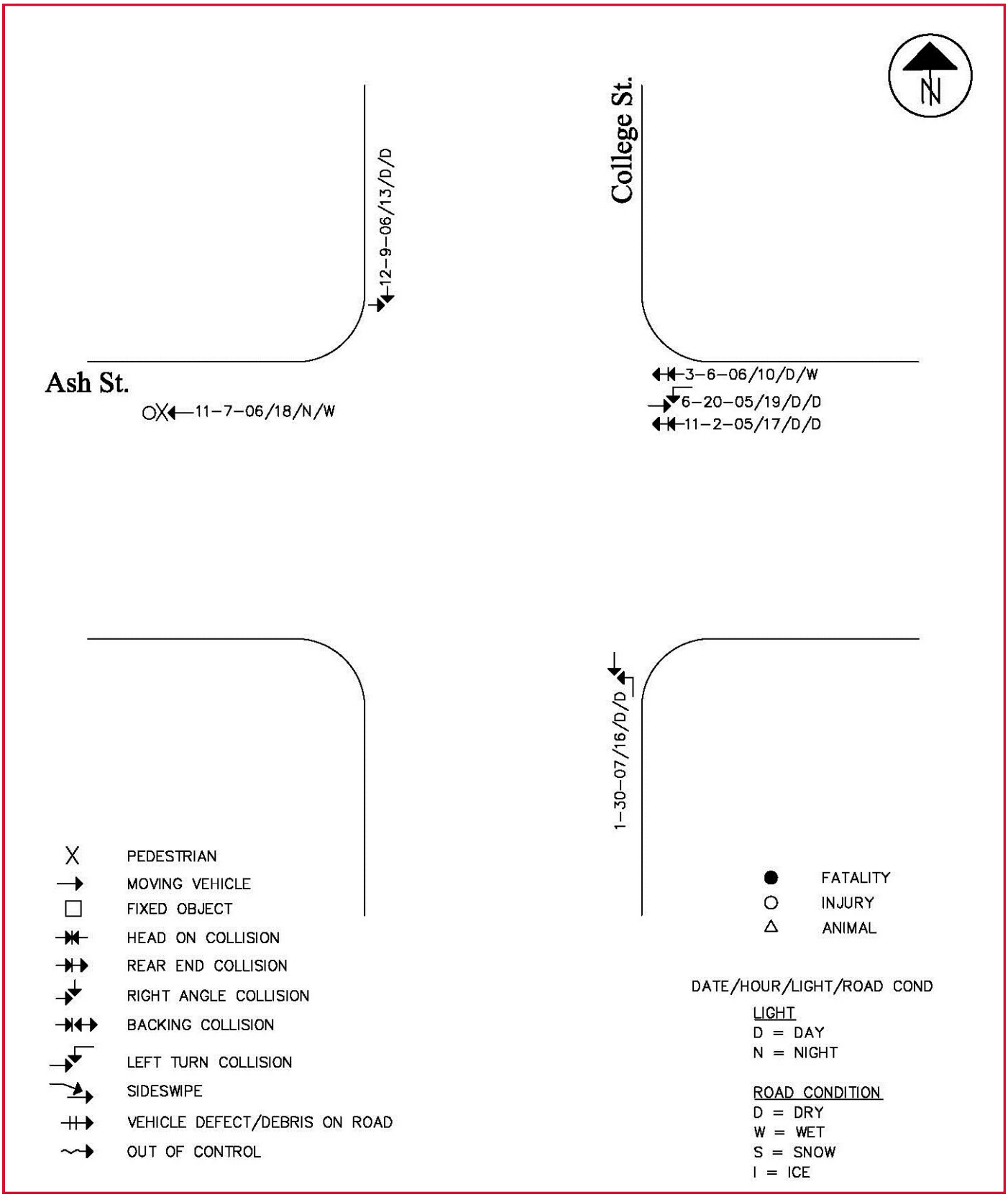
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

50 SEC N/S SPLIT

20 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at Ash Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB Ash St				NB College St				EB Ash St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	4	16	0	0	1	1	0	0	0	10	4	0	1	5	0	0			
7:15 to 7:30 am	6	18	0	0	6	2	2	0	1	13	3	0	1	5	1	0			
7:30 to 7:45 am	8	25	0	0	6	5	3	0	0	24	8	1	2	13	0	0			
7:45 to 8:00 am	4	29	1	0	6	7	1	1	1	11	6	0	0	2	3	0			
Total	22	88	1	0	19	15	6	1	2	58	21	1	4	25	4	0	192	40	33
8:00 to 8:15 am	6	36	0	0	4	7	1	0	1	14	6	0	0	6	0	0			
8:15 to 8:30 am	2	15	1	0	6	7	1	0	1	12	4	0	0	5	4	1			
8:30 to 8:45 am	3	29	0	0	2	6	1	0	0	15	3	0	0	6	2	0			
8:45 to 9:00 am	4	19	1	0	4	11	0	1	1	15	5	1	0	6	2	0			
Total	15	99	2	0	16	31	3	1	3	56	18	1	0	23	8	1	193	50	31
4:00 to 4:15 pm	2	45	1	0	16	26	5	0	3	47	17	1	0	10	4	1			
4:15 to 4:30 pm	2	28	1	4	14	15	3	0	3	44	3	0	0	9	4	1			
4:30 to 4:45 pm	6	39	1	0	8	12	7	0	3	46	8	1	0	5	6	0			
4:45 to 5:00 pm	2	37	0	0	5	14	3	0	4	40	9	0	0	3	1	0			
Total	12	149	3	4	43	67	18	0	13	177	37	2	0	27	15	2	391	128	42
5:00 to 5:15 pm	8	33	2	1	19	17	5	0	2	53	11	8	1	5	2	0			
5:15 to 5:30 pm	6	45	1	0	13	13	1	0	4	45	8	0	1	3	4	0			
5:30 to 5:45 pm	6	27	1	0	14	16	2	0	2	35	16	0	3	6	2	0			
5:45 to 6:00 pm	4	36	1	4	16	13	8	0	3	39	10	0	1	13	5	0			
Total	24	141	5	5	62	59	16	0	11	172	45	8	6	27	13	0	398	137	46
Grand Total	73	477	11	9	140	172	43	2	29	463	121	12	10	102	40	3			

SIGNAL WARANT ANALYSIS SUMMARY

College Street /Ash Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	192	40	No	192	40	No	No
8 AM to 9 AM	193	50	No	193	50	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	391	128	No	391	128	No	No
5 PM to 6 PM	398	137	No	398	137	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. A school was once located adjacent to this intersection but has since been converted to an apartment building. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

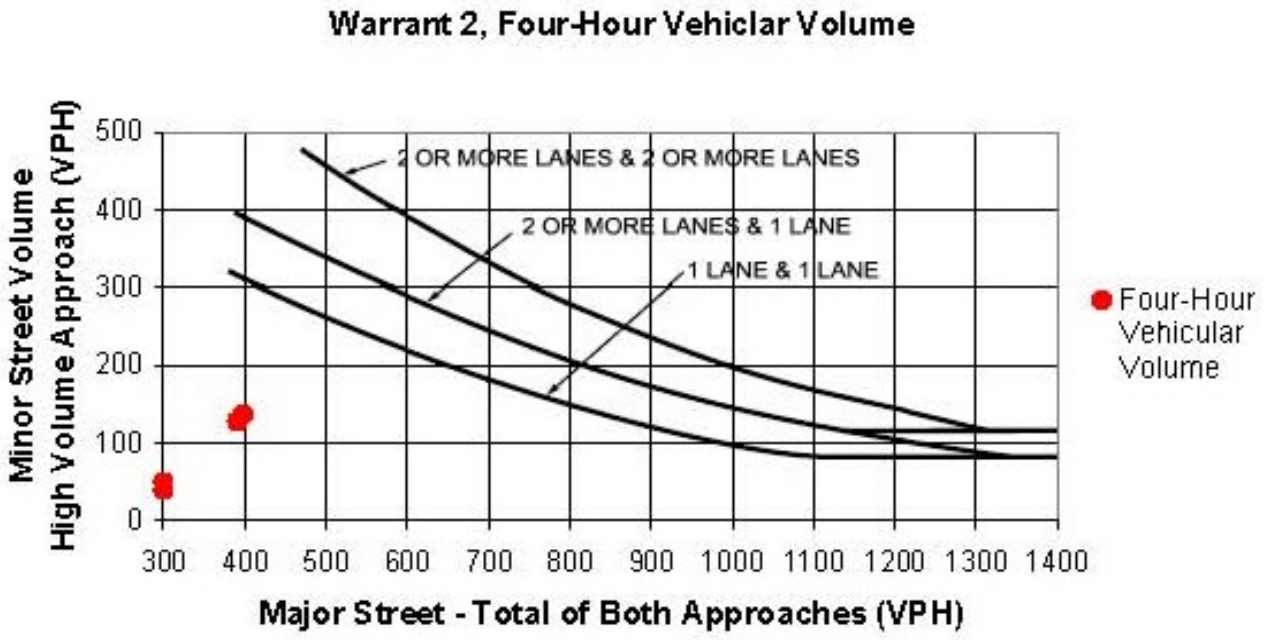
This intersection is located along a coordinated signal system. However, removal of the signal is not necessarily expected to impact progression along the College Street corridor.

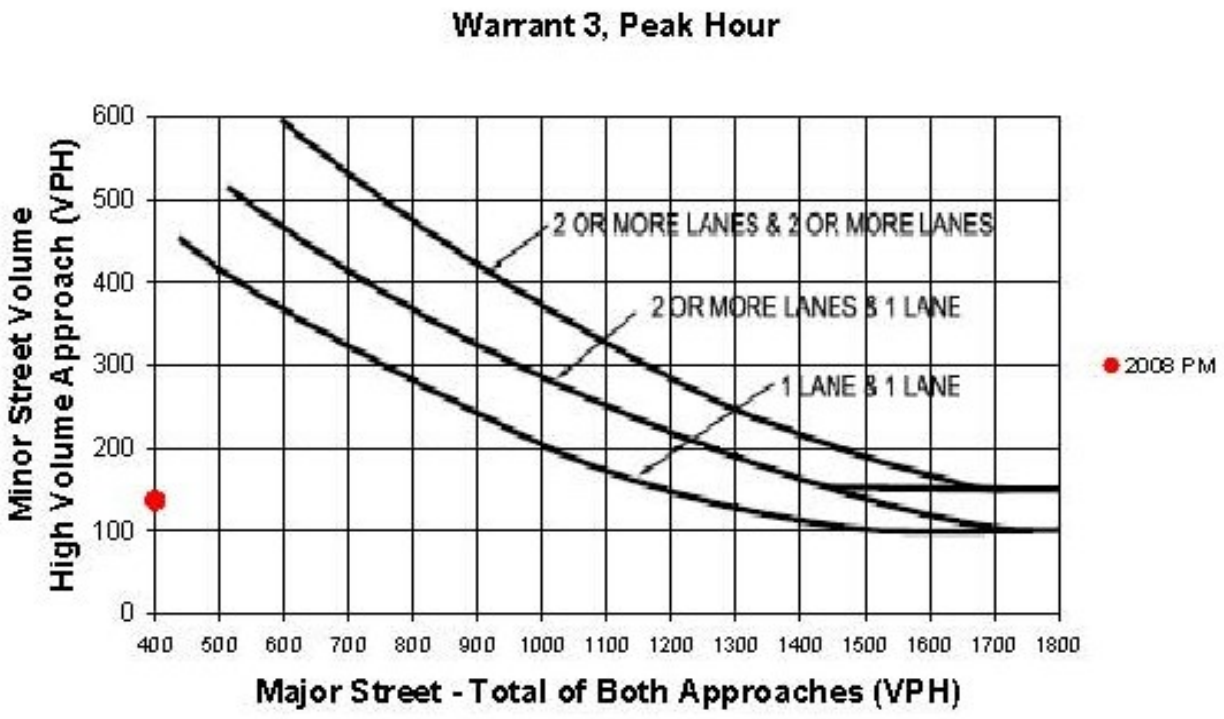
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has fewer than 600 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at Ash*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description

East/West Street: *Ash Street*	North/South Street: *College Street*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*11*	*172*	*45*	*24*	*141*	*5*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*12*	*191*	*50*	*26*	*156*	*5*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*6*	*27*	*13*	*62*	*59*	*16*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*6*	*30*	*14*	*68*	*65*	*17*
Percent Heavy Vehicles	*0*	*0*	*8*	*1*	*2*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*12*	*26*		*150*			*50*	
C (m) (veh/h)	*1388*	*1337*		*492*			*533*	
v/c	*0.01*	*0.02*		*0.30*			*0.09*	
95% queue length	*0.03*	*0.06*		*1.28*			*0.31*	
Control Delay (s/veh)	*7.6*	*7.7*		*15.5*			*12.5*	
LOS	*A*	*A*		*C*			*B*	
Approach Delay (s/veh)	--	--	*15.5*			*12.5*		
Approach LOS	--	--	*C*			*B*		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/13/2008 4:18 PM

College Street & High Street

Aerial Photo:

Photo: Looking West

Existing Conditions Discussion

The intersection of High Street with College Street has four approaches intersecting at a 90-degree angle and is currently signal controlled. Each approach has two lanes - one left-turn only lane and one through-right shared lane. The pretimed signal has a 70-second cycle length with four phases: (1) an 11-second east-west protected left turn phase, (2) a 24-second east-west permitted phase, (3) an 11-second north-south protected left-turn phase, and (4) a 24-second north-south permitted phase. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The traffic signals along College Street between Water Street and North Street are currently time-base coordinated. The primary concern at this intersection is with the timing and/or operation of the existing traffic signal and whether the signal should be coordinated with adjacent traffic signals.

Public Comments

– No significant comments were discussed regarding this intersection.

Analyses Results

– The existing signalized intersection was analyzed for capacity. According to the results, the intersection currently operates at an acceptable level of service.

– Seven reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

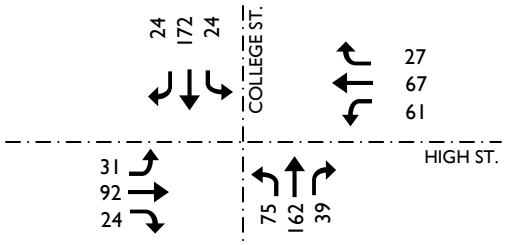
It is recommended that the operation of this signal be converted from pretimed to actuated. The ability to serve only those phases that have vehicular demand and to adjust the amount of green time based on the demand will reduce unnecessary delays at the intersection. It is also recommended that the traffic signals along College Street from Covington Avenue to High Street be designed as a coordinated system.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Left-turn lanes on all approaches
- Left-turn signals on all approaches
- Coordinated signals along College

Counted Traffic Volumes (peak hour)



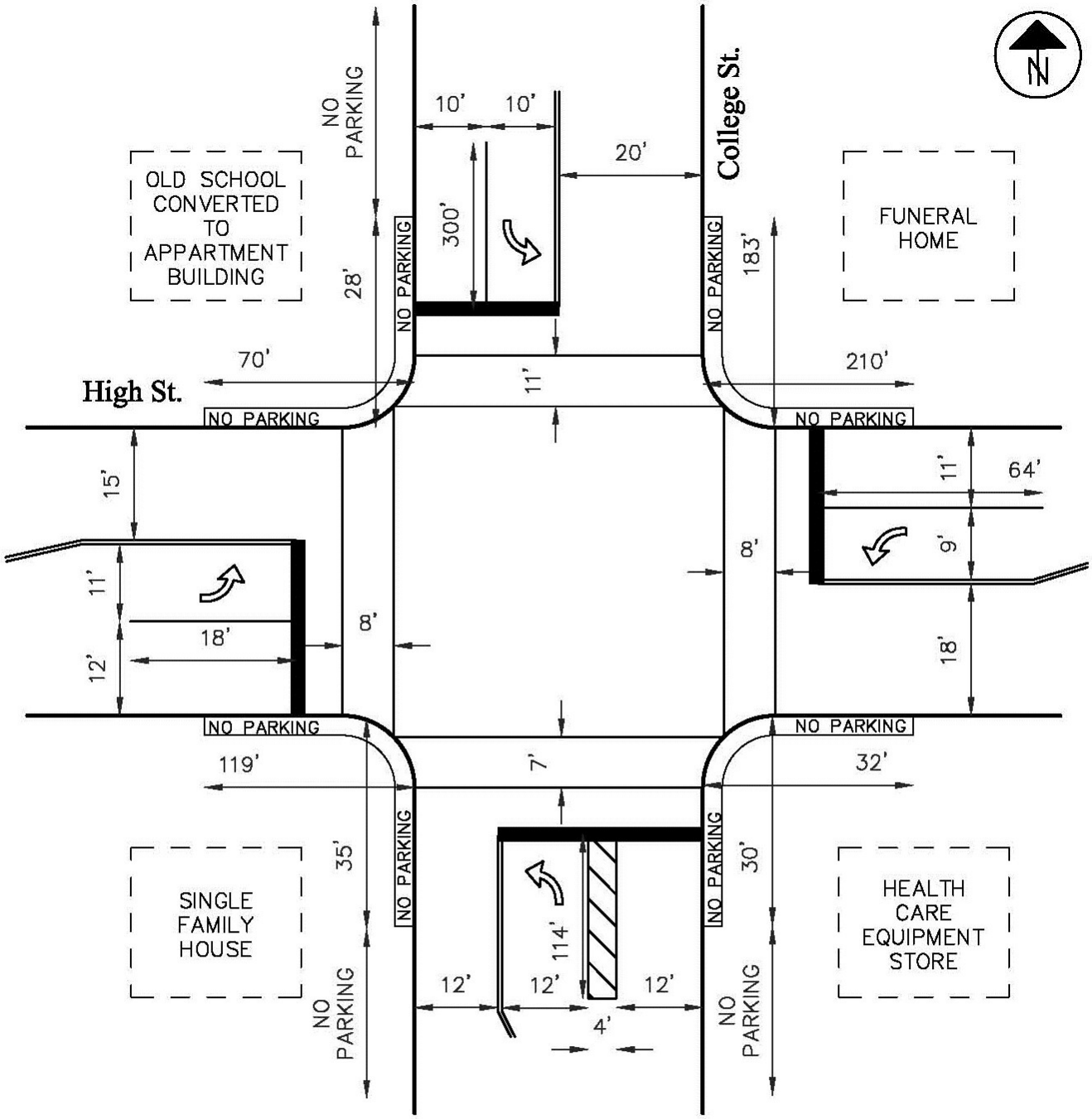
Crash History

- 7 reported crashes from 2005-2008
- Primarily rear-end type crashes

Recommendations

- Convert signal to actuated operation
- Coordinate College St. signals from Covington to High

INTERSECTION DIAGRAM



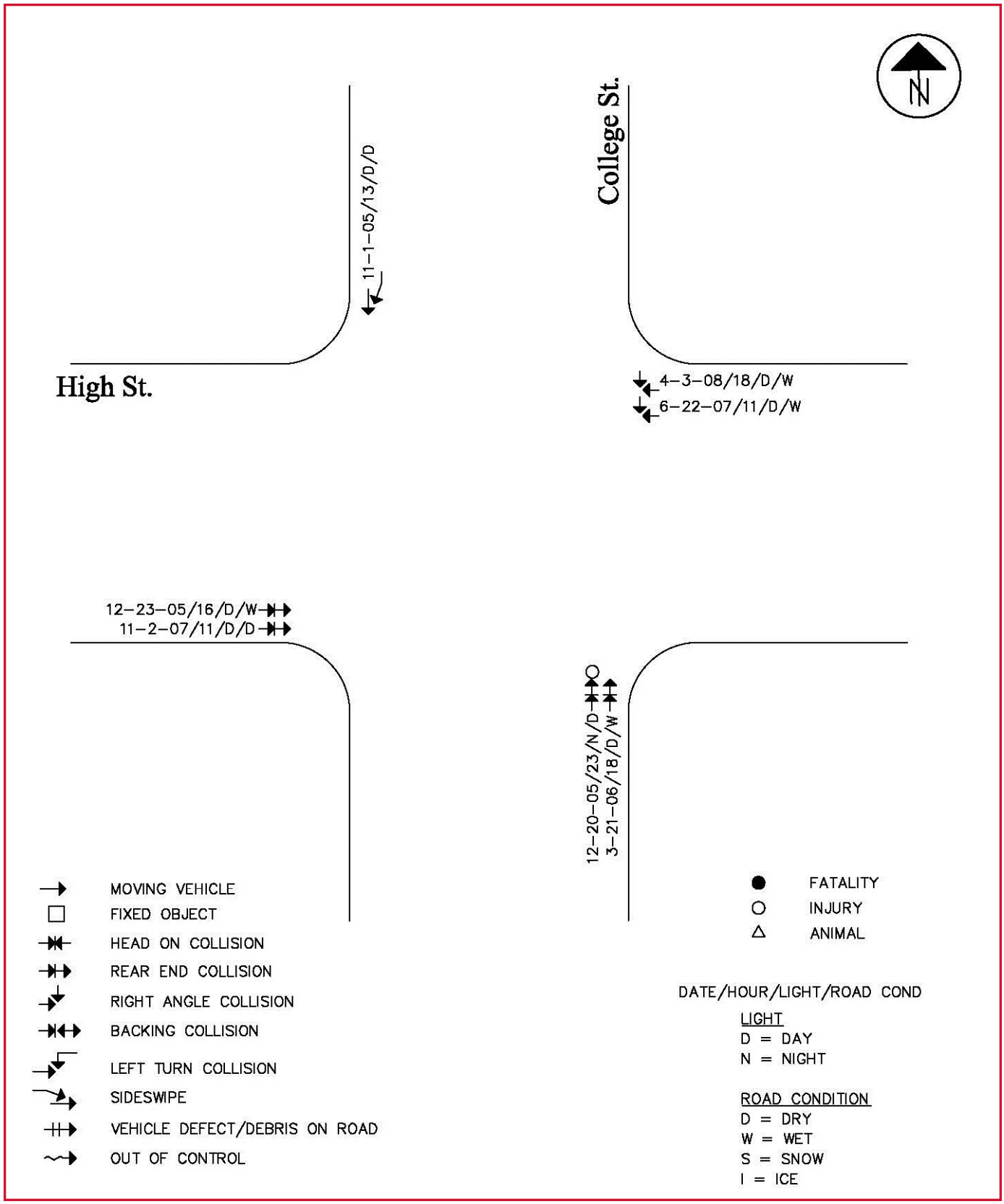
PRETIMED 4 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT - 11 SEC LEFT (perm/protected)

35 SEC E/W SPLIT - 11 SEC LEFT (perm/protected)

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at High Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB High St				NB College St				EB High St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	2	15	0	0	0	4	0	0	2	13	3	0	2	13	0	1			
7:15 to 7:30 am	1	20	2	0	1	2	0	1	4	14	3	0	2	7	3	0			
7:30 to 7:45 am	2	23	3	1	3	7	2	0	5	21	3	1	9	30	9	1			
7:45 to 8:00 am	4	36	2	0	4	9	0	0	4	11	8	0	6	21	3	0			
Total	9	94	7	1	8	22	2	1	15	59	17	1	19	71	15	2	201	32	105
8:00 to 8:15 am	4	34	4	0	6	10	1	0	6	20	2	0	1	17	2	1			
8:15 to 8:30 am	4	20	2	0	3	5	1	0	8	14	2	0	2	11	7	0			
8:30 to 8:45 am	1	30	1	1	7	6	1	0	8	16	5	0	2	17	4	0			
8:45 to 9:00 am	1	20	3	0	7	13	1	0	11	19	5	0	2	11	3	0			
Total	10	104	10	1	23	34	4	0	33	69	14	0	7	56	16	1	240	61	79
4:00 to 4:15 pm	6	52	8	1	13	16	4	2	16	48	10	1	11	23	8	0			
4:15 to 4:30 pm	5	42	2	0	11	12	5	1	21	42	12	0	4	22	7	0			
4:30 to 4:45 pm	5	42	4	0	13	12	4	1	23	42	7	0	7	28	14	2			
4:45 to 5:00 pm	2	39	1	0	20	20	4	0	19	41	11	0	3	30	6	0			
Total	18	175	15	1	57	60	17	4	79	173	40	1	25	103	35	2	500	134	163
5:00 to 5:15 pm	2	42	6	0	13	15	5	0	23	51	10	0	10	19	7	0			
5:15 to 5:30 pm	10	38	11	1	15	23	9	1	18	43	5	1	3	18	7	1			
5:30 to 5:45 pm	7	44	4	3	14	14	10	1	13	34	9	2	8	26	2	2			
5:45 to 6:00 pm	8	48	3	3	19	15	3	0	21	34	15	0	10	29	8	0			
Total	27	172	24	7	61	67	27	2	75	162	39	3	31	92	24	3	499	155	147
Grand Total	64	545	56	10	149	183	50	7	202	463	110	5	82	322	90	8			

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at High*
Agency or Co.	*Kleingers & Associates*	Area Type	*All other areas*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak (Existing)*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume (vph)	31	92	24	61	67	27	75	162	39	27	172	24
% Heavy Vehicles	2	0	1	1	0	0	3	1	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3		3	3		3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	3	0	0	2	0	0	3	0	0	7	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0		0	0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	

Phasing	Excl. Left	EW Perm	03	04	Excl. Left	NS Perm	07	08
Timing	G = 8.0	G = 15.0	G =	G =	G = 8.0	G = 15.0	G =	G =
	Y = 6	Y = 6	Y =	Y =	Y = 6	Y = 6	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 70.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	34	129		68	104		83	223		30	218	
Lane Group Capacity	526	394		508	390		420	392		428	400	
v/c Ratio	0.06	0.33		0.13	0.27		0.20	0.57		0.07	0.55	
Green Ratio	0.41	0.21		0.41	0.21		0.41	0.21		0.41	0.21	
Uniform Delay d_1	12.3	23.2		12.6	22.9		13.0	24.6		12.7	24.5	
Delay Factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	
Incremental Delay d_2	0.2	2.2		0.5	1.7		1.1	5.9		0.3	5.3	
PF Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Control Delay	12.6	25.4		13.2	24.6		14.1	30.5		13.0	29.7	
Lane Group LOS	B	C		B	C		B	C		B	C	
Approach Delay	22.8			20.1			26.0			27.7		
Approach LOS	C			C			C			C		
Intersection Delay	24.7			Intersection LOS						C		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 9:08 AM

College Street & Water Street

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of College Street with Water Street has four approaches intersecting at a 90-degree angle and is currently signal controlled. The eastbound and westbound approaches of Water Street are single lane approaches. The northbound approach of College Street has three lanes - one left-turn only lane, one through only lane, and one right-turn only lane. The southbound approach of College Street has two lanes - one left turn only lane and one through-right shared lane. The south and east legs of this intersection are designated as US Route 36. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The traffic signals along College Street between Water Street and North Street are currently time-base coordinated. The primary concern at this intersection is with the timing and/or operation of the existing traffic signal and whether the signal should be coordinated with adjacent traffic signals.

Public Comments

– No specific comments were discussed regarding this intersection.

Analyses Results

– The existing signalized intersection was analyzed for capacity. According to the results, the intersection currently operates at an acceptable level of service.

– Capacity was also checked with the addition of a westbound left-turn phase and a concurrent northbound right turn phase. Overall delay and level of service is improved compared to the existing phasing.

– Nine reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

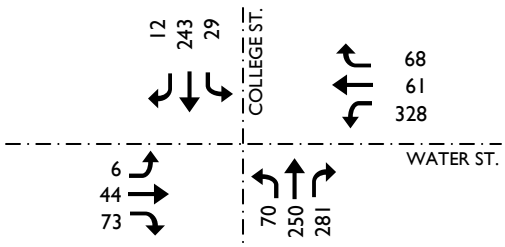
It is recommended that the operation of this signal be converted from pretimed to actuated and that a westbound left-turn phase and a concurrent northbound right turn phase be added. These additional phases will better serve the traffic patterns for vehicles following US Route 36. Also, the ability to serve only those phases that have vehicular demand and to adjust the amount of green time based on the demand will reduce unnecessary delays at the intersection. It is also recommended that the traffic signals along College Street from Covington Avenue to High Street be designed as a coordinated system. Finally, an electronically activated "No Turn on Red" is suggested for the eastbound approach to be activated when the westbound approach has a protected left-turn.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- US 36 carried by south and east legs
- Coordinated signals along College

Counted Traffic Volumes (peak hour)



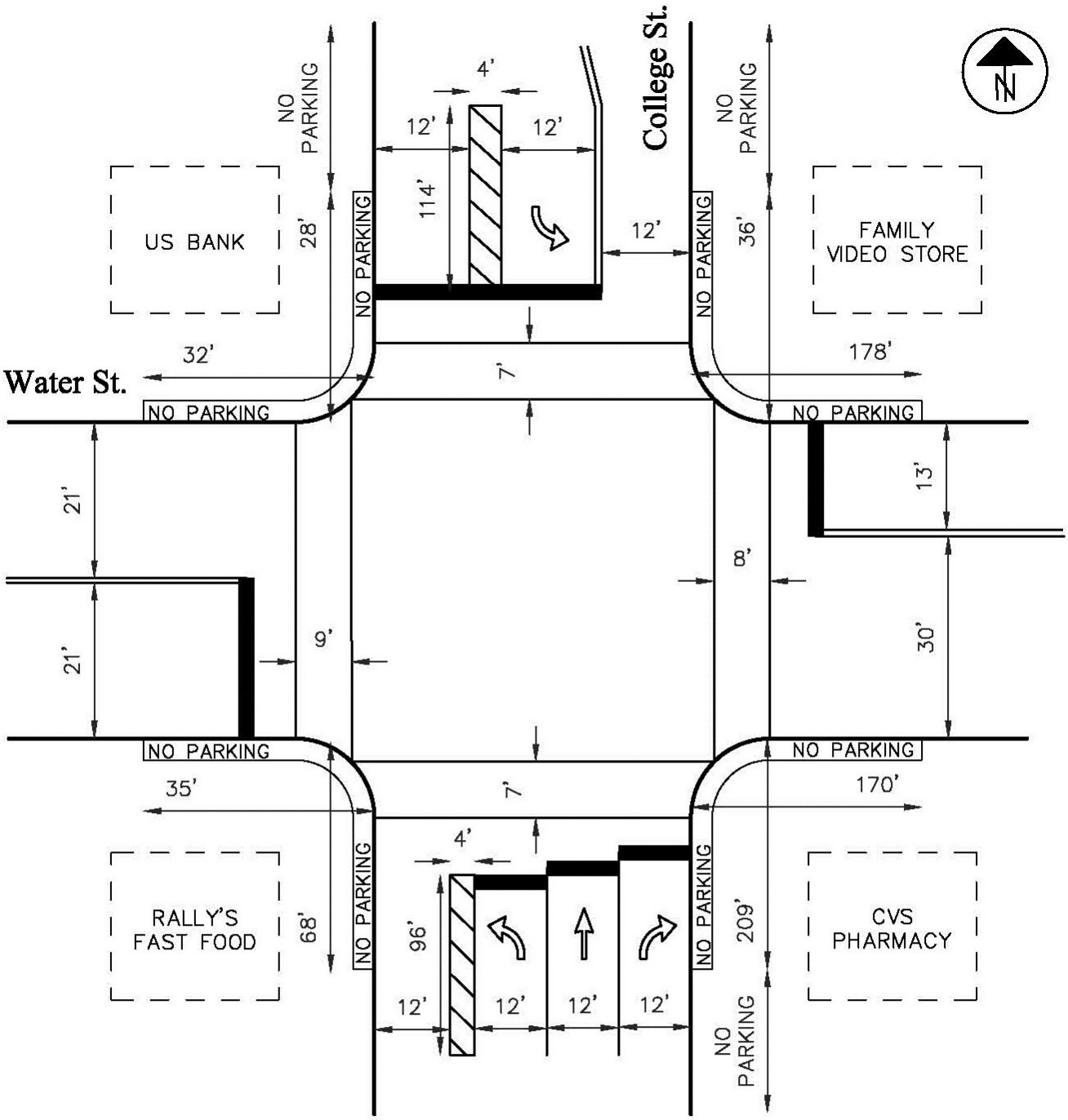
Crash History

- 9 reported crashes from 2005-2008
- No specific pattern

Recommendations

- Convert signal to actuated operation
- Add westbound left-turn signal and northbound right-turn signal
- Coordinate College St. signals from Covington to High

INTERSECTION DIAGRAM



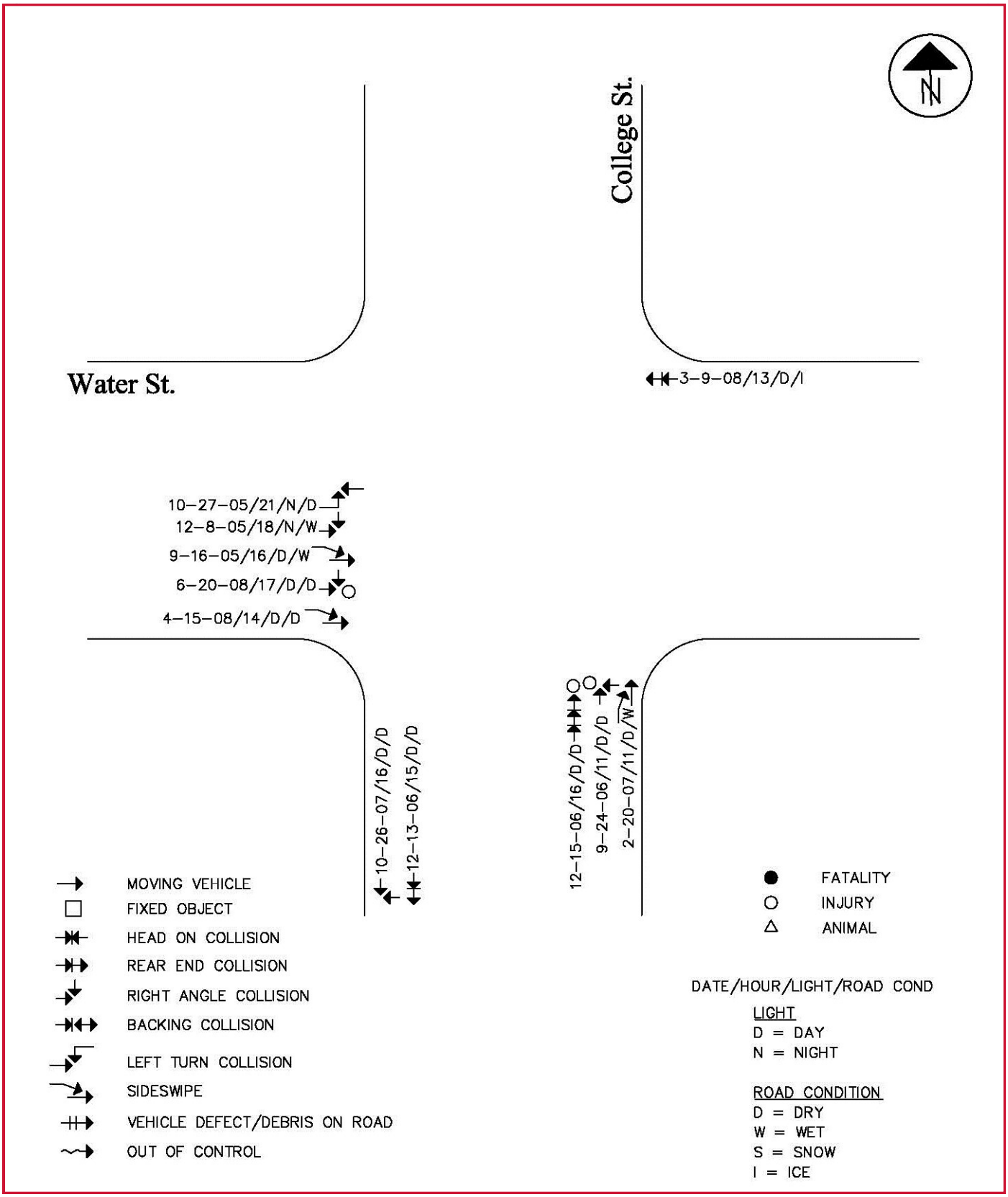
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

30 SEC N/S SPLIT

40 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at Water Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB Water St				NB College St				EB Water St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	5	12	1	0	36	3	2	0	4	18	41	0	0	11	13	0			
7:15 to 7:30 am	1	25	0	1	30	4	4	0	5	20	54	0	0	16	19	0			
7:30 to 7:45 am	8	24	2	0	41	2	4	0	4	28	59	1	0	19	21	0			
7:45 to 8:00 am	8	32	1	0	47	4	1	0	5	19	64	0	0	22	24	0			
Total	22	93	4	1	154	13	11	0	18	85	218	1	0	68	77	0	440	178	145
8:00 to 8:15 am	11	29	0	0	32	5	6	0	4	23	54	0	0	10	13	1			
8:15 to 8:30 am	4	25	0	2	35	4	4	1	3	17	61	0	0	12	14	0			
8:30 to 8:45 am	3	41	0	2	36	15	6	0	4	27	69	0	0	9	18	0			
8:45 to 9:00 am	8	24	0	1	37	10	6	1	6	30	49	1	0	13	12	0			
Total	26	119	0	5	140	34	22	2	17	97	233	1	0	44	57	1	492	196	101
4:00 to 4:15 pm	8	64	5	4	85	9	11	0	16	70	60	3	1	12	16	1			
4:15 to 4:30 pm	5	60	6	1	75	16	17	0	17	64	79	0	2	8	16	0			
4:30 to 4:45 pm	4	65	0	0	79	27	20	1	20	61	87	2	3	13	27	0			
4:45 to 5:00 pm	12	54	1	0	89	9	20	0	17	55	55	1	0	11	14	0			
Total	29	243	12	5	328	61	68	1	70	250	281	6	6	44	73	1	885	457	123
5:00 to 5:15 pm	4	56	0	0	88	17	20	0	15	60	62	9	1	19	27	3			
5:15 to 5:30 pm	4	52	6	3	85	13	11	1	18	60	56	3	1	9	29	3			
5:30 to 5:45 pm	4	56	2	1	68	12	13	1	19	56	60	0	0	15	20	0			
5:45 to 6:00 pm	6	66	4	0	82	18	14	0	19	61	63	3	2	10	27	0			
Total	18	230	12	4	323	60	58	2	71	237	241	15	4	53	103	6	809	441	160
Grand Total	95	685	28	15	945	168	159	5	176	669	973	23	10	209	310	8			

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at Water*
Agency or Co.	*Kleingers & Associates*	Area Type	*All other areas*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	0	1	0	0	1	0	1	1	1	1	1	0
Lane Group		LTR			LTR		L	T	R	L	TR	
Volume (vph)	6	44	73	328	61	68	70	250	281	29	243	12
% Heavy Vehicles	0	1	2	8	1	3	2	2	7	2	1	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time		2.0			2.0		2.0	2.0	2.0	2.0	2.0	
Extension of Effective Green		2.0			2.0		2.0	2.0	2.0	2.0	2.0	
Arrival Type		3			3		3	3	3	3	3	
Unit Extension		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Ped/Bike/RTOR Volume	1	0	0	1	0	0	6	0	0	5	0	0
Lane Width		12.0			12.0		12.0	12.0	12.0	12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour		0			0		0	0	0	0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	

Phasing	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 34.0	G =	G =	G =	G = 24.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 70.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		137			508		78	278	312	32	283	
Lane Group Capacity		816			597		334	639	517	338	641	
v/c Ratio		0.17			0.85		0.23	0.44	0.60	0.09	0.44	
Green Ratio		0.49			0.49		0.34	0.34	0.34	0.34	0.34	
Uniform Delay d_1		10.1			15.8		16.4	17.8	19.1	15.6	17.8	
Delay Factor k		0.50			0.50		0.50	0.50	0.50	0.50	0.50	
Incremental Delay d_2		0.4			14.2		1.6	2.2	5.2	0.6	2.2	
PF Factor		1.000			1.000		1.000	1.000	1.000	1.000	1.000	
Control Delay		10.5			30.0		18.1	19.9	24.2	16.2	20.0	
Lane Group LOS		B			C		B	B	C	B	C	
Approach Delay	10.5			30.0			21.7			19.6		
Approach LOS	B			C			C			B		
Intersection Delay	22.9			Intersection LOS						C		

Copyright © 2007 University of Florida, All Rights Reserved

HCS+™ Version 5.3 Generated: 12/16/2008 2:08 PM

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at Water*
Agency or Co.	*Kleingers & Associates*	Area Type	*All other areas*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak (Leading Left)*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	0	1	0	0	1	0	1	1	1	1	1	0
Lane Group		LTR			LTR		L	T	R	L	TR	
Volume (vph)	6	44	73	328	61	68	70	250	281	29	243	12
% Heavy Vehicles	0	1	2	8	1	3	2	2	7	2	1	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time		2.0			2.0		2.0	2.0	2.0	2.0	2.0	
Extension of Effective Green		2.0			2.0		2.0	2.0	2.0	2.0	2.0	
Arrival Type		3			3		3	3	3	3	3	
Unit Extension		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Ped/Bike/RTOR Volume	1	0	0	1	0	0	6	0	0	5	0	0
Lane Width		12.0			12.0		12.0	12.0	12.0	12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour		0			0		0	0	0	0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	

Phasing	WB Only	EW Perm	03	04	NS Perm	06	07	08
Timing	G = 12.0	G = 19.0	G =	G =	G = 21.0	G =	G =	G =
	Y = 6	Y = 6	Y =	Y =	Y = 6	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 70.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		137			508		78	278	312	32	283	
Lane Group Capacity		452			666		278	559	841	283	561	
v/c Ratio		0.30			0.76		0.28	0.50	0.37	0.11	0.50	
Green Ratio		0.27			0.53		0.30	0.30	0.56	0.30	0.30	
Uniform Delay d_1		20.2			13.0		18.7	20.2	8.7	17.8	20.2	
Delay Factor k		0.11			0.31		0.11	0.11	0.11	0.11	0.11	
Incremental Delay d_2		0.4			5.2		0.6	0.7	0.3	0.2	0.7	
PF Factor		1.000			1.000		1.000	1.000	1.000	1.000	1.000	
Control Delay		20.6			18.3		19.3	20.9	8.9	17.9	20.9	
Lane Group LOS		C			B		B	C	A	B	C	
Approach Delay	20.6			18.3			15.1			20.6		
Approach LOS	C			B			B			C		
Intersection Delay	17.6			Intersection LOS						B		

Copyright © 2007 University of Florida, All Rights Reserved

HCS+™ Version 5.3 Generated: 12/16/2008 2:21 PM

The Greene Street Corridor

Intersection of Greene Street and Downing Street

Intersection of Greene Street and Wayne Street

Intersection of Greene Street and Main Street

Greene Street & Downing Street

Aerial Photo:

Photo: Looking East

Existing Conditions Discussion

The intersection of Greene Street with Downing Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Vegetation, fencing, and a portion of a building partially obstruct sight distance at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its proximity to the central business district and may have been warranted when it was installed.

Public Comments

- "Traffic signal obstructs traffic flow."
- "Maybe this should be a two-way stop."
- "There is a library nearby; however, it may move."
- "St. Paul's Church is nearby. Four-way stop may be appropriate."
- "There are low traffic volumes."
- "Traffic signal is not needed."

Analyses Results

- Traffic signal warrants are not met
- No reported crashes at the intersection from Jan. 2005 to June 2008
- All-way stop control provides adequate capacity

Recommendations

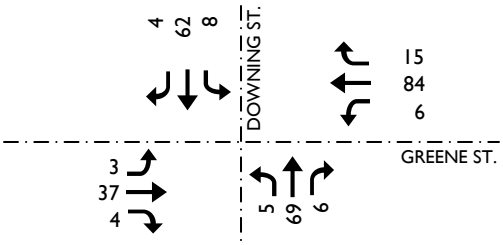
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Based on the relatively balanced traffic volumes on the intersection approaches, four-way stop control is recommended. Also, curb bump-outs should be considered to provide adequate locations for stop sign visibility. Four-way stop control is consistent with the surrounding development and with traffic control at similar adjacent intersections.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



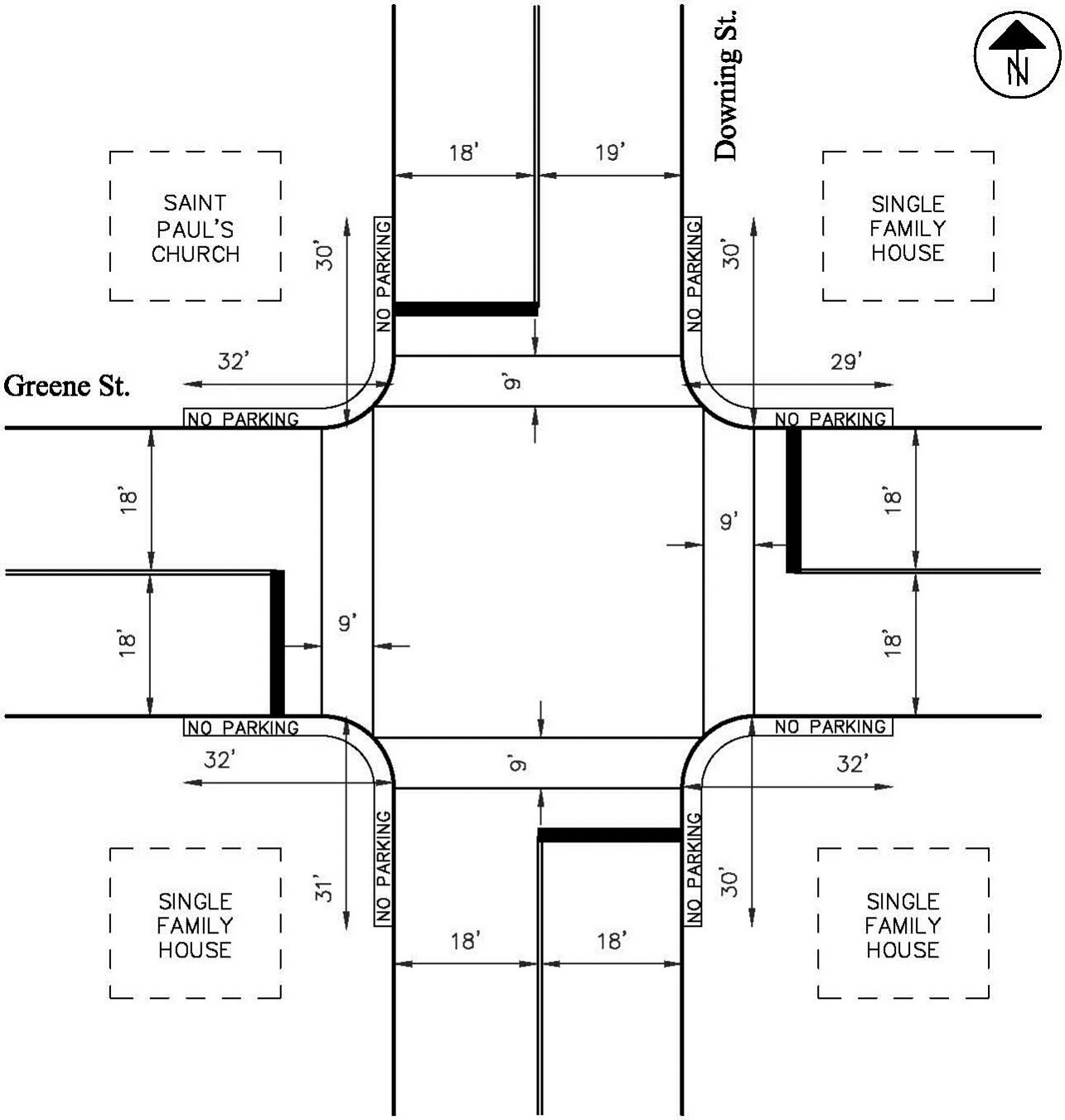
Crash History

- 0 reported crashes from 2005-2008

Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT

35 SEC E/W SPLIT

Turning Movement Counts Summary Table

Location: Downing Street at Greene Street

Date of Counts: Thursday 8/7/2008

	SB Downing St				WB Greene St				NB Downing St				EB Greene St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	2	7	1	0	1	2	0	0	0	6	1	1	0	7	0	0			
7:15 to 7:30 am	2	13	2	0	0	6	0	0	0	5	2	0	0	6	0	0			
7:30 to 7:45 am	2	7	0	0	1	6	0	1	0	7	4	0	2	6	1	0			
7:45 to 8:00 am	1	15	4	1	0	11	1	0	0	5	2	0	2	20	2	0			
Total	7	42	7	1	2	25	1	1	0	23	9	1	4	39	3	0	88	28	46
8:00 to 8:15 am	0	6	2	1	0	3	2	0	1	5	0	1	0	7	1	0			
8:15 to 8:30 am	1	15	1	0	2	9	0	0	0	4	0	0	0	6	2	0			
8:30 to 8:45 am	0	11	1	0	0	8	1	0	1	5	3	0	0	9	1	0			
8:45 to 9:00 am	1	9	1	0	1	10	1	2	0	4	0	1	0	8	1	0			
Total	2	41	5	1	3	30	4	2	2	18	3	2	0	30	5	0	71	37	35
4:00 to 4:15 pm	0	16	1	0	2	23	3	1	2	19	3	2	0	12	1	2			
4:15 to 4:30 pm	3	15	0	2	2	27	5	0	1	21	2	3	1	9	1	0			
4:30 to 4:45 pm	2	11	1	2	1	23	5	1	0	13	1	2	1	5	0	0			
4:45 to 5:00 pm	3	20	2	0	1	11	2	1	2	16	0	4	1	11	2	0			
Total	8	62	4	4	6	84	15	3	5	69	6	11	3	37	4	2	154	105	44
5:00 to 5:15 pm	3	20	2	0	1	11	2	1	2	16	0	4	1	11	2	0			
5:15 to 5:30 pm	1	12	0	0	0	22	5	0	1	14	1	0	0	9	0	0			
5:30 to 5:45 pm	1	12	0	0	0	22	5	0	1	14	1	0	0	9	0	0			
5:45 to 6:00 pm	2	9	0	0	1	13	6	2	2	15	0	1	1	9	1	0			
Total	7	53	2	0	2	68	18	3	6	59	2	5	2	38	3	0	129	88	43
Grand Total	24	198	18	6	13	207	38	9	13	169	20	19	9	144	15	2			

SIGNAL WARANT ANALYSIS SUMMARY

Downing Street / Greene Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	88	46	No	88	46	No	No
8 AM to 9 AM	71	37	No	71	37	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	154	105	No	154	105	No	No
5 PM to 6 PM	129	88	No	129	88	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

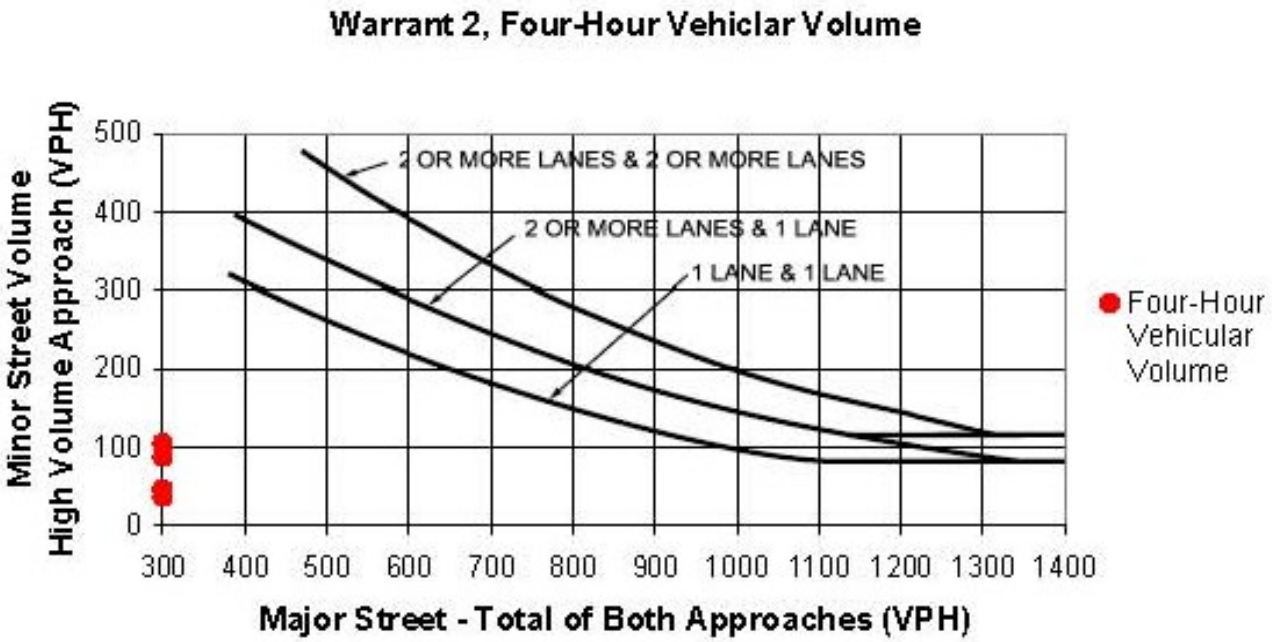
This intersection is not located at a critical point along a coordinated signal system.

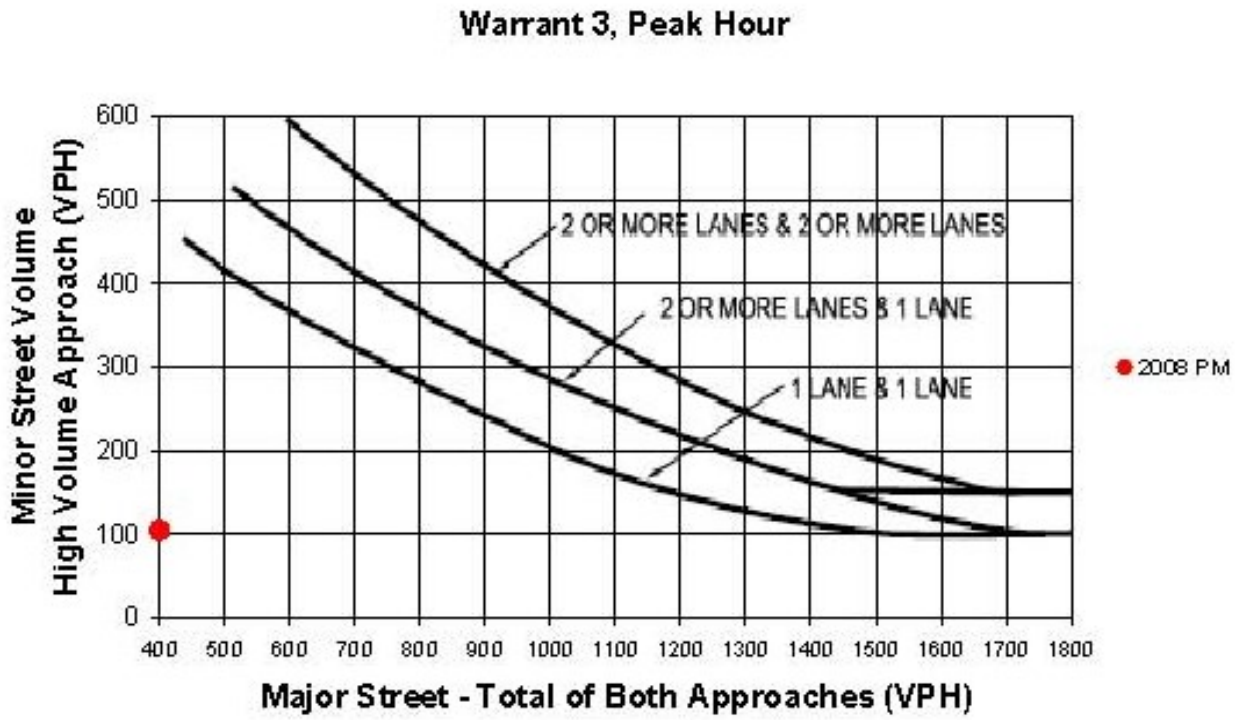
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) approximately 300 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*M. Nolt*
Agency/Co.	*Kleingers & Associates*
Date Performed	*11/13/2008*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*Downing at Greene*
Jurisdiction	*City of Piqua*
Analysis Year	*2008*

Project ID

East/West Street: *Greene Street*

North/South Street: *Downing Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	3	37	4	6	84	15
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	69	6	8	62	4
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	48		115		87		80	
% Heavy Vehicles	1		0		1		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1		0.1		0.1		0.1	
Prop. Right-Turns	0.1		0.1		0.1		0.1	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.0		-0.1		-0.0		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.04		0.10		0.08		0.07	
hd, final value (s)	4.39		4.27		4.35		4.38	
x, final value	0.06		0.14		0.11		0.10	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.4		2.3		2.3		2.4	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	298		365		337		330	
Delay (s/veh)	7.66		7.94		7.86		7.85	
LOS	A		A		A		A	
Approach: Delay (s/veh)	7.66		7.94		7.86		7.85	
LOS	A		A		A		A	
Intersection Delay (s/veh)	7.85							
Intersection LOS	A							

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21

Generated: 11/14/2008 10:05 AM

Greene Street & Wayne Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of Greene Street with Wayne Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. A building on the southwest corner of the intersection restricts sight distance. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its proximity to the central business district and may have been warranted when it was installed.

Public Comments

– No significant comments were discussed regarding this intersection.

Analyses Results

– Traffic signal warrants are not met

– Two reported crashes at the intersection from Jan. 2005 to June 2008

– All-way stop control provides adequate capacity

Recommendations

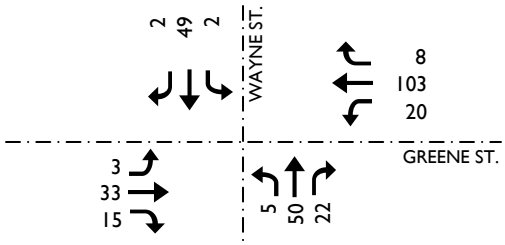
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Based on the relatively balanced traffic volumes on the intersection approaches, four-way stop control is recommended. Also, curb bump-outs should be considered to provide adequate locations for stop sign visibility. Four-way stop control is consistent with the surrounding development and with traffic control at similar adjacent intersections.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



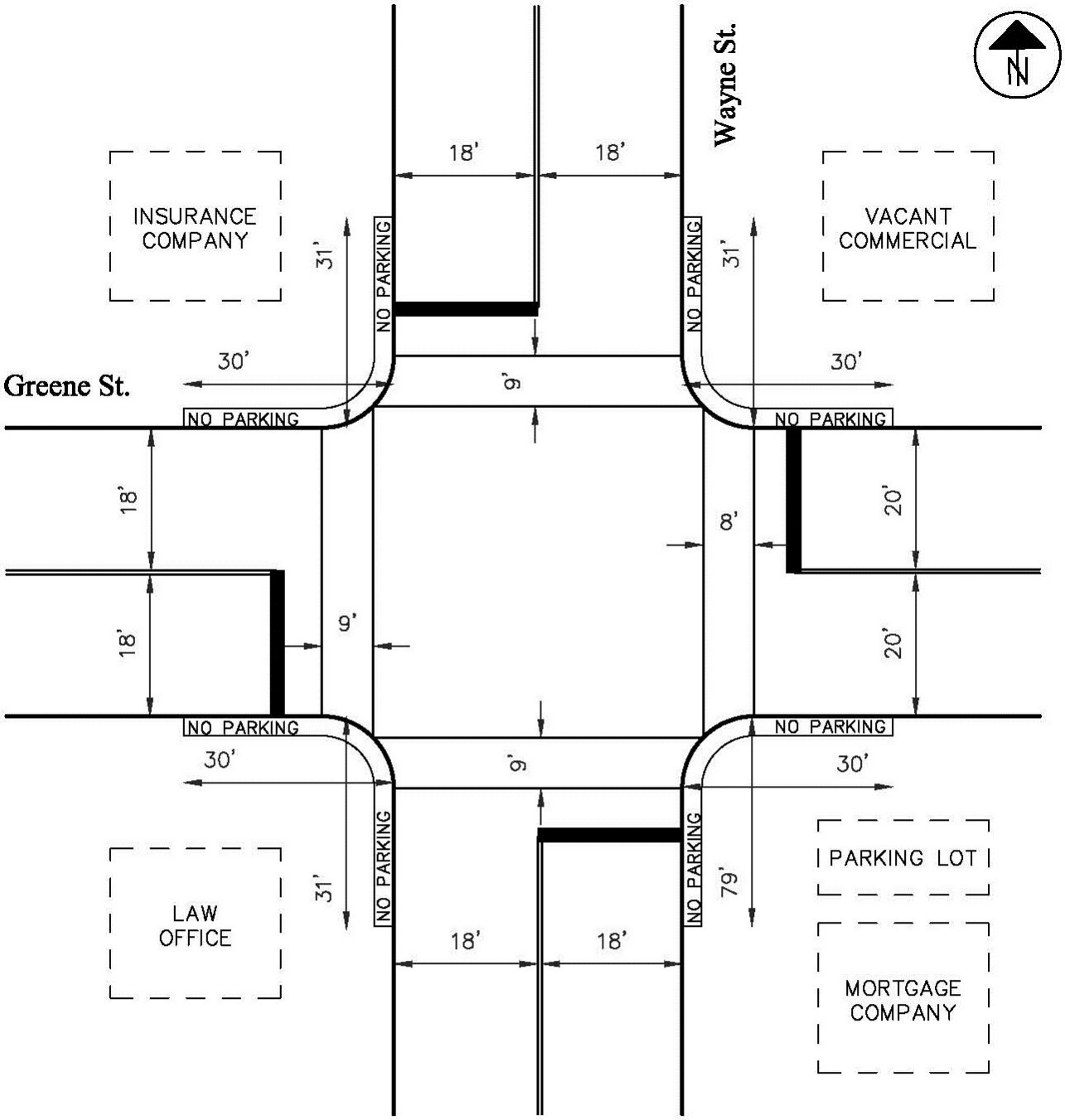
Crash History

- 2 reported crashes from 2005-2008
- Angle type crashes

Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



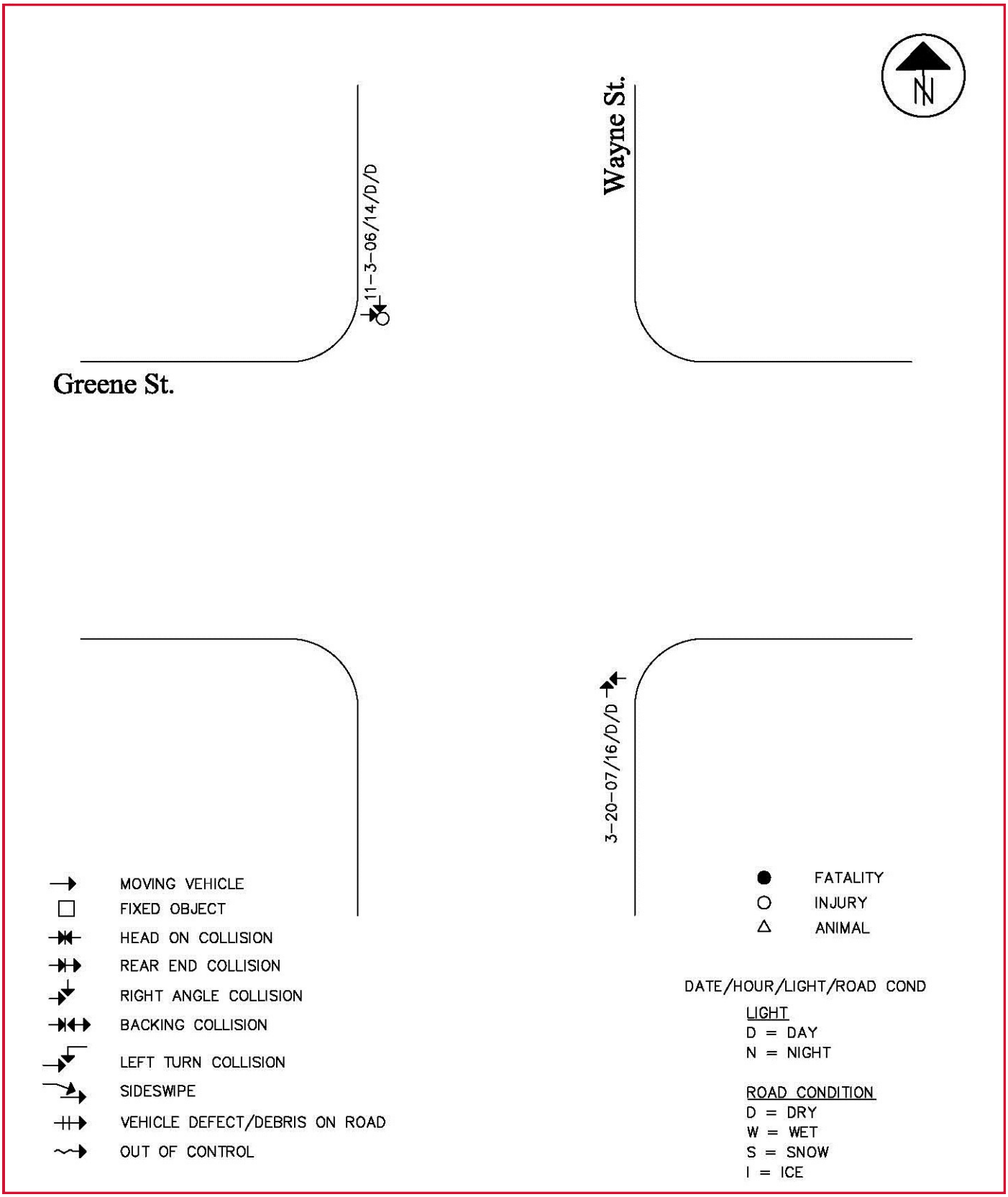
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT

35 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Wayne Street at Greene Street

Date of Counts: Thursday 8/7/2008

	SB Wayne St				WB Greene St				NB Wayne St				EB Greene St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	4	0	0	1	2	1	0	0	1	0	0	0	7	0	0			
7:15 to 7:30 am	0	6	2	0	2	7	0	0	0	3	1	0	0	10	2	0			
7:30 to 7:45 am	1	6	0	0	0	5	2	0	1	4	2	0	0	9	4	0			
7:45 to 8:00 am	1	8	0	0	0	12	0	0	1	2	1	0	2	17	0	0			
Total	2	24	2	0	3	26	3	0	2	10	4	0	2	43	6	0	83	28	16
8:00 to 8:15 am	0	7	1	0	1	4	1	0	0	5	2	1	0	5	0	1			
8:15 to 8:30 am	1	8	1	1	4	10	0	0	0	0	0	0	1	5	1	0			
8:30 to 8:45 am	2	6	0	0	5	10	2	0	0	2	0	5	1	9	1	1			
8:45 to 9:00 am	1	10	1	1	6	11	1	3	1	7	0	0	0	8	1	1			
Total	4	31	3	2	16	35	4	3	1	14	2	6	2	27	3	3	87	38	17
4:00 to 4:15 pm	1	14	1	1	9	29	0	4	2	13	3	0	1	10	2	0			
4:15 to 4:30 pm	1	14	1	0	3	25	2	1	2	13	7	2	1	13	2	2			
4:30 to 4:45 pm	0	10	0	1	4	26	2	0	1	15	7	3	0	4	5	0			
4:45 to 5:00 pm	0	11	0	0	4	23	4	2	0	9	5	0	1	6	6	0			
Total	2	49	2	2	20	103	8	7	5	50	22	5	3	33	15	2	182	53	77
5:00 to 5:15 pm	0	11	0	0	4	23	4	2	0	9	5	0	1	6	6	0			
5:15 to 5:30 pm	2	14	2	0	8	23	2	1	3	11	3	3	0	8	3	0			
5:30 to 5:45 pm	2	14	2	0	8	23	2	1	3	11	3	3	0	8	3	0			
5:45 to 6:00 pm	1	7	1	0	4	15	2	3	3	14	6	0	2	11	1	0			
Total	5	46	5	0	24	84	10	7	9	45	17	6	3	33	13	0	167	56	71
Grand Total	13	150	12	4	63	248	25	17	17	119	45	17	10	136	37	5			

SIGNAL WARANT ANALYSIS SUMMARY

Wayne Street / Greene Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	83	28	No	83	28	No	No
8 AM to 9 AM	87	38	No	87	38	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	182	77	No	182	77	No	No
5 PM to 6 PM	167	71	No	167	71	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

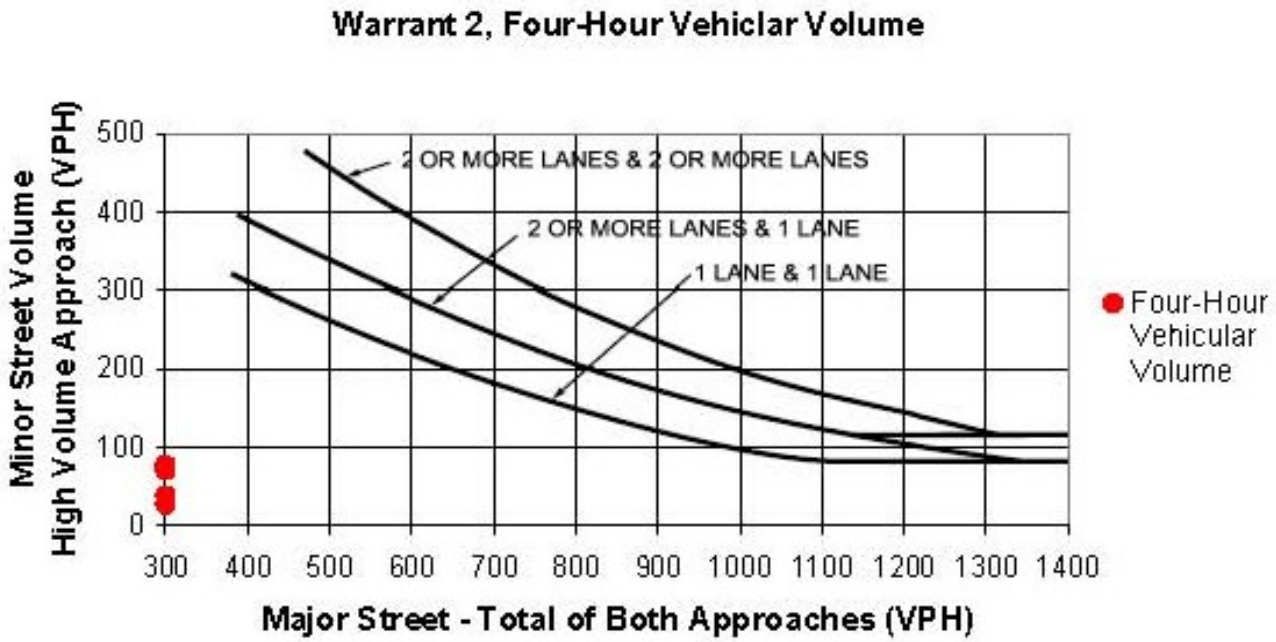
This intersection is not located at a critical point along a coordinated signal system.

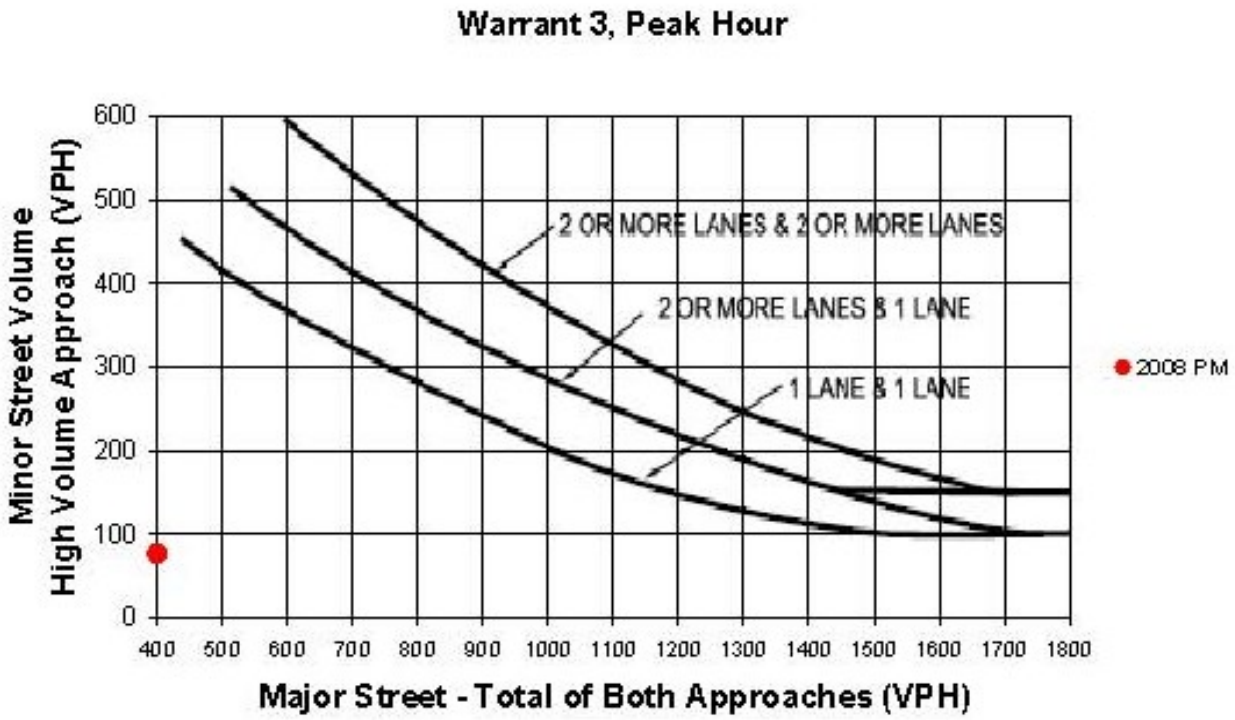
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has less than 320 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	Wayne at Greene
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: Greene Street

North/South Street: Wayne Street

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	3	33	15	20	103	8
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	5	50	22	2	49	2
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	55		144		84		58	
% Heavy Vehicles	2		1		1		1	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.1		0.2		0.1		0.0	
Prop. Right-Turns	0.3		0.1		0.3		0.0	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		0.0		-0.1		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.13		0.07		0.05	
hd, final value (s)	4.25		4.30		4.28		4.45	
x, final value	0.06		0.17		0.10		0.07	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.3		2.3		2.3		2.4	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	305		394		334		308	
Delay (s/veh)	7.55		8.19		7.75		7.79	
LOS	A		A		A		A	
Approach: Delay (s/veh)	7.55		8.19		7.75		7.79	
LOS	A		A		A		A	
Intersection Delay (s/veh)	7.91							
Intersection LOS	A							

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21

Generated: 11/14/2008 11:12 AM

Greene Street & Main Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of Greene Street with Main Street has four approaches intersecting at a 90-degree angle and is currently signal controlled. Each approach has two lanes - one left-turn only lane and one through-right shared lane. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. This intersection is located in the central business district. The primary concerns at this intersection are whether or not the existing traffic signal is warranted, to determine if there is an appropriate balance between the use of turn lanes and on-street parking in the area of this intersection, and to determine if the on-street parking layout interferes with the operation of the intersection. This traffic signal was likely installed initially due to its location in the central business district.

Public Comments

- "Need to balance the need for left-turn lanes with the need for downtown parking."
- "The left-turn lanes at this intersection cause all lanes to be narrow."

Analyses Results

- Traffic signal warrants are not met
- Two reported crashes at the intersection from Jan. 2005 to June 2008
- Capacity analysis indicates that the existing intersection is operating at an acceptable level of service
- Capacity analysis indicates that intersection operates at an acceptable level of service if left turn lanes are removed from Greene Street.

Recommendations

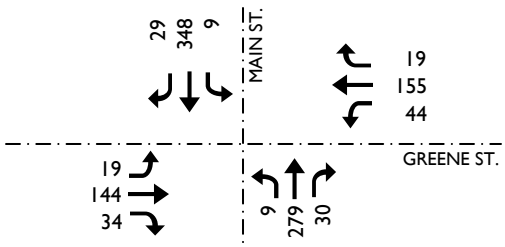
Due to the potential for future growth in traffic volumes and the intersection's location in the central business district, it is recommended that the traffic signal be retained. If additional on-street parking is desired along Greene Street, the left turn lanes on Greene Street may be removed to obtain the necessary road width. It is recommended that the left turn lanes on Main Street be retained to accommodate vehicles that would otherwise turn left at the intersection of Main Street and Ash Street, where left turns are currently prohibited.

Intersection at a Glance

Existing Conditions

- Mast arm traffic signal
- Left-turn lanes on all approaches
- Located in central business district

Counted Traffic Volumes (peak hour)



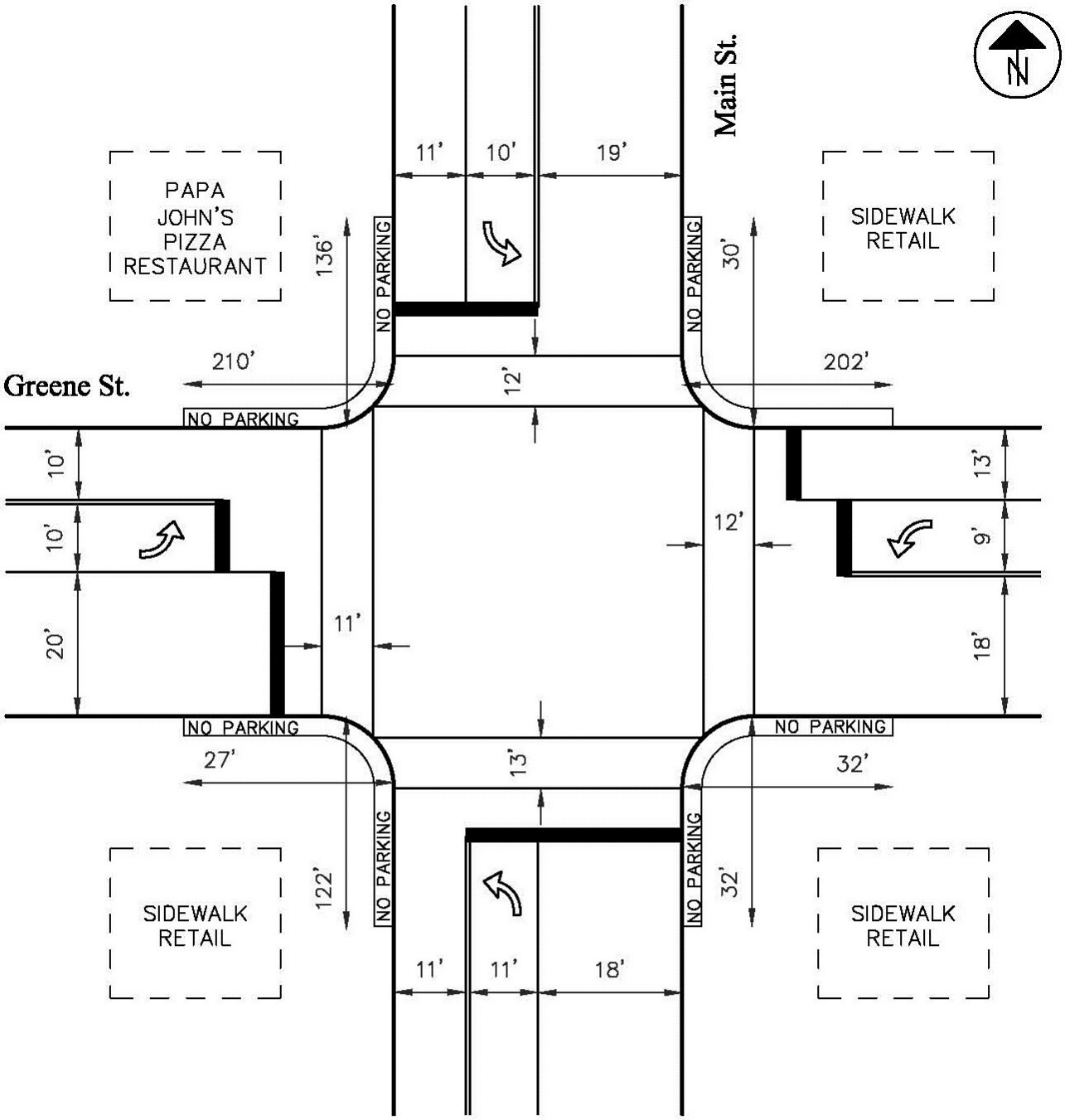
Crash History

- 2 reported crashes from 2005-2008
- No specific pattern

Recommendation

- Retain traffic signal
- Left-turn lanes on Greene Street may be removed if desired

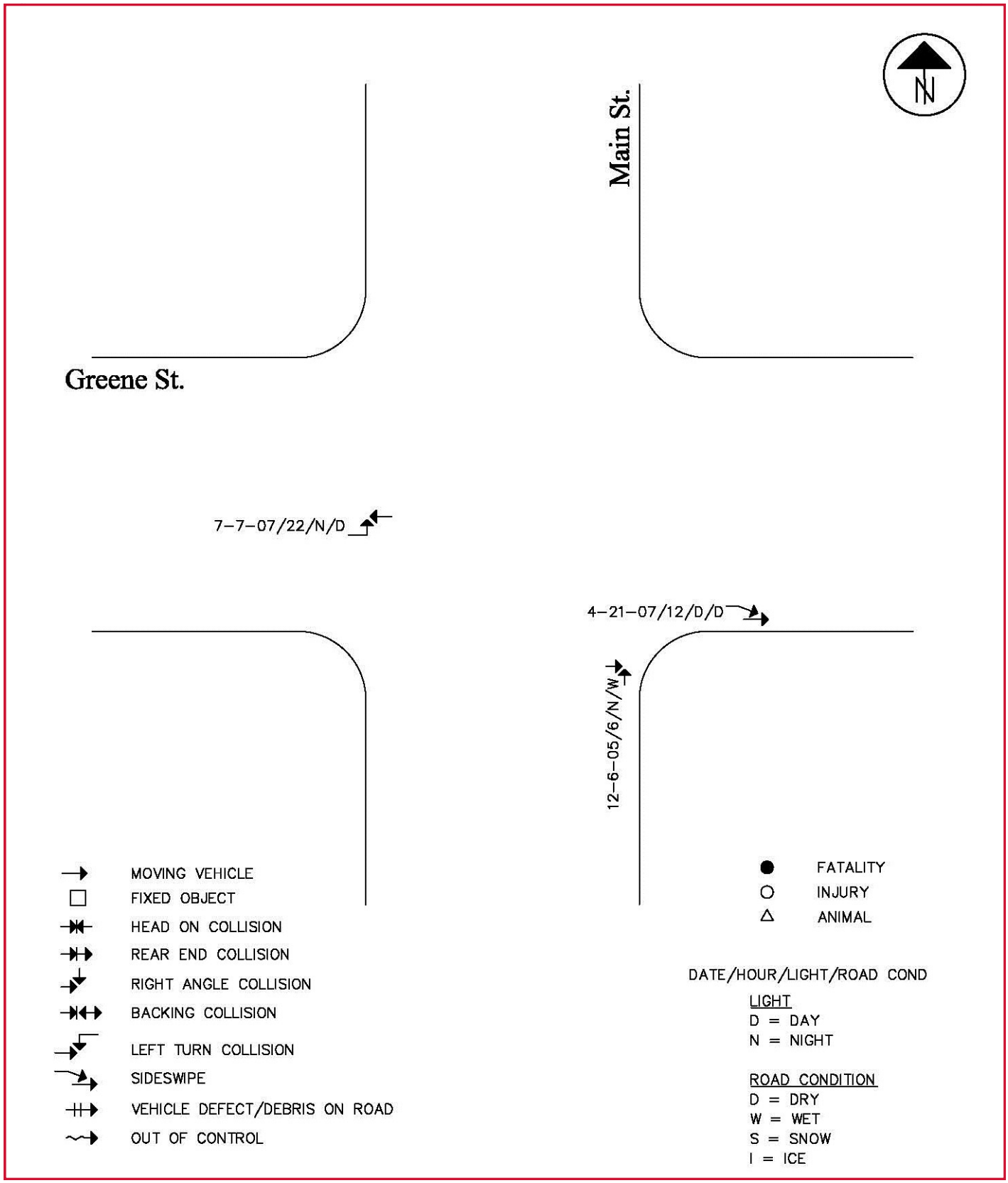
INTERSECTION DIAGRAM



ACTUATED SIGNAL

70 SEC CYCLE

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Main Street at Greene Street

Date of Counts: Thursday 8/7/2008 (7-9am & 4-6pm) and Thursday 10/9/2008 (11am-4pm)

	SB Main St				WB Greene St				NB Main St				EB Greene St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	17	38	1	0	2	2	1	0	1	21	1	0	2	5	1	0			
7:15 to 7:30 am	13	48	4	0	2	2	1	0	2	39	1	0	3	4	4	1			
7:30 to 7:45 am	12	69	2	0	2	1	2	1	0	47	4	1	4	2	2	0			
7:45 to 8:00 am	28	76	5	1	5	3	2	0	4	42	0	0	4	8	7	2			
Total	70	231	12	1	11	8	6	1	7	149	6	1	13	19	14	3	475	25	46
8:00 to 8:15 am	6	45	3	0	1	1	0	1	0	38	1	0	2	4	4	1			
8:15 to 8:30 am	13	50	4	1	0	4	2	0	5	42	3	0	1	4	1	1			
8:30 to 8:45 am	14	38	4	1	1	4	2	0	7	33	0	1	2	5	1	1			
8:45 to 9:00 am	14	59	3	0	4	3	2	1	7	34	7	0	5	0	3	2			
Total	47	192	14	2	6	12	6	2	19	147	11	1	10	13	9	5	430	24	32
11:00 to 11:15 am	4	37	4	3	2	4	4	1	7	36	0	0	3	5	7	3			
11:15 to 11:30 am	8	32	6	3	5	14	10	0	9	29	5	3	3	8	7	3			
11:30 to 11:45 am	6	37	4	0	1	7	9	1	11	34	4	2	3	3	7	1			
11:45 to 12:00 am	10	47	5	1	4	6	6	0	13	56	5	0	5	16	6	1			
Total	28	153	19	7	12	31	29	2	40	155	14	5	14	32	27	8	409	72	73
12:00 to 12:15 pm	17	49	1	2	4	13	9	1	7	26	10	1	5	19	8	1			
12:15 to 12:30 pm	8	44	6	3	5	9	6	0	11	58	12	2	5	9	3	2			
12:30 to 12:45 pm	8	40	6	3	6	14	6	0	7	54	6	0	6	13	9	6			
12:45 to 13:00 pm	10	52	4	1	2	10	9	1	6	56	2	1	10	9	9	1			
Total	43	185	17	9	17	46	30	2	31	194	30	4	26	50	29	10	500	93	105
2:00 to 2:15 pm	9	48	4	0	4	11	4	1	5	58	6	2	5	7	3	1			
2:15 to 2:30 pm	9	52	2	3	4	8	8	1	7	57	8	3	6	11	6	0			
2:30 to 2:45 pm	13	52	4	2	5	10	10	0	7	48	9	1	8	6	6	1			
2:45 to 3:00 pm	7	71	4	2	4	11	5	2	6	69	5	2	3	8	3	0			
Total	38	223	14	7	17	40	27	4	25	232	28	8	22	32	18	2	560	84	72
3:00 to 3:15 pm	14	68	7	1	4	18	11	2	20	49	4	0	8	8	4	3			
3:15 to 3:30 pm	5	76	9	1	5	10	6	0	10	94	2	2	5	12	10	0			
3:30 to 3:45 pm	4	57	1	1	5	14	11	3	5	73	1	3	10	15	4	2			
3:45 to 4:00 pm	13	77	6	0	4	11	5	1	20	102	10	0	5	9	7	1			
Total	36	278	23	3	18	53	33	6	55	318	17	5	28	44	25	6	727	104	97
4:00 to 4:15 pm	8	59	7	3	11	16	6	1	9	80	3	2	9	14	13	1			
4:15 to 4:30 pm	1	87	6	0	7	47	3	1	0	61	7	7	6	48	7	1			
4:30 to 4:45 pm	0	101	8	2	13	46	5	1	0	69	10	2	2	41	7	1			
4:45 to 5:00 pm	0	101	8	2	13	46	5	1	0	69	10	2	2	41	7	1			
Total	9	348	29	7	44	155	19	4	9	279	30	13	19	144	34	4	704	218	197
5:00 to 5:15 pm	0	101	8	2	13	46	5	1	0	69	10	2	2	41	7	1			
5:15 to 5:30 pm	0	74	4	0	12	45	4	0	1	75	4	1	5	48	7	1			
5:30 to 5:45 pm	0	74	4	0	12	45	4	0	1	75	4	1	5	48	7	1			
5:45 to 6:00 pm	0	74	3	0	6	45	1	0	1	54	9	1	3	41	5	0			
Total	0	323	19	2	43	181	14	1	3	273	27	5	15	178	26	3	645	238	219
Grand Total	271	1933	147	38	168	526	164	22	189	1747	163	42	147	512	182	41			

SIGNAL WARANT ANALYSIS SUMMARY

Main Street / Greene Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	475	46	No	475	46	No	No
8 AM to 9 AM	430	32	No	430	32	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM	409	43	No	409	43	No	No
12 PM to 1 PM	500	105	No	500	105	No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	560	84	No	560	84	No	No
3 PM to 4 PM	727	104	No	727	104	No	No
4 PM to 5 PM	704	218	Yes	704	218	No	Yes
5 PM to 6 PM	645	238	Yes	645	238	No	Yes

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

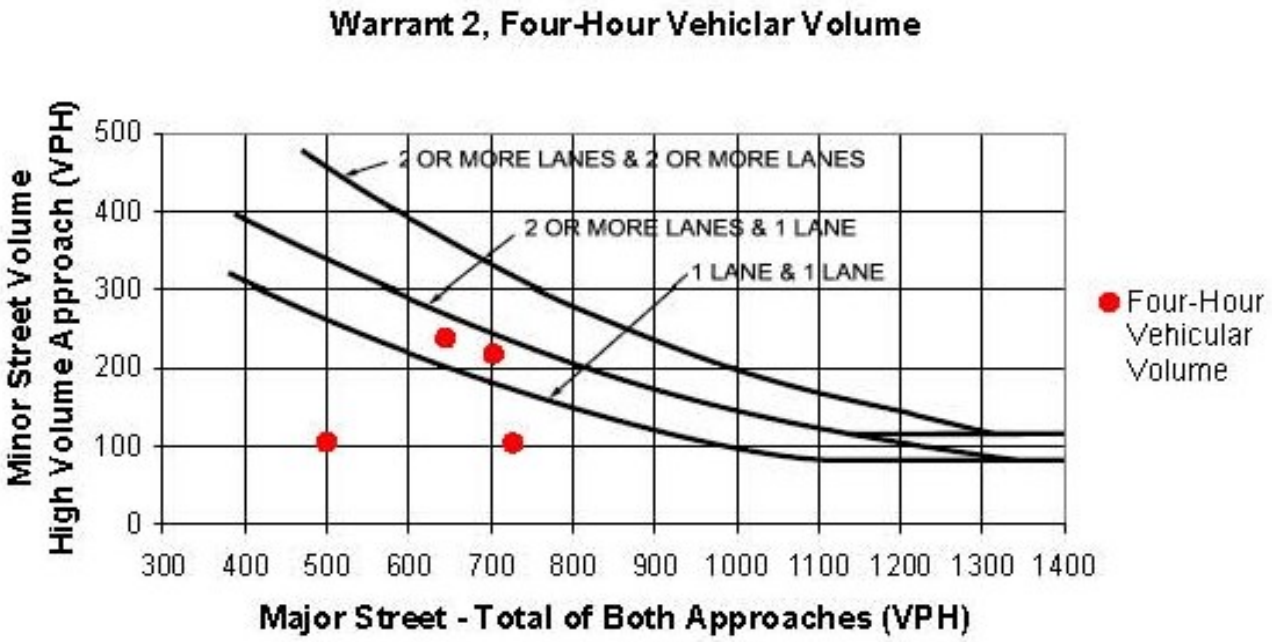
This intersection is located along a coordinated signal system (Main Street). It is not certain whether signalization at this intersection is critical to coordination.

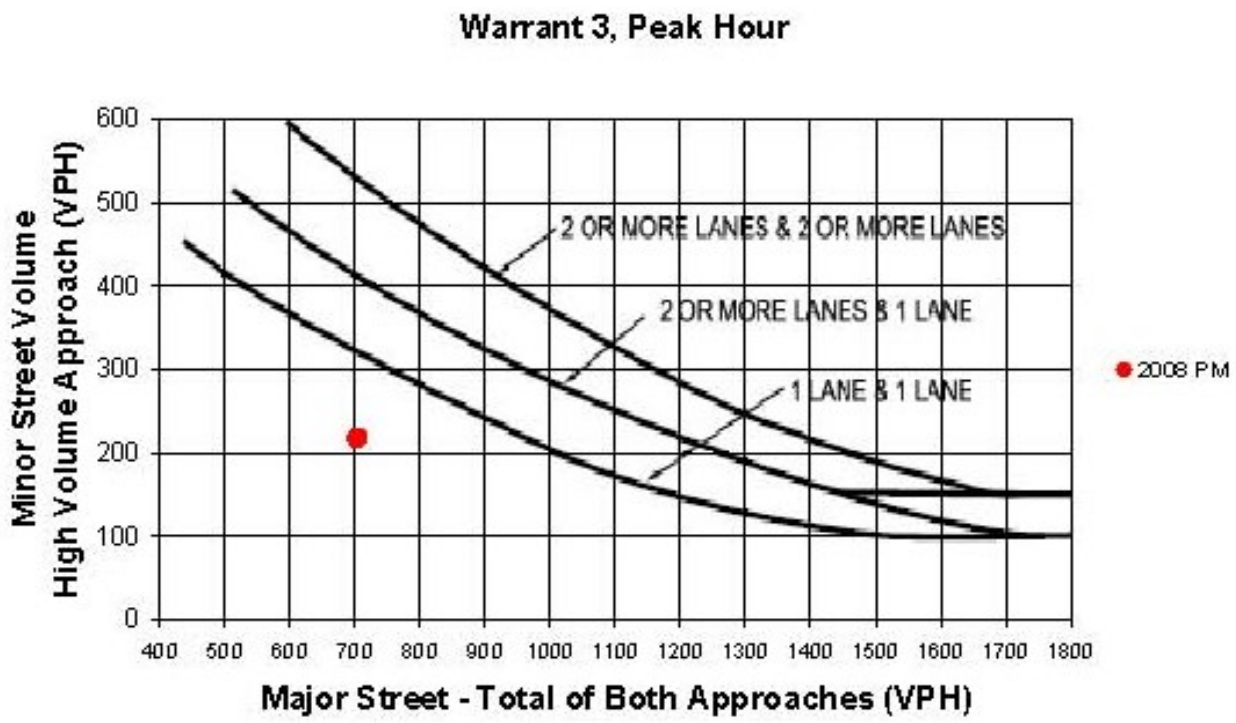
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, one right-angle crash and one left-turn crash was reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle and left-turn crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

At least two hours have more than the required 1000 approaching trips. Main Street qualifies as a major Piqua city route.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*Main at Greene*
Agency or Co.	*Kleingers & Associates*	Area Type	*CBD or Similar*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Lane Group	L	TR		L	TR		L	TR		L	TR	
Volume (vph)	19	144	34	44	155	19	9	279	30	9	348	29
% Heavy Vehicles	0	0	0	0	0	0	3	4	0	2	4	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3		3	3		3	3		3	3	
Unit Extension	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	4	0	0	4	0	0	13	0	0	7	0	0
Lane Width	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0		0	0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.3			3.2	

Phasing	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 26.0	G =	G =	G =	G = 32.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25					Cycle Length C = 70.0			

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	21	198		49	193		10	343		10	419	
Lane Group Capacity	404	617		402	625		325	744		386	745	
v/c Ratio	0.05	0.32		0.12	0.31		0.03	0.46		0.03	0.56	
Green Ratio	0.37	0.37		0.37	0.37		0.46	0.46		0.46	0.46	
Uniform Delay d_1	14.1	15.7		14.5	15.6		10.5	13.1		10.4	13.9	
Delay Factor k	0.50	0.50		0.50	0.50		0.50	0.50		0.50	0.50	
Incremental Delay d_2	0.2	1.4		0.6	1.3		0.2	2.1		0.1	3.1	
PF Factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	
Control Delay	14.3	17.1		15.1	16.9		10.6	15.1		10.6	16.9	
Lane Group LOS	B	B		B	B		B	B		B	B	
Approach Delay	16.8			16.5			15.0			16.8		
Approach LOS	B			B			B			B		
Intersection Delay	16.2			Intersection LOS						B		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 10:59 AM

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*Main at Greene*
Agency or Co.	*Kleingers & Associates*	Area Type	*CBD or Similar*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak (No LT lanes on Green)*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Lane Group		LTR			LTR		L	TR		L	TR	
Volume (vph)	19	144	34	44	155	19	9	279	30	9	348	29
% Heavy Vehicles	0	0	0	0	0	0	3	4	0	2	4	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time		2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green		2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type		3			3		3	3		3	3	
Unit Extension		3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	4	0	0	4	0	0	13	0	0	7	0	0
Lane Width		12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour		0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.3			3.2	

Phasing	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 26.0	G =	G =	G =	G = 32.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25					Cycle Length C = 70.0			

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		219			242		10	343		10	419	
Lane Group Capacity		594			563		325	744		386	745	
v/c Ratio		0.37			0.43		0.03	0.46		0.03	0.56	
Green Ratio		0.37			0.37		0.46	0.46		0.46	0.46	
Uniform Delay d_1		16.0			16.5		10.5	13.1		10.4	13.9	
Delay Factor k		0.50			0.50		0.50	0.50		0.50	0.50	
Incremental Delay d_2		1.8			2.4		0.2	2.1		0.1	3.1	
PF Factor		1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay		17.8			18.8		10.6	15.1		10.6	16.9	
Lane Group LOS		B			B		B	B		B	B	
Approach Delay	17.8			18.8			15.0			16.8		
Approach LOS	B			B			B			B		
Intersection Delay	16.9			Intersection LOS						B		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 11:02 AM

The SR 185 Corridor

Intersection of Park Avenue and College Street/Nicklin Avenue

Intersection of Park Avenue and Broadway Street

Intersection of Broadway Street and North Street

Intersection of Ash Street and Broadway Street

Intersection of Ash Street and Downing Street

Intersection of Ash Street and Main Street

Park Ave at College Street & Nicklin Ave

Aerial Photo:

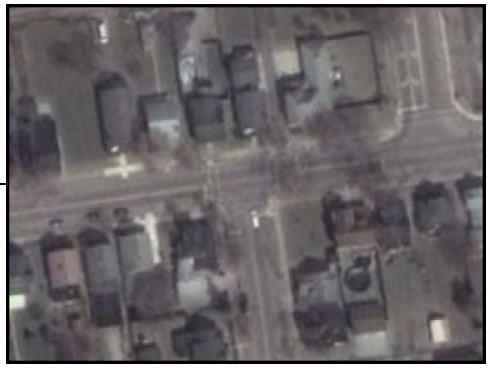


Photo: Looking West

Existing Conditions Discussion

The intersection of Park Avenue with College Street and Nicklin Avenue is a combination of two signalized "tee" type intersections controlled by one traffic signal controller. Nicklin Avenue is the north leg of the intersection and is located approximately 190 feet east of College Street, which is the south leg of the intersection. Each approach has a single lane. The actuated signal has a 70-second cycle length and has left turn signals on the westbound approach of Park Avenue at College Street and on the eastbound approach of Park Avenue at Nicklin Avenue. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The Nicklin Learning Center is located just north of this intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location between a school and a residential area and likely provided for school traffic capacity and pedestrian crossings.

Public Comments

- "There has been pressure from parents to keep the traffic signal due to students walking to school."
- "School pedestrian traffic is no longer an issue."
- "Traffic signal should stay in place due to the Nicklin Learning Center unless pedestrian volumes are low."
- "There is confusion with the signal operation. It is difficult to determine if the opposing traffic has the green light."
- "The intersection worked well as a four-way stop when the traffic signal was temporarily out of service."
- "There was a hospital near this intersection that has since closed."

Analyses Results

- Traffic signal warrants are not met
- Three reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

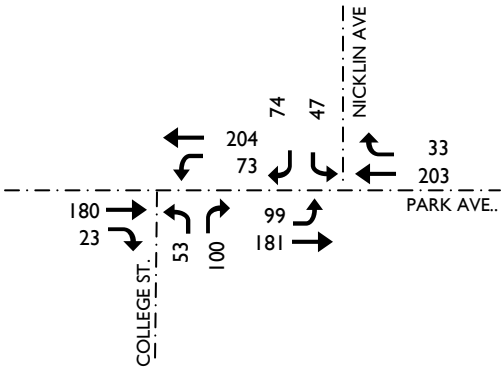
Due to the proximity of this intersection to the Nicklin Learning Center, the number of pedestrians observed during school times, and the unusual intersection configuration, it is recommended that this traffic signal be retained.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signals
- Offset "tee" type intersections
- Nicklin Learning Center located just north of this intersection

Counted Traffic Volumes (peak hour)



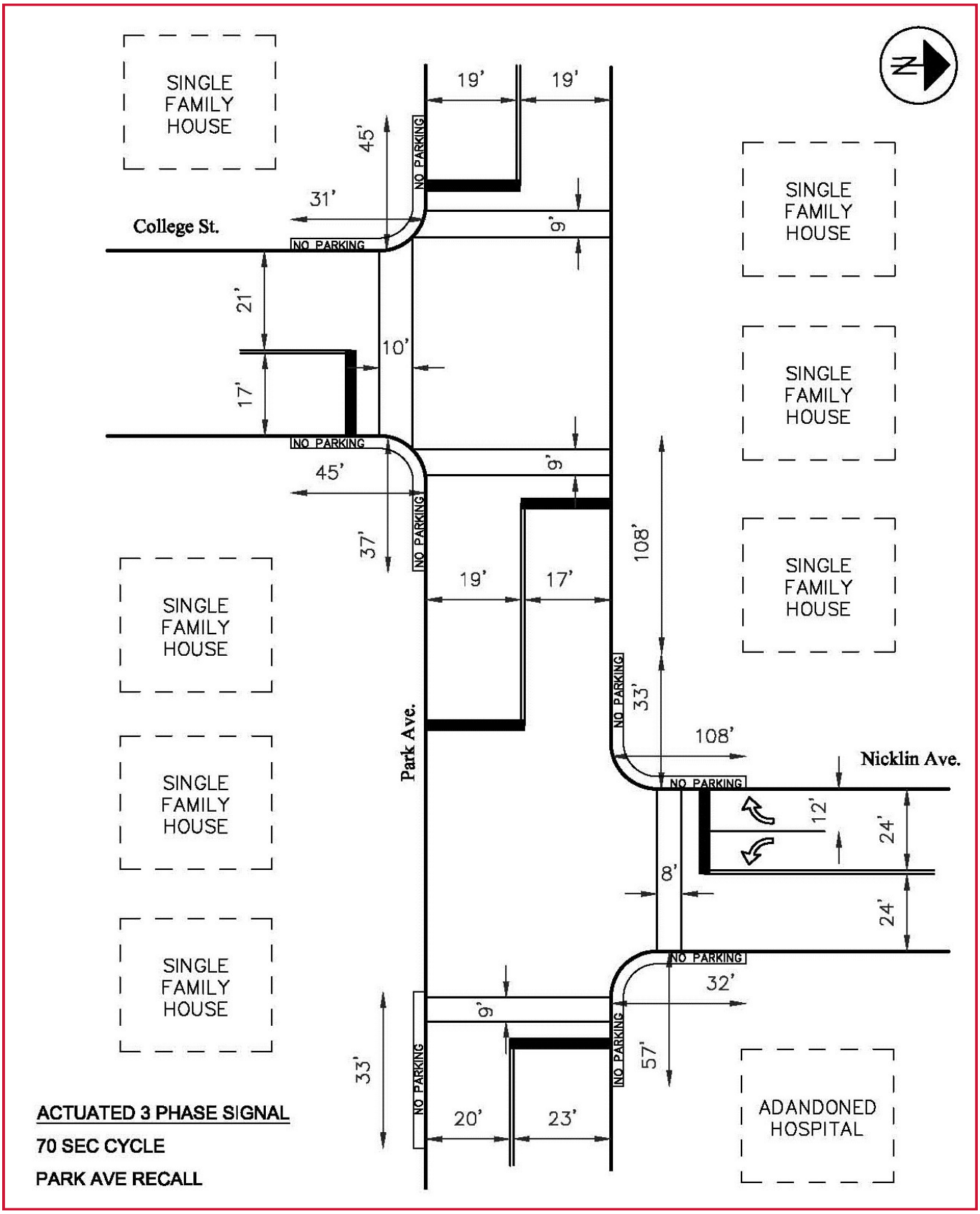
Crash History

- 3 reported crashes from 2005-2008
- No specific pattern

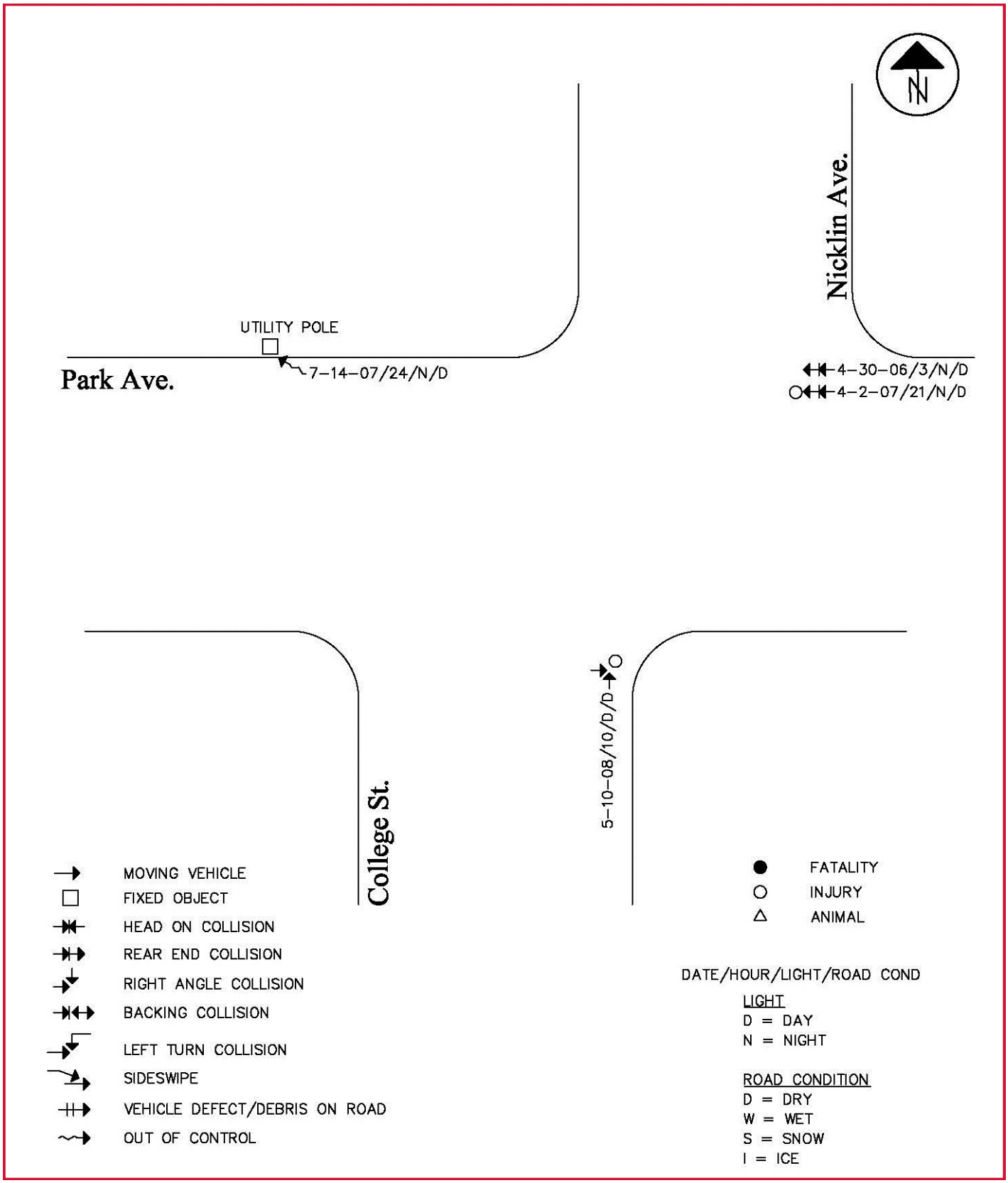
Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM



CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Park Avenue at College Street and Nicklin Avenue

Date of Counts: Thursday 10/9/2008

	SB Nicklin Ave				WB Park Ave				NB College St				EB Park Ave				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	6	3	5	0	2	23	0	0	3	5	3	2	1	69	3	0			
7:15 to 7:30 am	2	6	2	1	0	17	2	0	5	4	2	0	1	55	6	1			
7:30 to 7:45 am	3	6	1	0	3	34	9	0	3	7	1	0	3	49	7	1			
7:45 to 8:00 am	9	7	3	2	2	19	9	0	2	7	5	3	9	48	7	0			
Total	20	22	11	3	7	93	20	0	13	23	11	5	14	221	23	2	378	53	47
8:00 to 8:15 am	6	10	1	2	1	21	7	3	7	11	2	3	4	37	8	0			
8:15 to 8:30 am	13	17	3	5	0	14	9	0	6	22	0	0	10	36	5	0			
8:30 to 8:45 am	12	6	2	0	2	18	10	0	7	17	6	0	21	31	8	0			
8:45 to 9:00 am	9	5	3	0	0	13	9	0	2	6	2	0	8	31	7	0			
Total	40	38	9	7	3	66	35	3	22	56	10	3	43	135	28	0	310	87	88
2:00 to 2:15 pm	5	6	3	0	5	29	2	0	3	5	3	0	3	23	3	0			
2:15 to 2:30 pm	5	7	2	0	5	33	6	0	9	8	4	2	4	33	8	0			
2:30 to 2:45 pm	7	4	3	0	2	25	3	1	6	7	2	1	4	31	7	0			
2:45 to 3:00 pm	3	11	4	2	7	49	2	0	9	17	5	4	6	27	3	0			
Total	20	28	12	2	19	136	13	1	27	37	14	7	17	114	21	0	320	60	78
3:00 to 3:15 pm	10	8	7	1	2	49	8	0	9	20	11	1	10	29	9	0			
3:15 to 3:30 pm	12	22	3	3	6	41	9	1	19	14	8	12	9	38	5	0			
3:30 to 3:45 pm	11	14	9	0	8	32	7	0	9	11	7	5	4	34	5	1			
3:45 to 4:00 pm	14	6	5	0	7	58	9	1	16	21	8	6	10	46	4	0			
Total	47	50	24	4	23	180	33	2	53	66	34	24	33	147	23	1	439	121	153
4:00 to 4:15 pm	19	9	5	0	5	43	6	0	8	8	5	6	5	40	7	0			
4:15 to 4:30 pm	6	5	5	0	6	54	7	0	9	10	9	3	3	29	4	0			
4:30 to 4:45 pm	11	15	3	1	5	34	3	0	9	8	5	0	3	35	11	1			
4:45 to 5:00 pm	7	6	3	0	6	54	3	0	14	7	6	1	1	44	9	0			
Total	43	35	16	1	22	185	19	0	40	33	25	10	12	148	31	1	417	94	98
5:00 to 5:15 pm	8	13	7	0	11	53	2	0	21	11	8	0	6	45	10	0			
5:15 to 5:30 pm	12	13	0	2	2	37	2	0	24	14	9	2	3	45	6	1			
5:30 to 5:45 pm	3	7	10	2	6	53	5	0	10	13	12	0	5	36	16	0			
5:45 to 6:00 pm	9	6	5	1	4	41	6	1	14	9	2	0	2	42	6	2			
Total	32	39	22	5	23	184	15	1	69	47	31	2	16	168	38	3	444	93	147
Grand Total	202	212	94	22	97	844	135	7	224	262	125	51	135	933	164	7			

SIGNAL WARANT ANALYSIS SUMMARY

Park Avenue / College Street & Nicklin Avenue Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	378	53	No	378	53	No	No
8 AM to 9 AM	310	88	No	310	88	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	320	78	No	320	78	No	No
3 PM to 4 PM	439	153	No	439	153	No	No
4 PM to 5 PM	417	98	No	417	98	No	No
5 PM to 6 PM	444	147	No	444	147	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

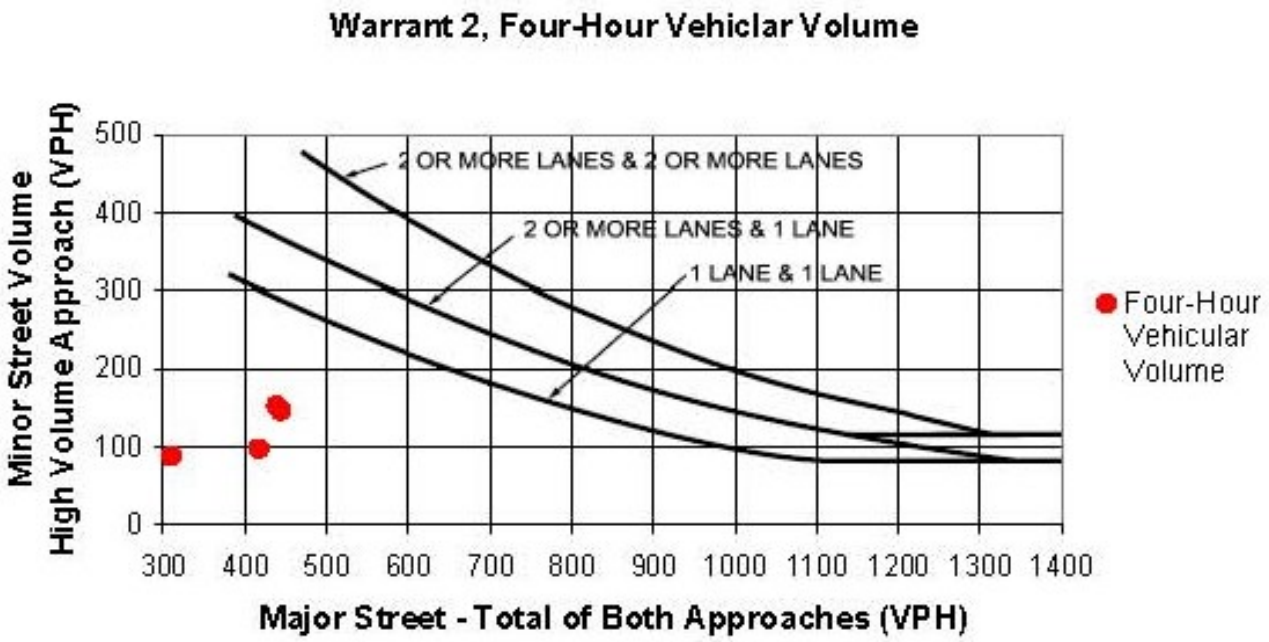
This intersection is not located at a critical point along a coordinated signal system.

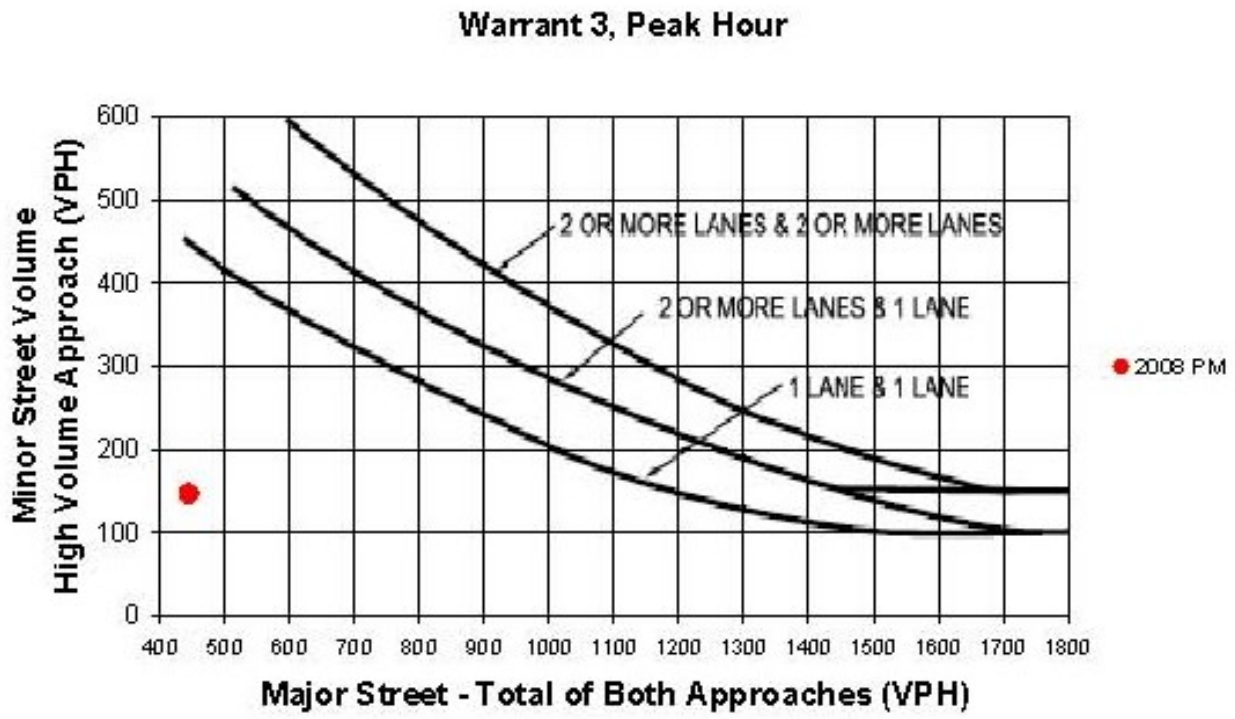
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, one right-angle crash was reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has less than 700 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM

Park Ave & Broadway Street

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of Park Avenue with Broadway Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. Ann Mira Das Park is located in the northeast corner of the intersection. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The west and south legs of the intersection are designated as SR 185. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location on the State Route.

Public Comments

- "There used to be a school on one corner of the intersection that is no longer there."
- "There is truck traffic on SR 185."
- "Consider re-routing SR 185 to a less residential area."
- "If SR 185 were to be re-routed, the traffic signal would not be needed at this intersection."

Analyses Results

- Traffic signal warrants are not met
- Three reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

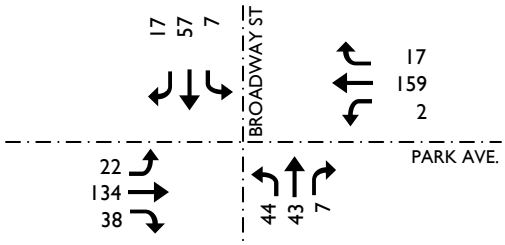
Due to the fact that SR 185 is routed through this intersection and that the existing traffic signals at the Broadway Street intersections with North Street and Ash Street are recommended to remain in operation, it is recommended that the traffic signal at this intersection remain in operation as well. Keeping this traffic signal in operation will provide consistency in the traffic control along Broadway Street. However, in order to reduce unnecessary stopping and delays, particularly for motorists on Park Avenue, it is recommended that the traffic signal be converted to actuated operation with pedestrian pushbuttons and pedestrian signal indications. The signal should rest in green on the Park Avenue phase.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- SR 185 carried by west and south legs

Counted Traffic Volumes (peak hour)



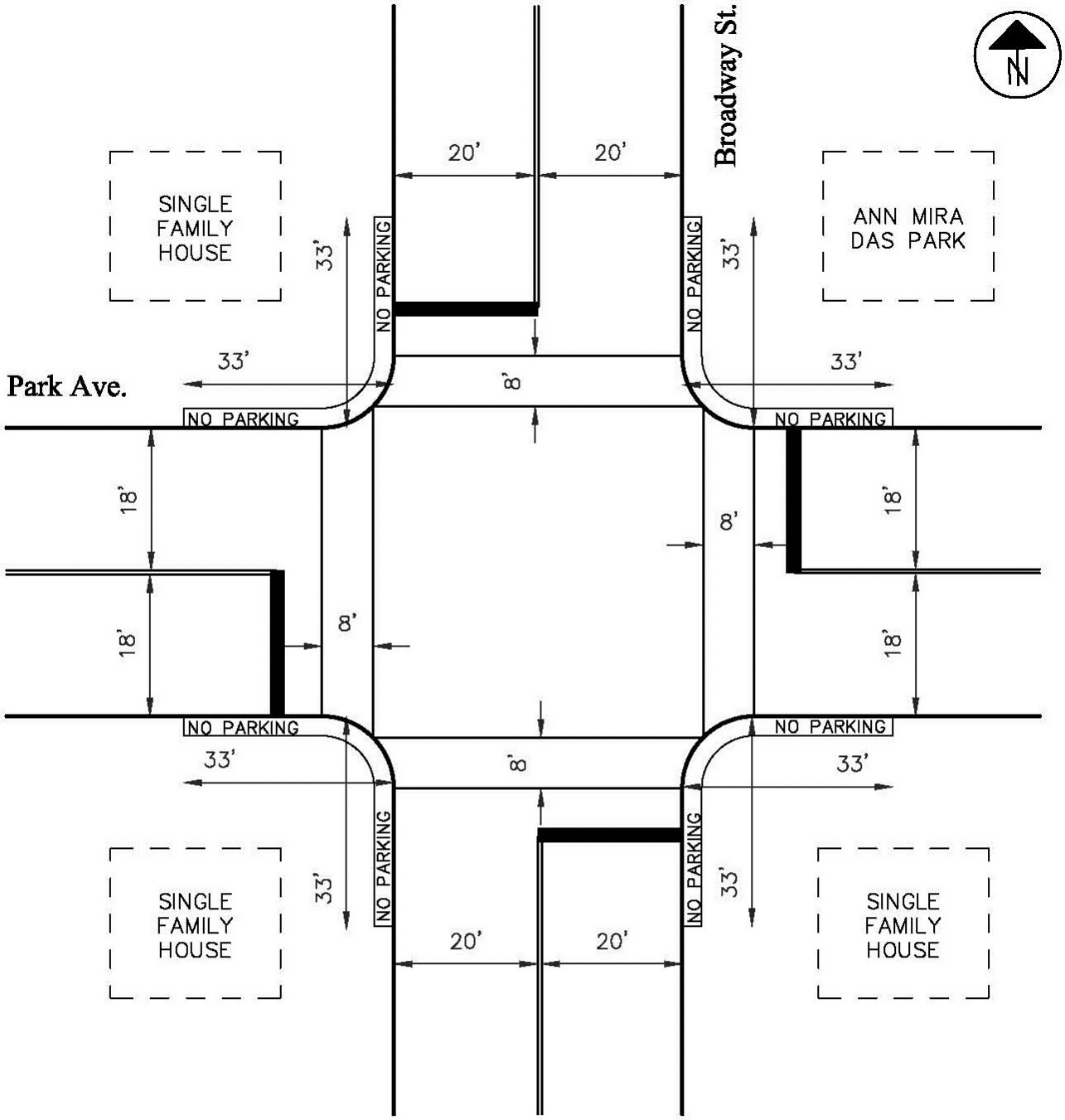
Crash History

- 3 reported crashes from 2005-2008
- Primarily angle type crashes

Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM



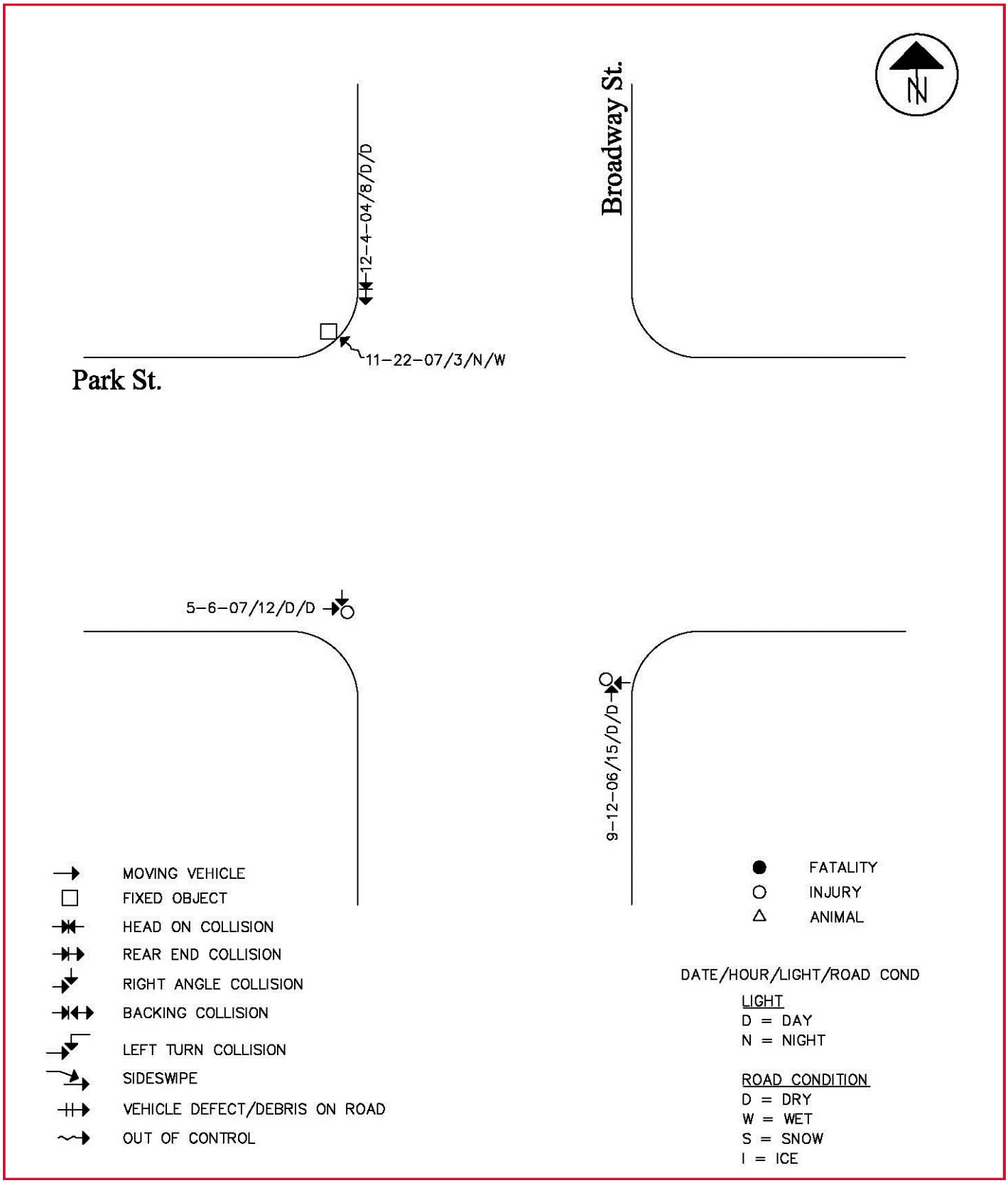
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

30 SEC N/S SPLIT

40 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Broadway Street at Park Avenue

Date of Counts: Thursday 8/7/2008

	SB Broadway St				WB Park Ave				NB Broadway St				EB Park Ave				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	3	3	1	0	15	3	0	2	4	0	0	1	25	3	0			
7:15 to 7:30 am	0	13	1	0	0	19	2	0	3	1	0	0	0	28	3	0			
7:30 to 7:45 am	2	11	3	0	0	9	3	0	6	2	3	1	3	46	13	0			
7:45 to 8:00 am	4	14	4	0	0	27	3	0	2	7	2	0	0	48	13	0			
Total	6	41	11	1	0	70	11	0	13	14	5	1	4	147	32	0	264	58	32
8:00 to 8:15 am	1	15	0	0	1	14	3	0	3	5	0	0	2	28	9	0			
8:15 to 8:30 am	1	11	2	0	0	18	2	0	0	0	0	0	1	45	12	0			
8:30 to 8:45 am	2	6	1	0	2	15	1	0	4	3	0	0	0	23	8	0			
8:45 to 9:00 am	0	4	0	0	0	8	0	0	5	7	1	0	4	38	5	0			
Total	4	36	3	0	3	55	6	0	12	15	1	0	7	134	34	0	239	43	28
4:00 to 4:15 pm	1	6	0	2	2	35	2	0	11	2	0	0	4	50	12	0			
4:15 to 4:30 pm	1	14	2	0	0	40	2	0	7	12	2	0	3	25	11	0			
4:30 to 4:45 pm	2	13	4	0	1	38	3	0	10	15	1	0	3	40	17	0			
4:45 to 5:00 pm	3	15	3	0	1	36	2	0	5	15	1	0	4	29	9	0			
Total	7	48	9	2	4	149	9	0	33	44	4	0	14	144	49	0	369	64	81
5:00 to 5:15 pm	2	15	3	0	0	34	5	0	9	12	0	0	7	34	11	0			
5:15 to 5:30 pm	0	11	9	0	0	49	5	1	6	16	2	0	5	30	7	1			
5:30 to 5:45 pm	2	10	2	0	2	34	3	0	18	8	3	0	3	34	13	0			
5:45 to 6:00 pm	3	21	3	0	0	42	4	0	11	7	2	0	7	36	7	0			
Total	7	57	17	0	2	159	17	1	44	43	7	0	22	134	38	1	372	81	94
Grand Total	24	182	40	3	9	433	43	1	102	116	17	1	47	559	153	1			

SIGNAL WARANT ANALYSIS SUMMARY

Broadway Street /Park Avenue Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threshold	500	150		750	75		
7 AM to 8 AM	264	58	No	264	58	No	No
8 AM to 9 AM	239	43	No	239	43	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	369	81	No	369	81	No	No
5 PM to 6 PM	372	94	No	372	94	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

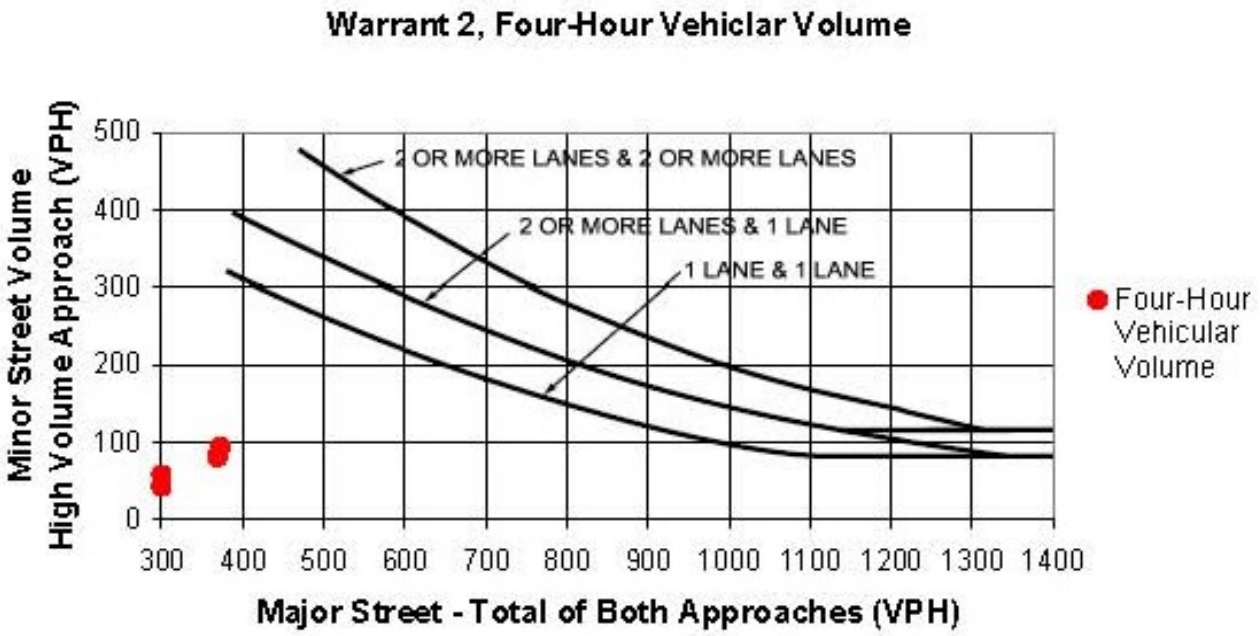
This intersection is not located at a critical point along a coordinated signal system.

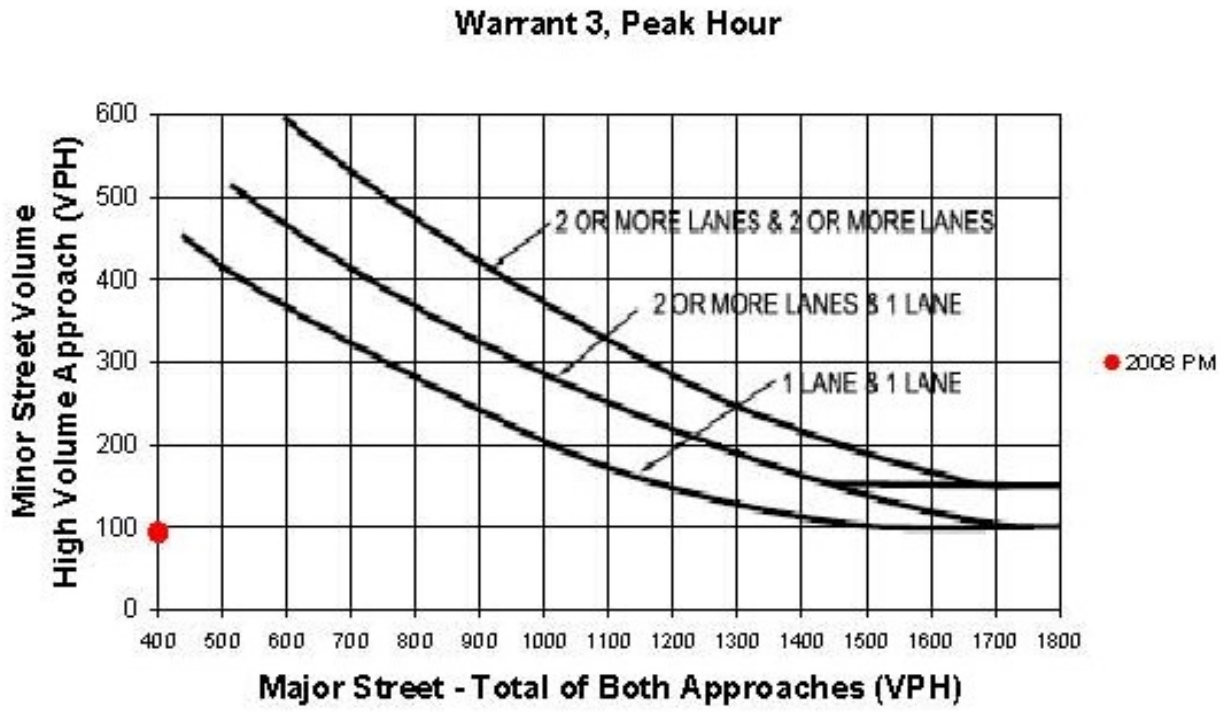
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has fewer than 550 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM

Broadway Street & North Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of Broadway Street with North Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Broadway Street is designated as SR 185 through this intersection. Piqua Catholic School is located just west of this intersection. A number of pedestrians were observed crossing the roadway at this intersection during school arrival and dismissal periods. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location on the State Route.

Public Comments

– No specific comments were discussed regarding this intersection.

Analyses Results

– Traffic signal warrants are not met

– Two reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

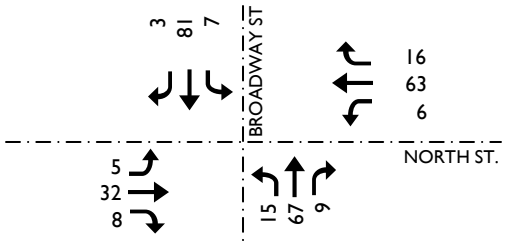
Due to the pedestrian crossings observed at this intersection during the school arrival and dismissal periods, it is recommended that the traffic signal at this intersection be retained. However, in order to reduce unnecessary stopping and delays, particularly for motorists on Broadway Street, it is recommended that the traffic signal be converted to actuated operation with pedestrian pushbuttons and pedestrian signal indications. The signal should rest in green on the Broadway Street phase.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located near Piqua Catholic School

Counted Traffic Volumes (peak hour)



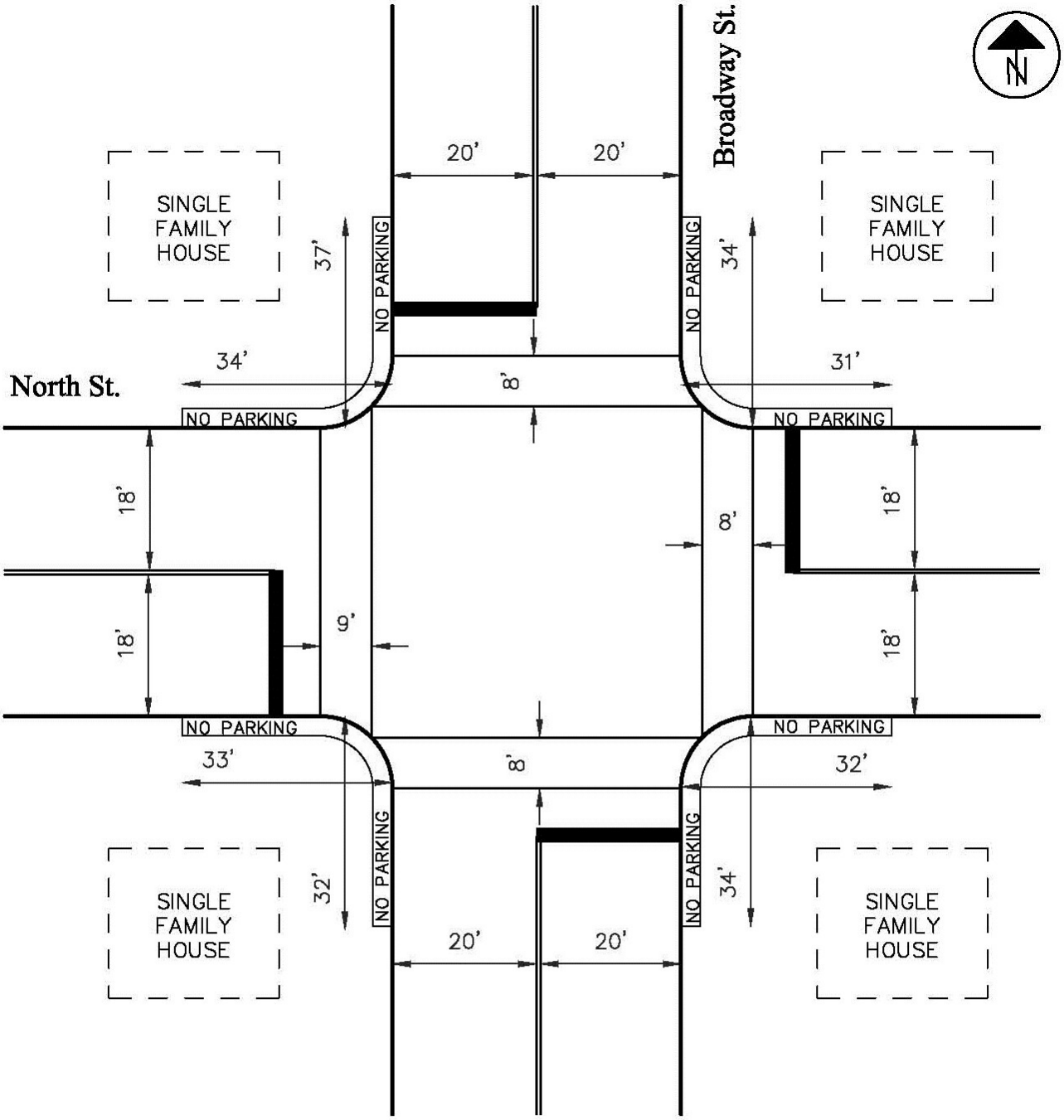
Crash History

- 2 reported crashes from 2005-2008
- Angle type crashes

Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM



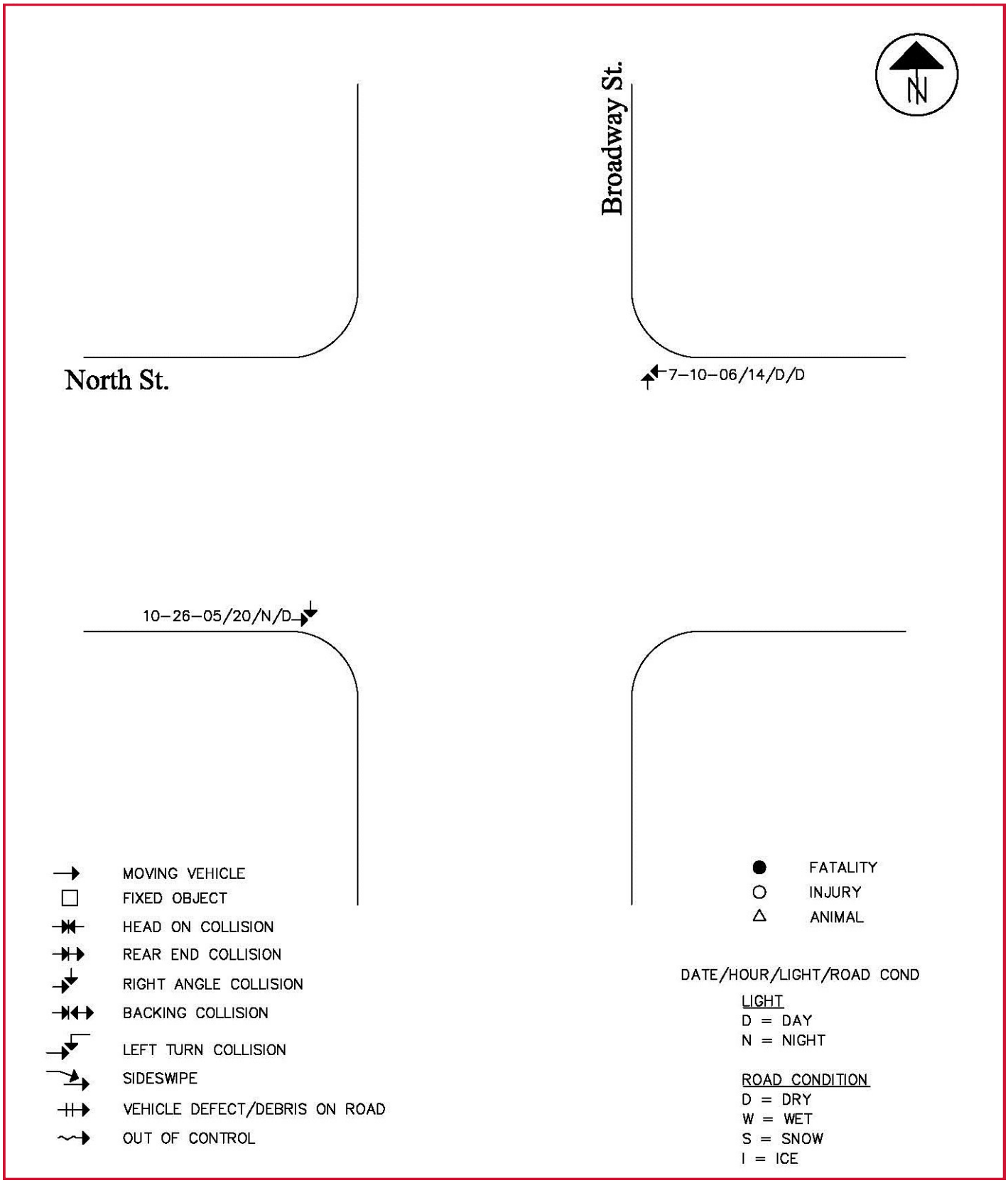
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

42 SEC N/S SPLIT

28 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Broadway Street at North Street

Date of Counts: Thursday 10/9/2008

	SB Broadway St				WB North St				NB Broadway St				EB North St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	6	18	2	2	3	7	1	1	0	1	5	1	1	7	2	1			
7:15 to 7:30 am	1	16	1	0	2	7	2	0	1	4	2	0	0	8	1	0			
7:30 to 7:45 am	2	28	2	0	2	1	4	0	1	5	1	0	0	10	1	0			
7:45 to 8:00 am	1	27	0	1	4	6	1	0	2	14	1	0	0	2	3	0			
Total	10	89	5	3	11	21	8	1	4	24	9	1	1	27	7	1	141	40	35
8:00 to 8:15 am	2	13	5	0	0	16	2	1	6	7	4	0	1	5	5	2			
8:15 to 8:30 am	2	27	3	0	0	3	2	0	4	7	2	2	0	1	4	0			
8:30 to 8:45 am	0	20	0	0	0	2	2	0	3	11	0	0	2	1	1	0			
8:45 to 9:00 am	1	19	1	0	0	1	0	0	2	7	0	0	0	2	1	0			
Total	5	79	9	0	0	22	6	1	15	32	6	2	3	9	11	2	146	28	23
2:00 to 2:15 pm	0	14	0	0	1	6	2	0	1	9	1	0	1	5	0	0			
2:15 to 2:30 pm	1	14	0	0	4	9	5	0	0	23	0	0	0	6	0	0			
2:30 to 2:45 pm	3	16	0	0	1	8	2	0	2	14	0	0	1	5	0	0			
2:45 to 3:00 pm	1	24	1	0	4	11	1	0	1	14	3	0	0	4	2	0			
Total	5	68	1	0	10	34	10	0	4	60	4	0	2	20	2	0	142	54	24
3:00 to 3:15 pm	1	16	2	0	2	13	4	0	6	21	1	2	2	7	2	4			
3:15 to 3:30 pm	3	24	1	2	2	23	3	3	4	13	2	7	2	8	2	10			
3:30 to 3:45 pm	1	20	0	1	1	11	5	1	3	14	3	0	1	9	2	1			
3:45 to 4:00 pm	2	21	0	1	1	16	4	0	2	19	3	1	0	8	2	2			
Total	7	81	3	4	6	63	16	4	15	67	9	10	5	32	8	17	182	85	45
Grand Total	27	317	18	7	27	140	40	6	38	183	28	13	11	88	28	20			

SIGNAL WARANT ANALYSIS SUMMARY

Broadway Street /North Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St Hourly Volume	Minor St Hourly Volume	Criteria Satisfied?	Major St Hourly Volume	Minor St Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	141	40	No	141	40	No	No
8 AM to 9 AM	146	28	No	146	28	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	142	54	No	142	54	No	No
3 PM to 4 PM	182	85	No	182	85	No	No
4 PM to 5 PM			No			No	No
5 PM to 6 PM			No			No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

Piqua Catholic Elementary School is located near the intersection. The majority of pedestrian crossings during the traffic counts were school related; however, the total number of minor street crossings during the afternoon peak was 21 – only one more than the minimum required. Available crossing gaps were not measured, but due to the low volumes sufficient gaps are anticipated.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

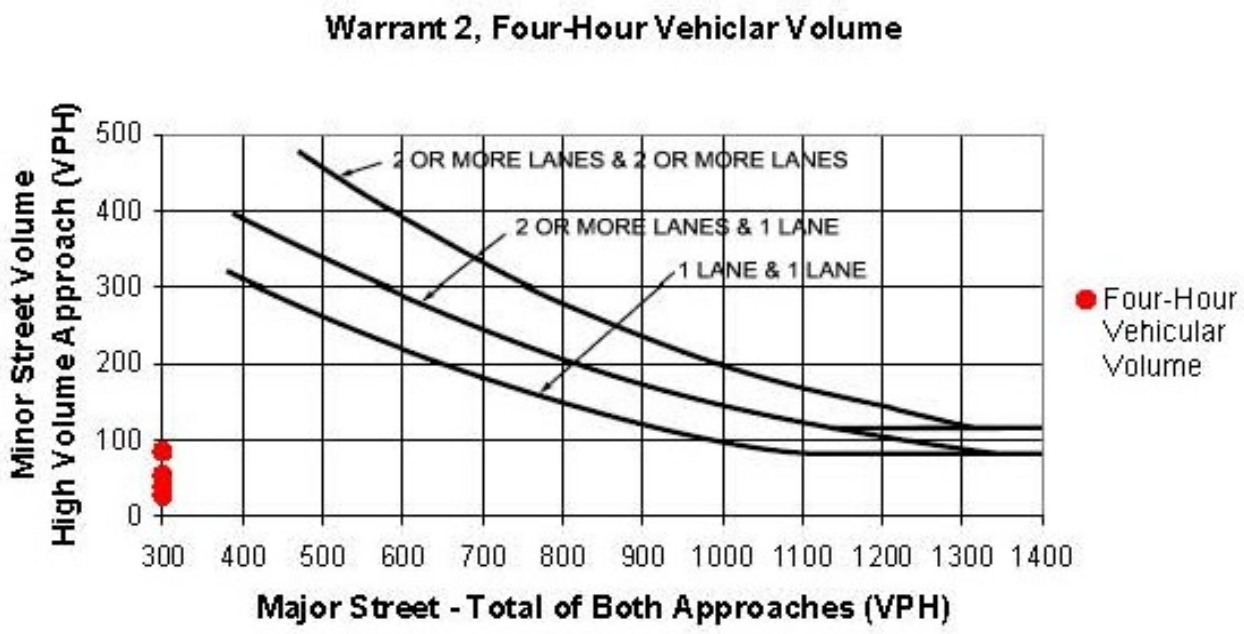
This intersection is not located at a critical point along a coordinated signal system.

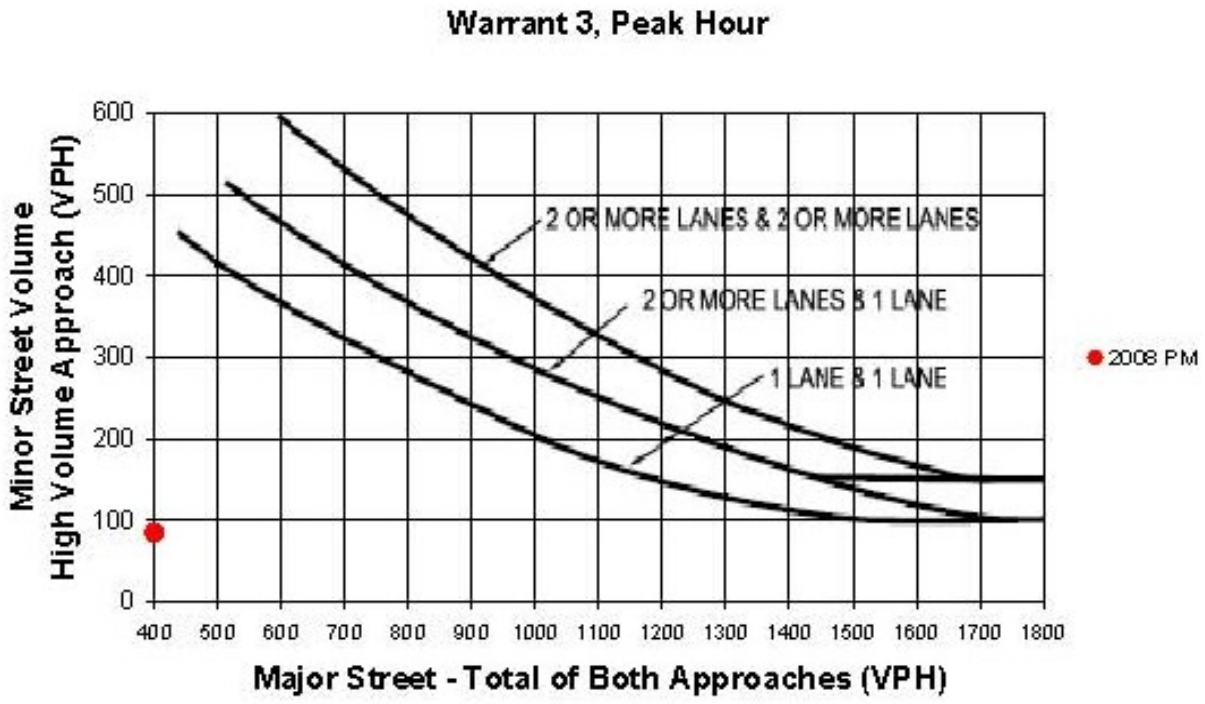
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has fewer than 315 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

Ash Street & Broadway Street

Aerial Photo:

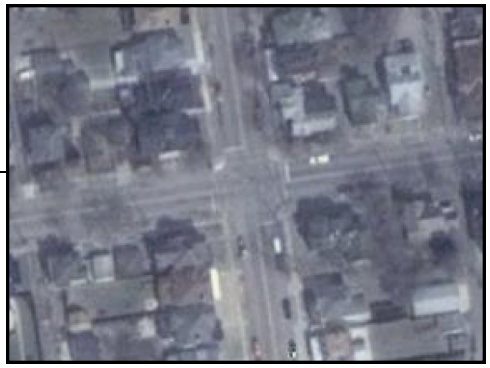


Photo: Looking South

Existing Conditions Discussion

The intersection of Ash Street with Broadway Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 60-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The north and east legs of the intersection are designated as SR 185. Shrubbery in the southwest corner and part of a home and a tree in the northeast corner partially restrict visibility at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to its location on the State Route.

Public Comments

– "Traffic signal is not needed."

Analyses Results

– Traffic signal warrants are not met

– No reported crashes at the intersection from Jan. 2005 to June 2008

Recommendations

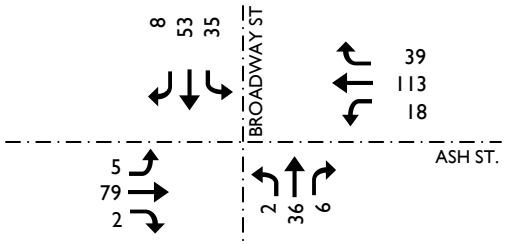
Due to the fact that SR 185 is routed through this intersection and that this intersection is conveniently located for motorists that want to divert from Ash Street to High Street and vice-versa, it is recommended that the traffic signal at this intersection remain in operation. However, in order to reduce unnecessary stopping and delays, particularly for motorists on Broadway Street, it is recommended that the traffic signal be converted to actuated operation with pedestrian pushbuttons and pedestrian signal indications. The signal should rest in green on the Ash Street phase.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- SR 185 carried by north and east legs

Counted Traffic Volumes (peak hour)



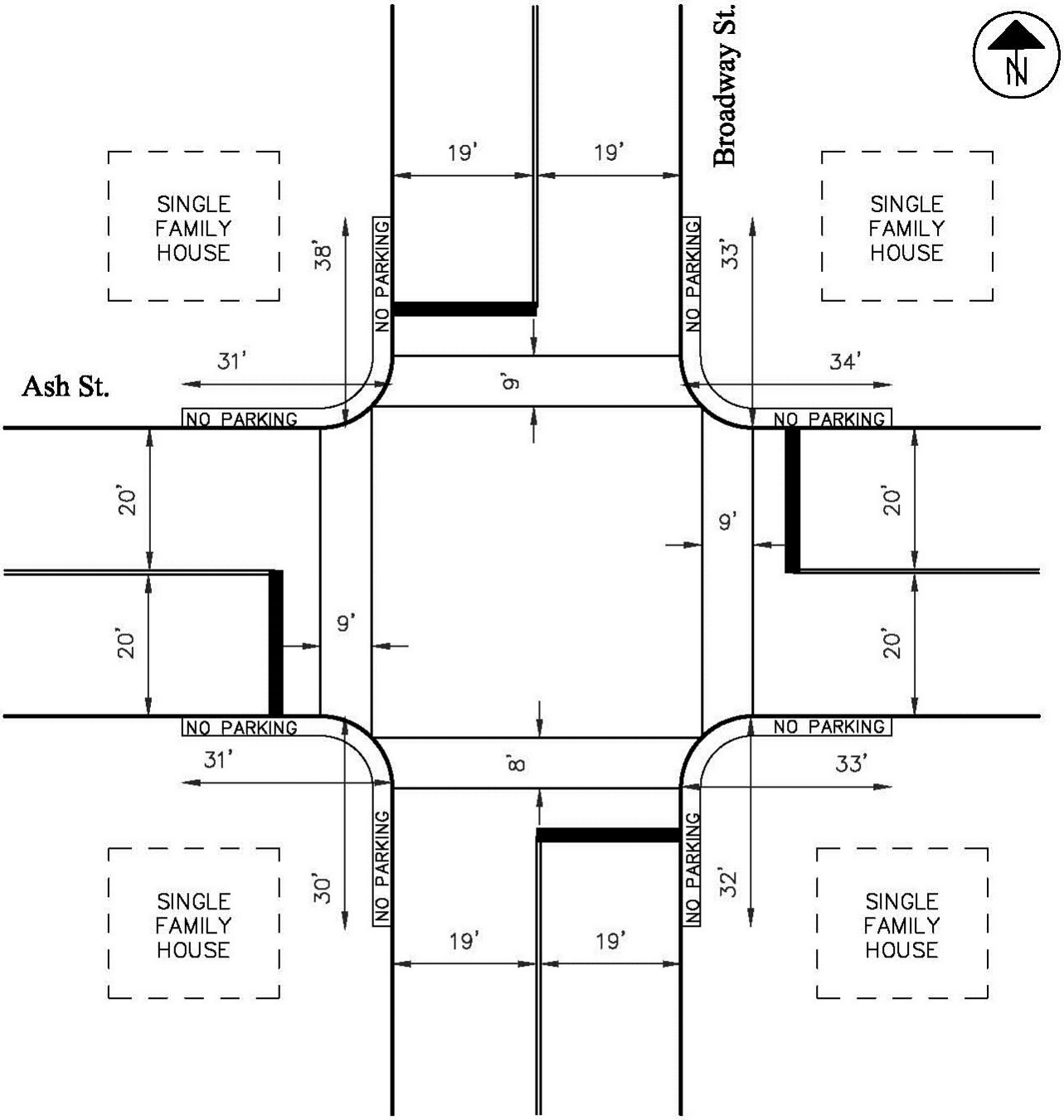
Crash History

- 0 reported crashes from 2005-2008

Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM



PRETIMED 2 PHASE SIGNAL

60 SEC CYCLE

30 SEC N/S SPLIT

30 SEC E/W SPLIT

Turning Movement Counts Summary Table

Location: Broadway Street at Ash Street

Date of Counts: Thursday 8/7/2008

	SB Broadway St				WB Ash St				NB Broadway St				EB Ash St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	5	3	0	0	1	10	4	0	0	2	1	0	0	10	0	0			
7:15 to 7:30 am	9	7	0	0	0	12	3	0	0	1	1	0	0	15	0	0			
7:30 to 7:45 am	9	15	1	1	4	10	4	0	0	4	3	2	1	23	0	0			
7:45 to 8:00 am	11	16	0	0	1	12	3	4	1	2	3	0	2	19	1	1			
Total	34	41	1	1	6	44	14	4	1	9	8	2	3	67	1	1	135	76	18
8:00 to 8:15 am	12	10	0	0	0	12	4	0	0	2	1	0	0	18	0	0			
8:15 to 8:30 am	18	9	1	0	0	12	0	0	2	1	3	0	0	26	0	0			
8:30 to 8:45 am	8	6	1	0	0	8	4	1	1	3	0	0	0	15	0	0			
8:45 to 9:00 am	6	4	0	0	1	13	5	1	0	5	2	0	0	17	1	0			
Total	44	29	2	0	1	45	13	2	3	11	6	0	0	76	1	0	136	75	20
4:00 to 4:15 pm	5	10	0	4	1	31	15	2	0	5	3	4	2	24	0	2			
4:15 to 4:30 pm	10	10	2	0	3	30	8	0	1	8	1	2	1	18	0	0			
4:30 to 4:45 pm	14	13	2	0	6	23	11	4	0	13	0	3	2	18	2	0			
4:45 to 5:00 pm	6	20	4	2	8	29	5	1	1	10	2	0	0	19	0	0			
Total	35	53	8	6	18	113	39	7	2	36	6	9	5	79	2	2	256	96	44
5:00 to 5:15 pm	6	20	4	2	8	29	5	1	1	10	2	0	0	19	0	0			
5:15 to 5:30 pm	10	12	2	4	2	25	14	0	0	10	1	0	0	21	1	3			
5:30 to 5:45 pm	10	12	2	4	2	25	14	0	0	10	1	0	0	21	1	3			
5:45 to 6:00 pm	8	13	1	0	0	23	14	4	0	3	2	0	0	19	0	0			
Total	34	57	9	10	12	102	47	5	1	33	6	0	0	80	2	6	243	100	40
Grand Total	147	180	20	17	37	304	113	18	7	89	26	11	8	302	6	9			

SIGNAL WARANT ANALYSIS SUMMARY

Broadway Street /Ash Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the PM peak hour and not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	135	76	No	135	76	No	No
8 AM to 9 AM	136	75	No	136	75	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	256	96	No	256	96	No	No
5 PM to 6 PM	243	100	No	243	100	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from four hours during the AM and PM peak were plotted on the Warrant 2 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is below the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

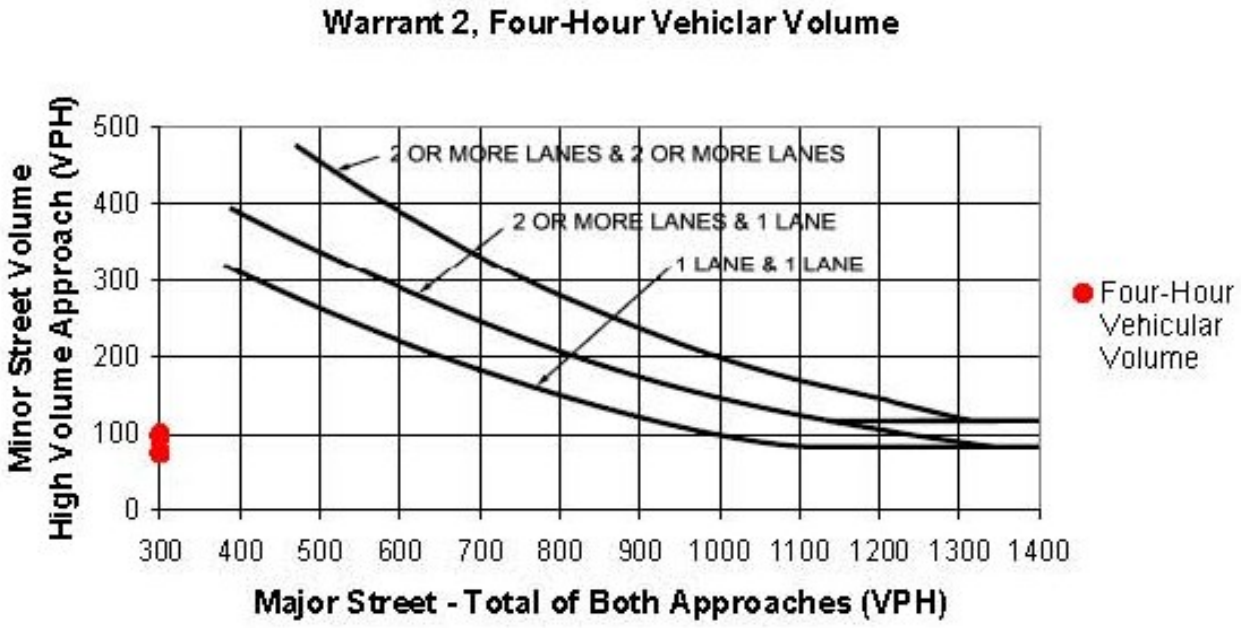
This intersection is not located at a critical point along a coordinated signal system.

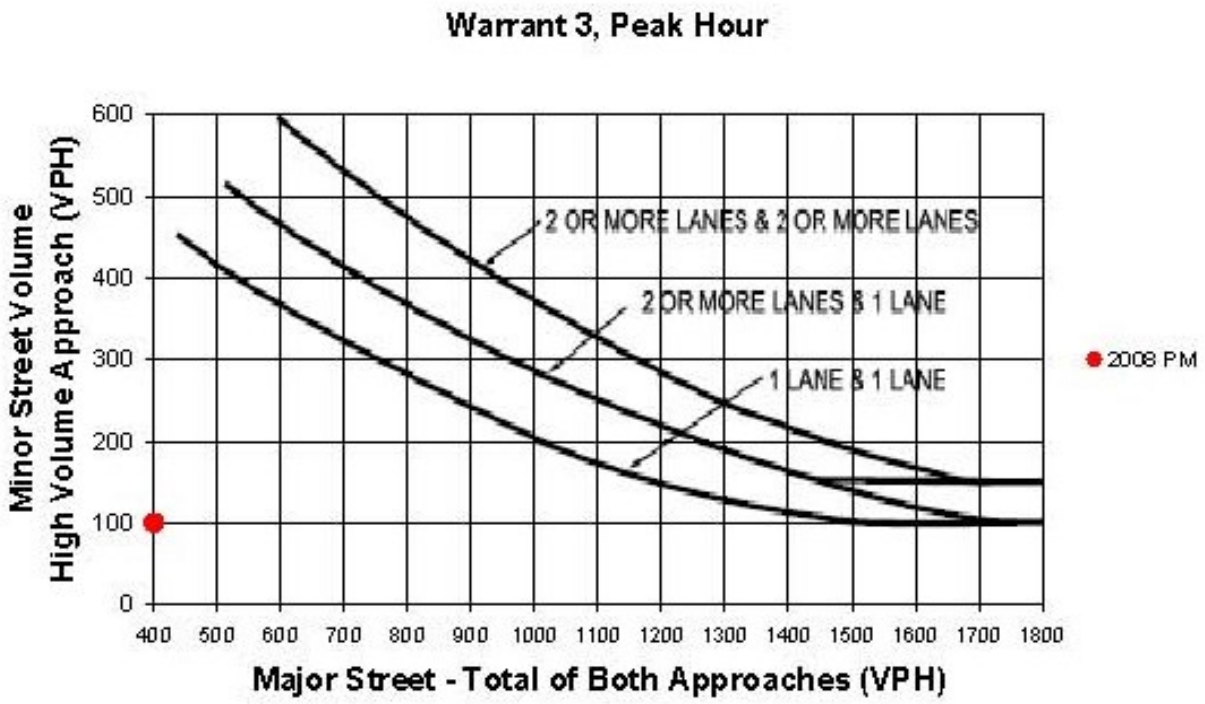
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has under 400 total approaching trips. This is much less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

Ash Street & Downing Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of Ash Street with Downing Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Ash Street is designated as SR 185 through this intersection. A church building on the southeast corner of the intersection partially restricts sight distance at the intersection; however, visibility is adequate if motorists stop beyond the stop bar closer to the intersection. The primary concerns at this intersection are the warrant status of the existing traffic signal as well as the timing and/or operation of the existing traffic signal and whether the signal should be coordinated with adjacent traffic signals. This signal may have been installed initially due to its location on the State Route and its proximity to the central business district.

Public Comments

- "Traffic signal is not needed."
- "Two-way stop may be appropriate."

Analyses Results

- Traffic signal warrants are not met
- Three reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control with stop signs on Downing Street provides adequate capacity

Recommendations

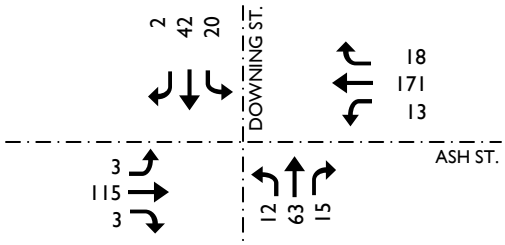
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Based on the traffic volumes entering the intersection on each roadway, two-way stop control with stop signs on Downing Street is recommended. Also, curb bump-outs should be considered to provide adequate locations for stop sign visibility. These modifications could be performed in conjunction with the potential future re-routing of SR 185.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



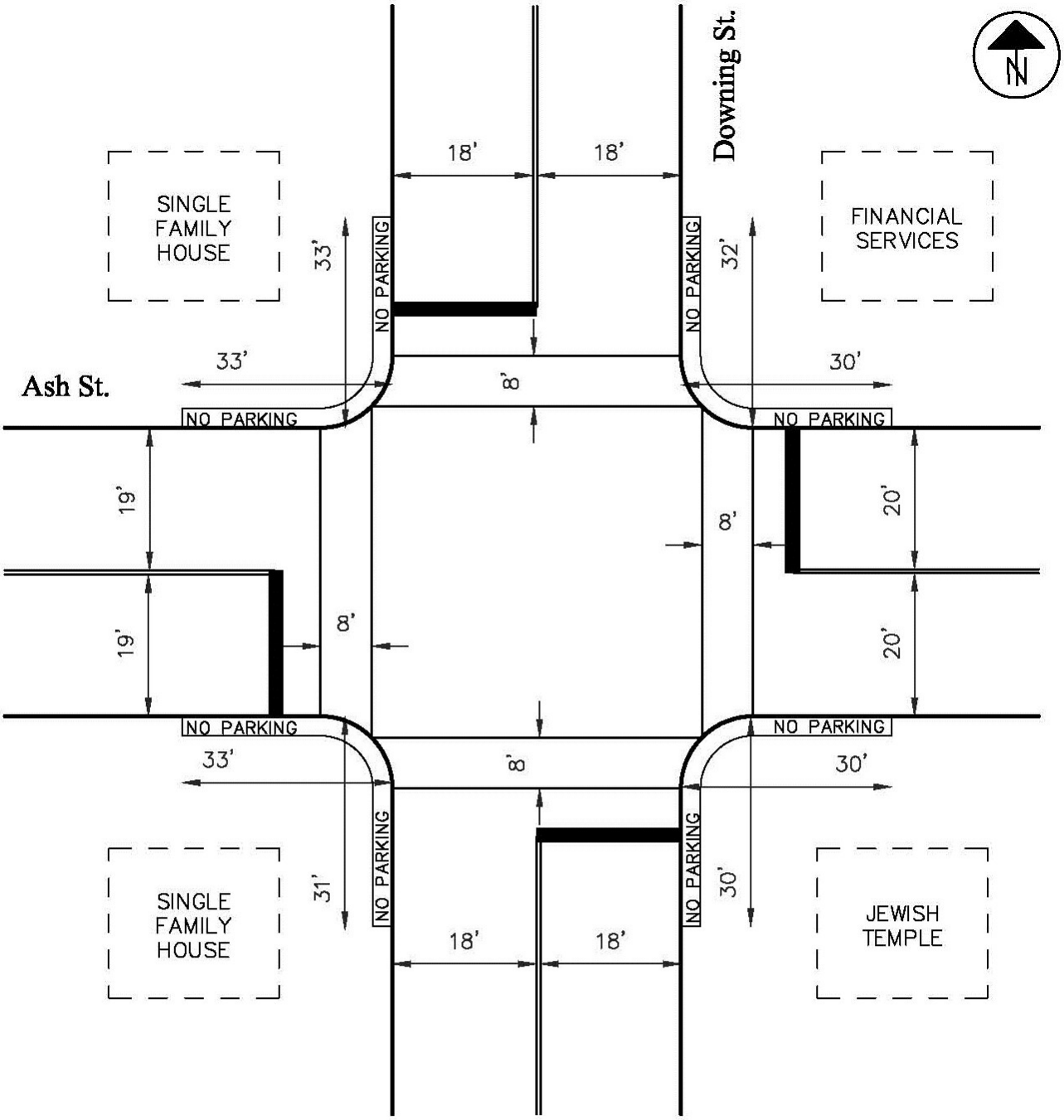
Crash History

- 3 reported crashes from 2005-2008
- Primarily rear-end type crashes

Recommendation

- Consider replacing traffic signal with two-way stop, with stop signs on Downing Street

INTERSECTION DIAGRAM



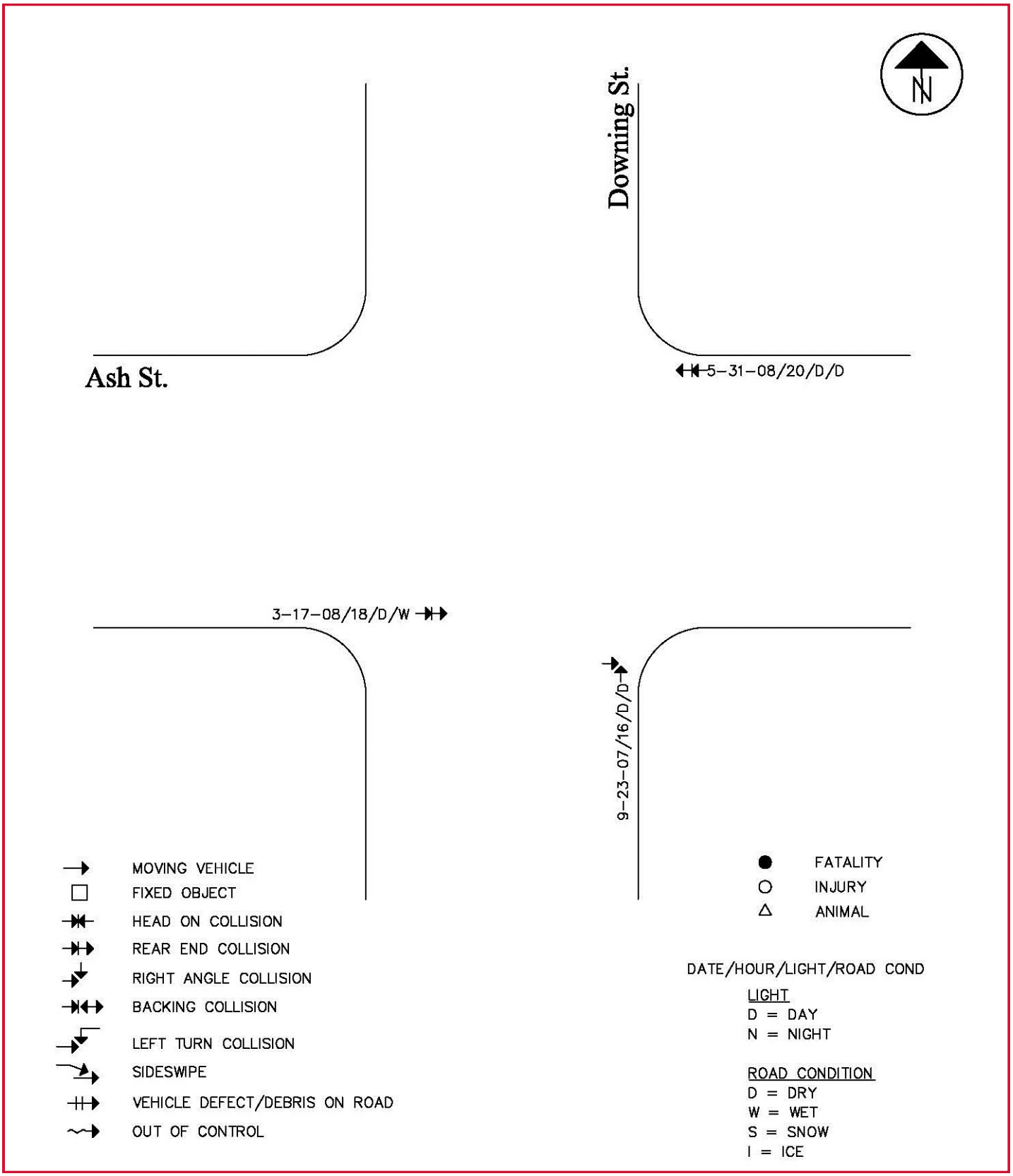
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT

35 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Downing Street at Ash Street

Date of Counts: Thursday 8/13/2008

	SB Downing St				WB Ash St				NB Downing St				EB Ash St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	3	8	1	0	0	9	1	1	1	5	2	0	1	25	0	0			
7:15 to 7:30 am	2	9	0	0	3	19	0	0	1	2	3	1	1	26	0	0			
7:30 to 7:45 am	12	5	2	0	0	13	1	0	0	3	4	0	1	51	2	1			
7:45 to 8:00 am	7	13	4	0	1	17	2	3	0	7	5	2	0	31	2	0			
Total	24	35	7	0	4	58	4	4	2	17	14	3	3	133	4	1	206	66	33
8:00 to 8:15 am	3	13	1	0	2	15	1	0	1	5	4	0	1	29	3	0			
8:15 to 8:30 am	6	13	2	0	4	20	2	0	0	3	3	0	0	31	1	0			
8:30 to 8:45 am	4	11	0	0	3	16	1	0	1	6	5	3	1	29	0	0			
8:45 to 9:00 am	3	6	0	0	3	13	0	0	1	9	6	0	0	27	0	0			
Total	16	43	3	0	12	64	4	0	3	23	18	3	2	116	4	0	202	62	44
4:00 to 4:15 pm	3	12	0	1	6	47	2	1	2	20	6	3	0	34	1	0			
4:15 to 4:30 pm	4	8	4	1	6	31	2	0	1	17	4	0	1	27	1	0			
4:30 to 4:45 pm	4	14	0	0	5	36	4	0	2	11	7	0	0	31	2	1			
4:45 to 5:00 pm	7	8	1	1	2	47	3	1	2	5	11	3	3	26	0	1			
Total	18	42	5	3	19	161	11	2	7	53	28	6	4	118	4	2	317	65	88
5:00 to 5:15 pm	4	15	1	0	4	64	6	0	5	18	6	1	1	33	1	0			
5:15 to 5:30 pm	5	10	0	3	3	33	4	0	3	22	3	1	0	24	1	0			
5:30 to 5:45 pm	6	10	1	0	4	38	3	1	2	12	4	0	1	28	0	2			
5:45 to 6:00 pm	5	7	0	0	2	36	5	0	2	11	2	0	1	30	1	0			
Total	20	42	2	3	13	171	18	1	12	63	15	2	3	115	3	2	323	64	90
Grand Total	78	162	17	6	48	454	37	7	24	156	75	14	12	482	15	5			

SIGNAL WARANT ANALYSIS SUMMARY

Downing Street / Ash Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	206	66	No	206	66	No	No
8 AM to 9 AM	202	62	No	202	62	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	317	88	No	317	88	No	No
5 PM to 6 PM	323	90	No	323	90	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

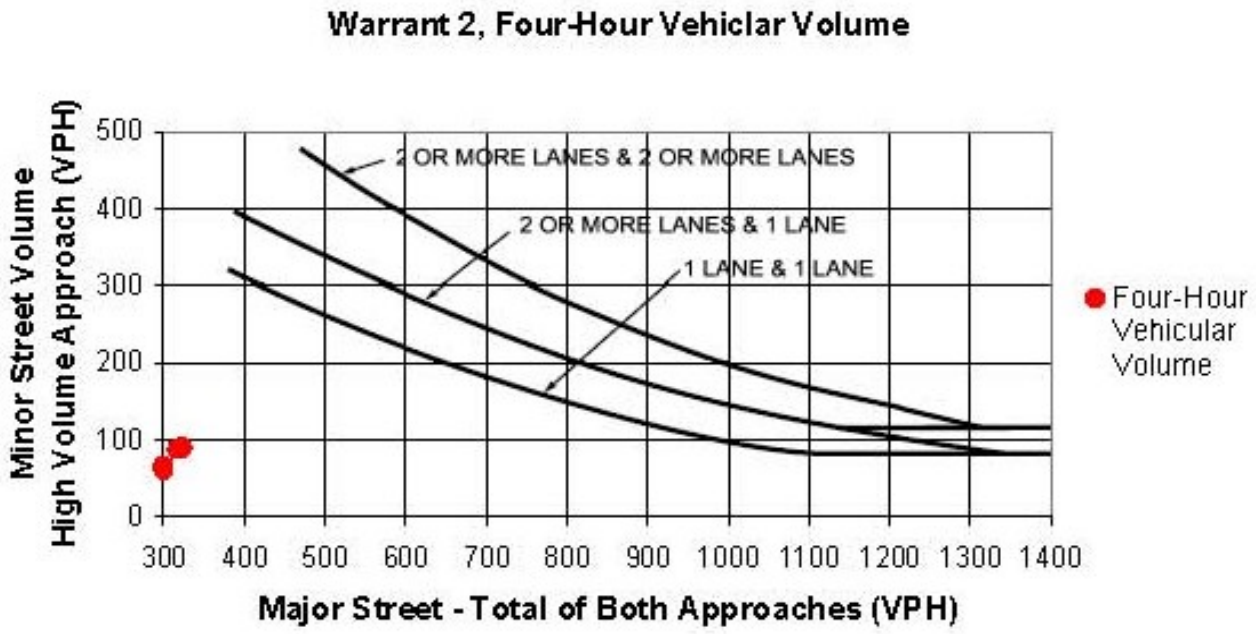
This intersection is not located at a critical point along a coordinated signal system.

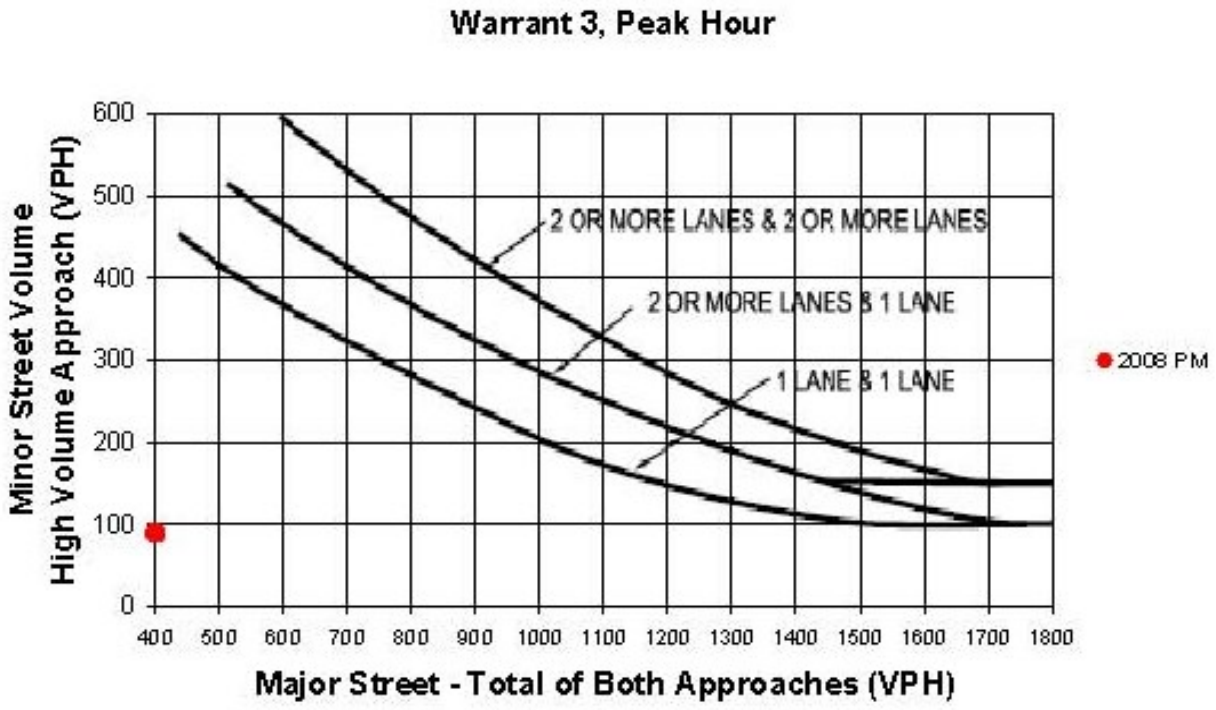
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, one right-angle crash was reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has fewer than 500 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*Downing at Ash*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description

East/West Street: *Ash Street*	North/South Street: *Downing Street*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	3	115	3	13	171	18
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	3	127	3	14	190	20
Percent Heavy Vehicles	0	--	--	2	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	12	63	15	20	42	2
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	13	70	16	22	46	2
Percent Heavy Vehicles	0	1	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	3	14		99			70	
C (m) (veh/h)	1366	1451		581			535	
v/c	0.00	0.01		0.17			0.13	
95% queue length	0.01	0.03		0.61			0.45	
Control Delay (s/veh)	7.6	7.5		12.5			12.7	
LOS	A	A		B			B	
Approach Delay (s/veh)	--	--	12.5			12.7		
Approach LOS	--	--	B			B		

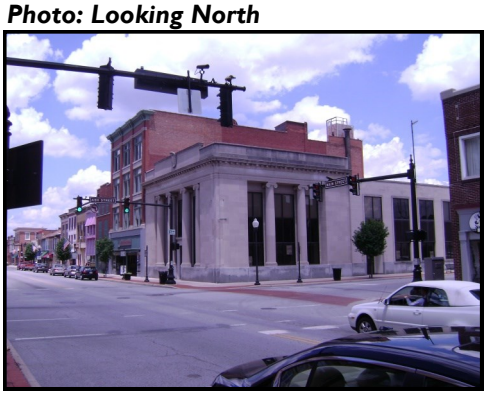
Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/13/2008 4:28 PM

Ash Street & Main Street

Aerial Photo:

Photo: Looking North



Existing Conditions Discussion

The intersection of Ash Street with Main Street has four approaches intersecting at a 90-degree angle and is currently signal controlled. The Ash Street approaches each have two lanes - one left-turn only lane and one through-right shared lane. Both directions of Main Street have single lane approaches. Left-turns from Main Street are prohibited at this intersection. The actuated signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Ash Street is designated as SR 185 through this intersection. This intersection is located in the central business district. The primary concerns at this intersection are whether or not the existing traffic signal is warranted, to determine if there is an appropriate balance between the use of turn lanes and on-street parking in the area of this intersection, and to determine if the on-street parking layout interferes with the operation of the intersection. This traffic signal was likely installed initially due to its location in the central business district.

Public Comments

- "Need to determine if left turn lanes are needed."
- "There is a significant number of left turns made from Ash Street."

Analyses Results

- Traffic Signal Warrant 8 is met
- Two reported crashes at the intersection from Jan. 2005 to June 2008
- Adequate capacity is provided with and without left-turn lanes on Ash Street

Recommendations

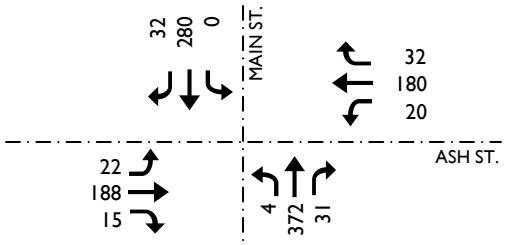
Due to the potential for future growth in traffic volumes, the fact that Signal Warrant 8 is met, and the intersection's location along SR 185 in the central business district, it is recommended that the traffic signal and the existing lane configuration be retained.

Intersection at a Glance

Existing Conditions

- Mast arm traffic signal
- Left-turn lanes Ash Street
- Left turns prohibited from Main Street
- Located in central business district

Counted Traffic Volumes (peak hour)



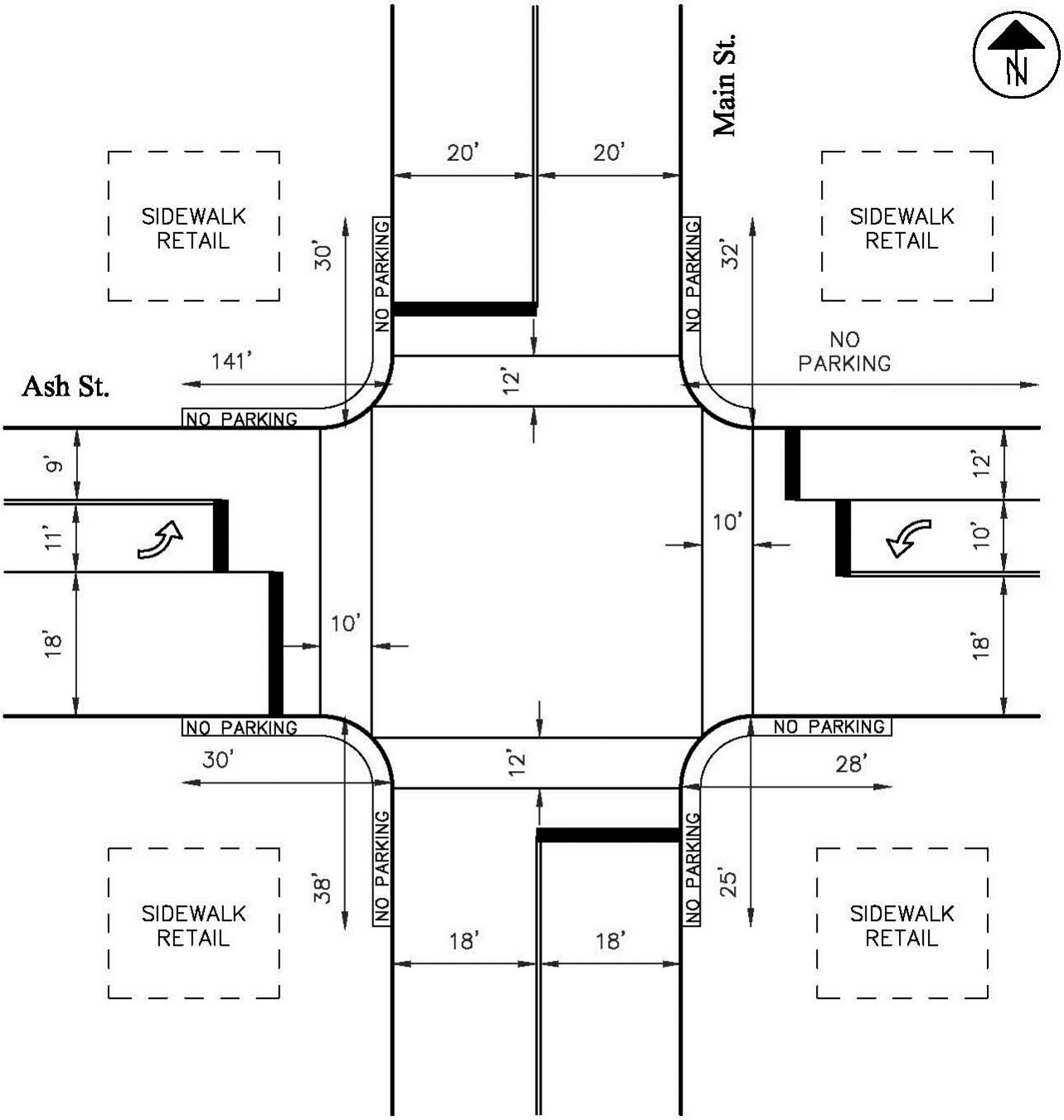
Crash History

- 2 reported crashes from 2005-2008
- No specific pattern

Recommendation

- Retain traffic signal and existing lane configuration.

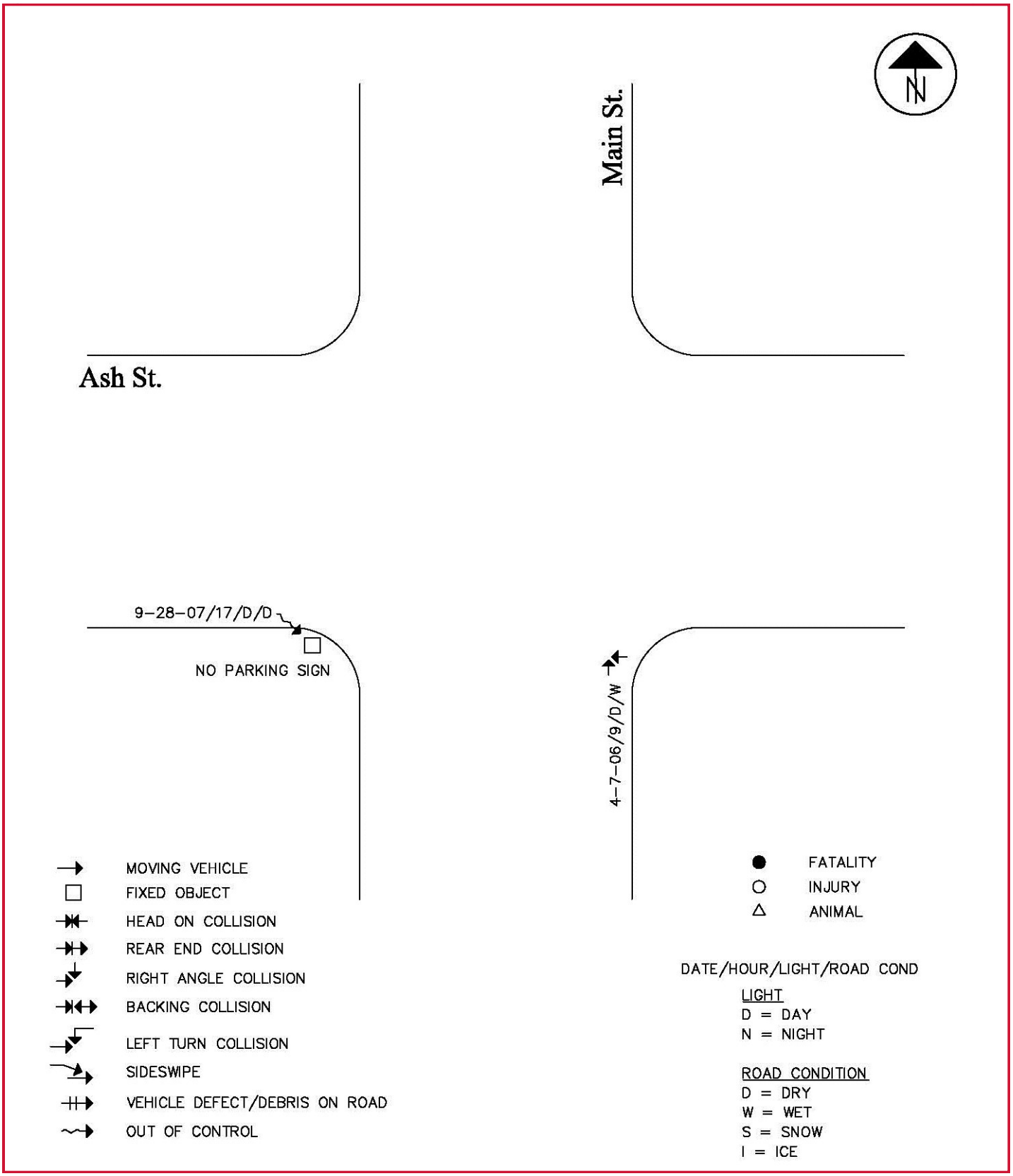
INTERSECTION DIAGRAM



ACTUATED SIGNAL

70 SEC CYCLE

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Main Street at Ash Street

Date of Counts: Thursday 8/7/2008 (7-9am & 4-6pm) and Thursday 10/9/2008 (11am-4pm)

	SB Main St				WB Ash St				NB Main St				EB Ash St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	19	2	0	4	18	4	0	0	40	4	0	0	14	0	0			
7:15 to 7:30 am	1	39	2	1	3	36	4	0	1	45	7	4	4	17	2	3			
7:30 to 7:45 am	0	45	0	2	6	29	6	0	0	69	6	1	3	20	3	1			
7:45 to 8:00 am	0	41	3	0	6	46	5	0	1	82	4	2	1	20	2	0			
Total	1	144	7	3	19	129	19	0	2	236	21	7	8	71	7	4	411	167	86
8:00 to 8:15 am	0	31	2	1	5	46	1	1	0	42	8	0	0	17	4	0			
8:15 to 8:30 am	1	44	3	1	10	44	2	0	0	52	1	3	1	19	1	0			
8:30 to 8:45 am	1	41	2	1	5	42	5	0	0	36	2	2	1	15	2	2			
8:45 to 9:00 am	0	44	7	5	4	38	0	4	0	59	4	6	5	25	2	1			
Total	2	160	14	8	24	170	8	5	0	189	15	11	7	76	9	3	380	202	92
11:00 to 11:15 am	0	35	7	2	7	29	5	0	0	36	10	3	5	39	6	0			
11:15 to 11:30 am	0	42	3	2	2	42	5	1	0	41	8	4	5	24	1	0			
11:30 to 11:45 am	1	48	7	4	3	29	5	0	0	56	12	1	9	48	3	1			
11:45 to 12:00 am	0	51	4	3	10	43	7	0	0	38	6	3	1	49	6	1			
Total	1	176	21	11	22	143	22	1	0	171	36	11	20	160	16	2	405	187	196
12:00 to 12:15 pm	1	43	4	6	6	45	10	1	0	60	9	1	9	39	6	2			
12:15 to 12:30 pm	1	54	3	2	6	38	10	0	0	51	8	1	4	32	6	1			
12:30 to 12:45 pm	0	49	10	2	7	38	4	1	0	53	12	3	9	55	6	3			
12:45 to 13:00 pm	0	45	3	4	3	40	11	0	0	52	12	2	6	51	11	6			
Total	2	191	20	14	22	161	35	2	0	216	41	7	28	177	29	12	470	218	234
2:00 to 2:15 pm	0	52	5	0	7	43	5	1	0	70	14	3	1	31	4	3			
2:15 to 2:30 pm	0	57	7	1	10	62	8	4	0	50	9	2	7	28	6	0			
2:30 to 2:45 pm	0	65	8	5	5	39	7	0	1	79	8	2	8	47	5	0			
2:45 to 3:00 pm	0	67	8	4	7	46	4	2	2	60	11	5	7	42	9	1			
Total	0	241	28	10	29	190	24	7	3	259	42	12	23	148	24	4	573	243	195
3:00 to 3:15 pm	0	74	9	6	2	44	7	3	1	90	9	4	9	50	6	0			
3:15 to 3:30 pm	0	64	5	0	3	37	11	0	1	80	5	2	4	39	6	0			
3:30 to 3:45 pm	0	77	7	3	7	57	6	1	1	117	9	3	7	48	0	3			
3:45 to 4:00 pm	0	65	11	4	8	42	8	1	1	85	8	5	2	51	3	4			
Total	0	280	32	13	20	180	32	5	4	372	31	14	22	188	15	7	719	232	225
4:00 to 4:15 pm	10	64	5	2	4	13	9	0	15	90	2	0	7	6	6	1			
4:15 to 4:30 pm	9	62	5	1	3	15	7	0	12	75	6	0	7	4	6	1			
4:30 to 4:45 pm	9	60	3	2	8	14	6	0	9	99	3	1	5	9	7	2			
4:45 to 5:00 pm	11	74	2	2	3	12	13	1	9	67	1	0	3	8	8	0			
Total	39	260	15	7	18	54	35	1	45	331	12	1	22	27	27	4	702	107	76
5:00 to 5:15 pm	11	74	2	2	3	12	13	1	9	67	1	0	3	8	8	0			
5:15 to 5:30 pm	12	61	4	0	3	11	7	0	9	79	3	0	4	8	5	0			
5:30 to 5:45 pm	12	61	4	0	3	11	7	0	9	79	3	0	4	8	5	0			
5:45 to 6:00 pm	15	56	3	0	2	4	11	1	17	62	6	0	5	7	2	0			
Total	50	252	13	2	11	38	38	2	44	287	13	0	16	31	20	0	659	87	67
Grand Total	95	1704	150	68	165	1065	213	23	98	2061	211	63	146	878	147	36			

SIGNAL WARANT ANALYSIS SUMMARY

Main Street / Ash Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	411	167	No	411	167	No	No
8 AM to 9 AM	380	202	No	380	202	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM	405	196	No	405	196	No	No
12 PM to 1 PM	470	234	No	470	234	No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	573	243	Yes	573	243	No	No
3 PM to 4 PM	719	232	Yes	719	232	No	Yes
4 PM to 5 PM	702	107	No	702	107	No	No
5 PM to 6 PM	659	87	No	659	87	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

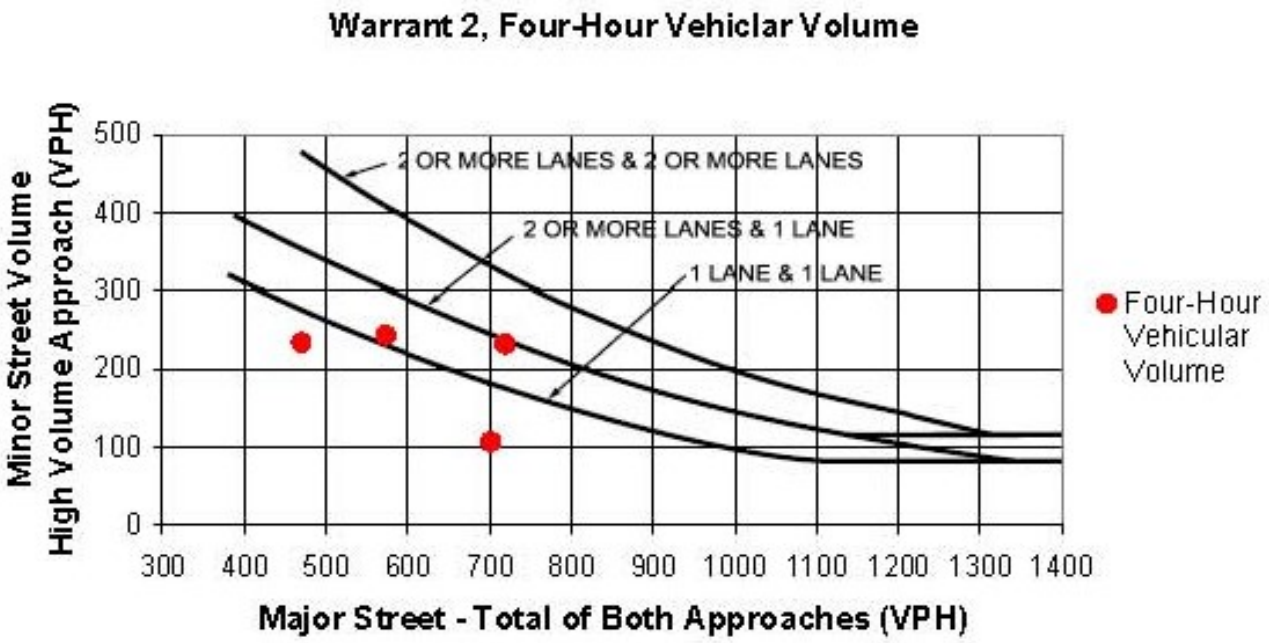
This intersection is located along a coordinated signal system (Main Street). It is not certain whether signalization at this intersection is critical to coordination.

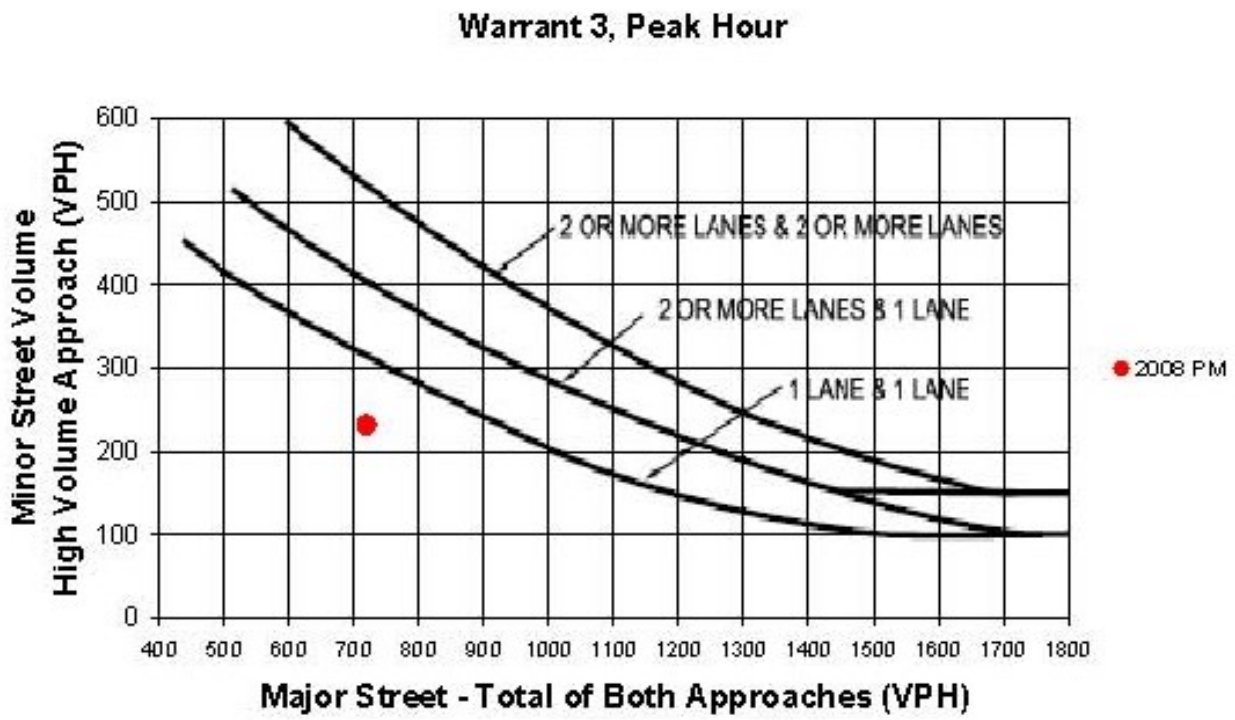
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, one right-angle crash was reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant IS Satisfied*

At least two hours have more than the required 1000 approaching trips. SR 185 approaches from the east and the west and qualifies as a major route. Main Street also qualifies as a major Piqua city route.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
Major Street - Total of Both Approaches (VPH)
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*Main at Ash*
Agency or Co.	*Kleingers & Associates*	Area Type	*CBD or Similar*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak Existing*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Lane Group	L	TR		L	TR			LTR			LTR	
Volume (vph)	22	188	15	20	180	32	4	372	31	0	280	32
% Heavy Vehicles	2	2	0	1	1	0	0	5	0	0	5	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time	2.0	2.0		2.0	2.0			2.0			2.0	
Extension of Effective Green	2.0	2.0		2.0	2.0			2.0			2.0	
Arrival Type	3	3		3	3			3			3	
Unit Extension	3.0	3.0		3.0	3.0			3.0			3.0	
Ped/Bike/RTOR Volume	7	0	0	5	0	0	14	0	0	13	0	0
Lane Width	12.0	12.0		12.0	12.0			12.0			12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0		0	0			0			0	
Minimum Pedestrian Time		3.2			3.2			3.3			3.3	

Phasing	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 26.0	G =	G =	G =	G = 32.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 70.0

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate	24	226		22	236			451			347	
Lane Group Capacity	371	617		384	615			738			736	
v/c Ratio	0.06	0.37		0.06	0.38			0.61			0.47	
Green Ratio	0.37	0.37		0.37	0.37			0.46			0.46	
Uniform Delay d_1	14.2	16.0		14.1	16.1			14.3			13.1	
Delay Factor k	0.50	0.50		0.50	0.50			0.50			0.50	
Incremental Delay d_2	0.3	1.7		0.3	1.8			3.8			2.2	
PF Factor	1.000	1.000		1.000	1.000			1.000			1.000	
Control Delay	14.5	17.7		14.4	17.9			18.1			15.3	
Lane Group LOS	B	B		B	B			B			B	
Approach Delay	17.4			17.6			18.1			15.3		
Approach LOS	B			B			B			B		
Intersection Delay	17.1			Intersection LOS						B		

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.21 Generated: 11/14/2008 12:23 PM

SHORT REPORT

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*Main at Ash*
Agency or Co.	*Kleingers & Associates*	Area Type	*CBD or Similar*
Date Performed	*11/13/2008*	Jurisdiction	*City of Piqua*
Time Period	*PM Peak No LT Lane on Ash*	Analysis Year	*2008*

Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Lane Group		LTR			LTR			LTR			LTR	
Volume (vph)	22	188	15	20	180	32	4	372	31	0	280	32
% Heavy Vehicles	2	2	0	1	1	0	0	5	0	0	5	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	P	P	P	P	P	P	P	P	P	P	P	P
Startup Lost Time		2.0			2.0			2.0			2.0	
Extension of Effective Green		2.0			2.0			2.0			2.0	
Arrival Type		3			3			3			3	
Unit Extension		3.0			3.0			3.0			3.0	
Ped/Bike/RTOR Volume	7	0	0	5	0	0	14	0	0	13	0	0
Lane Width		12.0			12.0			12.0			12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour		0			0			0			0	
Minimum Pedestrian Time		3.2			3.2			3.3			3.3	

Phasing	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 26.0	G =	G =	G =	G = 32.0	G =	G =	G =
	Y = 6	Y =	Y =	Y =	Y = 6	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 70.0		

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Adjusted Flow Rate		250			258			451			347	
Lane Group Capacity		589			594			738			736	
v/c Ratio		0.42			0.43			0.61			0.47	
Green Ratio		0.37			0.37			0.46			0.46	
Uniform Delay d_1		16.4			16.5			14.3			13.1	
Delay Factor k		0.50			0.50			0.50			0.50	
Incremental Delay d_2		2.2			2.3			3.8			2.2	
PF Factor		1.000			1.000			1.000			1.000	
Control Delay		18.7			18.8			18.1			15.3	
Lane Group LOS		B			B			B			B	
Approach Delay	18.7			18.8			18.1			15.3		
Approach LOS	B			B			B			B		
Intersection Delay	17.6			Intersection LOS						B		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 12:24 PM

Isolated Intersections

Intersection of South Street and Wayne Street

Intersection of South Street and Downing Street

Intersection of South Street and Roosevelt Avenue

Intersection of Wood Street and Roosevelt Avenue

Intersection of College Street and Wood Street

Intersection of College Street and Young Street

Intersection of South Street and Brice Avenue

Intersection of McKinley Avenue and Grant Street

Intersection of McKinley Avenue and Clark Avenue

South Street & Wayne Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of South Street with Wayne Street is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 70-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. A home in the northeast corner and shrubbery on the northwest corner partially restrict visibility at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to provide for vehicular and pedestrian traffic associated with a school that used to be located near this intersection.

Public Comments

– "Traffic signal is not needed due to low traffic volumes."

Analyses Results

– Traffic signal warrants are not met
– Three reported crashes at the intersection from Jan. 2005 to June 2008
– Four-way stop control provides adequate capacity

Recommendations

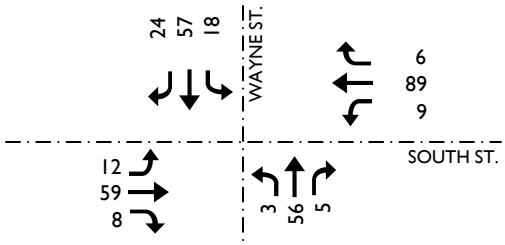
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Based on the relatively balanced traffic volumes on the intersection approaches and the sight distance restriction in the northeast corner, four-way stop control is recommended. Also, curb bump-outs should be considered to provide adequate locations for stop sign visibility.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



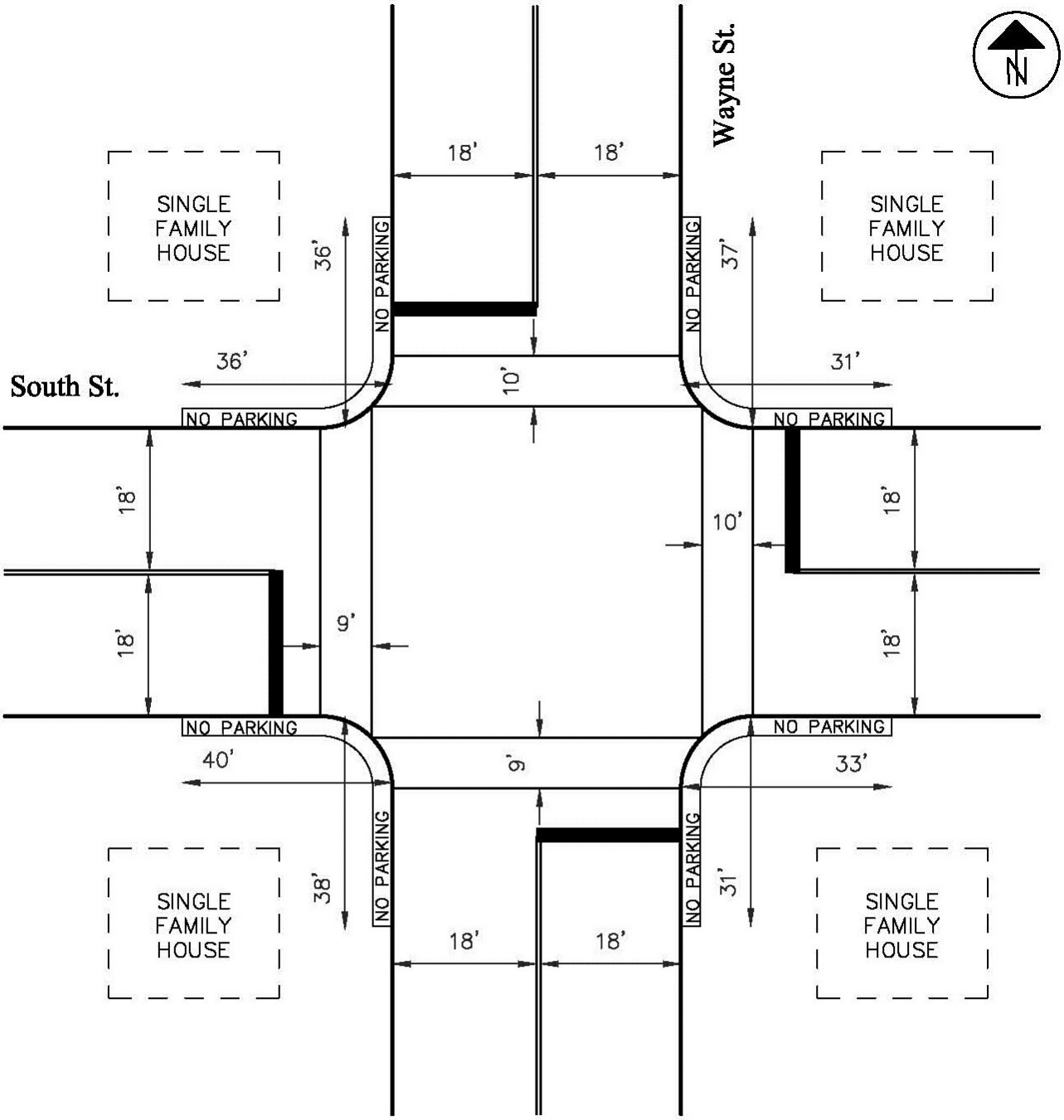
Crash History

- 3 reported crashes from 2005-2008
- Primarily rear-end type crashes

Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



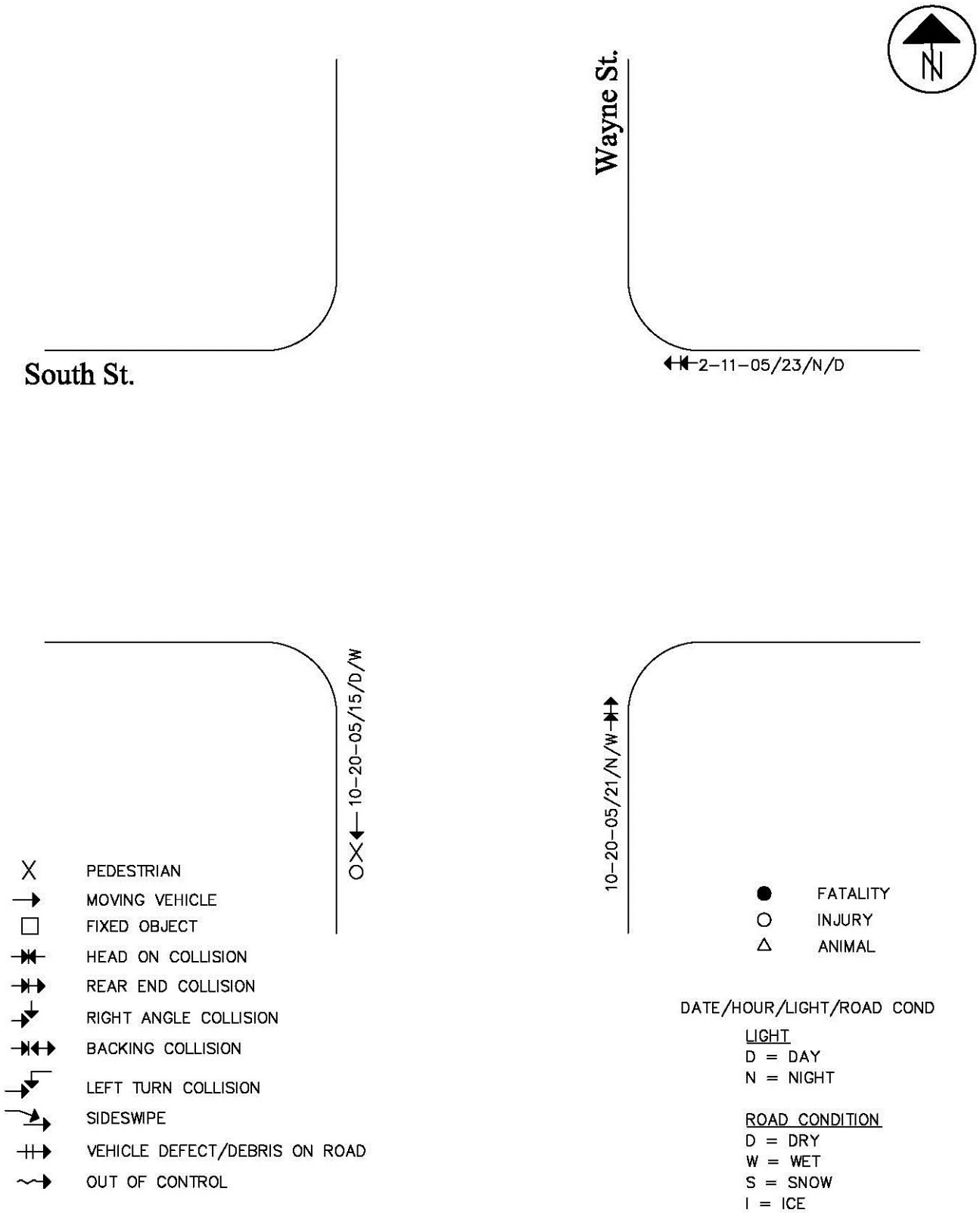
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

35 SEC N/S SPLIT

35 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: South Street at Wayne Street

Date of Counts: Thursday 10/9/2008

	SB Wayne St				WB South St				NB Wayne St				EB South St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	1	15	5	0	1	6	2	1	0	3	0	1	1	3	0	3			
7:15 to 7:30 am	2	9	1	0	0	7	1	0	0	3	0	1	0	9	1	0			
7:30 to 7:45 am	1	7	5	0	1	6	3	0	0	8	0	0	3	6	0	1			
7:45 to 8:00 am	1	10	0	1	0	5	0	1	1	3	0	1	5	11	1	7			
Total	5	41	11	1	2	24	6	2	1	17	0	3	9	29	2	11	72	57	18
8:00 to 8:15 am	0	11	1	0	0	15	1	0	0	9	0	0	2	15	0	7			
8:15 to 8:30 am	3	7	1	0	2	25	0	0	6	4	1	0	4	10	4	6			
8:30 to 8:45 am	0	11	2	0	3	21	1	0	3	3	0	0	1	7	0	0			
8:45 to 9:00 am	0	10	1	0	1	7	0	0	0	6	0	0	4	9	1	0			
Total	3	39	5	0	6	68	2	0	9	22	1	0	11	41	5	13	133	47	32
2:00 to 2:15 pm	2	6	4	1	0	8	2	1	0	14	0	1	2	10	2	1			
2:15 to 2:30 pm	4	12	10	0	2	12	5	0	1	7	0	0	1	17	1	0			
2:30 to 2:45 pm	0	8	3	0	1	18	1	0	0	11	2	1	5	16	0	0			
2:45 to 3:00 pm	2	11	5	0	2	24	2	0	2	5	1	4	1	9	1	8			
Total	8	37	22	1	5	62	10	1	3	37	3	6	9	52	4	9	142	67	43
3:00 to 3:15 pm	5	11	6	2	3	22	2	5	0	12	1	2	4	18	2	2			
3:15 to 3:30 pm	4	13	4	2	1	21	2	2	1	11	1	1	4	13	2	5			
3:30 to 3:45 pm	3	22	2	4	5	21	1	2	2	19	1	4	2	18	1	24			
3:45 to 4:00 pm	0	11	6	0	0	25	1	6	0	14	2	3	2	10	3	7			
Total	12	57	18	8	9	89	6	15	3	56	5	10	12	59	8	38	183	87	64
Grand Total	28	174	56	10	22	243	24	18	16	132	9	19	41	181	19	71			

SIGNAL WARANT ANALYSIS SUMMARY

South Street / Wayne Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	72	57	No	72	57	No	No
8 AM to 9 AM	133	47	No	133	47	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	142	67	No	142	67	No	No
5 PM to 6 PM	183	87	No	183	87	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

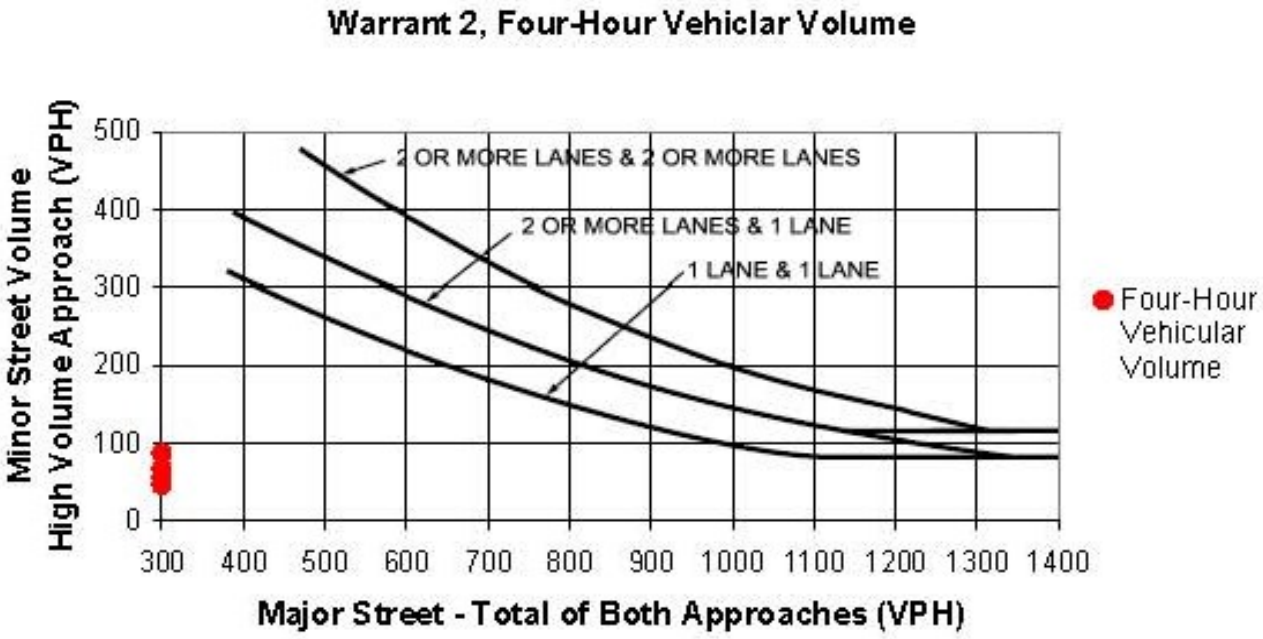
This intersection is not located at a critical point along a coordinated signal system.

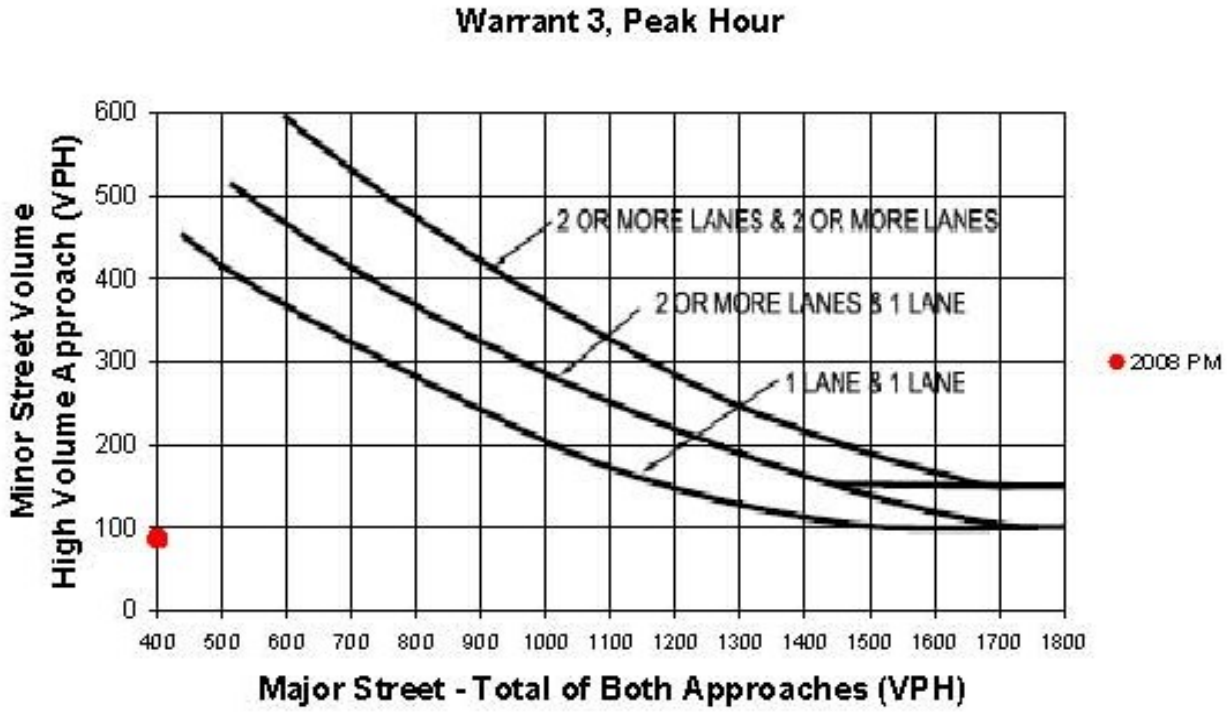
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within that could be fixed by traffic signal control. Although signals can help with reducing some types of crashes, it is not likely that removal of the signal will result in five or more crashes of those types in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has less than 350 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	South at Wayne
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: *South Street*

North/South Street: *Wayne Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	12	59	8	9	89	6
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	3	56	5	12	57	18
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	86		114		70		96	
% Heavy Vehicles	3		9		3		6	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.2		0.1		0.0		0.1	
Prop. Right-Turns	0.1		0.1		0.1		0.2	
Prop. Heavy Vehicle	0.0		0.1		0.0		0.1	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		0.1		0.0		0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.08		0.10		0.06		0.09	
hd, final value (s)	4.45		4.53		4.50		4.46	
x, final value	0.11		0.14		0.09		0.12	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.5		2.5		2.5		2.5	

Capacity and Level of Service

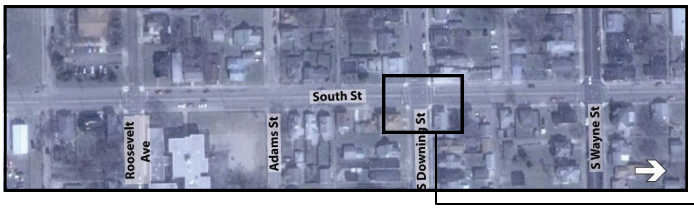
	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	336		364		320		346	
Delay (s/veh)	7.98		8.29		7.94		8.06	
LOS	A		A		A		A	
Approach: Delay (s/veh)	7.98		8.29		7.94		8.06	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.09							
Intersection LOS	A							

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21

Generated: 11/14/2008 11:45 AM

South Street & Downing Street



Aerial Photo:

Photo: Looking East

Existing Conditions Discussion

The intersection of South Street with Downing Street is four-way stop controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. There are overhead flashing red beacons facing each approach. The intersection is located in a residential area. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. A home in the northeast corner and shrubbery on the southeast corner partially restrict visibility at the intersection. The primary concern at this intersection is whether or not a four-way stop is the most appropriate and effective traffic control device.

Public Comments

- "There was a school located near this intersection."
- "Traffic patterns are affected by changes in business/operation at Hartzell facilities."

Analyses Results

- Three reported crashes at the intersection from Jan. 2005 to June 2008
- Overhead flashing beacons may indicate a past safety problem

Recommendations

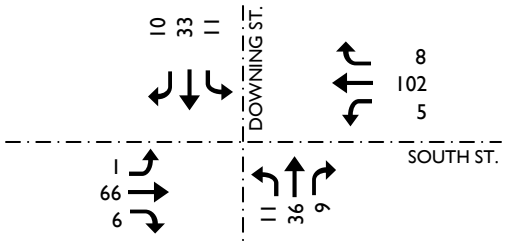
Due to the relatively balanced traffic volumes, the intersection's location in a residential area, and the possibility that there was a previous safety problem at this location, it is recommended that four-way stop control at this intersection be retained.

Intersection at a Glance

Existing Conditions

- Four-way stop control
- Single lane approaches
- Overhead flashing beacons

Counted Traffic Volumes (peak hour)



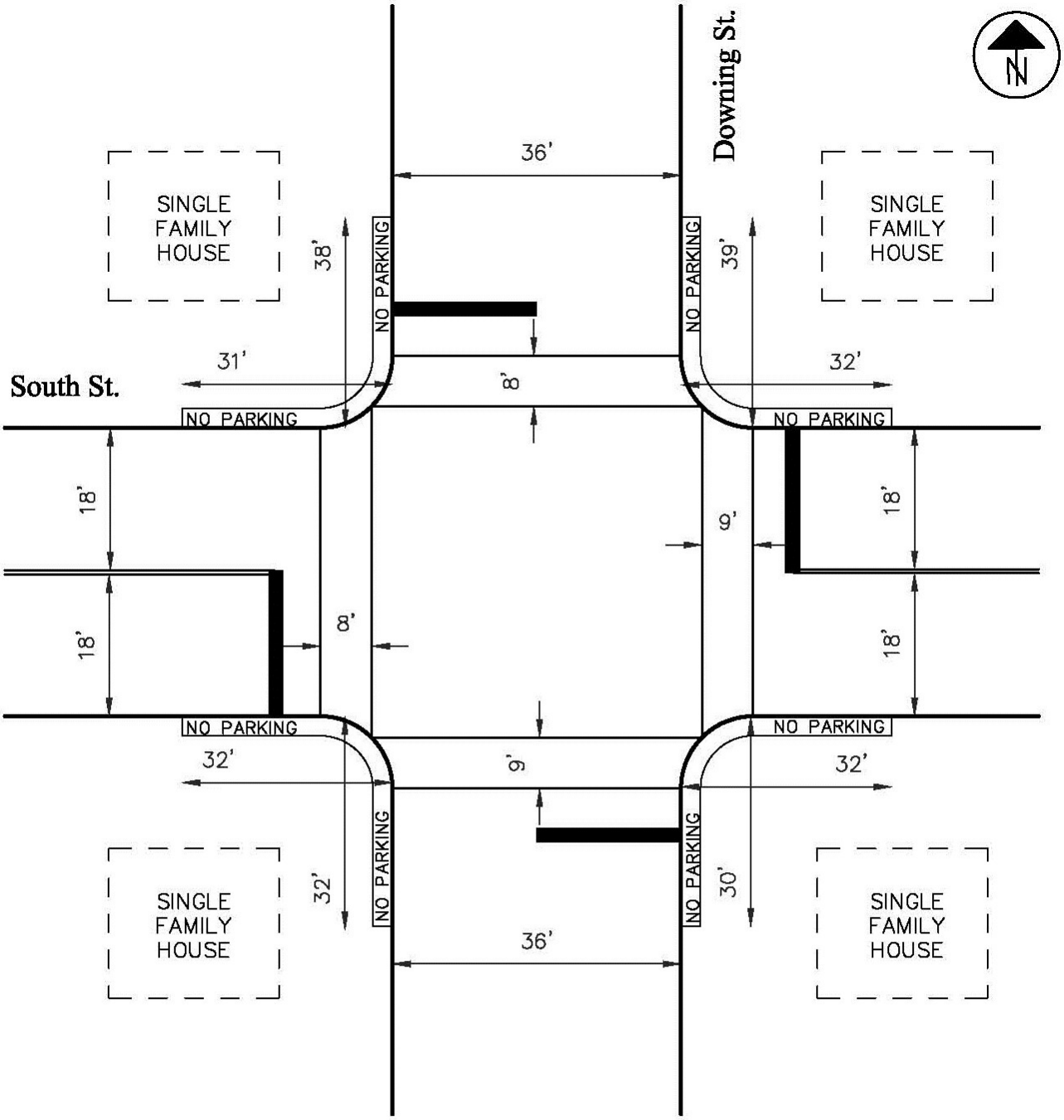
Crash History

- 3 reported crashes from 2005-2008
- Primarily angle type crashes

Recommendation

- Retain four-way stop control

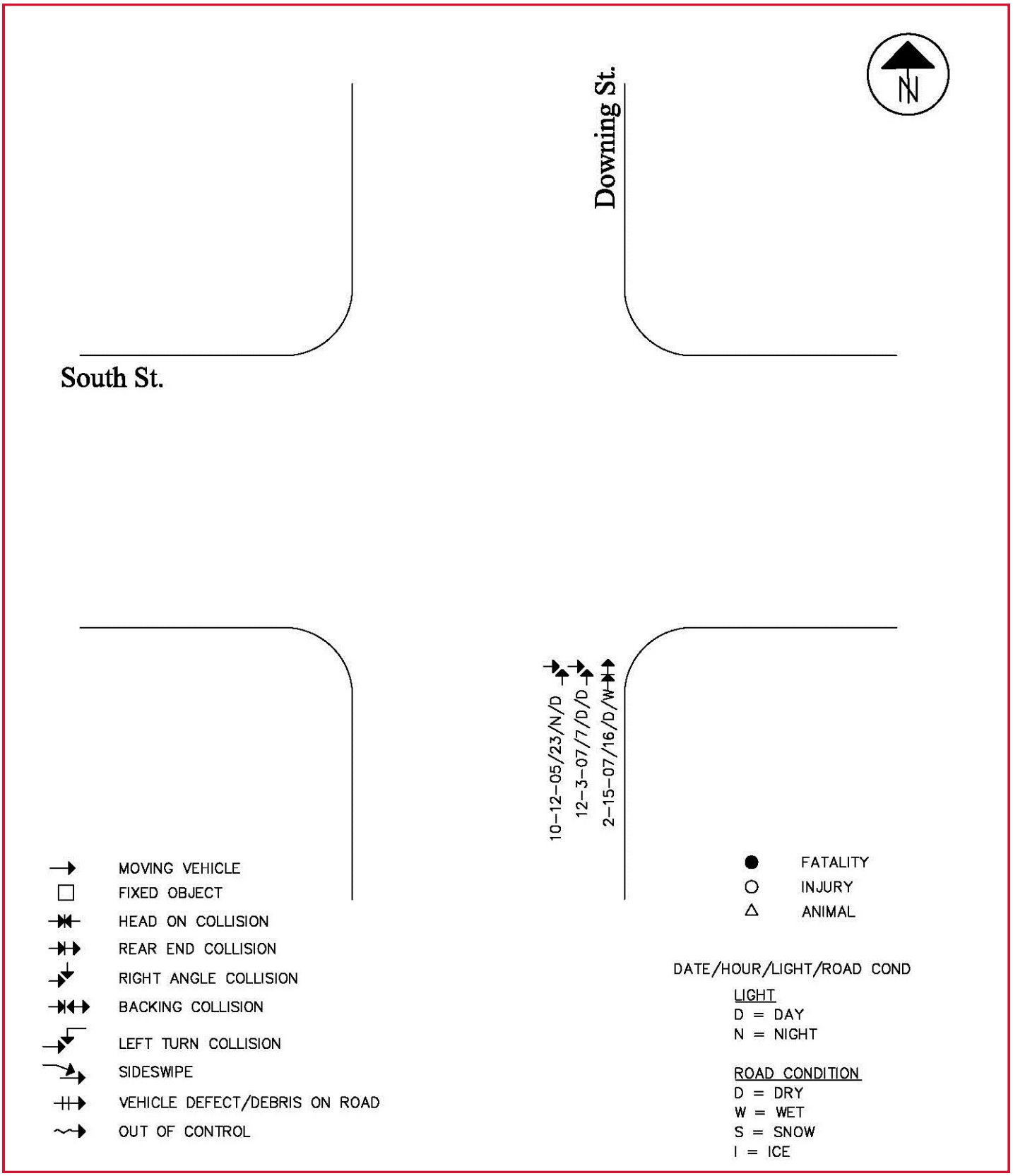
INTERSECTION DIAGRAM



4-WAY STOP CONTOLLED

OVERHEAD RED FLASHERS

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: South Street at Downing Street

Date of Counts: Thursday 8/13/2008

	SB Downing St				WB South St				NB Downing St				EB South St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	0	3	0	0	0	1	0	0	0	2	0	0	1	3	1	0			
7:15 to 7:30 am	0	6	0	0	1	5	0	0	0	3	1	0	1	6	0	0			
7:30 to 7:45 am	1	5	1	0	0	3	1	0	1	2	0	0	0	12	0	0			
7:45 to 8:00 am	2	9	0	0	0	6	1	0	0	1	0	0	0	14	0	0			
Total	3	23	1	0	1	15	2	0	1	8	1	0	2	35	1	0	56	27	10
8:00 to 8:15 am	1	6	2	0	0	11	0	0	1	1	0	0	0	10	0	0			
8:15 to 8:30 am	0	3	0	0	0	4	2	0	1	0	0	0	0	5	0	0			
8:30 to 8:45 am	0	5	1	0	1	5	0	1	0	5	1	1	0	12	0	0			
8:45 to 9:00 am	0	8	0	0	0	4	0	1	1	3	0	1	2	10	1	0			
Total	1	22	3	0	1	24	2	2	3	9	1	2	2	37	1	0	67	26	13
4:00 to 4:15 pm	1	9	4	0	0	20	1	2	3	10	0	0	1	17	0	1			
4:15 to 4:30 pm	2	5	1	0	1	24	0	4	1	9	1	0	1	21	0	1			
4:30 to 4:45 pm	3	4	4	1	0	13	4	3	2	8	2	0	1	20	2	1			
4:45 to 5:00 pm	3	8	3	0	1	24	2	12	4	4	1	0	1	21	1	1			
Total	9	26	12	1	2	81	7	21	10	31	4	0	4	79	3	4	176	47	45
5:00 to 5:15 pm	5	11	6	0	2	30	0	0	4	13	1	0	1	23	1	1			
5:15 to 5:30 pm	2	8	2	0	0	24	2	0	2	10	3	0	0	15	2	0			
5:30 to 5:45 pm	2	7	1	0	3	29	1	0	3	5	4	1	0	14	1	1			
5:45 to 6:00 pm	2	7	1	0	0	19	5	1	2	8	1	6	0	14	2	0			
Total	11	33	10	0	5	102	8	1	11	36	9	7	1	66	6	2	188	54	56
Grand Total	24	104	26	1	9	222	19	24	25	84	15	9	9	217	11	6			

South Street & Roosevelt Ave

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of South Street with Roosevelt Avenue is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The pretimed signal has a 50-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. A home on the southwest corner and a slope on the northeast corner partially restrict visibility at the intersection; however, visibility is adequate if motorists stop beyond the stop bar closer to the intersection. There is a building on the southeast corner that was formally used as a school. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to provide for vehicular and pedestrian traffic associated with a school that used to be located near this intersection.

Public Comments

- "Traffic signal is not needed due to low traffic volumes."
- "There used to be a school located near the intersection."
- "Traffic signal is not warranted."
- "Signal was installed due to school - school is no longer there."
- "Two-way stop would function appropriately."

Analyses Results

- Traffic signal warrants are not met
- Two reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control provides adequate capacity

Recommendations

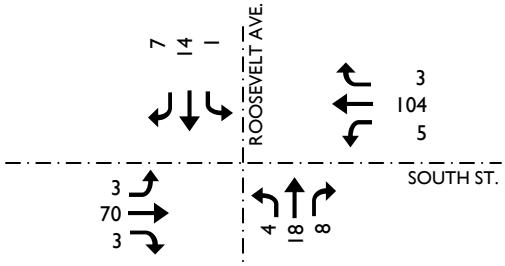
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Two-way stop control is recommended where traffic on South Street does not stop. Also, curb bump-outs should be considered to provide adequate locations for stop sign visibility. Consideration should be given to improving intersection sight distance if practical.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Located in residential area

Counted Traffic Volumes (peak hour)



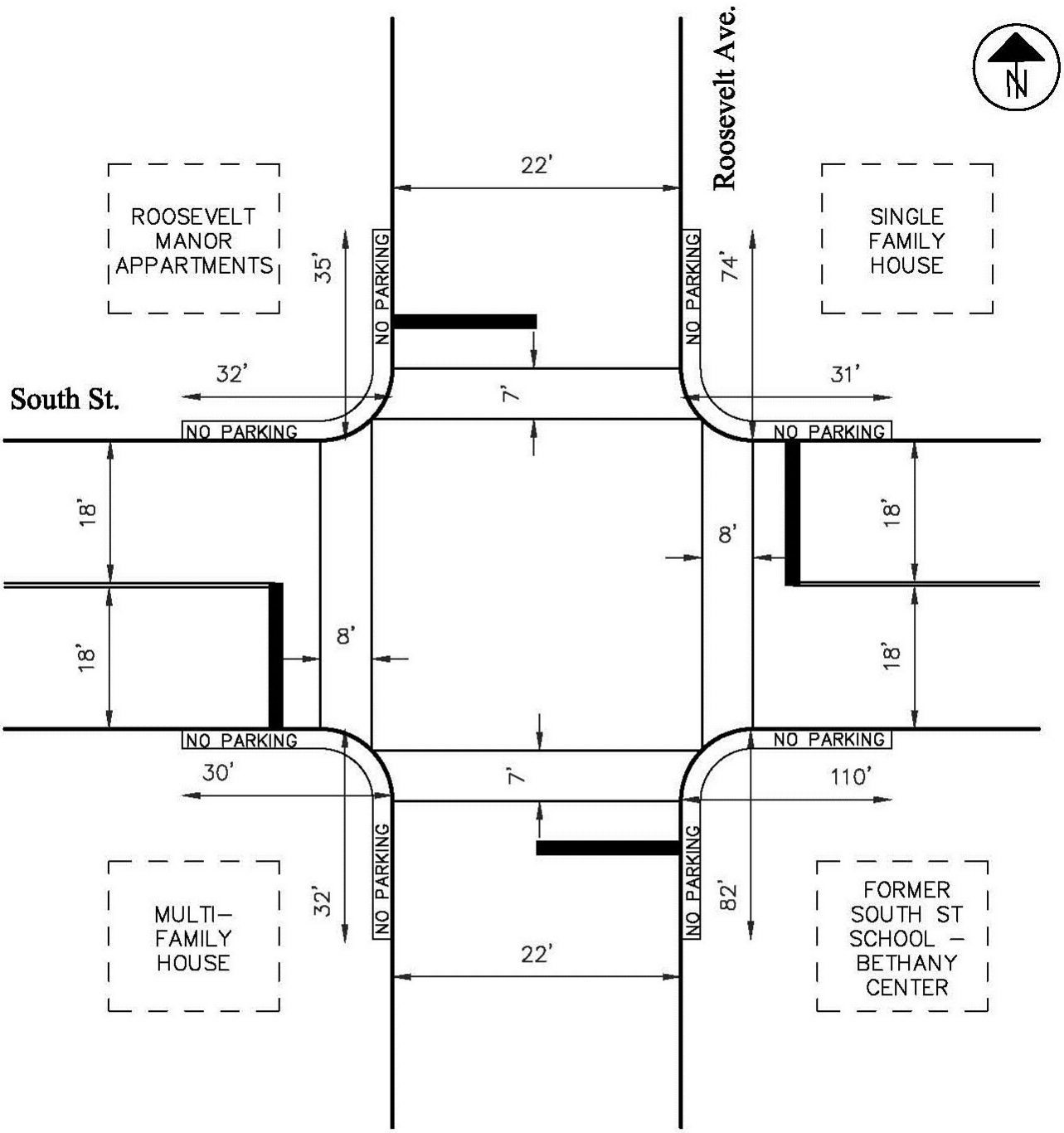
Crash History

- 2 reported crashes from 2005-2008
- Angle type crashes

Recommendation

- Consider replacing traffic signal with two-way stop

INTERSECTION DIAGRAM



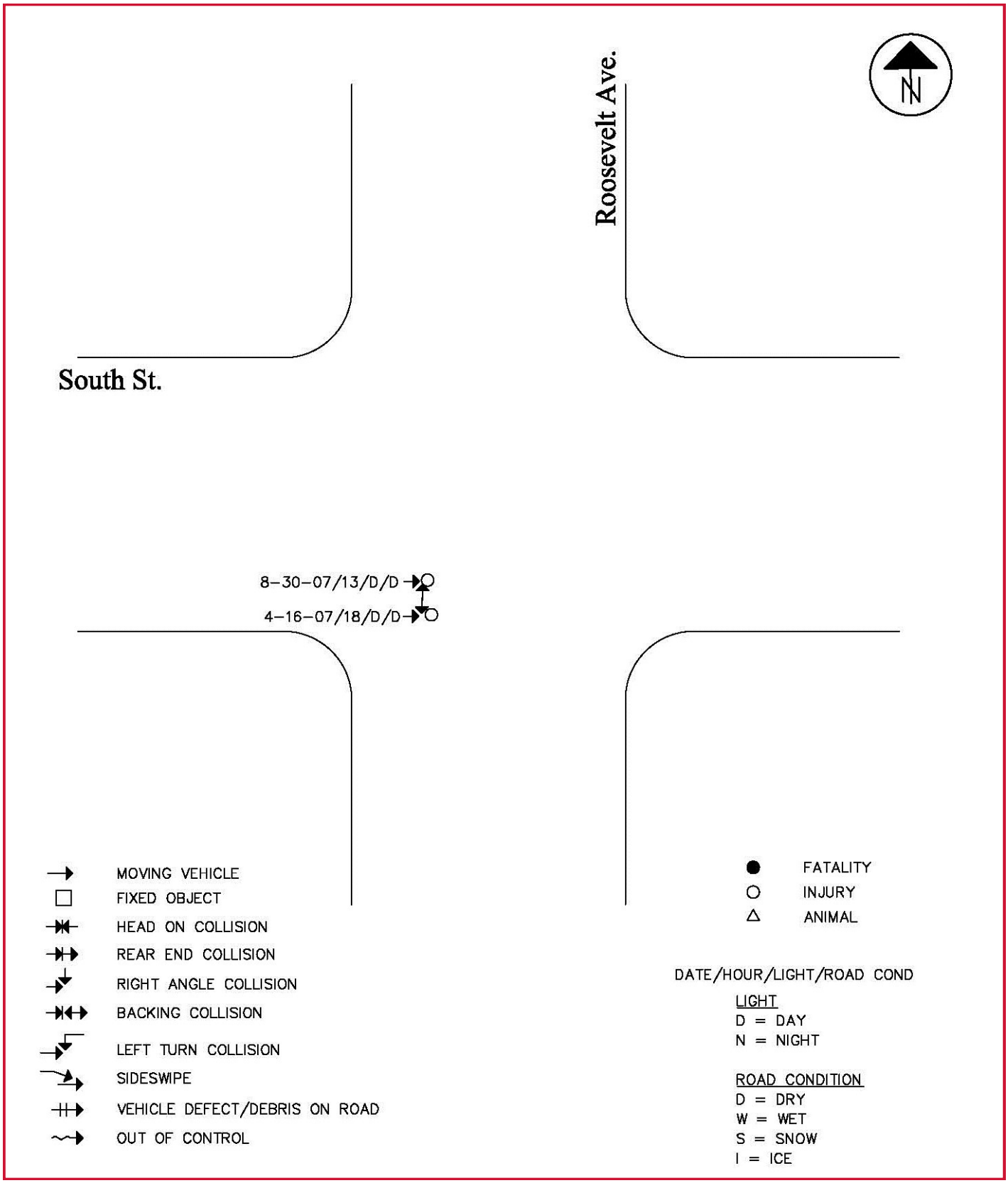
PRETIMED 2 PHASE SIGNAL

50 SEC CYCLE

25 SEC N/S SPLIT

25 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: South Street at Roosevelt Avenue

Date of Counts: Thursday 8/13/2008

	SB Roosevelt Ave				WB South St				NB Roosevelt Ave				EB South St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	3	1	0	0	3	0	0	1	3	0	0	0	4	0	0			
7:15 to 7:30 am	0	2	0	0	0	5	0	0	1	1	0	0	0	8	0	0			
7:30 to 7:45 am	0	0	1	0	0	5	0	0	0	2	1	0	2	11	1	0			
7:45 to 8:00 am	0	7	2	0	1	5	0	0	0	1	1	0	0	13	1	0			
Total	0	12	4	0	1	18	0	0	2	7	2	0	2	36	2	0	59	16	11
8:00 to 8:15 am	0	2	0	0	1	11	1	0	0	2	0	0	0	10	0	0			
8:15 to 8:30 am	0	1	2	0	0	4	0	0	0	1	0	0	1	5	0	0			
8:30 to 8:45 am	0	2	1	0	1	5	0	0	0	1	0	0	2	11	0	0			
8:45 to 9:00 am	0	2	0	0	1	4	1	1	0	0	0	2	0	13	0	0			
Total	0	7	3	0	3	24	2	1	0	4	0	2	3	39	0	0	71	10	4
4:00 to 4:15 pm	3	5	1	0	0	23	0	1	0	7	0	1	0	15	1	1			
4:15 to 4:30 pm	3	3	0	0	0	19	1	5	0	5	0	0	4	21	0	0			
4:30 to 4:45 pm	0	2	3	0	2	16	1	0	3	2	1	0	1	25	0	1			
4:45 to 5:00 pm	1	1	2	0	0	27	1	12	0	1	6	0	2	20	0	2			
Total	7	11	6	0	2	85	3	18	3	15	7	1	7	81	1	4	179	24	25
5:00 to 5:15 pm	0	8	3	0	3	29	1	0	2	5	2	0	2	27	1	0			
5:15 to 5:30 pm	0	2	1	0	0	23	2	0	0	5	4	0	1	15	1	1			
5:30 to 5:45 pm	0	1	1	0	1	30	0	0	0	4	0	2	0	14	0	1			
5:45 to 6:00 pm	1	3	2	1	1	22	0	0	2	4	2	1	0	14	1	0			
Total	1	14	7	1	5	104	3	0	4	18	8	3	3	70	3	2	188	22	30
Grand Total	8	44	20	1	11	231	8	19	9	44	17	6	15	226	6	6			

SIGNAL WARANT ANALYSIS SUMMARY

South Street / Roosevelt Avenue Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	59	16	No	59	16	No	No
8 AM to 9 AM	71	10	No	71	10	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	179	25	No	179	25	No	No
5 PM to 6 PM	188	30	No	188	30	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). None of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

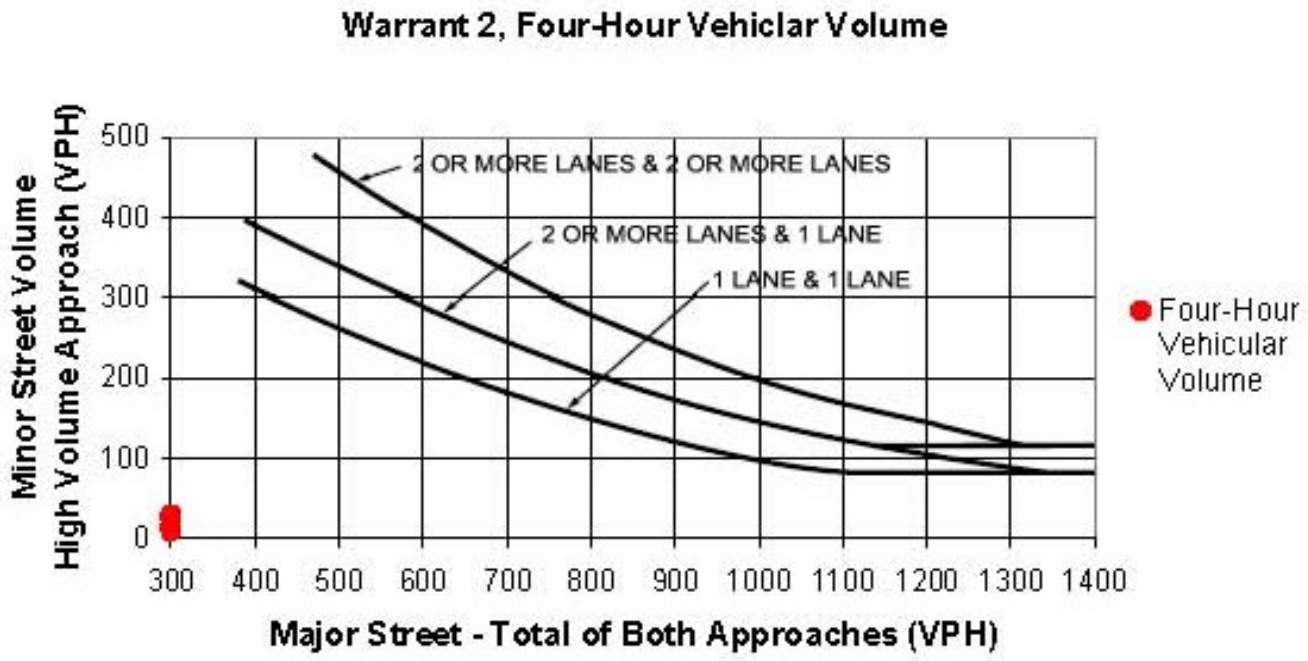
This intersection is not located at a critical point along a coordinated signal system.

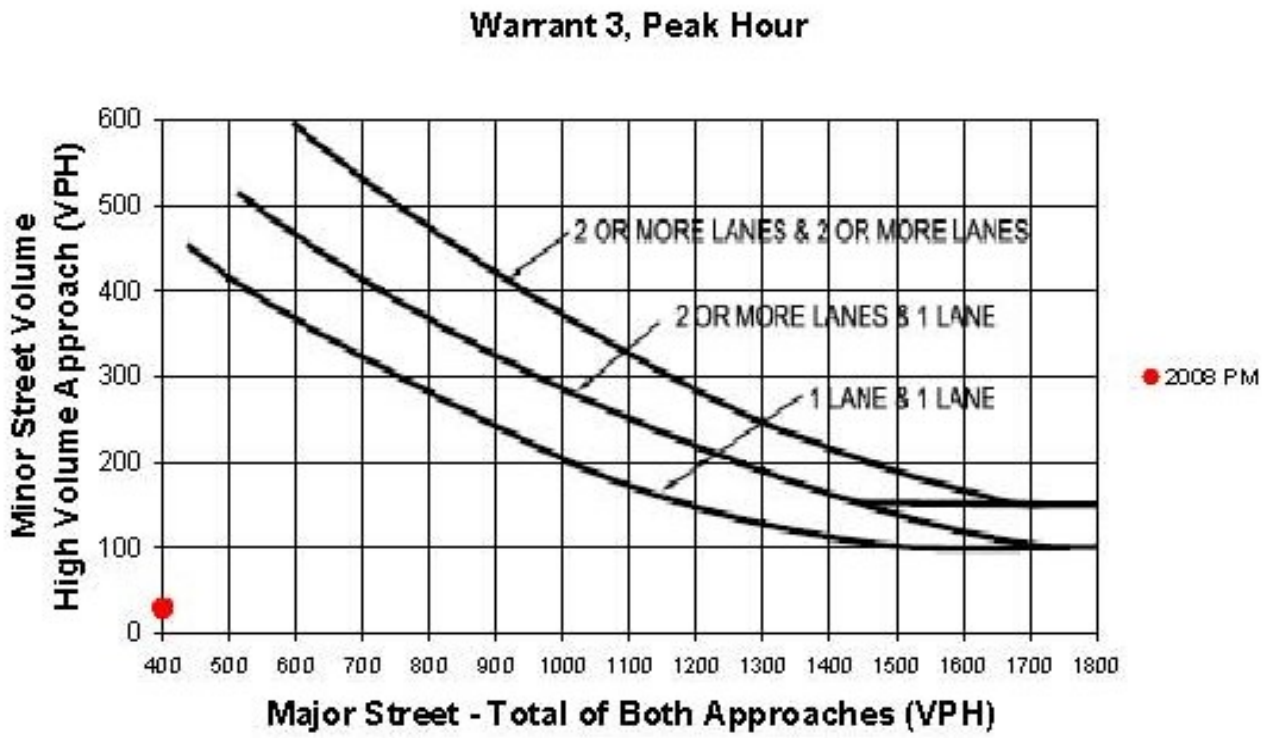
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, two right-angle crashes were reported in the vicinity of this intersection within a three year period. Although signals can help with reducing right-angle crashes, it is not likely that removal of the signal will result in five or more crashes of that type in one calendar year to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has 250 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*South at Roosevelt*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description	
East/West Street: *South Street*	North/South Street: *Roosevelt Avenue*
Intersection Orientation: *East-West*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	*3*	*70*	*3*	*5*	*104*	*3*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*3*	*77*	*3*	*5*	*115*	*3*
Percent Heavy Vehicles	*7*	--	--	*0*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration	*LTR*			*LTR*		
Upstream Signal		*0*			*0*	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	*4*	*18*	*8*	*1*	*14*	*7*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR (veh/h)	*4*	*20*	*8*	*1*	*15*	*7*
Percent Heavy Vehicles	*0*	*0*	*0*	*0*	*0*	*0*
Percent Grade (%)		*0*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration		*LTR*			*LTR*	

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	*LTR*	*LTR*		*LTR*			*LTR*	
v (veh/h)	*3*	*5*		*32*			*23*	
C (m) (veh/h)	*1437*	*1523*		*739*			*742*	
v/c	*0.00*	*0.00*		*0.04*			*0.03*	
95% queue length	*0.01*	*0.01*		*0.14*			*0.10*	
Control Delay (s/veh)	*7.5*	*7.4*		*10.1*			*10.0*	
LOS	*A*	*A*		*B*			*B*	
Approach Delay (s/veh)	--	--	*10.1*			*10.0*		
Approach LOS	--	--	*B*			*B*		

Copyright © 2007 University of Florida, All Rights Reserved

HCS+™ Version 5.3 Generated: 1/15/2009 5:01 PM

Wood Street & Roosevelt Ave

Aerial Photo:

Photo: Looking West

Existing Conditions Discussion

The intersection of Wood Street with Roosevelt Avenue is signal controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area with businesses located on two of the corners. The pretimed signal has a 75-second cycle length with two phases. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. Buildings located directly behind the sidewalk on the southwest corner and the northeast corner significantly limit visibility at the intersection. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially due to visibility problems and to provide for pedestrian crossings.

Public Comments

- "There is poor visibility at the intersection."
- "There are high pedestrian volumes late at night."
- "The traffic signal helps to slow traffic."
- "The streets are narrow, making turns difficult."
- "Traffic signal is redundant."
- "There are low traffic volumes."
- "There are sight distance restrictions - may need four-way stop."
- "This may need to be a one-way street due to the narrow width."
- "Traffic signal is not warranted."
- "Two-way stop would be adequate."
-

Analyses Results

- Traffic signal warrants are not met
- Four reported crashes at the intersection from Jan. 2005 to June 2008
- Four-way stop control provides adequate capacity

Recommendations

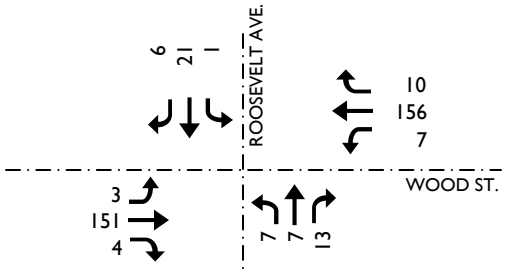
It is recommended that consideration be given to the removal of the traffic signal at this intersection. Due to the existing sight distance restrictions at the intersection, four-way stop control is recommended. Some parking may need to be removed to ensure adequate stop sign visibility. A four-way stop at this location will help to discourage through traffic on Wood Street.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Corner development restricts visibility

Counted Traffic Volumes (peak hour)



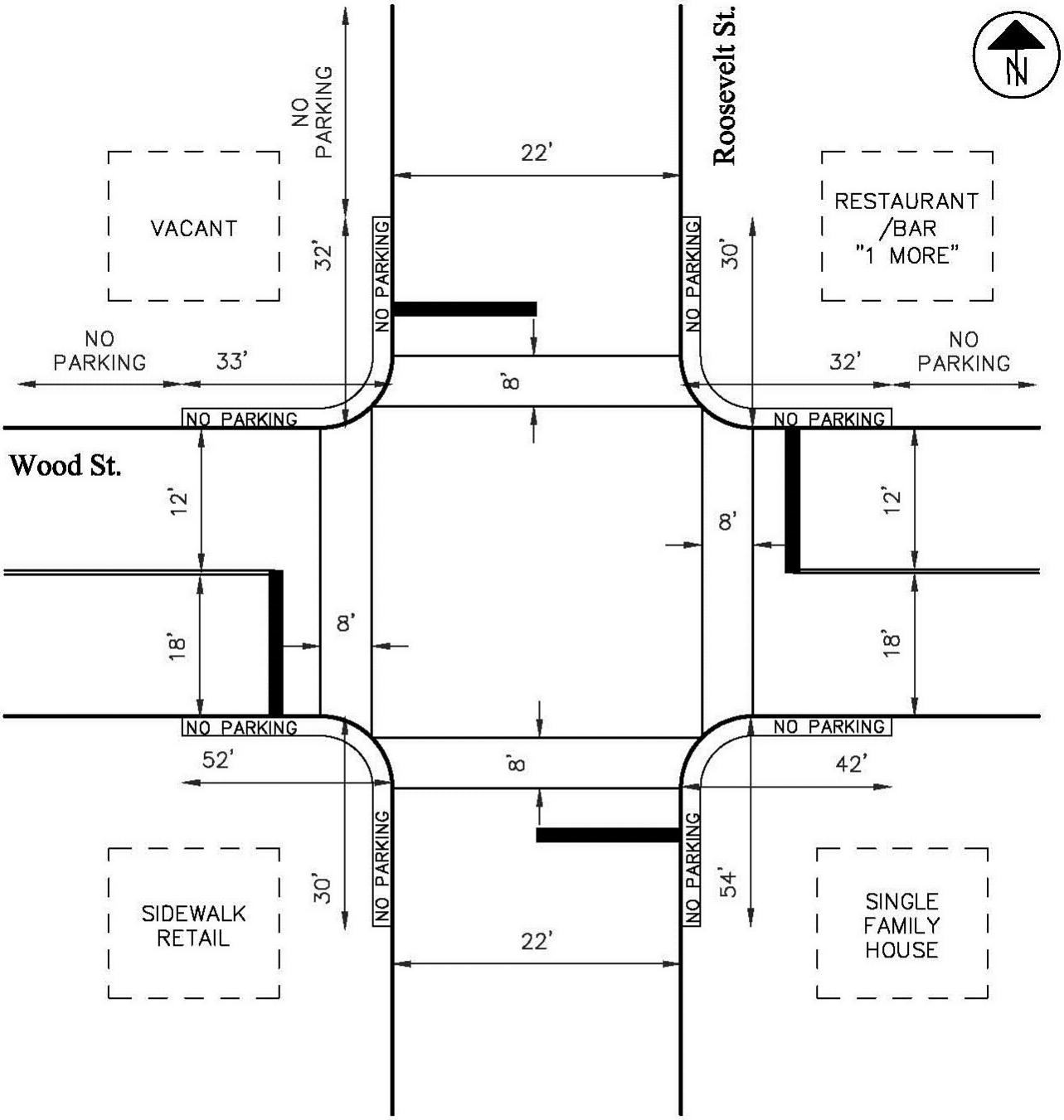
Crash History

- 4 reported crashes from 2005-2008
- Primarily angle type crashes

Recommendation

- Consider replacing traffic signal with four-way stop

INTERSECTION DIAGRAM



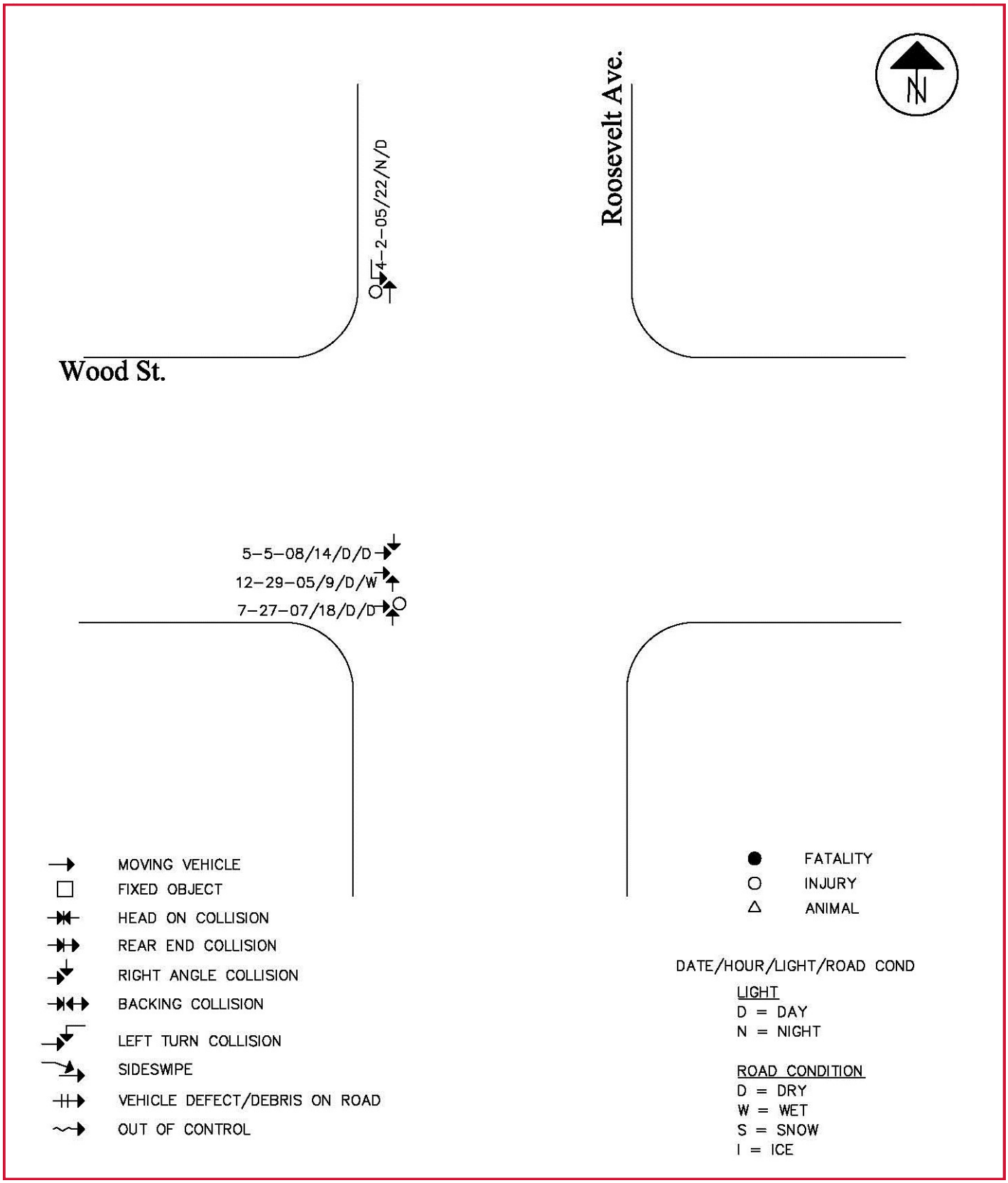
PRETIMED 2 PHASE SIGNAL

75 SEC CYCLE

20 SEC N/S SPLIT

55 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: Roosevelt Avenue at Wood Street

Date of Counts: Thursday 8/7/2008

	SB Roosevelt Ave				WB Wood St				NB Roosevelt Ave				EB Wood St				Major	Minor St	
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Street	#1	#2
7:00 to 7:15 am	0	1	2	0	0	3	0	0	1	1	1	0	0	12	0	0			
7:15 to 7:30 am	0	2	0	0	0	5	0	0	0	0	0	0	0	18	3	0			
7:30 to 7:45 am	0	2	0	0	1	4	1	1	1	3	1	0	1	29	0	0			
7:45 to 8:00 am	1	8	0	0	0	12	0	0	1	1	1	0	0	37	1	0			
Total	1	13	2	0	1	24	1	1	3	5	3	0	1	96	4	0	127	16	11
8:00 to 8:15 am	1	1	1	0	1	4	0	0	0	4	1	0	0	13	0	0			
8:15 to 8:30 am	0	2	1	0	1	6	0	0	0	1	1	0	0	30	0	0			
8:30 to 8:45 am	0	1	0	0	2	16	1	0	1	2	1	1	1	23	1	0			
8:45 to 9:00 am	0	1	0	0	1	11	0	1	1	4	0	0	0	27	1	0			
Total	1	5	2	0	5	37	1	1	2	11	3	1	1	93	2	0	139	8	16
4:00 to 4:15 pm	0	5	2	2	1	44	2	0	0	3	0	0	1	41	0	0			
4:15 to 4:30 pm	0	8	0	0	2	34	3	1	3	1	5	0	0	34	3	1			
4:30 to 4:45 pm	1	1	2	1	4	38	1	1	1	1	5	1	1	42	1	2			
4:45 to 5:00 pm	0	7	2	0	0	40	4	1	3	2	3	0	1	34	0	2			
Total	1	21	6	3	7	156	10	3	7	7	13	1	3	151	4	5	331	28	27
5:00 to 5:15 pm	0	7	2	0	0	40	4	1	3	2	3	0	1	34	0	2			
5:15 to 5:30 pm	1	3	1	2	3	18	2	0	0	1	1	0	2	49	0	0			
5:30 to 5:45 pm	1	3	1	2	3	18	2	0	0	1	1	0	2	49	0	0			
5:45 to 6:00 pm	1	2	0	3	2	33	1	1	0	4	1	2	1	28	1	0			
Total	3	15	4	7	8	109	9	2	3	8	6	2	6	160	1	2	293	22	17
Grand Total	6	54	14	10	21	326	21	7	15	31	25	4	11	500	11	7			

SIGNAL WARANT ANALYSIS SUMMARY

Roosevelt Avenue / Wood Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	127	16	No	127	16	No	No
8 AM to 9 AM	139	16	No	139	16	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	331	28	No	331	28	No	No
5 PM to 6 PM	293	22	No	293	22	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

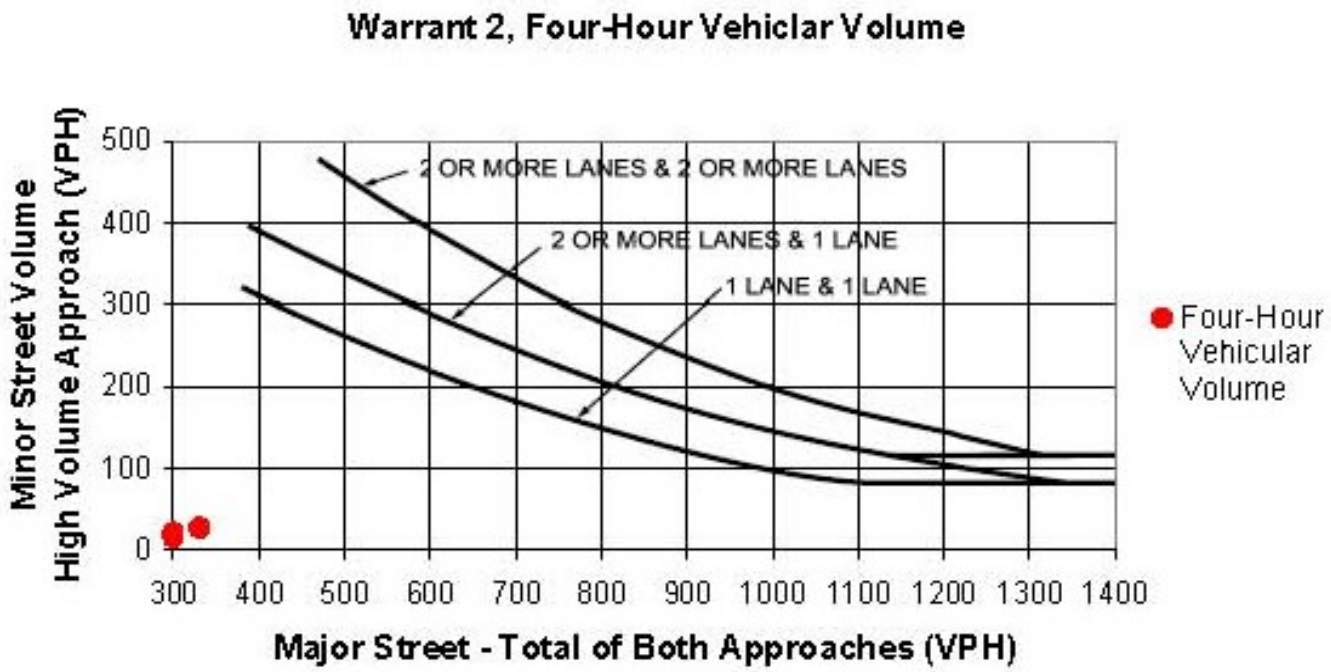
This intersection is not located at a critical point along a coordinated signal system.

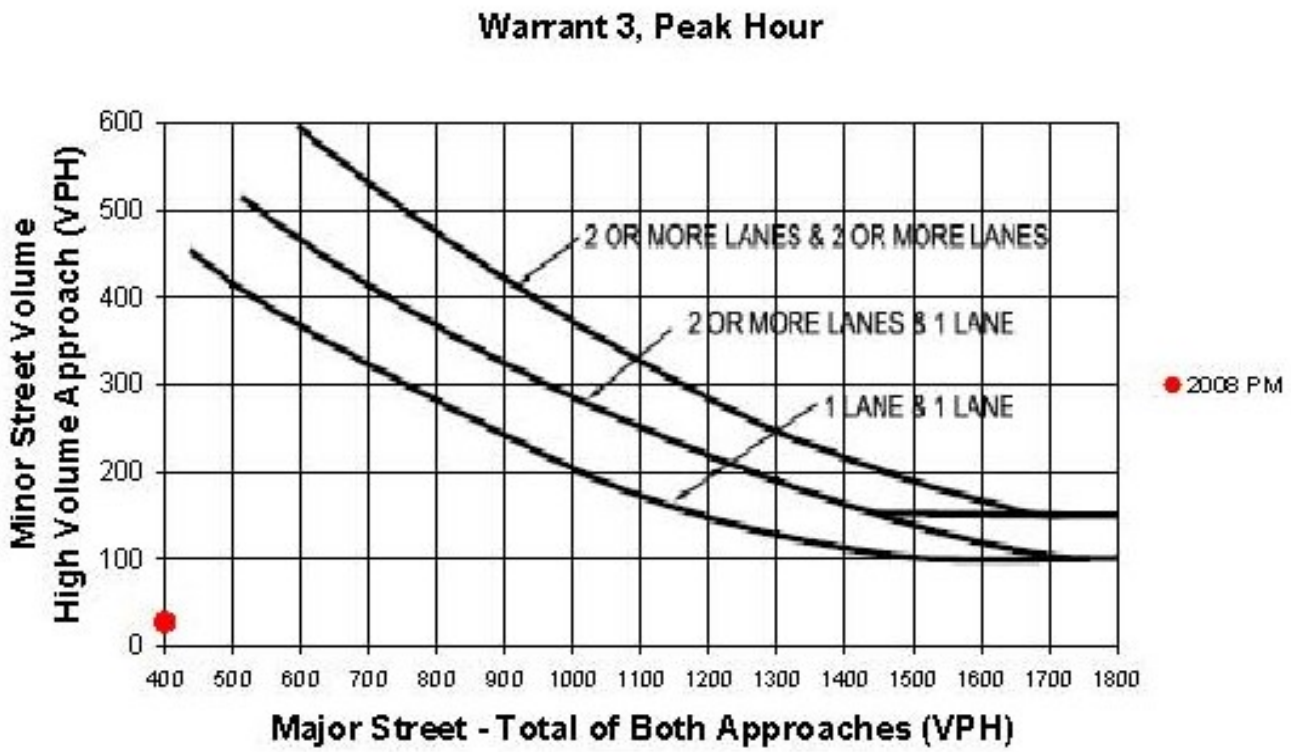
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, three right-angle crashes and one left-turn crash were reported in the vicinity of this intersection within a three year period. This intersection has not experienced five or more crashes of those types in one 12-month period to meet the signal warrant thresholds.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has less than 400 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	Roosevelt at Wood
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: *Wood Street* | North/South Street: *Roosevelt Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	3	151	4	7	156	10
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	7	7	13	1	21	6
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	174		191		28		30	
% Heavy Vehicles	1		2		1		4	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.0		0.3		0.0	
Prop. Right-Turns	0.0		0.1		0.5		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		0.0		-0.2		-0.0	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.15		0.17		0.02		0.03	
hd, final value (s)	4.24		4.23		4.51		4.69	
x, final value	0.21		0.22		0.04		0.04	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.2		2.2		2.5		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	424		441		278		280	
Delay (s/veh)	8.33		8.44		7.67		7.88	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.33		8.44		7.67		7.88	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.31							
Intersection LOS	A							

Copyright © 2005 University of Florida, All Rights Reserved *HCS+*™ Version 5.21 Generated: 11/14/2008 11:38 AM

College Street & Wood Street

Aerial Photo:

Photo: Looking East

Existing Conditions Discussion

The intersection of College Street with Wood Street is four-way stop controlled. The east, west, and south legs intersect at 90-degree angles while the north leg is slightly skewed. There is a single lane on each approach. The intersection is located between residential and commercial areas. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The primary concern at this intersection is whether or not a four-way stop is the most appropriate and effective traffic control device.

Public Comments

- "This intersection is used to bypass the traffic signal at Covington and College."
- "There needs to be a public education/awareness effort if and when changes are made."

Analyses Results

- Nine reported crashes at the intersection from Jan. 2005 to June 2008
- Four-way stop control provides adequate capacity

Recommendations

Due to the relatively high traffic volumes and the fact that the existing four-way stop control accommodates traffic at an acceptable level of service, it is recommended that four-way stop control be retained at this intersection.

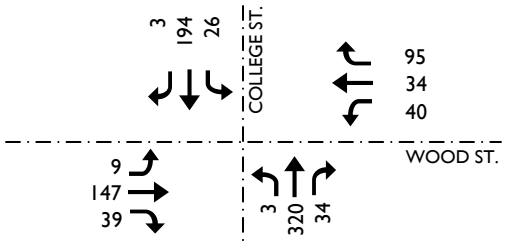
Note: During this study, it was noted that there is a desire to discourage through traffic from using Wood Street. In order to deemphasize Wood Street as a through route, consideration should be given to reducing roadway widths and curb radii at the intersection of Wayne Street and Wood Street. Currently, this intersection is relatively wide and tends to promote through traffic.

Intersection at a Glance

Existing Conditions

- Four-way stop control
- Single lane approaches
- Relatively high traffic volumes

Counted Traffic Volumes (peak hour)



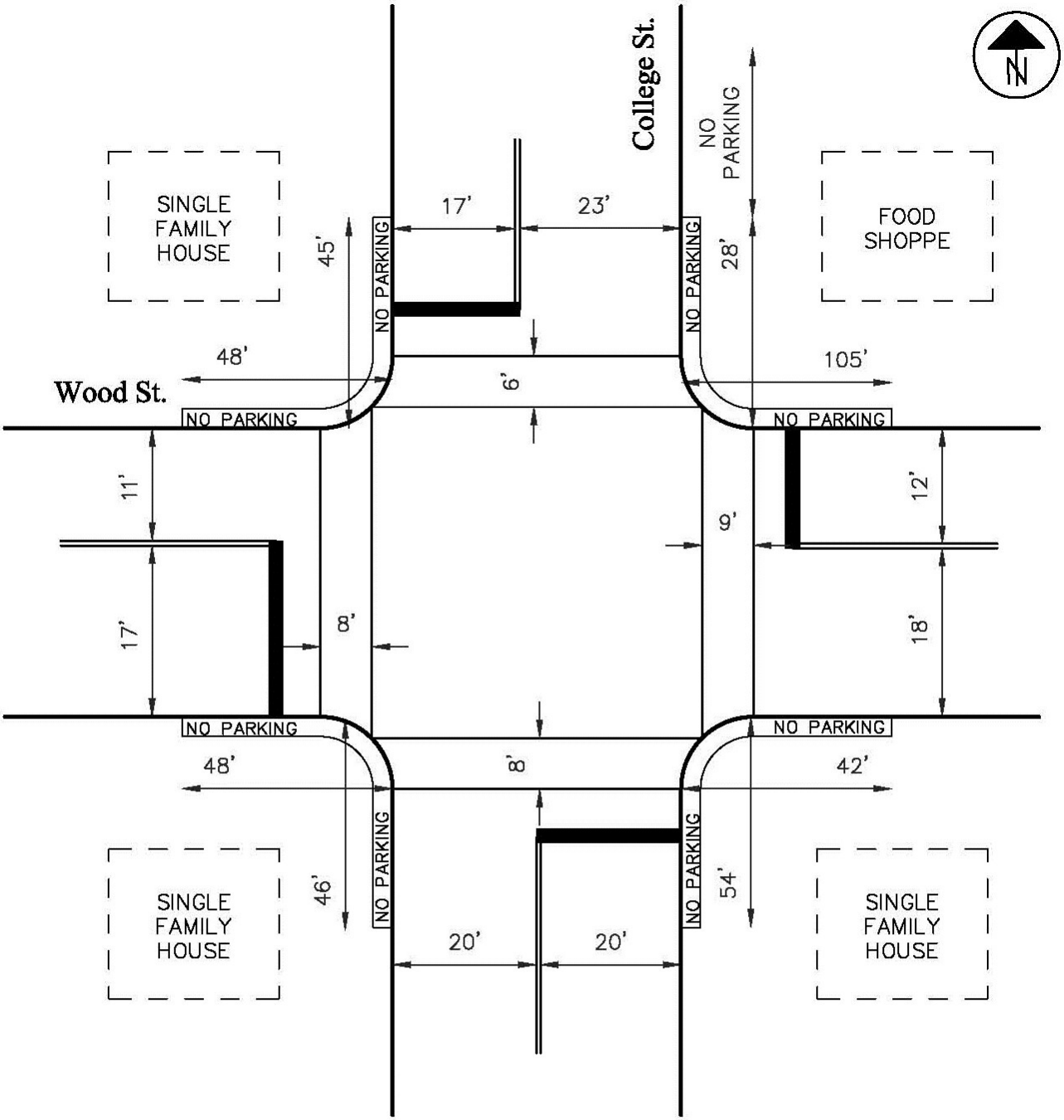
Crash History

- 9 reported crashes from 2005-2008
- Primarily angle type crashes

Recommendation

- Retain four-way stop control

INTERSECTION DIAGRAM



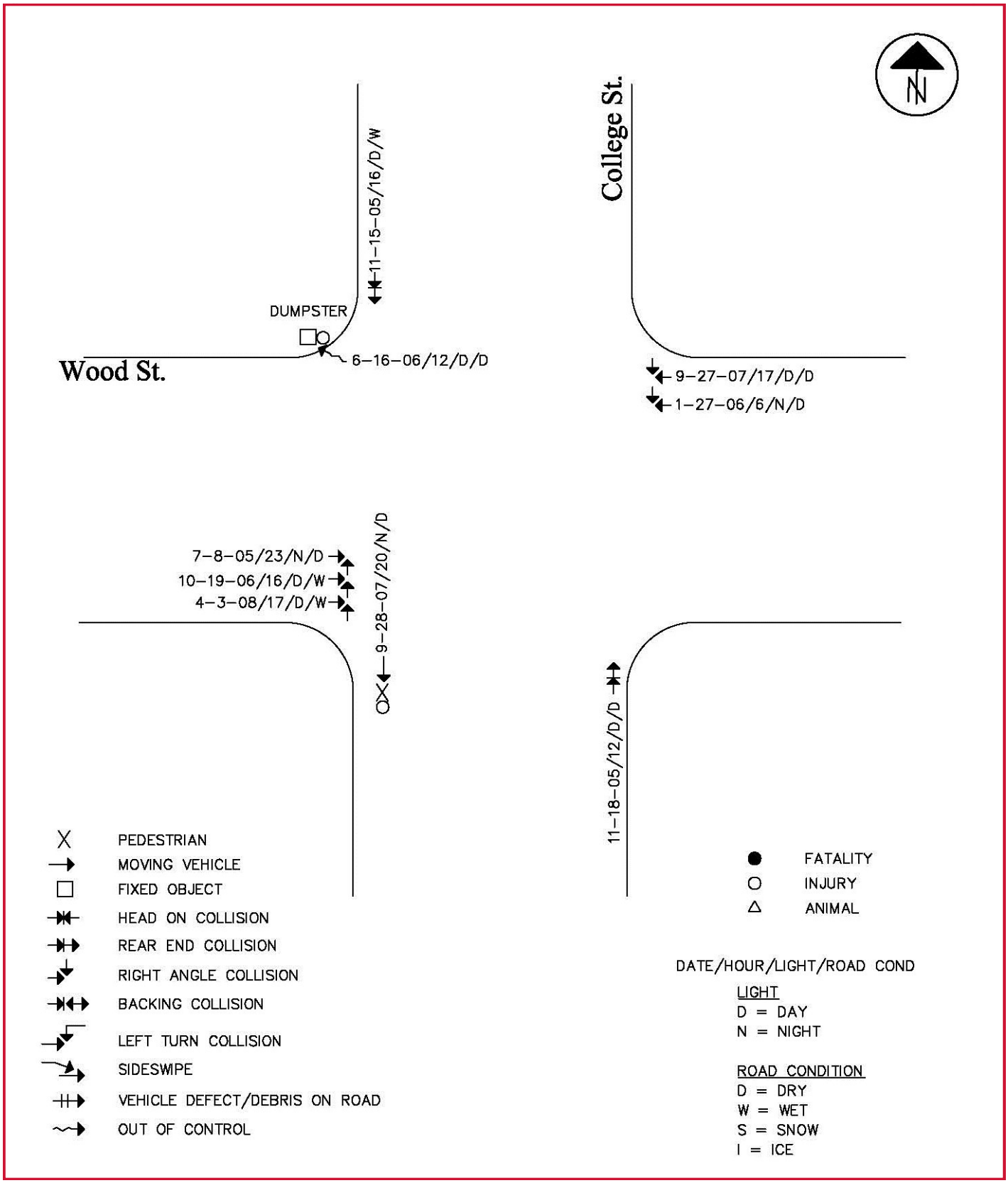
PRETIMED 2 PHASE SIGNAL

70 SEC CYCLE

30 SEC N/S SPLIT

40 SEC E/W SPLIT

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at Wood Street

Date of Counts: Thursday 8/13/2008 (7-9am & 4-6pm) and Thursday 10/9/2008 (11am-4pm)

	SB College St				WB Wood St				NB College St				EB Wood St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	1	26	0	0	2	4	3	0	0	21	6	0	1	18	5	0			
7:15 to 7:30 am	6	29	0	0	1	3	3	0	0	28	2	0	1	16	4	0			
7:30 to 7:45 am	3	40	0	0	2	1	4	0	1	29	4	1	2	26	6	0			
7:45 to 8:00 am	1	50	0	0	4	0	2	0	1	33	2	0	1	22	6	0			
Total	11	145	0	0	9	8	12	0	2	111	14	1	5	82	21	0	283	29	108
8:00 to 8:15 am	5	26	0	0	5	7	3	0	0	23	3	0	1	18	5	0			
8:15 to 8:30 am	0	29	0	0	3	2	6	0	0	29	3	0	0	20	5	0			
8:30 to 8:45 am	4	44	0	1	0	0	8	0	1	39	4	0	1	13	7	0			
8:45 to 9:00 am	3	27	0	0	1	3	8	0	0	28	5	0	1	14	1	0			
Total	12	126	0	1	9	12	25	0	1	119	15	0	3	65	18	0	273	46	86
11:00 to 11:15 am	2	44	0	0	7	4	11	0	1	48	6	0	1	20	9	0			
11:15 to 11:30 am	4	33	0	0	4	3	13	0	1	48	5	0	5	16	6	0			
11:30 to 11:45 am	7	31	0	0	5	7	13	0	0	44	7	0	3	19	4	1			
11:45 to 12:00 am	6	43	0	0	8	4	16	0	3	52	4	1	2	27	10	2			
Total	19	151	0	0	24	18	53	0	5	192	22	1	11	82	29	3	389	95	122
12:00 to 12:15 pm	4	38	0	1	6	6	22	1	1	43	6	1	4	23	16	0			
12:15 to 12:30 pm	7	34	0	0	4	9	18	0	3	43	4	0	5	18	7	0			
12:30 to 12:45 pm	11	37	0	2	5	4	17	1	0	43	7	0	3	26	10	1			
12:45 to 13:00 pm	9	30	0	0	3	6	14	0	1	44	3	0	1	24	7	0			
Total	31	139	0	3	18	25	71	2	5	173	20	1	13	91	40	1	368	114	144
2:00 to 2:15 pm	7	27	0	0	5	3	17	1	1	39	1	0	0	26	6	0			
2:15 to 2:30 pm	9	45	1	0	7	8	18	1	1	55	9	0	2	30	9	0			
2:30 to 2:45 pm	12	42	1	0	6	10	15	0	2	42	4	0	0	28	11	1			
2:45 to 3:00 pm	6	42	1	0	8	4	20	0	1	53	13	0	2	26	4	1			
Total	34	156	3	0	26	25	70	2	5	189	27	0	4	110	30	2	414	121	144
3:00 to 3:15 pm	7	54	2	0	10	9	20	0	1	81	10	3	2	39	10	3			
3:15 to 3:30 pm	7	54	1	0	12	8	17	0	1	84	3	1	0	26	9	3			
3:30 to 3:45 pm	7	38	0	0	9	6	25	1	1	71	11	1	2	44	9	0			
3:45 to 4:00 pm	5	48	0	0	9	11	33	0	0	84	10	0	5	38	11	0			
Total	26	194	3	0	40	34	95	1	3	320	34	5	9	147	39	6	580	169	195
4:00 to 4:15 pm	10	48	1	0	8	7	32	0	2	81	7	0	2	25	5	0			
4:15 to 4:30 pm	10	43	3	0	13	9	9	0	2	77	12	1	3	25	11	0			
4:30 to 4:45 pm	10	49	0	1	11	7	23	0	0	64	6	0	0	35	14	0			
4:45 to 5:00 pm	8	41	0	0	8	10	23	0	1	69	8	0	1	26	4	0			
Total	38	181	4	1	40	33	87	0	5	291	33	1	6	111	34	0	552	160	151
5:00 to 5:15 pm	5	53	0	2	10	3	25	0	2	68	6	3	2	29	9	0			
5:15 to 5:30 pm	3	48	0	2	5	7	22	1	1	69	3	7	1	22	14	1			
5:30 to 5:45 pm	4	47	1	2	12	6	20	0	1	72	5	0	1	29	3	1			
5:45 to 6:00 pm	7	62	0	2	5	8	16	0	0	61	3	0	1	21	9	0			
Total	19	210	1	8	32	24	83	1	4	270	17	10	5	101	35	2	521	139	141
Grand Total	190	1302	11	13	198	179	496	6	30	1665	182	19	56	789	246	14			

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	M. Nolt
Agency/Co.	Kleingers & Associates
Date Performed	11/13/2008
Analysis Time Period	PM Peak

Site Information

Intersection	College at Wood
Jurisdiction	City of Piqua
Analysis Year	2008

Project ID

East/West Street: *Wood Street*

North/South Street: *College Street*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	9	147	39	40	34	95
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	3	320	34	26	194	3
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.90		0.90		0.90		0.90	
Flow Rate (veh/h)	216		186		395		246	
% Heavy Vehicles	3		2		3		3	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.0		0.2		0.0		0.1	
Prop. Right-Turns	0.2		0.6		0.1		0.0	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		-0.3		-0.0		0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.19		0.17		0.35		0.22	
hd, final value (s)	6.14		6.03		5.65		5.98	
x, final value	0.37		0.31		0.62		0.41	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	4.1		4.0		3.6		4.0	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	466		436		608		496	
Delay (s/veh)	12.68		11.73		17.39		13.05	
LOS	B		B		C		B	
Approach: Delay (s/veh)	12.68		11.73		17.39		13.05	
LOS	B		B		C		B	
Intersection Delay (s/veh)	14.38							
Intersection LOS	B							

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21

Generated: 11/14/2008 9:46 AM

College Street & Young Street

Aerial Photo:

Photo: Looking North

Existing Conditions Discussion

The intersection of College Street with Young Street is four-way stop controlled and has four approaches intersecting at a 90-degree angle. There is a single lane on each approach. The intersection is located in an area that has residential and industrial uses. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. On-street parking along College Street restricts visibility of approaching traffic. The primary concern at this intersection is whether or not a four-way stop is the most appropriate and effective traffic control device.

Public Comments

- "Four-way stop is not necessary."
- "The surrounding land use has changed. Manufacturing land uses are no longer there."

Analyses Results

- Three reported crashes at the intersection from Jan. 2005 to June 2008
- Two-way stop control with stop signs on Young Street provides adequate capacity

Recommendations

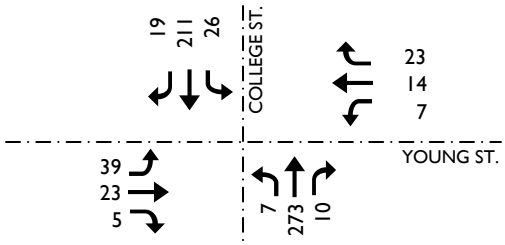
Due to the relatively low traffic volumes approaching the intersection on Young Street, it is recommended that consideration be given to converting this intersection into a two-way stop with stop signs on Young Street. If this modification is implemented, it should be accompanied by the removal of some of the on-street parking along College Street to provide adequate sight distance.

Intersection at a Glance

Existing Conditions

- Four-way stop control
- Single lane approaches
- Adjacent to residential and industrial land uses

Counted Traffic Volumes (peak hour)



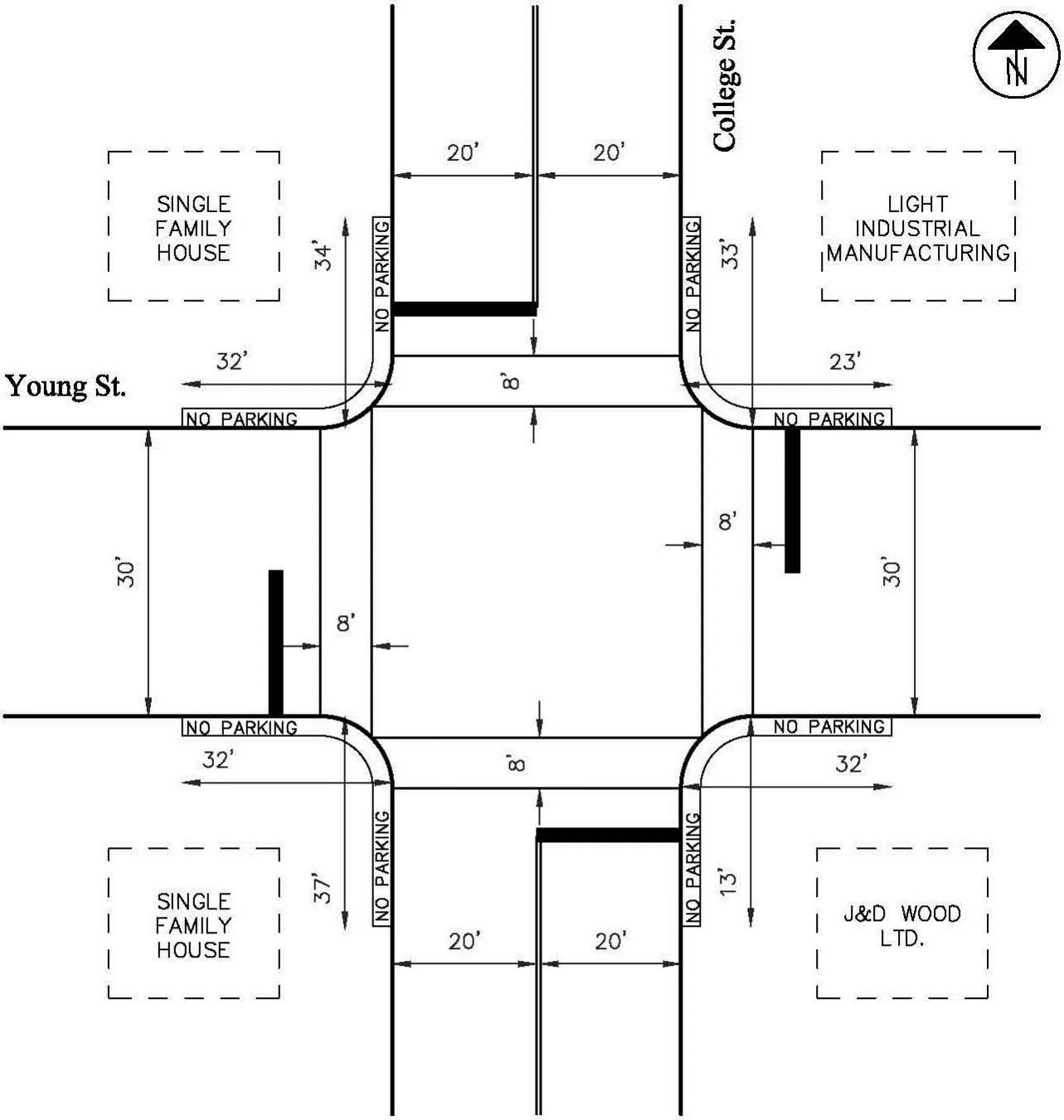
Crash History

- 3 reported crashes from 2005-2008
- Primarily angle type crashes

Recommendation

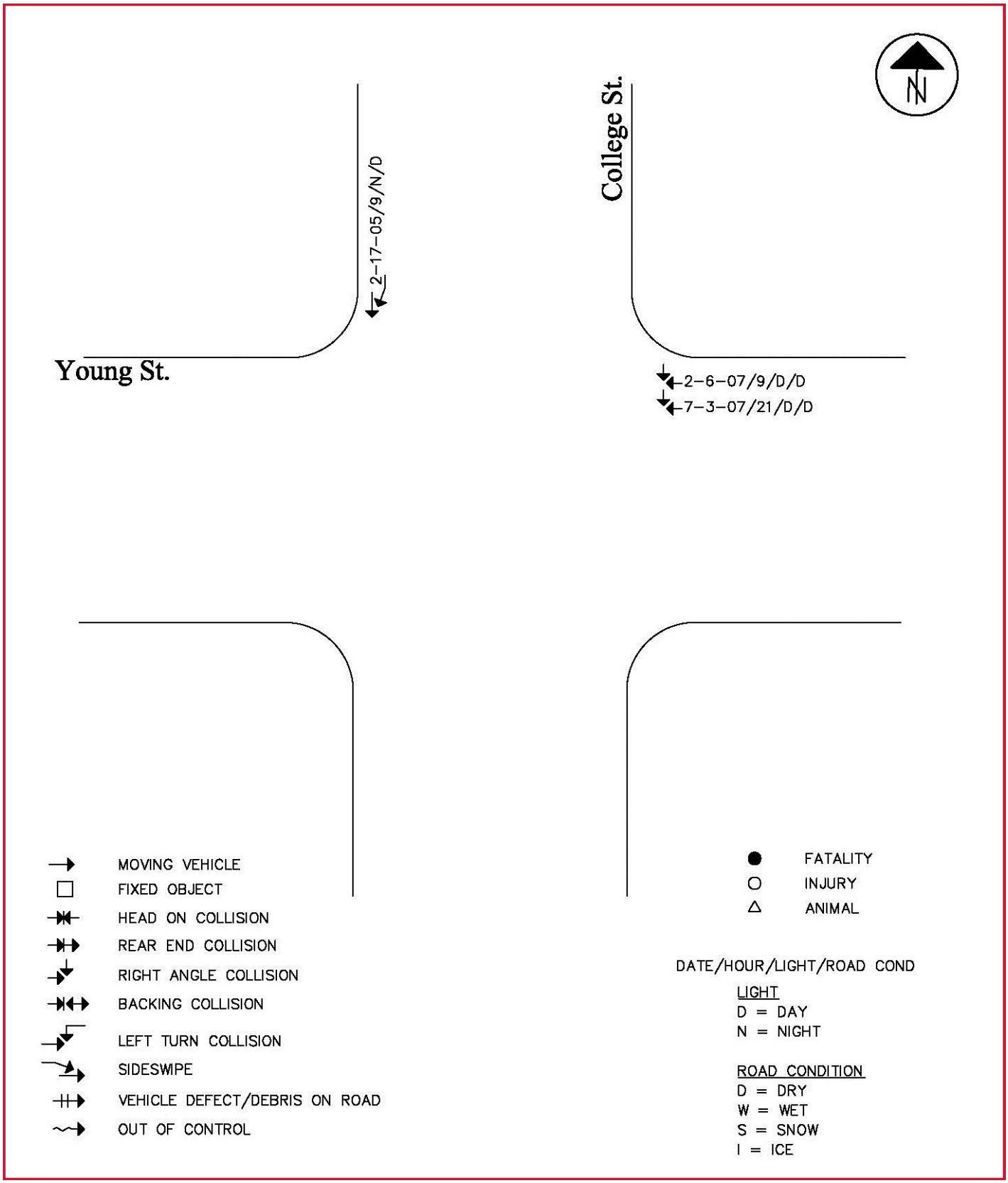
- Consider converting intersection to two-way stop, with stop signs on Young Street

INTERSECTION DIAGRAM



4-WAY STOP CONTOLLED

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: College Street at Young Street

Date of Counts: Thursday 8/13/2008

	SB College St				WB Young St				NB College St				EB Young St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	1	32	2	0	0	3	1	0	1	25	1	0	2	0	1	0			
7:15 to 7:30 am	3	33	0	0	0	0	2	0	1	25	2	0	6	2	0	0			
7:30 to 7:45 am	1	44	2	0	1	3	5	0	0	25	1	0	4	2	4	0			
7:45 to 8:00 am	5	52	4	0	0	0	1	0	1	30	0	0	2	0	2	0			
Total	10	161	8	0	1	6	9	0	3	105	4	0	14	4	7	0	291	16	25
8:00 to 8:15 am	1	33	3	0	0	1	0	0	1	21	1	0	3	2	2	0			
8:15 to 8:30 am	2	36	0	0	2	0	0	0	0	33	1	0	1	3	0	0			
8:30 to 8:45 am	6	45	1	1	1	1	6	0	0	30	0	0	7	4	0	0			
8:45 to 9:00 am	4	23	2	0	2	1	2	0	0	25	0	0	4	0	2	0			
Total	13	137	6	1	5	3	8	0	1	109	2	0	15	9	4	0	268	16	28
4:00 to 4:15 pm	5	52	5	0	1	2	6	4	3	69	5	0	15	6	2	0			
4:15 to 4:30 pm	7	56	4	1	2	2	10	1	1	75	1	1	11	10	3	0			
4:30 to 4:45 pm	8	63	5	2	1	5	4	2	2	60	2	1	7	4	0	4			
4:45 to 5:00 pm	6	40	5	0	3	5	3	0	1	69	2	0	6	3	0	1			
Total	26	211	19	3	7	14	23	7	7	273	10	2	39	23	5	5	546	44	67
5:00 to 5:15 pm	8	58	3	1	2	4	8	0	1	69	3	4	1	2	2	1			
5:15 to 5:30 pm	5	54	5	2	0	1	7	0	1	64	0	6	5	11	1	4			
5:30 to 5:45 pm	2	49	9	0	1	5	7	0	1	68	0	0	7	2	1	2			
5:45 to 6:00 pm	3	65	7	1	0	2	9	2	0	56	0	0	2	3	0	0			
Total	18	226	24	4	3	12	31	2	3	257	3	10	15	18	4	7	531	46	37
Grand Total	67	735	57	8	16	35	71	9	14	744	19	12	83	54	20	12			

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*College at Young*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description

East/West Street: *Young Street*	North/South Street: *College Street*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	7	273	10	26	211	19
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	7	303	11	28	234	21
Percent Heavy Vehicles	0	--	--	5	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal		0			0	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	39	23	5	7	14	23
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	43	25	5	7	15	25
Percent Heavy Vehicles	0	0	5	13	0	1
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	7	28		47			73	
C (m) (veh/h)	1311	1215		492			370	
v/c	0.01	0.02		0.10			0.20	
95% queue length	0.02	0.07		0.32			0.72	
Control Delay (s/veh)	7.8	8.0		13.1			17.1	
LOS	A	A		B			C	
Approach Delay (s/veh)	--	--	13.1			17.1		
Approach LOS	--	--	B			C		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/14/2008 9:51 AM

South Street & Brice Ave

Aerial Photo:

Photo: Looking West

Existing Conditions Discussion

The intersection of South Street with Brice Avenue is signal controlled and has three approaches with Brice Avenue intersecting South Street at a slightly skewed angle. There is a single lane on each approach. The intersection is located in a residential area and is adjacent to Favorite Hill School. The actuated signal has pedestrian push buttons and pedestrian signal indications. The speed limit along South Street is reduced during school arrival and dismissal periods with signs and flashing beacons. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. The primary concern at this intersection is the warrant status of the existing traffic signal. This signal may have been installed initially to provide for pedestrian crossings between the school and the residential district on the opposite side of South Street.

Public Comments

- "Traffic signal is needed for student crossings."
- "There is a crossing guard that pushes the pedestrian button."
- "Pedestrian crossings used to occur at a mid-block location."
- "Operational changes may be needed."
- "Traffic signal provides a safe crossing for school students."
- "Motorist confusion may be a problem."
- "Alternate traffic control may be appropriate."

Analyses Results

- Traffic Signal Warrant 5 may be met
- One reported crash at the intersection from Jan. 2005 to June 2008
- Very low vehicular traffic volumes on Brice Avenue
- Significant number of pedestrian crossings during school arrival and dismissal periods.

Recommendations

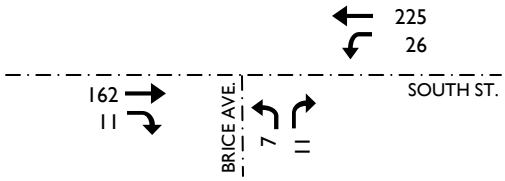
Due to the number of pedestrians observed crossing the intersection during school arrival and dismissal periods, it is recommended that the traffic signal at this intersection be retained.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Adjacent to Favorite Hill School
- Low vehicular traffic volumes

Counted Traffic Volumes (peak hour)



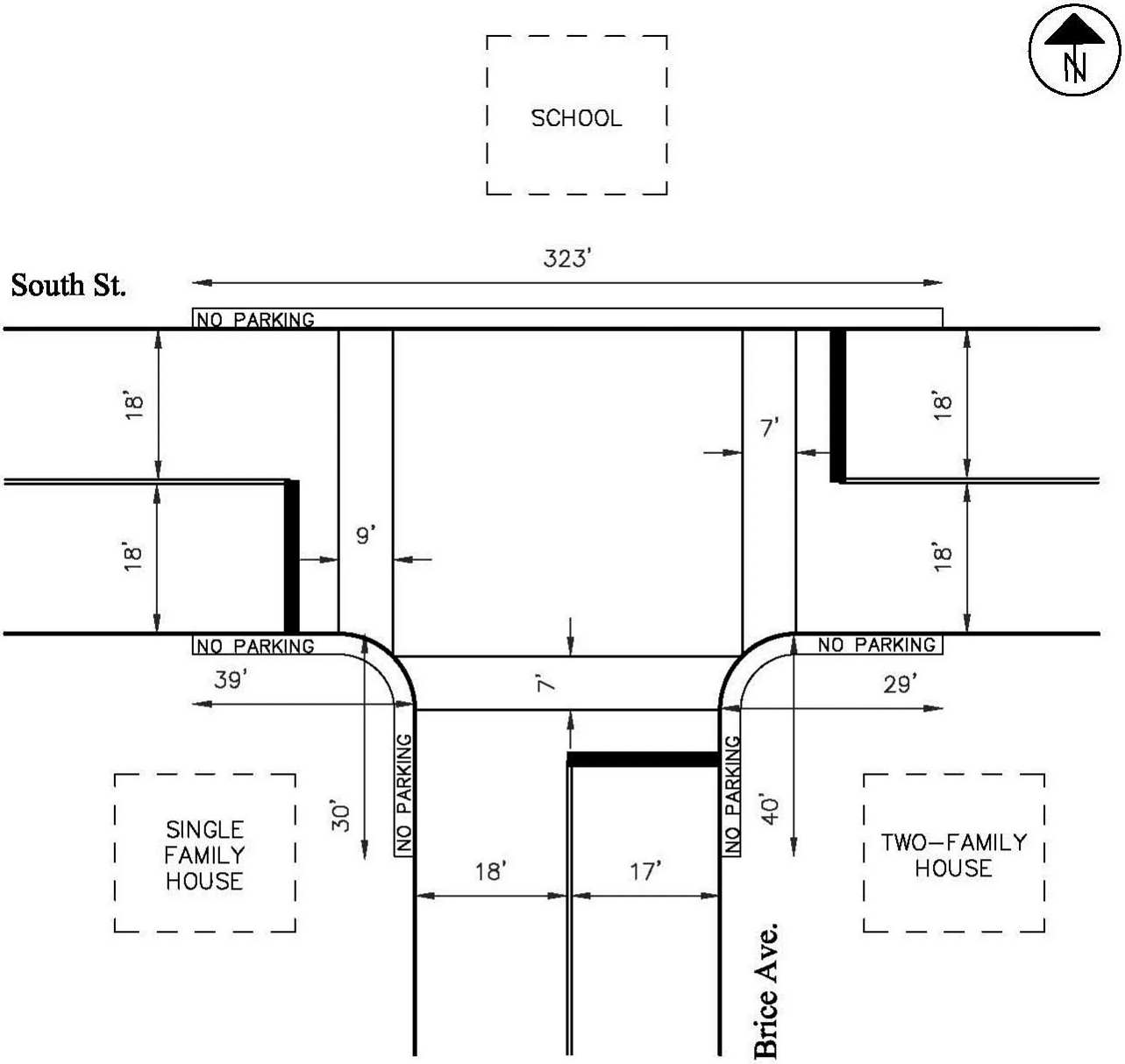
Crash History

- 1 reported crash from 2005-2008
- Rear-end type crash

Recommendation

- Retain traffic signal

INTERSECTION DIAGRAM

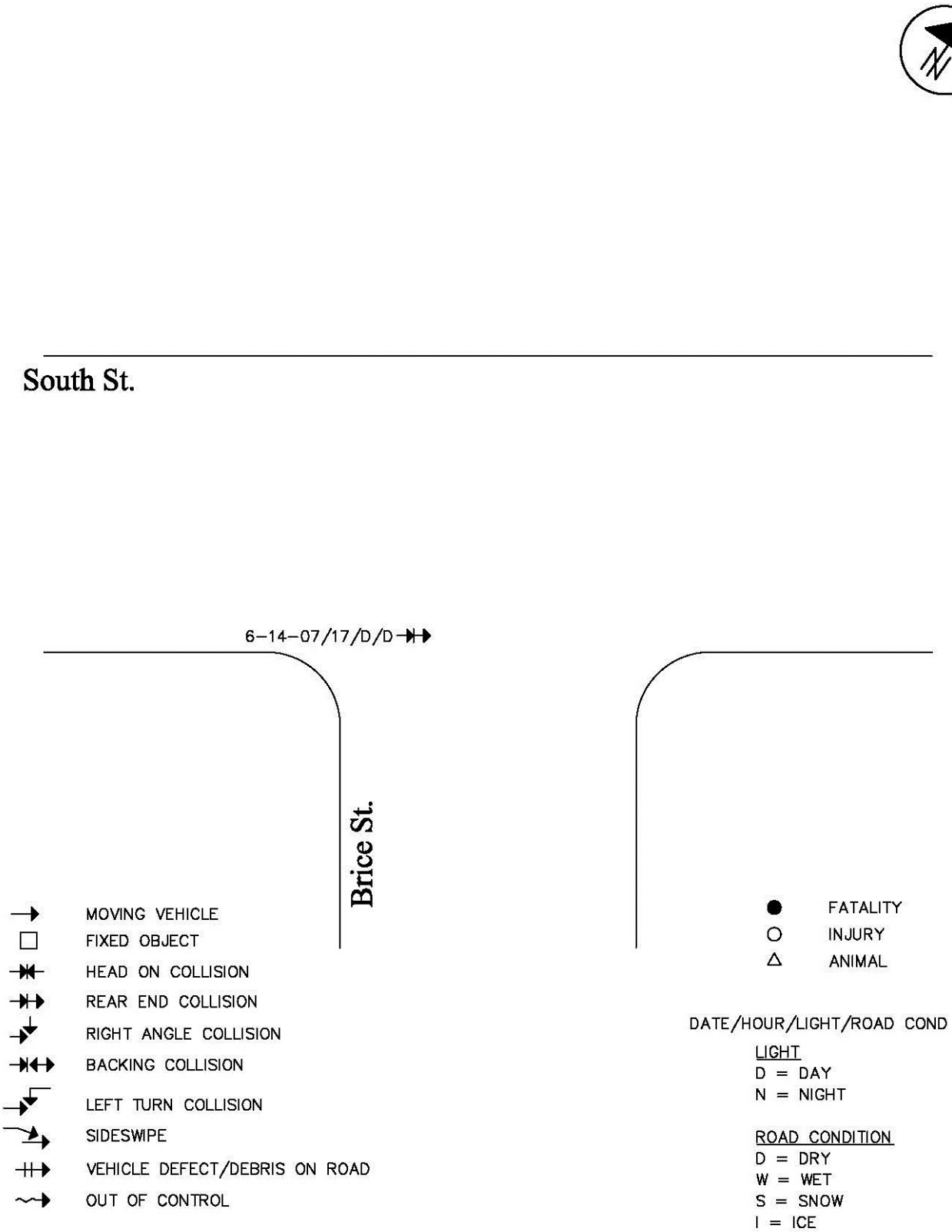


ACTUATED SIGNAL

UNKNOWN CYCLE

MIN 21 SEC BRICE AVE INTERVAL

CRASH DIAGRAM



Turning Movement Counts Summary Table

Location: South Street at Brice Avenue

Date of Counts: Thursday 10/9/2008

	WB South St				NB Brice Ave				EB South St				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	0	0	0	0	1	13	0	2	0	0	5	1	0	18	2	1			
7:15 to 7:30 am	0	0	0	0	1	8	0	0	0	0	1	0	0	24	0	0			
7:30 to 7:45 am	0	0	0	1	0	23	0	2	0	0	2	0	0	39	0	0			
7:45 to 8:00 am	0	0	0	1	2	17	0	1	0	0	0	0	0	24	0	0			
Total	0	0	0	2	4	61	0	5	0	0	8	1	0	105	2	1	172	0	8
8:00 to 8:15 am	0	0	0	3	7	25	0	3	1	0	2	3	0	22	1	0			
8:15 to 8:30 am	0	0	0	7	3	38	0	1	1	0	2	2	0	20	1	0			
8:30 to 8:45 am	0	0	0	1	6	36	1	0	0	0	5	4	0	19	3	0			
8:45 to 9:00 am	0	0	0	0	1	23	0	0	0	0	0	0	0	19	0	0			
Total	0	0	0	11	17	122	1	4	2	0	9	9	0	80	5	0	225	0	11
2:00 to 2:15 pm	0	0	0	0	1	30	0	0	0	0	1	0	0	38	1	0			
2:15 to 2:30 pm	0	0	0	0	2	33	0	0	1	0	2	0	0	36	2	0			
2:30 to 2:45 pm	0	0	0	0	2	31	0	0	1	0	3	0	0	35	4	0			
2:45 to 3:00 pm	0	0	0	1	2	41	0	0	2	0	1	1	0	24	1	0			
Total	0	0	0	1	7	135	0	0	4	0	7	1	0	133	8	0	283	0	11
3:00 to 3:15 pm	0	0	0	2	6	45	0	0	0	0	3	5	0	44	3	1			
3:15 to 3:30 pm	0	0	0	11	7	47	0	0	3	0	5	23	0	40	2	3			
3:30 to 3:45 pm	0	0	0	14	9	69	0	0	3	0	3	9	0	34	4	2			
3:45 to 4:00 pm	0	0	0	3	4	64	0	0	1	0	0	5	0	44	2	1			
Total	0	0	0	30	26	225	0	0	7	0	11	42	0	162	11	7	424	0	18
Grand Total	0	0	0	44	54	543	1	9	13	0	35	53	0	480	26	8			

SIGNAL WARANT ANALYSIS SUMMARY

South Street / Brice Avenue Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	172	8	No	172	8	No	No
8 AM to 9 AM	225	11	No	225	11	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	283	11	No	283	11	No	No
3 PM to 4 PM	424	18	No	424	18	No	No
4 PM to 5 PM			No			No	No
5 PM to 6 PM			No			No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant MAY be Satisfied*

Favorite Hill Elementary School is located adjacent to the intersection. The majority of pedestrian crossings during the traffic counts were school related; however, the total number of minor street crossings during the afternoon peak was 72 – more than the minimum required. Available crossing gaps were not measured.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

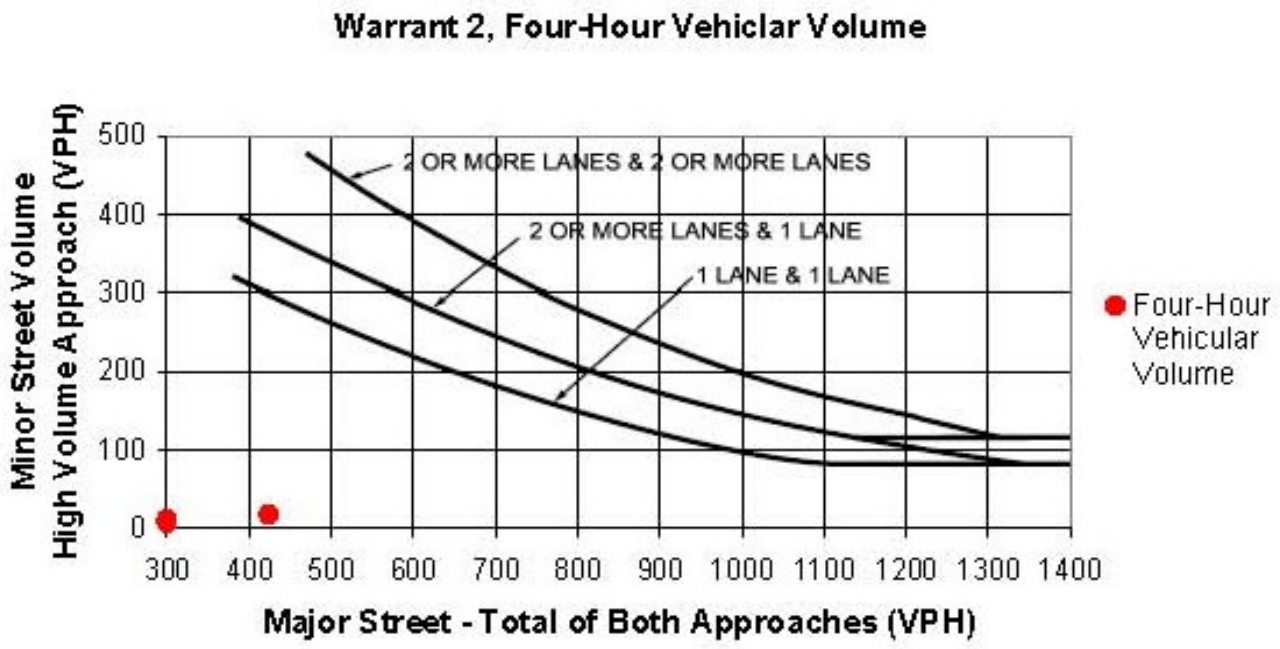
This intersection is not located at a critical point along a coordinated signal system.

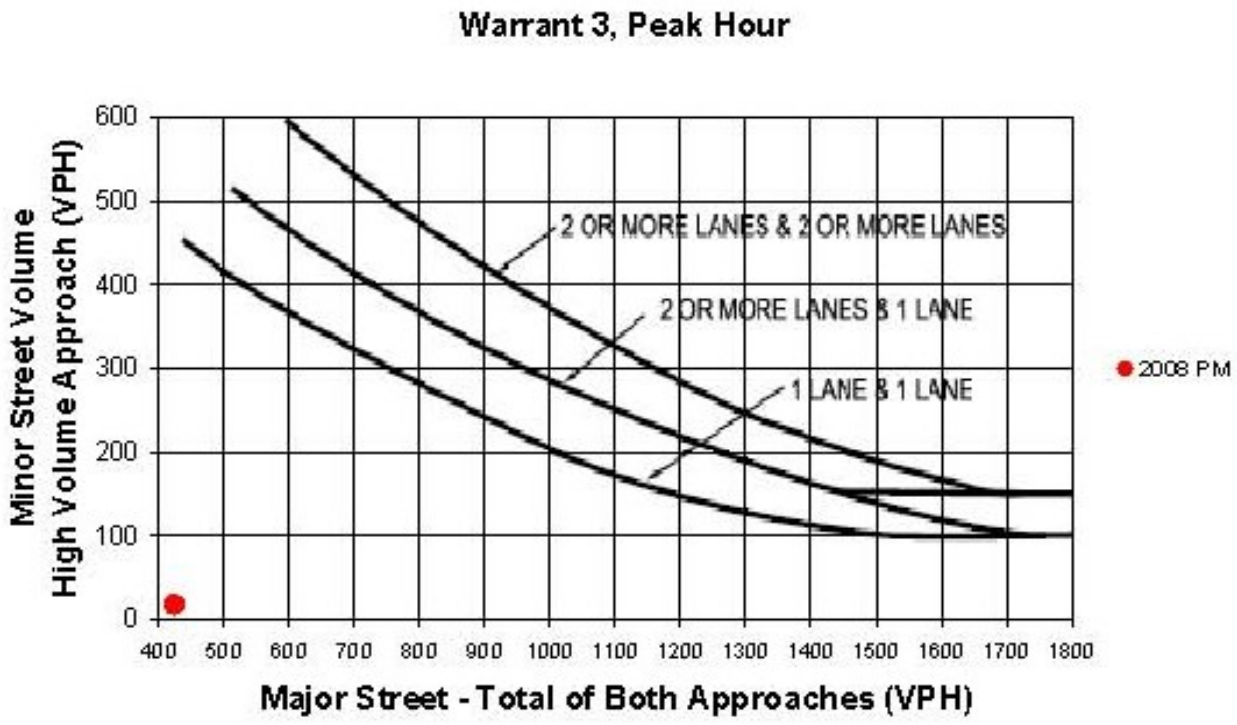
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes that could be corrected by traffic signal control were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (3-4 PM) has less than 450 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

McKinley Ave & Grant Street

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of McKinley Avenue with Grant Street is signal controlled and has four approaches that intersect at a 90-degree angle. There is a single lane on each approach. The intersection is located in a residential area. The actuated signal has pedestrian push buttons and pedestrian signal indications. A home and fence in the southeast corner of the intersection and parking along McKinley Avenue restrict visibility. The primary concern at this intersection is the warrant status of the existing traffic signal.

Note: This intersection was added as a study area intersection toward the end of this project. All data for this intersection was collected by the City of Piqua and provided for use in this study.

Public Comments

- This intersection was not included in the study at the time of the Input/Awareness meeting. Therefore, no public comments were received.

Analyses Results

- Traffic signal warrants are not met
- One reported crash at the intersection from Jan. 2005 to June 2008
- Two-way stop control provides adequate capacity

Recommendations

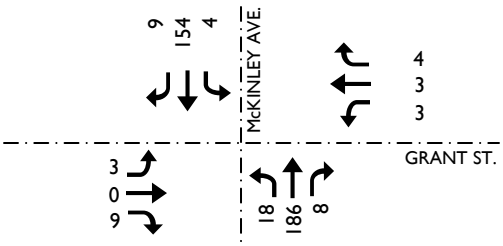
It is recommended that consideration be given to the removal of the traffic signal at this intersection and the implementation of two-way stop control with stop signs on Grant Street. However, before this modification is implemented, the existing sight distance restrictions should be removed. Also, curb bump-outs should be considered to narrow the intersection and provide adequate locations for stop sign visibility.

Intersection at a Glance

Existing Conditions

- Span-wire traffic signal
- Single lane approaches
- Low vehicular traffic volumes on Grant
- On-street parking and adjacent home and fence restrict visibility

Counted Traffic Volumes (peak hour)



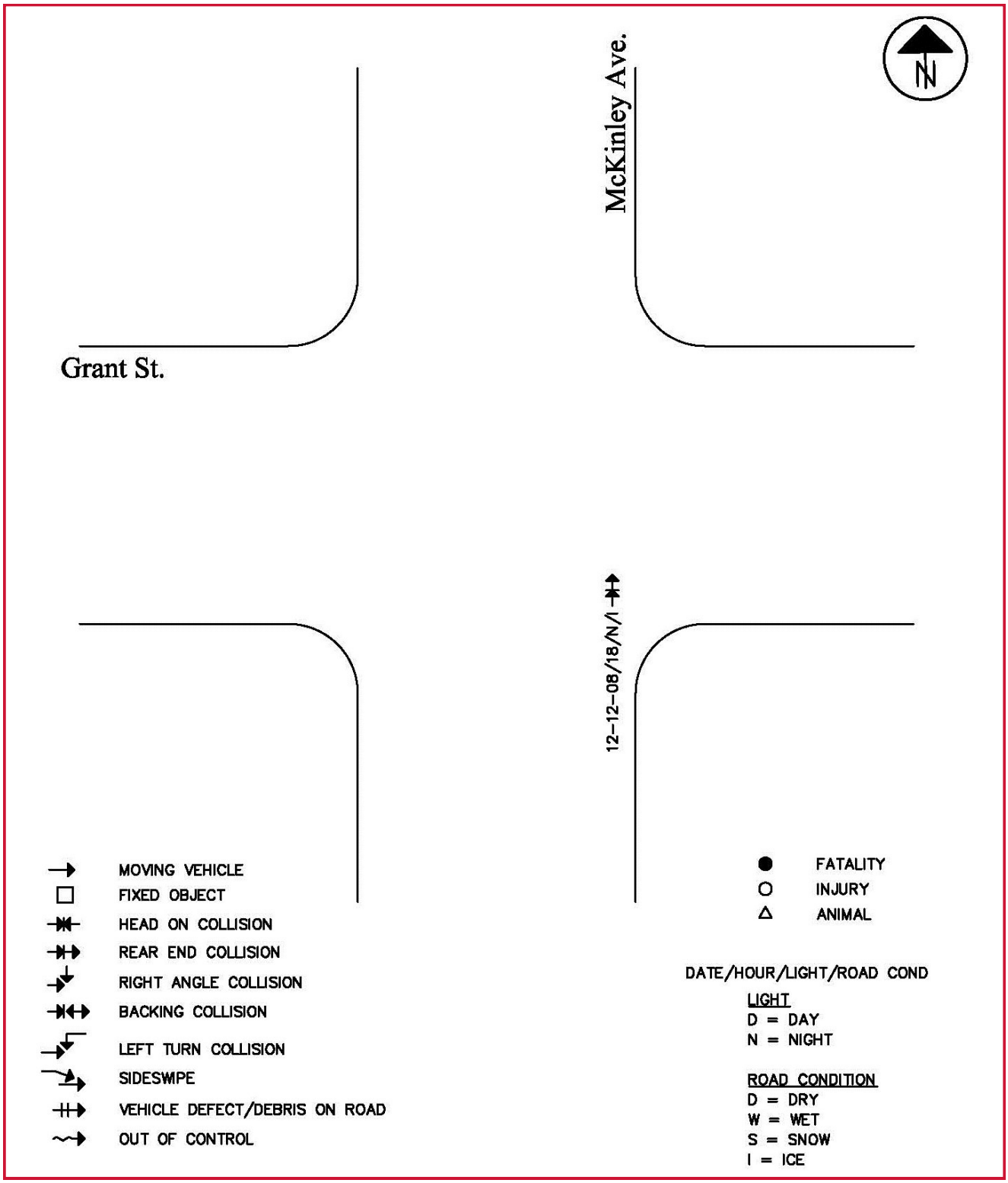
Crash History

- 1 reported crash from 2005-2008
- Rear-end crash

Recommendations

- Consider replacing traffic signal with two-way stop if sight distance restrictions can be eliminated.

CRASH DIAGRAM



TRAFFIC COUNT
Location: MCKINLEY & GRANT, Piqua, OH
Date: Tuesday, 02 December 2008
Weather: Cold 31F, Light Snow & Windy

0700 TO 0900

	MCKINLEY S/B			MCKINLEY N/B			GRANT W/B			GRANT E/B		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
0700	0	15	0	0	15	0	0	0	0	0	1	4
0715	0	15	0	0	30	0	0	0	0	0	0	2
0730	1	18	0	3	27	0	2	0	2	1	0	3
0745	0	29	1	5	36	1	0	0	1	1	0	1
0800	2	22	0	1	32	0	2	2	1	1	0	0
0815	1	23	2	1	26	1	1	1	0	1	0	1
0830	1	21	2	5	33	1	2	1	4	4	0	4
0845	0	32	1	1	27	0	0	0	0	0	0	1
TOTALS	5	175	6	16	226	3	7	4	8	8	1	16

1600 TO 1800

1600	1	36	2	7	56	1	0	2	1	1	0	4
1615	1	35	3	3	47	1	1	0	0	2	0	1
1630	0	37	2	3	46	3	0	0	3	0	0	1
1645	2	46	2	5	37	3	2	1	0	0	0	3
1700	1	42	2	5	48	0	2	0	0	0	0	2
1715	2	36	1	1	48	2	1	0	0	3	0	5
1730	2	40	0	7	25	0	0	0	1	4	0	2
1745	2	24	0	7	33	0	0	0	0	1	1	2
TOTALS	11	296	12	38	340	10	6	3	5	11	1	20

GRAND TOTALS	16	471	18	54	566	13	13	7	13	19	2	36

SIGNAL WARANT ANALYSIS SUMMARY

McKinley Avenue / Grant Street Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	196	13	No	196	13	No	No
8 AM to 9 AM	235	14	No	235	14	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM			No			No	No
3 PM to 4 PM			No			No	No
4 PM to 5 PM	379	12	No	379	12	No	No
5 PM to 6 PM	328	20	No	328	20	No	No

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). No plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume –

Pedestrian volumes were not counted as part of the data collection.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

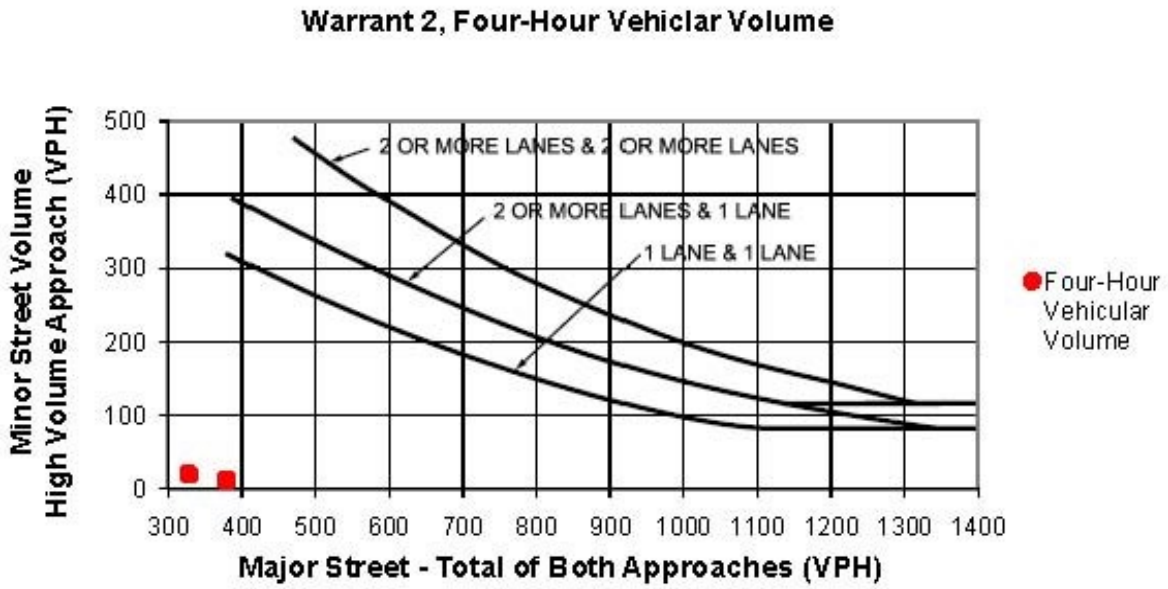
This intersection is not located at a critical point along a coordinated signal system.

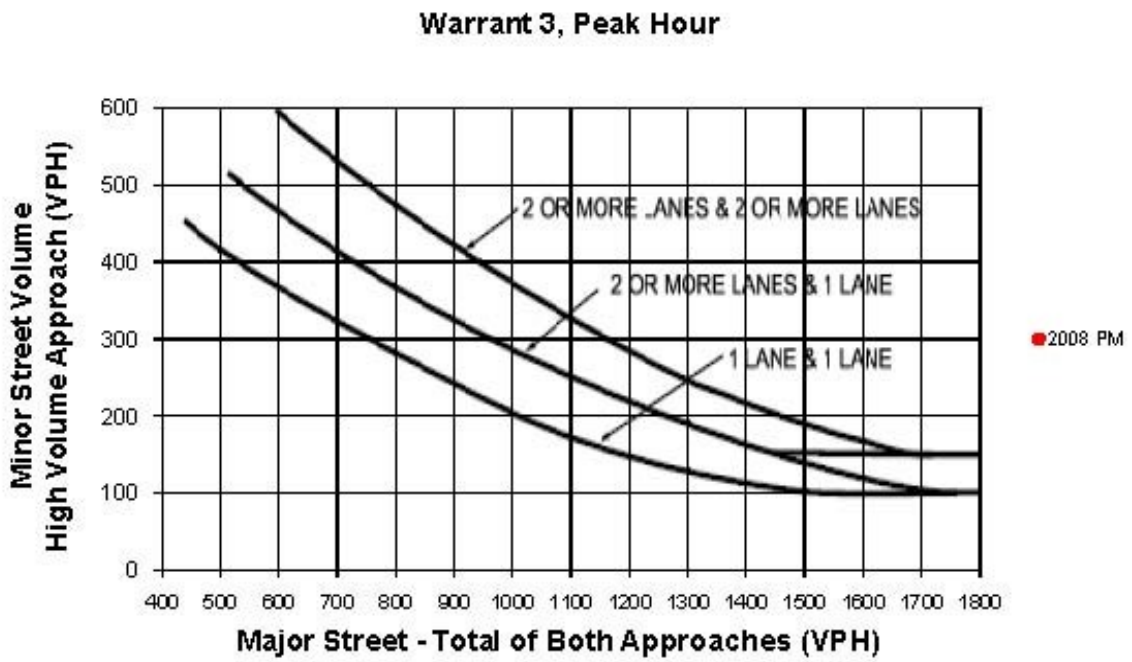
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, only one crash was reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (4-5 PM) has 401 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
300 400 500 600 700 800 900 1000 1100 1200 1300 1400
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	M. Nolt	Intersection	McKinley at Grant
Agency/Co.	Kleingers & Associates	Jurisdiction	City of Piqua
Date Performed	11/13/2008	Analysis Year	2008
Analysis Time Period	PM Peak		

Project Description

East/West Street: Grant Street	North/South Street: McKinley Avenue
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	18	186	8	4	154	9
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	20	206	8	4	171	10
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	3	0	9	3	3	4
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	3	0	10	3	3	4
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	20	4		10			13	
C (m) (veh/h)	1407	1356		596			751	
v/c	0.01	0.00		0.02			0.02	
95% queue length	0.04	0.01		0.05			0.05	
Control Delay (s/veh)	7.6	7.7		11.1			9.9	
LOS	A	A		B			A	
Approach Delay (s/veh)	--	--	11.1			9.9		
Approach LOS	--	--	B			A		

Copyright © 2007 University of Florida, All Rights Reserved HCS+™ Version 5.3 Generated: 12/18/2008 11:23 PM

McKinley Ave & Clark Ave

Aerial Photo:

Photo: Looking South

Existing Conditions Discussion

The intersection of McKinley Avenue with Clark Avenue is two-way stop controlled with stop signs on Clark Avenue. The intersection has four approaches intersecting at a 90-degree angle. The west leg of Clark Avenue serves as the entrance to Pitsenbarger Park. There is a single lane on each approach. The intersection is located in an area that has residential, recreational and commercial land uses. Parking restrictions vary near the intersection and are provided in detail on the existing conditions diagram. On-street parking along McKinley Avenue and a fence bordering the property on the southeast corner of the intersection restrict visibility of approaching traffic. Traffic volumes on McKinley Avenue are significantly higher than those on Clark Avenue. The primary concern at this intersection is whether or not a two-way stop is the most appropriate and effective traffic control device.

Public Comments

- "There are sight distance concerns at the intersection."
- "Traffic signal may be needed."
- "Concerns regarding safety of children going to park."
- "If traffic signal were to be considered, the installation and maintenance costs should be considered."

Analyses Results

- Traffic signal warrants are not met
- No reported crashes at the intersection from Jan. 2005 to June 2008
- Existing two-way stop control provides adequate capacity

Recommendations

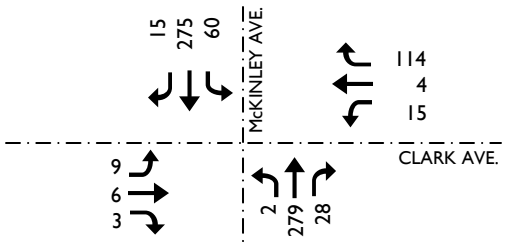
Existing two-way stop appears to be operating appropriately. As a result, it is recommended that two-way stop control be retained. It is recommended that consideration be given to addressing the sight distance restrictions at the intersection. It is also recommended that consideration be given to the installation of advance signing to warn motorists on McKinley Avenue of the potential for pedestrian crossings and vehicles entering or exiting the park facility.

Intersection at a Glance

Existing Conditions

- Two-way stop control
- Single lane approaches
- Adjacent to Pitsenbarger Park
- On-street parking and adjacent fence restrict visibility

Counted Traffic Volumes (peak hour)



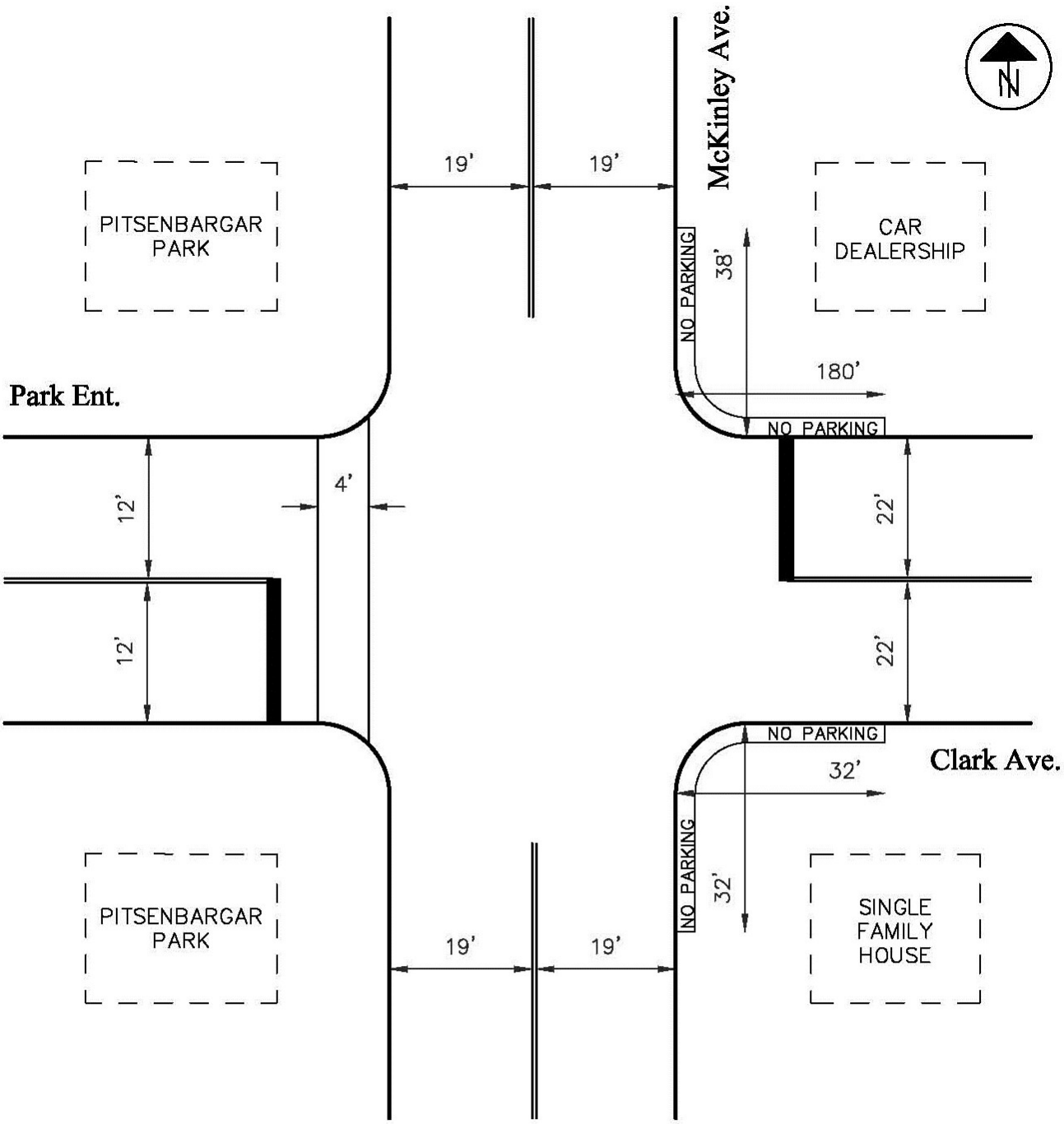
Crash History

- 0 reported crashes from 2005-2008

Recommendations

- Retain two-way stop
- Address sight distance restrictions
- Consider advance signing to warn of pedestrian crossings and park vehicles

INTERSECTION DIAGRAM



2-WAY STOP CONTOLLED

Turning Movement Counts Summary Table

Location: McKinley Avenue at Clark Avenue

Date of Counts: Thursday 8/13/2008 (7-9am & 4-6pm) and Thursday 10/9/2008 (2-4pm)

	SB McKinley Ave				WB Clark Ave				NB McKinley Ave				EB Clark Ave				Major Street	Minor St #1	Minor St #2
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds			
7:00 to 7:15 am	19	39	0	0	3	0	10	0	0	36	3	0	0	0	0	0			
7:15 to 7:30 am	21	57	0	2	0	1	16	0	0	23	6	0	0	0	0	0			
7:30 to 7:45 am	23	61	1	0	1	0	14	0	0	40	5	0	0	0	0	0			
7:45 to 8:00 am	12	52	0	4	3	0	10	2	0	48	0	2	0	2	0	0			
Total	75	209	1	6	7	1	50	2	0	147	14	2	0	2	0	0	446	58	2
8:00 to 8:15 am	12	51	0	1	0	1	12	0	0	24	4	0	0	0	0	0			
8:15 to 8:30 am	12	33	0	0	3	0	7	0	0	23	5	3	0	0	1	0			
8:30 to 8:45 am	11	38	0	0	2	0	5	0	1	27	0	1	0	0	1	0			
8:45 to 9:00 am	9	23	1	0	2	0	10	0	0	36	3	0	0	0	0	0			
Total	44	145	1	1	7	1	34	0	1	110	12	4	0	0	2	0	313	42	2
2:00 to 2:15 pm	8	48	0	0	1	1	14	0	0	45	2	0	1	0	0	0			
2:15 to 2:30 pm	18	53	0	0	4	1	17	0	0	45	3	0	0	0	0	0			
2:30 to 2:45 pm	11	50	0	0	3	0	5	1	0	47	2	0	0	0	0	0			
2:45 to 3:00 pm	14	49	0	0	2	0	23	0	1	53	2	0	0	1	1	0			
Total	51	200	0	0	10	2	59	1	1	190	9	0	1	1	1	0	451	71	3
3:00 to 3:15 pm	24	50	0	0	5	0	27	0	0	52	6	0	0	0	0	0			
3:15 to 3:30 pm	17	51	0	0	5	0	27	0	0	55	7	0	0	0	0	0			
3:30 to 3:45 pm	13	64	1	0	4	0	32	0	0	67	6	0	0	0	0	0			
3:45 to 4:00 pm	24	65	0	0	4	1	37	0	0	61	3	0	0	0	0	0			
Total	78	230	1	0	18	1	123	0	0	235	22	0	0	0	0	0	566	142	0
4:00 to 4:15 pm	20	63	5	2	4	1	35	0	0	77	5	0	2	0	0	0			
4:15 to 4:30 pm	18	61	0	0	5	0	22	1	0	59	6	0	0	0	0	0			
4:30 to 4:45 pm	21	58	1	0	2	1	31	0	0	55	5	1	0	0	2	0			
4:45 to 5:00 pm	14	52	0	0	6	2	24	0	1	66	2	0	1	1	1	0			
Total	73	234	6	2	17	4	112	1	1	257	18	1	3	1	3	0	589	133	7
5:00 to 5:15 pm	15	76	4	0	5	0	33	0	0	62	5	0	4	3	1	0			
5:15 to 5:30 pm	9	78	2	3	3	1	34	5	0	79	4	0	2	1	0	0			
5:30 to 5:45 pm	18	74	4	1	4	0	28	0	1	60	11	0	0	0	0	0			
5:45 to 6:00 pm	18	47	5	0	3	3	19	0	1	78	8	0	3	2	2	0			
Total	60	275	15	4	15	4	114	5	2	279	28	0	9	6	3	0	659	133	18
Grand Total	381	1293	24	13	74	13	492	9	5	1218	103	7	13	10	9	0			

SIGNAL WARANT ANALYSIS SUMMARY

McKinley Avenue / Clark Avenue Intersection

This signal warrant analysis is based on the guidelines in Chapter 4C of the 2003 Ohio MUTCD. The existing intersection has one approach lane from each direction and was analyzed with the counted traffic volumes.

Warrant 1, Eight-Hour Vehicular Warrant – *Warrant is NOT Satisfied*

Counted volumes from four hours in the AM and PM peak do not meet the eight-hour warrant thresholds. The remaining hours are expected to be lower in volume than the counted hours and will not meet the thresholds.

Time Period	Condition A			Condition B			Combination of Conditions A & B
	Major St	Minor St		Major St	Minor St		
	Hourly Volume	Hourly Volume	Criteria Satisfied?	Hourly Volume	Hourly Volume	Criteria Satisfied?	(80% of Each) Criteria Satisfied?
Warrant Threashold	500	150		750	75		
7 AM to 8 AM	446	58	No	446	58	No	No
8 AM to 9 AM	131	42	No	131	42	No	No
9 AM to 10 AM			No			No	No
10 AM to 11 AM			No			No	No
11 AM to 12 PM			No			No	No
12 PM to 1 PM			No			No	No
1 PM to 2 PM			No			No	No
2 PM to 3 PM	451	71	No	451	71	No	No
3 PM to 4 PM	566	142	No	566	142	No	No
4 PM to 5 PM	589	133	No	589	133	No	No
5 PM to 6 PM	659	133	No	659	133	No	Yes

Warrant 2, Four-Hour Vehicular Volume – *Warrant is NOT Satisfied*

Counted volumes from the four hours with the highest counted volumes were plotted on the Warrant 2 Table (attached). Two of the four plotted points are above the warrant threshold line for "1 lane & 1 lane".

Warrant 3, Peak Hour Vehicular Volume – *Warrant is NOT Satisfied*

The counted PM peak hour volumes were plotted on the Warrant 3 Table (attached). The plotted point is not above the warrant threshold line for "1 lane & 1 lane".

Warrant 4, Pedestrian Volume – *Warrant is NOT Satisfied*

The pedestrian crossings in each of the counted hours do not meet the minimum requirement of 100 or more for each of four hours of the day. The available gaps were not measured.

Warrant 5, School Crossing – *Warrant is NOT Satisfied*

No schools are currently located or planned in the city blocks adjacent to this intersection. Therefore, this warrant is not expected to be satisfied.

Warrant 6, Coordinated Signal System – *Warrant is NOT Satisfied*

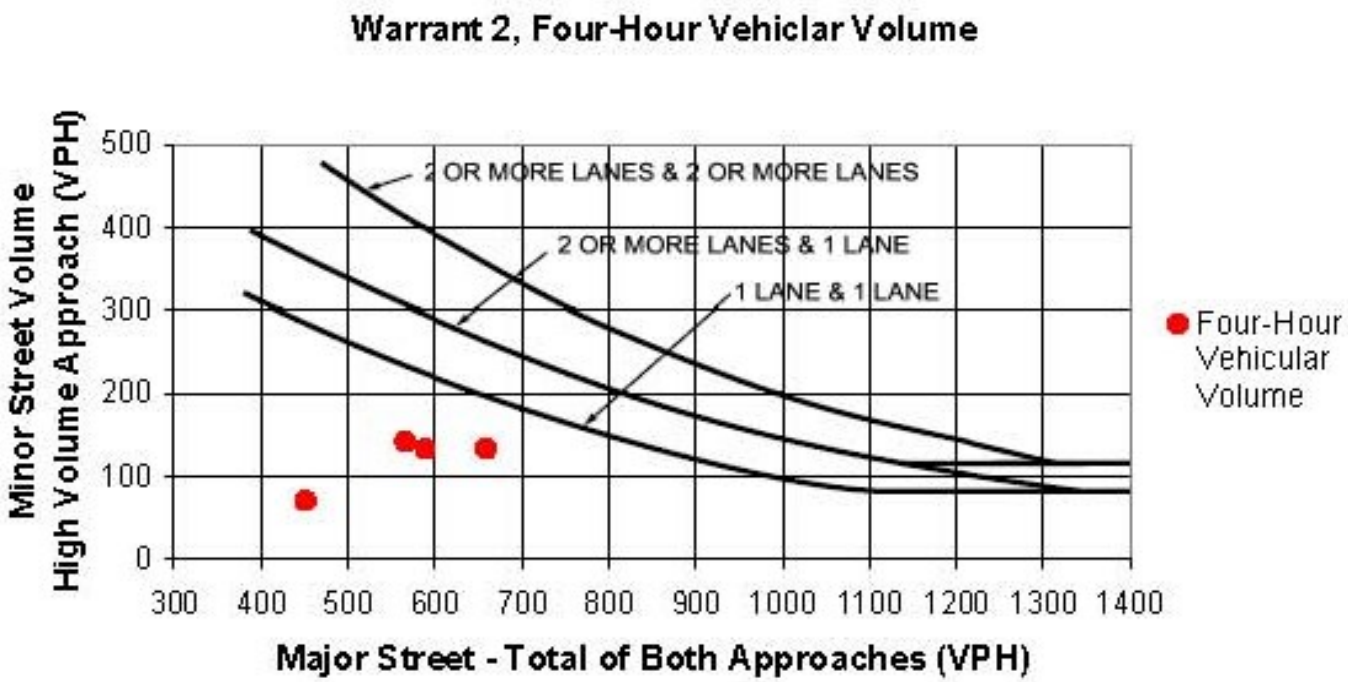
This intersection is not located at a critical point along a coordinated signal system.

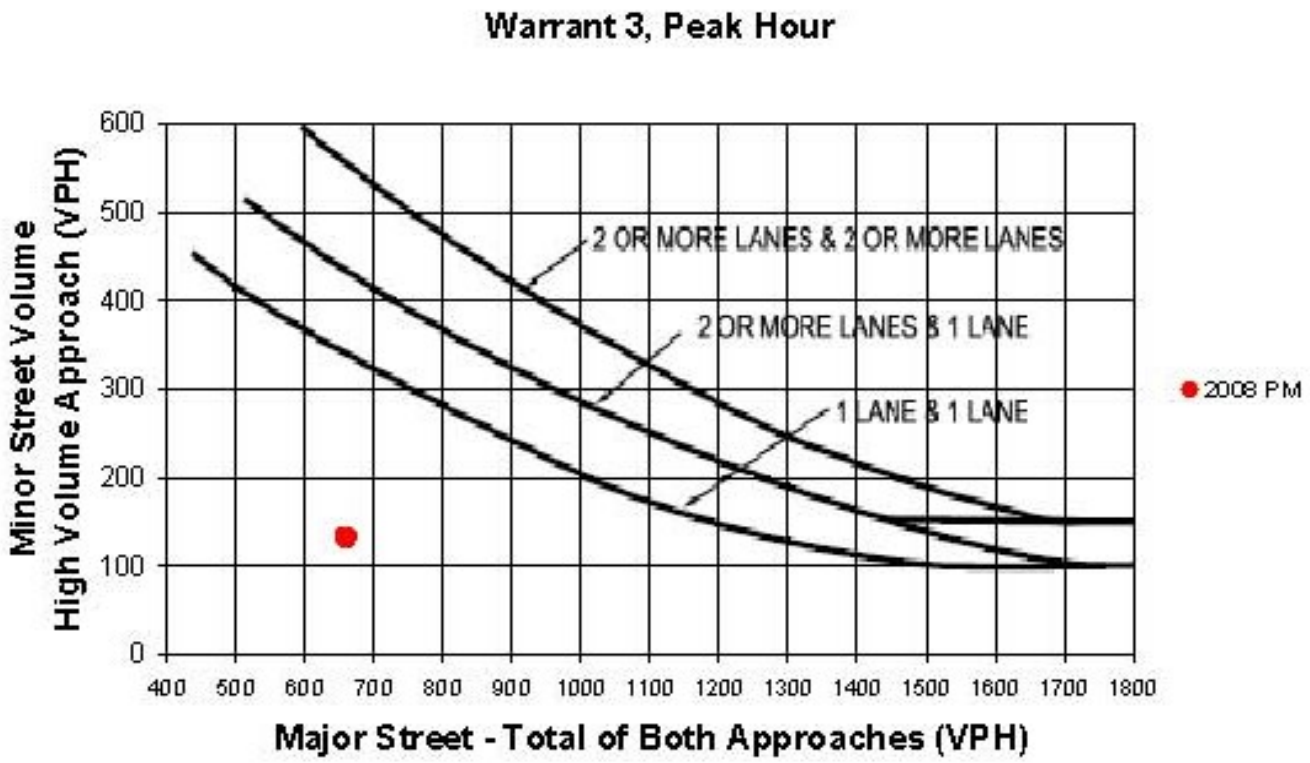
Warrant 7, Crash Experience – *Warrant is NOT Satisfied*

According to the crash data provided by the city of Piqua, no crashes were reported in the vicinity of this intersection within a three year period.

Warrant 8, Roadway Network – *Warrant is NOT Satisfied*

The hour with the largest traffic volumes (5-6 PM) has 810 total approaching trips. This is less than the required 1000 approaching trips.


Warrant 2, Four-Hour Vehiclar Volume
Minor Street Volume
High Volume Approach (VPH)
500
400
300
200
100
0
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
Four-Hour Vehicular Volume
Major Street - Total of Both Approaches (VPH)


Warrant 3, Peak Hour
Minor Street Volume
High Volume Approach (VPH)
600
500
400
300
200
100
0
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
2 OR MORE LANES & 2 OR MORE LANES
2 OR MORE LANES & 1 LANE
1 LANE & 1 LANE
2008 PM
Major Street - Total of Both Approaches (VPH)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*M. Nolt*	Intersection	*McKinley at Clark*
Agency/Co.	*Kleingers & Associates*	Jurisdiction	*City of Piqua*
Date Performed	*11/13/2008*	Analysis Year	*2008*
Analysis Time Period	*PM Peak*		

Project Description

East/West Street: *Clark Avenue*	North/South Street: *McKinley Avenue*
Intersection Orientation: *North-South*	Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	2	279	28	60	275	15
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	2	310	31	66	305	16
Percent Heavy Vehicles	0	--	--	1	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal		0			1	

Minor Street	Eastbound			Westbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)	9	6	3	15	4	114
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR (veh/h)	10	6	3	16	4	126
Percent Heavy Vehicles	0	0	0	0	0	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	Northbound	Southbound	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	LTR		LTR			LTR	
v (veh/h)	2	66		146			19	
C (m) (veh/h)	1250	1214		589			272	
v/c	0.00	0.05		0.25			0.07	
95% queue length	0.00	0.17		0.97			0.22	
Control Delay (s/veh)	7.9	8.1		13.1			19.2	
LOS	A	A		B			C	
Approach Delay (s/veh)	--	--	13.1			19.2		
Approach LOS	--	--	B			C		

Copyright © 2005 University of Florida, All Rights Reserved

HCS+™ Version 5.21 Generated: 11/13/2008 5:08 PM

The analyses performed in this report indicate that alternate traffic control methods should be considered as a result of the existing conditions at many of the study intersections. However, there are a number of intersections where it is recommended that the existing traffic control device be retained. The recommendations for each intersection were based on a number of factors. These factors include:

- Historical crash data
- Effectiveness of existing and alternative traffic control methods
- Intersection visibility / safety
- Intersection geometry
- Traffic volumes (vehicles, bicycles, and pedestrians)
- Potential for increases in the traffic volumes
- Surrounding development characteristics
- The intersection's function as a part of the overall roadway network
- Traffic signal timing / coordination issues
- Effective use of the roadway right-of-way
- Possible re-routing of SR 185 and the potential decrease in traffic along the existing route

This information presented in this report is intended to be used for decision making by the City of Piqua to determine what actions should be taken with reference to future traffic control at each of the study intersections. While the report outlines a number of safety-related improvements that should be performed in conjunction with the recommended change in traffic control, it is the responsibility of the designer of the traffic control modifications to ensure that the appropriate intersection design criteria are addressed. Although not specifically mentioned for all intersections where the modification of a particular traffic control device is recommended, it is a general recommendation that the removal of on-street parking and other sight distance restrictions be considered to provide adequate visibility of traffic control devices and/or approaching traffic.

The changes recommended for each intersection are summarized on the following page. Also, an Existing Traffic Control Map and a Proposed Traffic Control Map are included at the end of the Appendix.

Intersection	Existing Traffic Control	Recommendation
High at Broadway	Traffic Signal	Retain traffic signal
High at Downing	Traffic Signal	Consider replacing traffic signal with four-way stop
High at Wayne	Traffic Signal	Consider replacing traffic signal with four-way stop
High/Market at Main	Two-Way Stop	Retain existing traffic control
College at North	Traffic Signal	Consider replacing traffic signal with two-way stop, with stop signs on North Street
College at Greene	Traffic Signal	Consider replacing traffic signal with two-way stop, with stop signs on Greene Street
College at Ash	Traffic Signal	Consider replacing traffic signal with two-way stop, with stop signs on Ash Street
College at High	Traffic Signal	Convert signal to actuated operation. Coordinate College St. signals from Covington to High
College at Water	Traffic Signal	Convert signal to actuated operation. Add westbound left-turn signal and northbound right-turn signal. Coordinate College St. signals from Covington to High
Greene at Downing	Traffic Signal	Consider replacing traffic signal with four-way stop
Greene at Wayne	Traffic Signal	Consider replacing traffic signal with four-way stop
Greene at Main	Traffic Signal	Retain traffic signal. Left-turn lanes on Greene Street may be removed if desired
Park at College / Nicklin	Traffic Signal	Retain traffic signal
Park at Broadway	Traffic Signal	Retain traffic signal
Broadway at North	Traffic Signal	Retain traffic signal
Ash at Broadway	Traffic Signal	Retain traffic signal
Ash at Downing	Traffic Signal	Consider replacing traffic signal with two-way stop, with stop signs on Downing Street
Ash at Main	Traffic Signal	Retain traffic signal and existing lane configuration
South at Wayne	Traffic Signal	Consider replacing traffic signal with four-way stop
South at Downing	Four-Way Stop	Retain four-way stop control
South at Roosevelt	Traffic Signal	Consider replacing traffic signal with two-way stop
Wood at Roosevelt	Traffic Signal	Consider replacing traffic signal with four-way stop
College at Wood	Four-Way Stop	Retain four-way stop control
College at Young	Four-Way Stop	Consider converting intersection to two-way stop, with stop signs on Young St.
South at Brice	Traffic Signal	Retain traffic signal
McKinley at Grant	Traffic Signal	Consider replacing traffic signal with two-way stop if sight distance restrictions can be eliminated
McKinley at Clark	Two-Way Stop	Retain two-way stop. Address sight distance restrictions. Consider advance signing to warn of pedestrian crossings.

Appendix