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January 22, 2009

Mr. Dean Fischer, Director of Public Works
City of Whitewater
312 West Whitewater Street
Whitewater, WI 53190

Re: Pedestrian Access and Mobility–West Main Street

Dear Dean,

In a letter dated September 12, 2008, the study team outlined various pedestrian treatment considerations that may help address pedestrian access and mobility concerns along the West Main Street corridor (Figure 1).

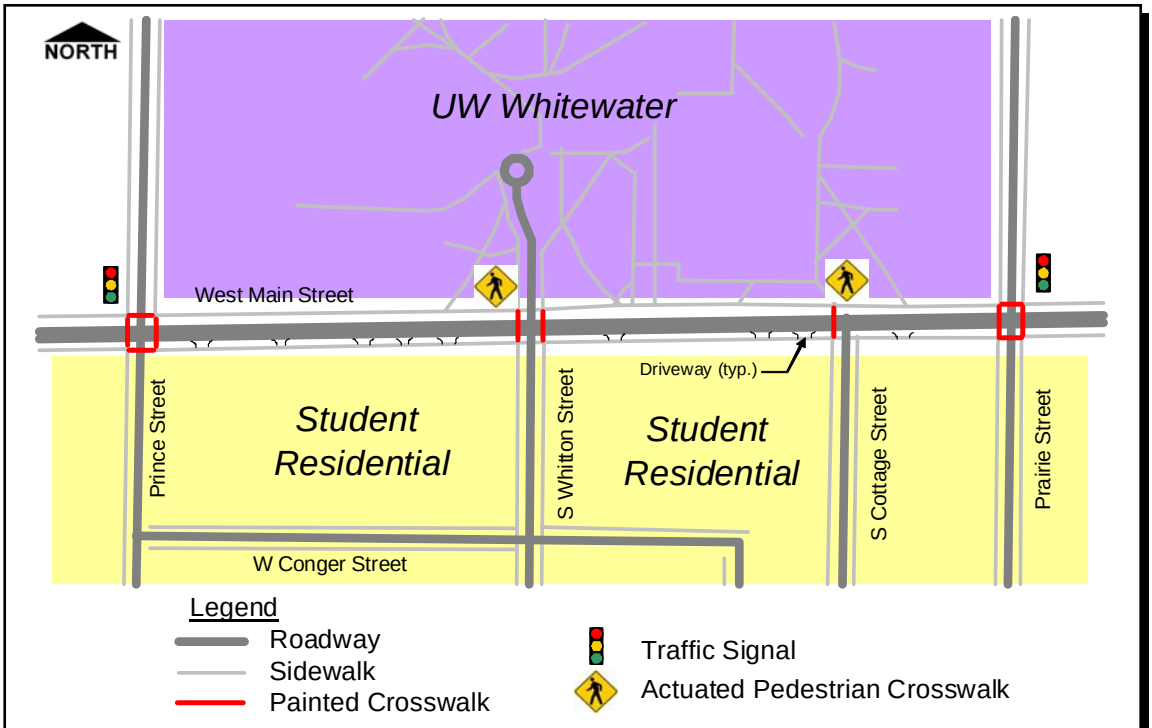


Figure 1 Corridor Location

Based on discussion, the City Council requested the study team further examine the pedestrian hybrid signal or HAWK (high intensity actuated walk). In a letter dated October 17, 2008, the study team recommended the HAWK system not be installed at the Whiton Street and Main Street intersection for the following reasons:

- Adding the HAWK would result in three control types between the Prairie Street and Prince Street intersections. This could potentially confuse drivers and pedestrians.
- Allowing a signal to be actuated and stopped by pedestrians will likely yield unacceptable traffic operations during peak periods.
- Installing a device not accepted by FHWA and WisDOT could pose liability issues.

After further discussions by the council, it was determined that a comprehensive evaluation of some treatment considerations be pursued and a traffic analysis of the area be conducted. The following discusses the results of this analysis.

Existing Conditions

The study team conducted a 12-hour vehicle and pedestrian turning-movement count on November 6, 2008, from 6 A.M. to 6 P.M., at the Main Street and Whiton Street intersection, along with AM and PM peak-hour turning-movement volumes for the adjacent intersections (Prairie Street and Prince Street). This volume data along with the current signal timings was used to evaluate the existing corridor operations.

Over 1500 pedestrians use this four-lane undivided segment of Main Street daily as a travel route to access the UW-Whitewater campus. The Main Street and Whiton Street intersection carries a majority of the pedestrian traffic on the corridor and between 850 and 1475 vehicles per hour. The hourly peaks for both pedestrian and traffic volumes appear to have a strong correlation with the UW-Whitewater class schedule, which is illustrated in Figure 3. The pedestrian volumes at this intersection satisfy the pedestrian volume traffic signal warrant. However, none of the vehicle warrants were satisfied. The AM and PM peak-hour traffic volumes and corresponding pedestrian volumes for this intersection can be seen in Figure 2.

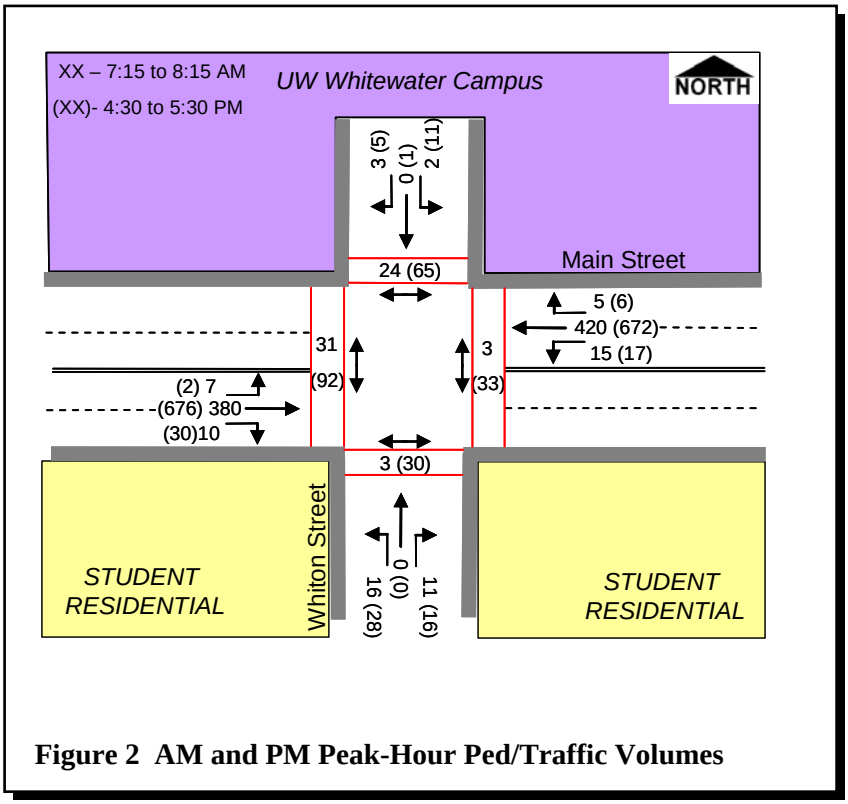


Figure 2 AM and PM Peak-Hour Ped/Traffic Volumes

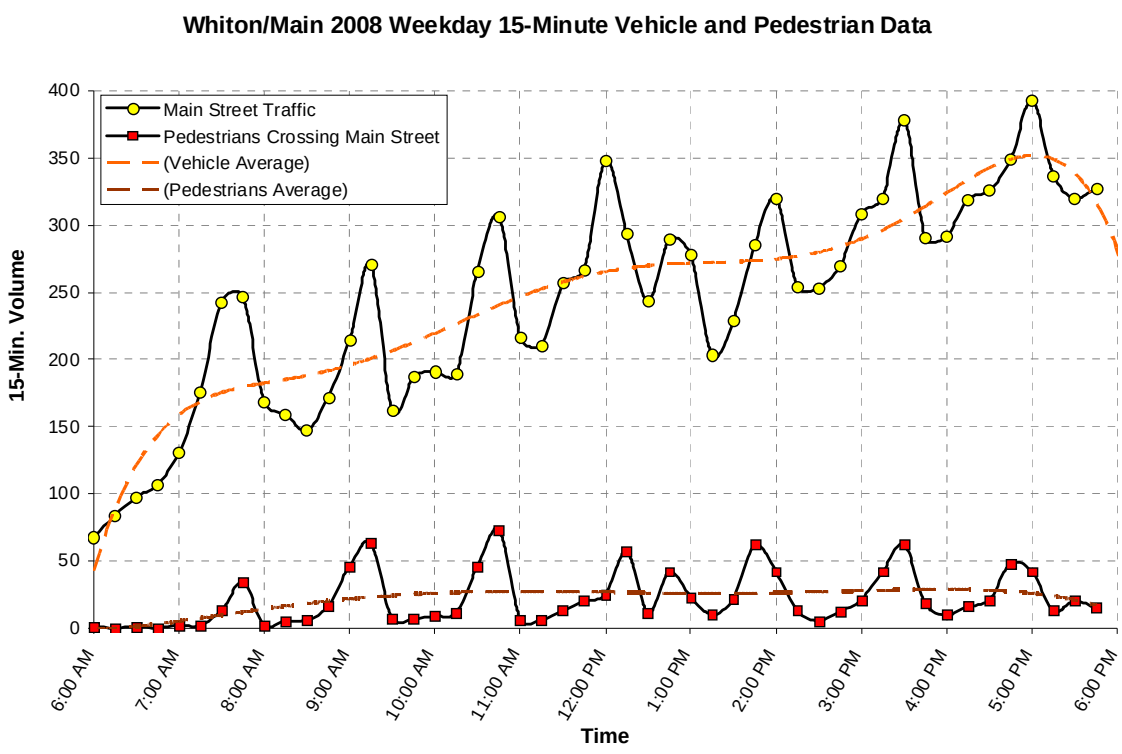


Figure 3 Whiton/Main 2008 Weekday 15-Minute Vehicle and Pedestrian Data

A pushbutton pedestrian flasher system was installed by the City of Whitewater in the summer of 2008 in an attempt to help alert drivers of the presence of pedestrians in the area. Although this system has shown to be beneficial, several concerns have arisen regarding pedestrian and vehicle compliance and visibility. Recently, enhancements have been made to the system to address many of these concerns. These improvements include additional pushbuttons so all quadrants are served and additional signing to alert vehicles.

Main Street currently has a posted speed limit of 25 mph and Whiton Street, a two-lane local roadway, also has a posted speed limit of 25 mph. The study team deployed two Hi-Star traffic and speed counters to help understand travel speeds of vehicles. During the AM peak period (7:15 to 8:15 A.M.), approximately 67 percent of the total traffic on Main Street was traveling at speeds of 30 mph or greater. During the PM peak period (4:30 to 5:30 P.M.), approximately 44 percent of the total traffic on Main Street was traveling at speeds of 30 mph or greater.

Existing Operations

The operation of a roadway (level of congestion) is typically described as Level of Service (LOS). The LOS rating system describes the traffic flow conditions of a roadway or intersection and ranges from A (free flow conditions) to F (over capacity). The following paragraphs describe the characteristics of LOS for intersections.

LOS is determined by the average delay, in seconds, of all vehicles entering an intersection. The average delay is based on the peak 15-minute period of the peak hour being analyzed. Since this delay is an average value, some vehicles will experience greater delay and some will experience less delay. Intersections with short average delays have high LOS; conversely, intersections with long average delays have low LOS. Many municipalities consider LOS D the limit of acceptable delay, with LOS E accepted under certain circumstances. An LOS F for the total intersection is considered an indication of the need for improvement. Many communities establish a delay of up to 55 seconds for signalized intersections and 35 seconds for unsignalized intersections, both corresponding to LOS D, as their minimum standard. Sometimes this standard is difficult to achieve in congested urban corridors.

LOS characteristics are different for signalized and unsignalized intersections. Drivers anticipate longer delays at signalized intersections that carry large amounts of traffic. However, drivers generally feel unsignalized intersections should have less delay. Additionally, several driver behavior considerations combine to make delays at unsignalized intersection less desirable than at signalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, whereas drivers on the minor approaches to unsignalized intersections must remain attentive to identify acceptable gaps for entry. Typically, LOS is only calculated for the legs of an unsignalized intersection that have to yield to other movements (stop control or left turns). Table 1 shows the LOS thresholds for signalized and unsignalized intersections.

Level Of Service	Signalized Intersections (average delay, seconds)	Unsignalized Intersections (average delay, seconds)
A	≤ 10	≤ 10
B	>10 to 20	>10 to 15
C	>20 to 35	>15 to 25
D	>35 to 55	>25 to 35
E	>55 to 80	>35 to 50
F	> 80	> 50

Table 1 Level of Service (LOS) Thresholds

The unsignalized intersection of Main Street and Whiton Street currently operates at LOS A during the AM peak and LOS C during the PM peak with 10 and 16 seconds of

delay, respectively. Existing operations by approach, along with the intersections of Main Street/Prince Street and Main Street/Prairie Street, can be seen in Table 2.

Intersection	Peak		Operating Conditions by Approach				Overall
			Northbound	Southbound	Eastbound	Westbound	
Main St. and Prince St.	AM	LOS (delay)	C (35 s)	C (32 s)	A (4 s)	A (4 s)	A (9 s)
		Queue	145 ft	55 ft	115 ft	130 ft	
	PM	LOS (delay)	C (28 s)	C (34 s)	A (7 s)	A (7 s)	B (12 s)
		Queue	125 ft	280 ft	185 ft	235 ft	
Main St. and Whiton St.	AM	LOS (delay)	A (9 s)	A (9 s)	A (10 s)	A (10 s)	A (10 s)
		Queue	55 ft	30 ft	100 ft	125 ft	
	PM	LOS (delay)	B (10 s)	A (10 s)	C (16 s)	C (16 s)	C (16 s)
		Queue	60 ft	45 ft	165 ft	180 ft	
Main St. and Prairie St.	AM	LOS (delay)	C (29 s)	C (29 s)	A (5 s)	C (33 s)	C (22 s)
		Queue	105 ft	60 ft	155 ft	220 ft	
	PM	LOS (delay)	C (21 s)	C (29 s)	B (11 s)	C (28 s)	C (21 s)
		Queue	80 ft	385 ft	245 ft	210 ft	

Table 2 Existing Main Street Traffic Operations

Based on the existing operations analysis, there does not appear to be a need for improvement; however, a recent pedestrian fatality at the Whiton Street and Main Street intersection indicates a possible need for improved access and mobility. A likely disconnect between the needs may be the combination of long crossing distance, ambiguity of left-turning vehicles, low visibility, and lack of proper driver/pedestrian interaction.

Focus Group Meeting

Based on City staff and council input, the study team developed a West Main Street Traffic Analysis Focus Group made up of individuals familiar with the study area:

- Dean Fischer, Director of Public Works
- Lisa Otterbacher, City of Whitewater Police Department representative
- Catherine Collins, UW Whitewater
- Tony Sabel, Disabled UW-Whitewater student
- Matt Kiederlen, UW-Whitewater Police
- Elizabeth Watson, UW Whitewater Center for Disabled Students
- Dick Telfer, UW Whitewater Chancellor
- Jim Miller, City of Whitewater Resident
- Roy Nosek, Council Member
- Kevin Brunner, City Manager
- Rose Mary Leaver, City of Whitewater Resident
- Mark Fisher, Strand Associates, Inc.
- Luke Holman, Strand Associates, Inc.

A meeting of this focus group was held on November 12, 2008, at Whitewater City Hall. Two main topics were discussed at the meeting, (1) the goals/objectives for the corridor and (2) potential measures to meet the goals/objectives.

The following goals were identified by the focus group:

1. Provide pedestrian and vehicle safety.
2. Provide access for disabled users.
3. Maintain acceptable Main Street vehicle operations.
4. Establish clear expectations and communication between vehicles and pedestrians.
5. Address roadway geometry and environmental elements.
6. Provide specialized ADA equipment (if applicable).
7. Establish clear expectation of Main Street left-turning vehicles.
8. Maintain northerly campus access at Whiton Street.

The following alternatives were identified by the members as potential ways to meet the goals and objectives:

1. Traffic signal (includes investigation of varying programming parameters).
2. Adjust timings of Prince Street and Prairie Street traffic signals.
3. Widen Main Street to develop pedestrian refuge at Whiton Street.
4. Other traffic management strategies (e.g., free bike program).
5. Restrict Main Street left-turning vehicles.
6. Convert Main Street from four lanes to two lanes near Whiton Street.
7. Remove access and develop cul-de-sac for Whiton Street and Cottage Street.
8. Crossing guards during varying times of the day.
9. Roundabout at Whiton Street.
10. Restrict parking three blocks south of Main Street.

Following the meeting, each member was asked to vote for up to three alternatives they would like investigated further. A total of 23 votes were submitted and the top 5 alternatives, in order of priority, include:

1. Traffic signal (includes investigation of varying programming parameters).
2. Widen Main Street to develop pedestrian refuge at Whiton Street.
3. Restrict Main Street left-turning vehicles.
4. Remove access and develop cul-de-sac for Whiton Street and Cottage Street.
5. Crossing guards during varying times of the day.

These five alternatives were chosen to be examined further by the study team.

Alternative Discussion

The following section briefly discusses the top five alternatives identified by the focus group.

Information about many of these alternatives was collected from the Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE) found at http://www.walkinginfo.org.

A. Alternative 1: Traffic Signal Control at Whiton Street

Installing traffic signal control can be used to regulate the movements of both pedestrians and vehicles.

1. Potential advantages

    a. Permits pedestrians to cross while vehicles are stopped via the traffic control device.
    b. Permits children and elderly pedestrians ample time to cross the roadway.
    c. Maintains vehicle progression by timing with adjacent intersections along corridor that are in a coordinated system.
    d. Could be set up so it disrupts traffic only when pedestrians actuate the signals.

2. Potential disadvantages

    a. May reduce the efficiency of motor vehicle travel through the corridor.

This alternative could also include the investigation of additional accommodations for disabled users beyond the standard ADA requirements. Some of those may include wheelchair activations or pavement sensor activation for pedestrians.

B. Alternative 2: Pedestrian Refuge at Whiton Street

Pedestrian refuge islands allow pedestrians to cross a roadway in two stages, as shown in Figure 4.

1. Potential advantages

    a. Allow pedestrians to seek gaps in traffic one direction at a time.
    b. Further encourages pedestrians to cross at designated locations.
    c. May reduce vehicle speeds approaching pedestrian crossing locations.
    d. Does not preclude installation of traffic signals, left-turn restrictions and/or cul-de-sac options.

2. Potential disadvantages

a. Require additional right-of-way or lane adjustments.
b. Require increased maintenance.

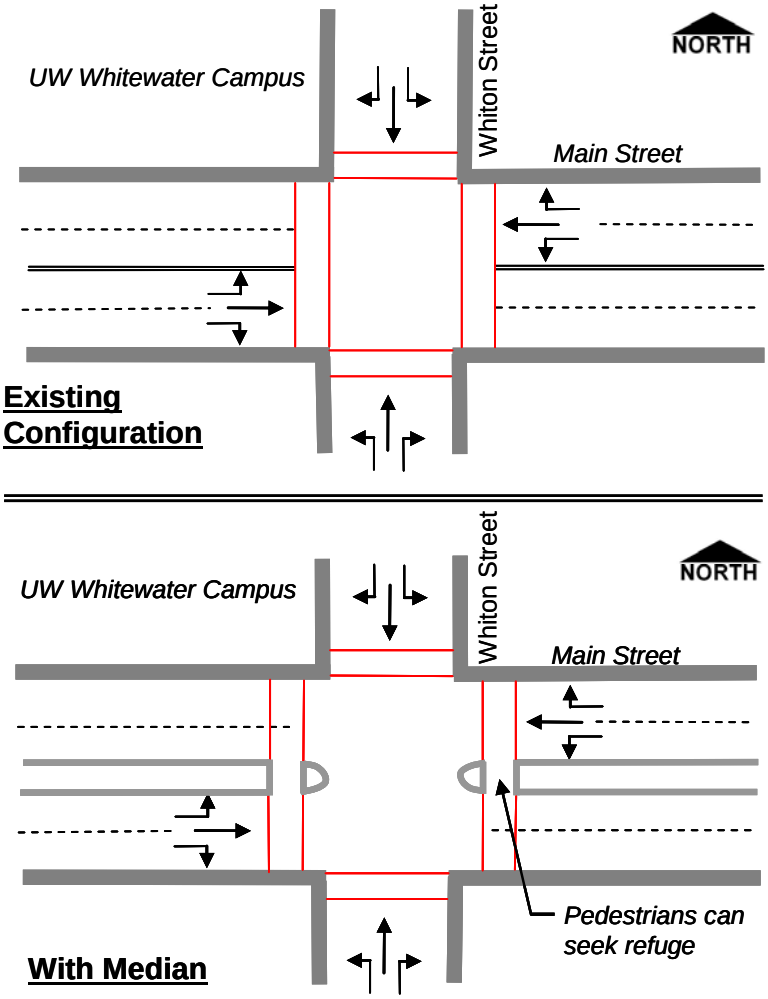


Figure 4 Pedestrian Crossing Island

C. Alternative 3: Restrict Main Street Left-Turning Vehicles

Restricting the movement of vehicles to an existing street is a way to potentially reduce conflict between pedestrians and vehicles along a corridor.

1. Potential advantages

a. Provides opportunity to reduce confusion for right-lane traveling vehicles on intent of inside-lane vehicles; stopping for a pedestrian or making a turning movement, as shown in Figure 5.
b. Low cost treatment and easy to implement.

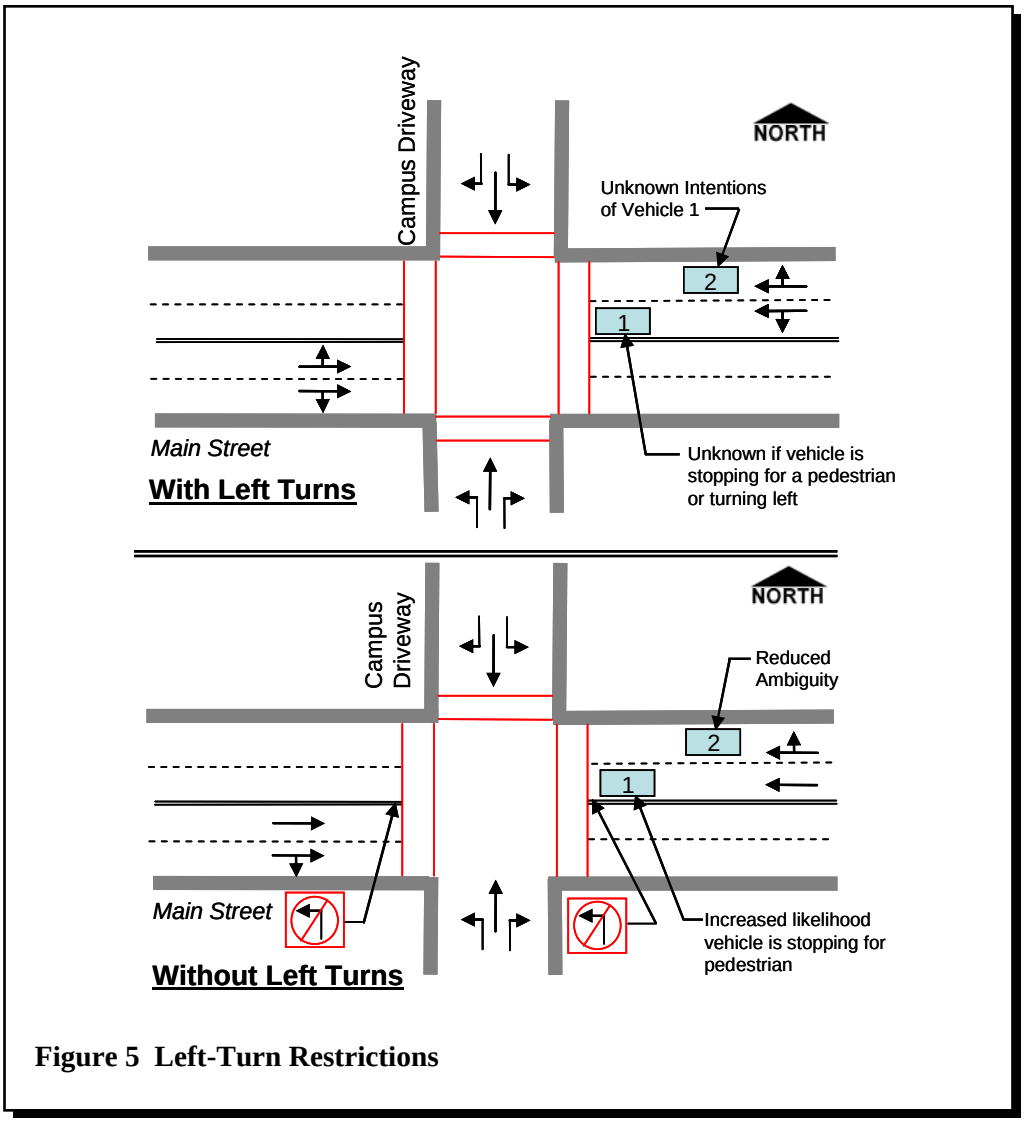


Figure 5 Left-Turn Restrictions

2. Potential disadvantages

a. May increase vehicle speeds, especially in the center lanes where no turning traffic is expected.
b. Most effective when the right-lane traveling vehicles have clear understanding that left turns are restricted: only good in commuter locations.
c. Lack of compliance would reduce effectiveness.
d. May create problems elsewhere.

With this alternative, access to Whiton Street and the UW-Whitewater driveway from Main Street would be limited to right-in only. Traffic entering Main Street from the side roads would not be restricted. However, with this alternative both side road approaches have the ability to be converted into right-in/right-out-only access if deemed necessary in the future.

D. Alternative 4: Cul-de-Sac Whiton Street

Similar to Alternative 5, this alternative inhibits the movement of vehicles to or from an existing street as a way to potentially reduce conflict between pedestrians and vehicles along a corridor. The lane configuration for this alternative can be seen in Figure 6.

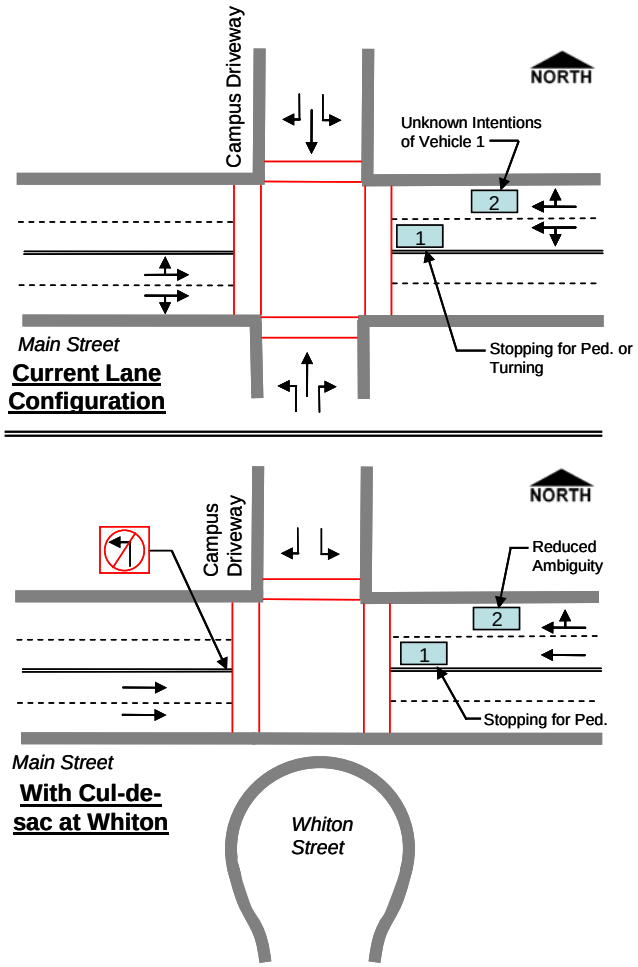


Figure 6 Whiton Street Cul-de-sac

1. Potential advantages

    a. Provides opportunity to reduce confusion for right-lane traveling vehicles on intent of inside-lane vehicles; stopping for a pedestrian or making a turning movement.

2. Potential disadvantages

    a. Shifts Whiton Street vehicles to adjacent intersections, which could create problems elsewhere.
    b. May increase vehicle speeds.
    c. Additional right-of-way.

With this alterative, access to the UW-Whitewater driveway from Main Street would be limited to right-in only. Traffic entering Main Street from the UW-Whitewater campus would not be restricted. However, with this alternative the UW-Whitewater campus approach has the ability to be converted into right-in/right-out only access if deemed necessary in the future.

E. Alternative 5: Crossing Guard at Whiton Street During Varying Periods of the Day

According to walkinginfo.org, "Adult school crossing guards can play a key role in promoting safe driver and pedestrian behaviors at crosswalks near schools."

1. Potential advantages

    a. Reminds drivers of the presence of pedestrians.
    b. Drivers must stop for crossing guard with a hand-held stop sign. Drivers failing to yield the right-of-way when directed to do so by a crossing guard may be fined following a write-up of the vehicle and violation. Increased compliance is seen during times crossing guards are present.

2. Potential disadvantages

    a. Since crossing guards are typically not used at universities and most users are adults, there could be pedestrian disregard and disdain for crossing guards.
    b. Cost associated with hiring a part-time employee.
    c. Would only assist in times crossing guards are present. During off-peak times, pedestrians would not be protected.
    d. Would likely produce poor Main Street operations since the stopping of Main Street traffic would be random and not synchronized with adjacent intersection traffic signals.

It is important to note the focus group discussed other traffic management strategies, which included the following:

1. Bike Program

   Implementing a free-bicycle or a bike-sharing program for students to promote nonmotor vehicle travel to the University could be an affective way to reduce trips on Main Street. According to Bikingbis.com, over 70 campuses in the United States offer some sort of bike program ranging from loaning/sharing bikes to giving away bikes in an effort to reduce vehicle commuter traffic and increase parking capacity. A notable side benefit to these programs is increased fitness, health, and sustainability. Although some universities have suspended this program because of increased vandalism, theft, and poor maintenance of bikes, more universities are adding similar programs. Areas with significant winter weather impacts would likely see reduced usage during winter months. A treatment such as this could be implemented with other treatments to provide a combined benefit; however, this alternative would not fully address the earlier mentioned access and mobility issues.

2. Advanced Stop-Lines

   Advance stop lines placed 40 to 50 feet in advance of the crosswalk could increase the separation between stopped vehicles and crosswalks, however, it would likely violate driver expectations, cause confusion, and have a minimal impact/benefit.

3. Parking Restrictions in the Vicinity

   Many campus commuters use on-street parking on the roadways south of Main Street and cross Main Street to access the campus. Based on observations during the traffic count, numerous campus commuters could be seen driving along Main Street and turning to the southerly roads looking for places to park. This type of activity would certainly increase vehicle volumes on Main Street during these times. This was also shown in the traffic data at Whiton Street where pedestrian/vehicle volume spikes were aligned with the UW class schedule. A parking restriction could reduce the amount of vehicle traffic on Main Street; however, pedestrians would still need to find locations to park and would likely still need to cross Main Street. A treatment such as this could be implemented with other treatments to provide a combined benefit; however, this alternative would not fully address the earlier mentioned access and mobility issues.

Alternative Screening and Evaluation

Based on the above discussion, the top five alternatives were then evaluated against the focus–group–developed goals and objectives. Table 3 is a matrix that provides a qualitative assessment of the top five alternatives against the goals and objectives. From this assessment and previous alternative discussions, the study team determined it would carry forward the following alternatives for full evaluation:

- Alternative 1–Traffic Signal
- Alternative 2–Median Refuge
- Alternative 4–Cul-de-Sac (Whiton Street)

	Goals & Objectives- All Periods of the Day								
Alternatives*	Pedestrian Safety	Vehicle Safety	Disabled User Access	Main Street Vehicle Operations Maintained	Vehicle-Pedestrian Expectations	Addresses Geometric/ Environmental Issues	Includes Specialized ADA Equipment	Main Street Left-Tuning Vehicle Expectation	North Campus Access at Whiton Street
Alternative 1- Traffic Signal	Good	Moderate	Good	Good	Good	Good	Good	Moderate	Moderate
Alternative 2- Pedestrian Refuge	Good	Good	Moderate	Good	Moderate	Poor	N/A	Moderate	Moderate
Alternative 3- Restrict Left Turn Vehicles	Poor	Good	Poor	Good	Moderate	Poor	N/A	Moderate	Moderate
Alternative 4- Whiton Street Cul-de-sac	Poor	Good	Poor	Good	Moderate-Good	Poor	N/A	Moderate-Good	Moderate
Alternative 5- Crossing Guards	Poor-Moderate	Moderate	Good	Poor	Poor-Moderate	Poor	N/A	Moderate	Moderate

*** All Alternatives Assume Main Street Left-Turn Restrictions**

Table 3 Alternatives versus Goals and Objectives

Alternative Evaluation

Where applicable, Synchro/SimTraffic modeling software was used to help understand how each alternative might operate and the impacts that alternative has on adjacent intersections. Detailed drawings of each alternative are enclosed.

A. Alternative 1: Traffic Signal at Whiton Street.

1. Modeling indicates a traffic signal at Whiton Street would yield satisfactory operations.

2. Operations at the Prince/Main Street and Prairie/Main Street intersections fluctuate slightly with the addition of the Whiton Street signal; however, modeling does not show significant operation concerns.

B. Alternative 2: Pedestrian Refuge

Since the pedestrian refuge island implements no significant geometric or traffic control changes, operations at the adjacent intersections would likely remain the same.

C. Alternative 4: Whiton Street Cul-de-Sac

1. Modeling indicates Whiton Street would maintain satisfactory operations with this alternative.

2. Operations at the Prince/Main Street and Prairie/Main Street intersections fluctuate slightly with the redistributed Whiton Street traffic; however, modeling does not show significant operation concerns.

Conclusions

Table 4 provides a general comparison of cost, right-of-way, pedestrian mobility, and vehicle progression associated with each of the pedestrian treatment options.

Pedestrian Treatment Option	Construction Cost	Right-of-Way Needs	Pedestrian Mobility	Vehicle Progression
Traffic Signal Control	$125,000	Low	Good	Moderate-Good
Pedestrian Refuge	$165,000	Moderate	Moderate-Good	Good
Cul-de-Sac Whiton Street	$60,000	Moderate	Moderate	Good

Table 4 Pedestrian Treatment Options Comparison

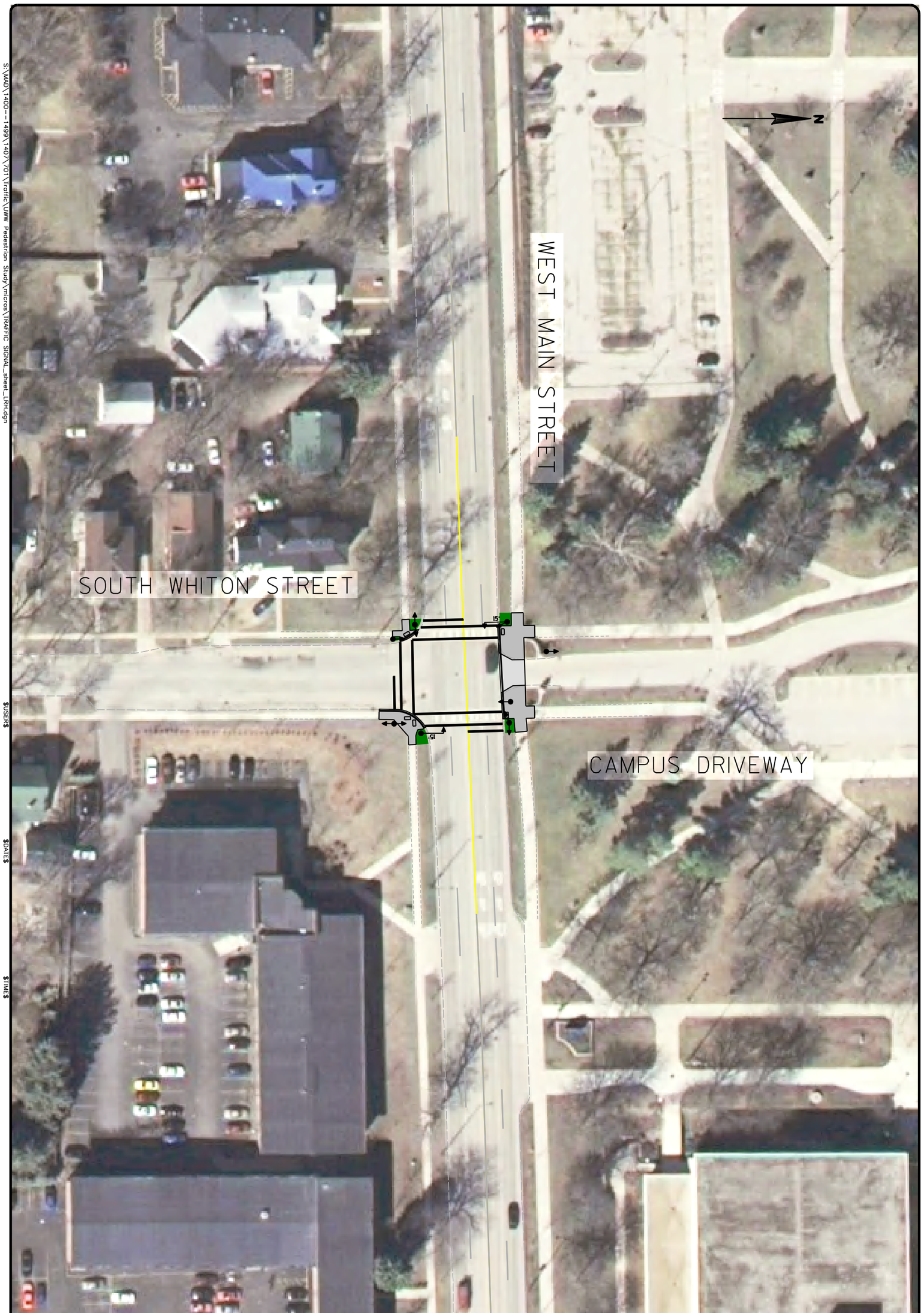
Please contact us if you have any questions or need additional information.

Sincerely,

STRAND ASSOCIATES, INC.

Luke R. Holman, P.E.

Robert A. Jack



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$USER$

$DATE$

$TIME$

WEST MAIN STREET / SOUTH WHITON STREET INTERSECTION
ALTERNATIVE 1- TRAFFIC SIGNAL
UNIVERSITY OF WISCONSIN - WHITEWATER

CITY OF WHITEWATER
WHITEWATER, WISCONSIN

STRAND ASSOCIATES, INC. ENGINEERS

FIGURE NO. 1
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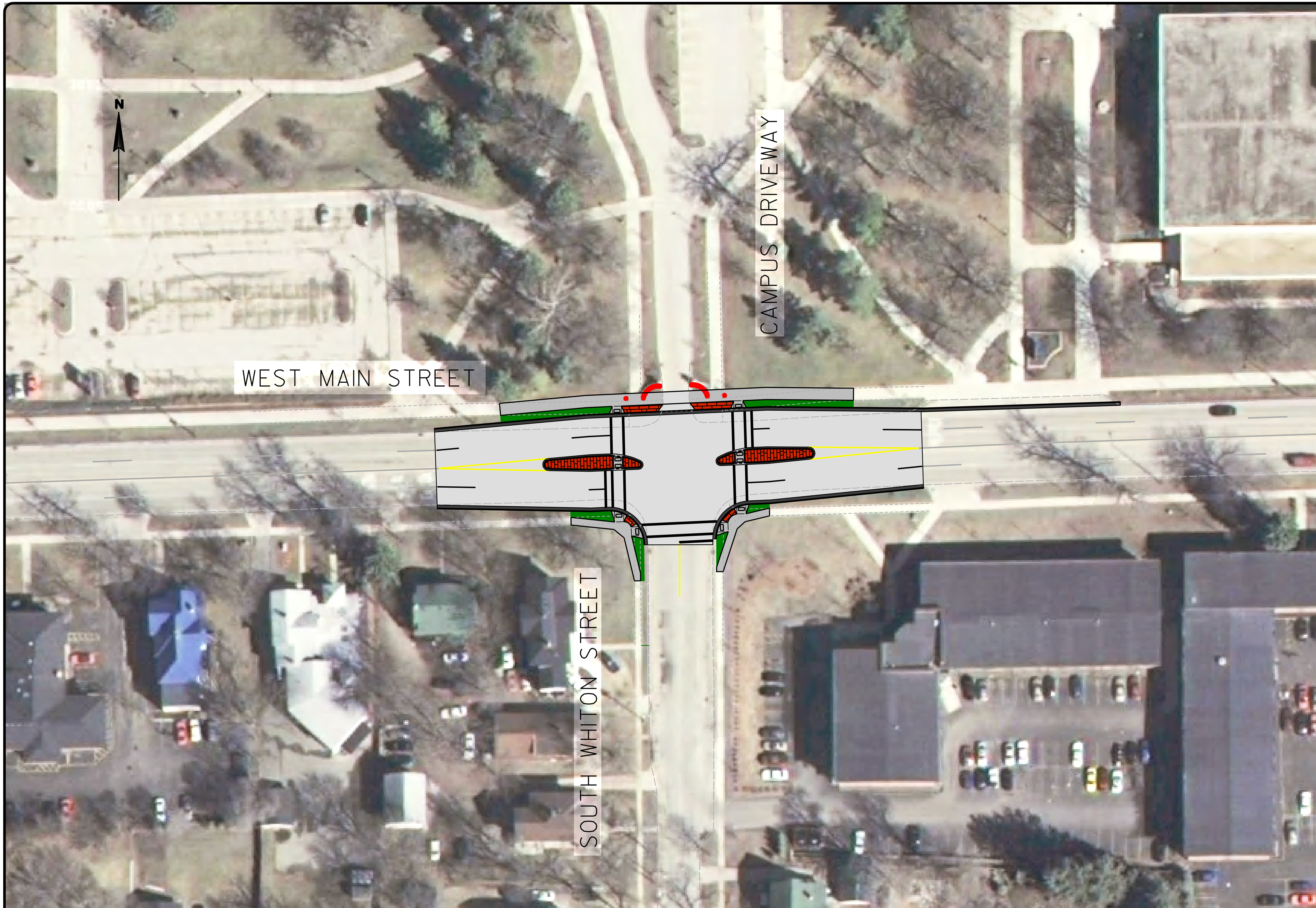

WEST MAIN STREET / SOUTH WHITON STREET INTERSECTION
ALTERNATIVE 2- MEDIAN REFUGE
UNIVERSITY OF WISCONSIN - WHITEWATER

CITY OF WHITEWATER
WHITEWATER, WISCONSIN

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FIGURE NO. 2
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WEST MAIN STREET / SOUTH WHITON STREET INTERSECTION
ALTERNATIVE 4- CUL-DE-SAC AT WHITON STREET
UNIVERSITY OF WISCONSIN - WHITEWATER

CITY OF WHITEWATER
WHITEWATER, WISCONSIN

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FIGURE NO. 3
1-407.701

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