

**MEMORANDUM**

To: Mr. David DeAngelis, Elm Grove Village Manager

From: Ken Voigt, P.E., Senior Transportation Engineer

Date: October 19, 2016

Project Number: 49-0077.00

Re: Technical Review of Wisconsin Avenue Extension Engineering Studies

**Study Background**

Ayres Associates has been retained by the Village of Elm Grove to review the numerous technical engineering studies conducted for the proposed extension of Wisconsin Avenue to Pilgrim Road. Ayres Associates services include the technical analysis review and field observations of existing study intersection operation. Based on the above tasks Ayres Associates has prepared a brief summary of its findings and recommendations.

**Review Summary**

It has been reported by the Village of Elm Grove that the Wisconsin Department of Transportation has the authority to restrict full access to its state highway system intersections and driveways to maximize traffic safety and efficient traffic operation.

Overall, the base traffic analysis study conducted by TADI in 2011 appears to provide a very thorough and accurate technical analysis of alternative scenarios for a Wisconsin Avenue extension to Pilgrim Parkway. Ayres Associates engineers concur that the only reasonable alternatives should be limited to: A) removing the traffic signals and limiting access to right turn in and out plus southbound left turns at the existing Watertown Plank Road intersection (Scenario 4); or B) realigning Watertown Plank Road to connect directly with Wisconsin Avenue north of Ace Hardware (Scenario 5).

*The TADI reports recommend implementation of Scenario 4A which includes signalization of the Wisconsin Avenue/Ace Hardware intersection and construction of a dual northbound left turn lane to accommodate U-turns created by restricting westbound left turn from Watertown Plank Road to Pilgrim Parkway.*

Implementation of Scenario 4 can be expected to increase existing Watertown Plank Road traffic diversion to Terrace Drive due to the proposed westbound left turn restriction at Pilgrim Parkway. There do not appear to be any reasonable traffic management measures to eliminate Terrace Drive traffic diversion impacts without constructing a cul-de-sac or channelizing its intersection with Bluemound Road to only permit westbound left turns.

A summary of total real estate acquisition and construction costs estimated in the TADI reports indicates:

- Scenario 4A: \$2,425,000 to \$3,230,000
- Scenario 4B: \$3,025,000 to \$4,030,000
- Scenario 5A: \$4,025,000 to \$5,530,000
- Scenario 5B: \$3,725,000 to \$5,230,000

*The TES reports concluded that the TADI scenario analysis does not include traffic diversion impacts to Terrace Drive that are expected to occur due to the westbound left turn restriction of Watertown Plank Road at Pilgrim Parkway.*

The TES reports identified safety concerns that will be exacerbated due to turning movements and U-turns that occur at the Terrace Drive intersection with Bluemound Road. *The TES reports recommends implementation of Scenario 5B which involves realignment of Watertown Plank Road to the north of Ace Hardware to intersect with a roundabout at the Wisconsin Avenue extension at Pilgrim Parkway.*

### **AYRES RECOMMENDATION**

*It is Ayres Associates' conclusion from our review of the traffic studies prepared by TADI and TES that the extension of Wisconsin Avenue should intersect with a realigned Watertown Plank Road that includes construction of a roundabout intersection control with a Wisconsin Avenue extension. This will require redesign of the Ace Hardware parking lot as a realigned Watertown Plank Road cannot run through the existing parking lot. It is Ayres Associates' opinion that Scenario 4 creates unnecessary traffic conflicts and rerouting of traffic from Watertown Plank Road to a U-turn movement at a new Wisconsin Avenue intersection and traffic diversion to other Village neighborhood streets such as Terrace Drive. It is recognized that Scenario 5B has the highest cost estimate range of \$3,725,000 to \$5,230,000 compared to the Scenario 4 traffic control options.*

*Since there may be serious environmental, residential and business impacts from either Scenarios 4 or 5 it is also recommended that a detailed 'Environmental Assessment' with an appropriate public involvement program be initiated that includes a detailed design for a realigned Watertown Plank Road. Ayres Associates has only seen a concept design for Scenario 4A. This is in keeping with the National Environmental Policy Act requirements when environmental wetland and navigable waterways may be potentially impacted by a roadway construction project.*

*It is also recommended that a detailed micro-traffic simulation model be developed for each of the Scenario 4 and 5 traffic control options to reflect the interaction between intersection operation along Pilgrim Parkway and public understanding of each scenario.*

### **Technical Report Review**

The Village has provided Ayres Associates with the following report, memorandums and correspondence related to the extension of Wisconsin Avenue;

1. Traffic Analysis Report for: Wisconsin Avenue Extension - Main Street to Pilgrim Parkway, March 18, 2011 (TADI)
2. Technical Memorandum, Wisconsin Avenue Extension – Main Street to Pilgrim Parkway, February, 28, 2014 (TADI)
3. Technical Memorandum, Origin-Destination Study for Watertown Plank Road, August 6, 2015 (TADI)
4. Wisconsin Avenue Extension – Main Street to Pilgrim Parkway, February 28, 2014 (TES)

5. Wisconsin Avenue Extension – Main Street to Pilgrim Parkway, revised February, 2015 (TES)
6. Wisconsin Avenue Extension – Main Street to Pilgrim Parkway Supplemental Report, September 28, 2015 (TES)
7. City of Brookfield Request for Wisconsin Avenue Extension to Pilgrim Pkwy Report, February 5, 2016 (TES)
8. Terrace Drive Traffic Count Exhibits, July 18, 2016 (TES)
9. Village of Elm Grove Resolution No. 011113D, Adopted November 14, 2001
10. Village President Palmer letter to Mayor Ponto, July 11, 2016
11. Mayor Ponto letter to Village President Palmer, July 20, 2016
12. Wisconsin Avenue Signalized Intersection Exhibit – Alternative 4A
13. City of Brookfield Future Land Use Exhibits and Matrix

As indicated in the above list of reports, memorandums, exhibits and correspondence, three technical reports were prepared by Traffic Analysis and Design, Inc. (TADI) for the City of Brookfield. The TADI reports contain technical analyses of year 2011 and year 2031 intersection traffic operating conditions for the existing street network and four basic design alternatives for a Wisconsin Avenue extension to Pilgrim Parkway. Each analysis focused on the Pilgrim Road intersections with the Ace Hardware driveway/office access roadway, with Watertown Plank Road and with Bluemound Road. The reports studied three different intersection traffic control options for a Wisconsin Avenue extension to Pilgrim Road involving the use of stop signs on the Ace Hardware/Wisconsin Avenue extension approaches to Pilgrim Road or the use of traffic signals or construction of a roundabout at that intersection. Based on the analysis findings, each alternative also analyzed restricting Watertown Plank Road access to Pilgrim Road by limiting it to right turns in and out, plus a left turn in traffic movement, or by cul-de-sacing its approach to Pilgrim Road. The cul-de-sac scenario would include construction of a realigned Watertown Plank Road to intersect with the Wisconsin Avenue extension intersection at the Ace Hardware driveway. For reference purposes, the approximate Pilgrim Road spacing between the Bluemound Road and Watertown Plank Road intersection is 230 feet with the spacing between Watertown Plank Road and a Wisconsin Avenue extension at 480 feet.

The analyses were based on year 2031 traffic projections developed by the Wisconsin Department of Transportation for its 2009 study of the Bluemound Road corridor. Basically, the 20-year traffic projections between the years 2011 and 2031 indicate an evening peak hour traffic growth of approximately 13 percent on Pilgrim Road and on Watertown Plank Road with Bluemound Road traffic growth increasing by approximately 27 percent during the same 20-year time period. It is noted that the 2013 traffic projections were updated with year 2035 forecasts prepared by the Southeastern Wisconsin Regional Planning Commission.

In addition to the TADI reports, five technical analyses were conducted by Traffic Engineering Services (TES) at the request of the Village of Elm Grove to evaluate the TADI analysis procedures and findings. The TES analyses also investigated the traffic diversion impact that may occur on Terrace Drive should Watertown Plank Road access be restricted at its intersection with Pilgrim Parkway.

Finally, information is included in this report on correspondence between the Village of Elm Grove and the City of Brookfield related to their collective support for a split-diamond interchange with I-94 involving Calhoun and Brookfield Roads and a redesign of the existing Moorland Road Interchange to provide for an Executive Drive off-ramp option.

This technical review report summarizes the information from these previous studies and provides a recommendation of which alternative intersection option to implement.

## Technical Report Summary

### **Report 1: TADI 'Traffic Analysis Report for: Wisconsin Avenue Extension – Main Street to Pilgrim Parkway'**

The TADI 'Traffic Analysis Report for: Wisconsin Avenue Extension – Main Street to Pilgrim Parkway' report dated March 18, 2011 provides the basic in-depth benchmark traffic analysis of existing (year 2011) and future (year 2031) intersection operation for the following set of five alternative traffic control design scenarios.

- Scenario 1: Existing conditions involving USH 18 resurfacing without the extension of Wisconsin Avenue
- Scenario 2: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with two-way stop sign control
- Scenario 3: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with traffic signal control
- Scenario 4: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with traffic signal (4A) or roundabout (4B) control and removal of Watertown Plank Road traffic signals
- Scenario 5: Extension of Wisconsin Avenue to Pilgrim Parkway plus realignment of Watertown Plank Road to connect with Wisconsin Avenue creating a four-leg intersection that would operate with traffic signal (5A) or roundabout (5B) control

All studies focused on analyzing morning 7:30 to 8:30 AM and evening 4:45 to 5:45 PM peak hour traffic operation. Traffic operation at the study intersections was based on traffic signal timing requirements to maximize efficient operation of the Pilgrim Parkway intersection with Bluemound Road.

A description of each scenario is summarized below with TADI report recommendations indicated in italics. Under all scenarios, Pilgrim Parkway would be widened to provide a full median between Watertown Plank Road and a point north of the Wisconsin Avenue extension.

### **Traffic Control Scenario Review**

#### **Scenario 1: Existing conditions with USH 18 resurfacing without the extension of Wisconsin Avenue**

The existing Watertown Plank Road intersection would continue to operate under traffic signal control with full access to Pilgrim Parkway. At Watertown Plank Road, Pilgrim Parkway would be widened to accommodate three southbound traffic lanes plus a separate left turn lane. At Wisconsin Avenue, Pilgrim Parkway would be widened to provide two northbound and southbound lanes along with separate left turn lanes.

- *Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because required turn lane storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate queue*

*spillback problems, it is recommended to **drop** Scenario 1 from the list of feasible scenarios for Pilgrim Parkway.*

- Field observations conducted by Ayres Associates indicate that the existing Bluemound Road eastbound left turn movement to Pilgrim Parkway spills back into Bluemound Road when the traffic signals at Watertown Plank Road allow westbound traffic on Watertown Plank Road to make left turns onto Pilgrim Parkway. In many cases, as many as three cars would block the Bluemound Road intersection until northbound Pilgrim Parkway traffic received a green light at Watertown Plank Road.

#### Scenario 2: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with two-way stop sign control

The existing Watertown Plank Road intersection would continue to operate under traffic signal control with full access to Pilgrim Parkway. At Watertown Plank Road, Pilgrim Parkway would be widened to accommodate three southbound traffic lanes plus a separate left turn lane. Pilgrim Parkway at Wisconsin Avenue would be widened to provide two northbound and southbound lanes along with separate left turn lanes and a southbound right turn lane.

- *Due to fatal flaws with the operation of the Pilgrim Parkway intersection with the Wisconsin Avenue extension/Ace Hardware driveway under two-way stop sign control, it is recommended to **drop** Scenario 2 from the list of feasible scenarios for Pilgrim Parkway.*

#### Scenario 3: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with traffic signal control

The existing Watertown Plank Road intersection would continue to operate under traffic signal control with full access to Pilgrim Parkway. At Watertown Plank Road, Pilgrim Parkway would be widened to accommodate three southbound traffic lanes plus a separate left turn lane. Pilgrim Parkway at Wisconsin Avenue would be widened to provide two northbound and southbound lanes along with separate left turn lanes and a separate southbound right turn lane.

- *Due to queue spillback problems between Bluemound Road and Watertown Plank Road, and because required turn lane storage lengths are not expected to fit between Bluemound Road and Watertown Plank Road which may further exacerbate queue spillback problems, it is recommended to **drop** Scenario 3 from the list of feasible scenarios for Pilgrim Parkway.*

#### Scenario 4: Extension of Wisconsin Avenue to Pilgrim Parkway opposite the Ace Hardware driveway with traffic signal (4A) or roundabout (4B) control and removal of Watertown Plank Road traffic signals

The existing traffic signals at the Watertown Plank Road intersection would be removed with limited right turn only access to Pilgrim Parkway and right and left turn access from Pilgrim Parkway. Northbound left turns at Watertown Plank Road would be prohibited along with eastbound left turns from the office driveway opposite Watertown Plank Road, both of which would be relocated to the Wisconsin Avenue intersection. This restriction would create northbound U-turn movements at the new Wisconsin Avenue extension intersection. At

Watertown Plank Road, Pilgrim Parkway would be widened to accommodate three southbound traffic lanes plus a separate left turn lane.

This scenario was analyzed with traffic signal control (Scenario 4A) or with roundabout control (Scenario 4B) at the Wisconsin Avenue intersection. Under Scenario 4A with traffic signals, Pilgrim Parkway at Wisconsin Avenue would be widened to provide two northbound through traffic lanes with a double left turn lane. Southbound Pilgrim Parkway would be widened to provide two through traffic lanes, and separate left and right turn lanes. In comparison, under Scenario 4B with construction of a dual lane roundabout, Pilgrim Parkway widening would only include two northbound and two southbound through traffic lanes.

- *Due to changes in traffic control and access control at the Pilgrim Parkway intersection with Watertown Plank Road, it is recommended to retain Scenarios 4A and 4B in the list of **feasible** alternatives for Pilgrim Parkway.*

Scenario 5: Extension of Wisconsin Avenue to Pilgrim Parkway and realignment of Watertown Plank Road to connect with Wisconsin Avenue creating a four-leg intersection that would operate with traffic signal (5A) or roundabout (5B) control

The major difference between this scenario and Scenario 4 is that Watertown Plank Road would be cul-de-saced at its existing intersection with Pilgrim Parkway and relocated around the north side of Ace Hardware to connect directly with a Wisconsin Avenue extension. Existing access to the office development adjacent to the west side of Pilgrim Parkway at Watertown Plank Road would be maintained but limited to right turn in and out access. At Watertown Plank Road, Pilgrim Parkway would be widened to accommodate three southbound traffic lanes.

This scenario was analyzed with traffic signal control (Scenario 5A) or with roundabout control (Scenario 5B) at the Wisconsin Avenue intersection. Under Scenario 5A with traffic signals, northbound and southbound Pilgrim Parkway at Wisconsin Avenue would be widened to provide two through traffic lanes plus separate left and right turn lanes. In comparison, under Scenario 5B with construction of a dual lane roundabout, Pilgrim Parkway widening would only include two northbound and two southbound through traffic lanes.

- *Due to changes in traffic control and access control at the Pilgrim Parkway intersection with Watertown Plank Road, it is recommended to retain Scenarios 5A and 5B in the list of **feasible** alternatives for Pilgrim Parkway.*

Since Both Scenarios 4 and 5 included an analysis of traffic signal and roundabout control operation at the Wisconsin Avenue intersection with Pilgrim Road, an *Intersection Control Evaluation* was performed. That evaluation process is a standardized requirement by the Wisconsin Department of Transportation to determine which control option provides the best overall solution for implementation. The evaluation addresses eight factors:

**1. Traffic Safety**

- Traffic signals normally have 4 times the number of vehicle conflict points and twice the number of pedestrian conflict points as well as a higher exposure to injury related crashes than roundabouts.

**2. Traffic Operating Conditions**

- The roundabout scenarios are expected to operate at a better level of service than the signalized scenarios.

- Intersection queuing with the roundabout scenarios are expected to be equal or less than those attributed to the signal scenarios.
  - The existing traffic signals at Bluemound Road can provide a metering effect of traffic entering a signalized Wisconsin Avenue intersection that cannot be provided with a roundabout control at Wisconsin Avenue.
  - Scenarios 5A and 5B eliminate U-turn movement traffic conflicts at the Wisconsin Avenue intersection compared to those created with Scenarios 4A or 4B.
- 3. Right-of-Way Impacts**
- Scenario 4A (traffic signals) is expected to have the least property impact and implementation cost.
  - Scenarios 5A and 5B involve a realigned Watertown Plank Road which requires substantive private property acquisition.
  - Real Estate Acquisition Cost comparison summary:
    - Scenario 4A: \$725,000 to \$1,030,000
    - Scenario 4B: \$1,025,000 to \$1,530,000
    - Scenario 5A: \$1,525,000 to \$2,530,000
    - Scenario 5B: \$1,525,000 to \$2,530,000
- 4. Access**
- Watertown Plank Road access is restricted under Scenarios 4A and 4B compared to Scenarios 5A and 5B.
- 5. Pedestrian and Bike Rider Impacts**
- In general, signalized intersections are easier to use by pedestrians but require longer crossing distances.
  - Roundabouts may pose crossing difficulty for visually impaired pedestrians.
  - If bicyclists use special roundabout bike ramps to avoid vehicle traffic conflicts, it can create pedestrian/bicycle conflicts.
- 6. Operation and Maintenance Costs**
- Generally, traffic signals are expected to have higher costs due to controller/signal maintenance which is partially offset by roundabout street lighting and pavement marking costs.
- 7. Construction Cost**
- Scenario 4A is estimated to have the lowest construction cost. Scenarios 5A and 5B costs are estimated to be the highest due to the cost of realigning Watertown Plank Road.
  - Construction Cost Summary
    - Scenario 4A: \$1,700,000 to \$2,200,000
    - Scenario 4B: \$2,000,000 to \$2,500,000
    - Scenario 5A: \$2,500,000 to \$3,000,000
    - Scenario 5B: \$2,200,000 to \$2,700,000
- 8. Practical Feasibility**
- Scenarios 4A and 4B may be the most practical because they maintain the existing Watertown Plank Road alignment
  - The environmental wetland and navigable waterway west of Pilgrim Road and property takings required for Scenarios 5A or 5B may favor Scenario 4A as the most practical scenario.

*The recommendation of the TADI March 18, 2011 report was to implement Scenario 4A.*

## **AYRES RECOMMENDATION**

*It is noted that the evaluation of a roundabout intersection control option under Scenarios 4 and 5 may need to be updated based on a preliminary review by the Ayres Associates technical roundabout design expert. It appears that the Level of Service may not operate at LOS 'A' and that a detailed design may indicate a larger roundabout lane configuration than described in the TADI reports.*

## **Report 2: TADI Technical Memorandum 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway'**

The TADI Technical Memorandum 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway' dated February 28, 2014 reanalyzed the scenarios developed in their March 18, 2011 report based on updated traffic counts, recent land use changes and current traffic analysis computer models. The Southeastern Wisconsin Regional Planning Commission traffic projections developed for the IH 94 Interchange Feasibility Study and the Calhoun South Neighborhood Land Use & Transportation Plan for the year 2035 were used in this scenario re-evaluation.

The conclusion of the updated analysis: *'It is the professional opinion of TADI engineers that Scenario 4A can be expected to be the best option for a Wisconsin Avenue extension to Pilgrim Parkway for the following reasons:*

- *Operates acceptably and with queues that can be accommodated with design;*
- *Provides a metering effect on Pilgrim Parkway to minimize chances of queue spillback;*
- *Results in the least right-of-way and access impact and costs;*
- *Maintains existing Watertown Plank Road and provides three-quarters access to it;*
- *Provides for visually-impaired pedestrians and keeps bicyclist on the street;*
- *Provides for lower pavement marking maintenance costs and for less confusion in cases of pavement markings being covered by snow;*
- *Is the least cost scenario; and*
- *Is expected to be the most practically feasible alternative.*

## **Report 3: TADI Technical Memorandum 'Origin-Destination Study for Watertown Plank Road'**

The TADI Technical Memorandum 'Origin-Destination Study for Watertown Plank Road' was prepared to study Village of Elm Grove concerns related to restricting Watertown Plank Road to left-in/right-in/right-out movements at Pilgrim Road and its impact to the businesses along the south side of Watertown Plank Road. The study traced travel patterns during the 3:00 to 6:00 PM time period of vehicles that exited the Culvers, Bakers Square, Mobil, and Walgreens driveways on Watertown Plank Road with those vehicles that made a westbound to southbound left turn onto Pilgrim Parkway. The results of that analysis indicated a total of 96 vehicles exited the subject driveways as left turns to Watertown Plank Road and made a westbound left turn onto Pilgrim Parkway. The memorandum conclusion was these 96 vehicles could instead make a right turn onto Pilgrim Parkway and a subsequent northbound U-turn at the Wisconsin Avenue intersection or find alternative routes.

#### **Report 4: TES report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway'**

The TES report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway', dated February 28, 2014 concluded that the TADI traffic analysis of Scenarios 4A and 4B with westbound left turn restrictions on Watertown Plank Road did not account for traffic diversion to Terrace Drive and other Village neighborhood streets to access Bluemound Road. Based on the TES conclusions and Ayres Associates staff field observations a sizable volume of peak hour traffic currently uses Terrace Drive to avoid delays at the Watertown Plank Road intersection with Pilgrim Road. This condition is complicated by the high level of eastbound U-turns that currently occur at the Terrace Drive intersection with Bluemound Road. It is Ayres Associates' opinion that Scenarios 4A and 4B will exacerbate this residential neighborhood traffic intrusion as well as traffic conflicts and potential safety concerns along Bluemound Road at its intersection with Terrace Drive. There do not appear to be neighborhood traffic management measures, aside from construction of a Terrace Drive cul-de-sac or channelization of the Terrace Drive intersection, which would only allow westbound right turns from Bluemound Road, that could be implemented to mitigate the traffic diversion problem attributed to Scenarios 4A and 4B.

This report included morning and evening peak hour traffic count data at the Terrace Drive intersection with Bluemound Road and an operation analysis of how congestion and queuing could be worse with traffic diversion to Terrace Drive from Scenario 4A or 4B. The report also discussed changes in traffic signal control settings that could be included in the original TADI study analysis.

*The TES report concluded that realignment of Watertown Plank Road with construction of a roundabout at Wisconsin Avenue would provide the least negative impact to Village residents and businesses.*

#### **Report 5: TES revised report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway'**

The TES revised report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway', dated February, 2015 reaffirmed the analysis and conclusions in the previous TES February 28, 2014 report but included supplemental information on a concept roundabout design for a realigned Watertown Plank Road intersection at Wisconsin Avenue (Scenario 5B). The report indicates the realignment concept design was shared with Mr. Stu Elliot, owner of the Ace Hardware store.

The report also included a median channelization recommendation to the Bluemound Drive intersection with Terrace Drive to separate eastbound U-turns and traffic entering/exiting Terrace Drive.

#### **Report 6: TES supplemental report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway'**

The TES supplemental report, 'Wisconsin Avenue Extension – Main Street to Pilgrim Parkway', dated September 28, 2015 concluded that the TADI reports did not address the following impact issues:

- The impact on Terrace Drive between Watertown Plank Road and Bluemound Road will approximately double the volume of peak hour traffic if westbound left turns are restricted at Pilgrim Parkway;
- The Bluemound Road and Terrace Drive intersection diversion traffic increase is expected to create a negative impact on vehicles making turns at the intersection;
- Eastbound U-turns on Bluemound Road at Terrace Drive are a safety problem now that added traffic will exacerbate. Shortening the turn bay by 25-feet to separate U-turns from intersection traffic is needed with or without the proposed changes at Watertown Plank Road and Pilgrim Parkway;
- A future roundabout at the Wisconsin Ave/Pilgrim Parkway/Ace Hardware driveway is the preferred alternative with no other changes to Pilgrim Parkway traffic.

A five-year history of intersection crash data was obtained by Ayres Associates from the Wisconsin Department of Transportation which indicates there have been a total of four crashes were report between 2011 and 2015. This is less than 1 crash per year which indicates a relatively safe operation.

### **Report 7: TES report 'City of Brookfield Request for Wisconsin Avenue Extension to Pilgrim Parkway'**

The TES report 'City of Brookfield Request for Wisconsin Avenue Extension to Pilgrim Parkway', dated February 5, 2016 concluded that a trial test would not be feasible to evaluate the impact of restricting westbound left turn movements at the Watertown Plank Road intersection with Pilgrim Parkway because trucks would need to make U-turns south of the Ace Hardware driveway during the trial requiring a 60-foot widening of Pilgrim Parkway. The report also stated that creating U-turn movement at the Ace Hardware driveway is undesirable due to poor soil conditions and the fact that Pilgrim Road is restricted for heavy trucking. The report also states that a request to remove the eastbound traffic signal movement at Watertown Plank Road does not provide a major benefit before a Wisconsin Avenue intersection improvement is constructed and could result in traffic conflict concerns at the Wisconsin Avenue Ace Hardware driveway. Finally, the report notes that there have only been 6 crashes at the Watertown Plank Road intersection with Pilgrim Road over the last 2.5 years concluding this is not a safety problem warranting restricting eastbound traffic at the Watertown Plank Road intersection.

### **Report 8: TES Intersection Traffic Volume Exhibits**

The TES Intersection Traffic Volume Exhibits dated July 18, 2016 provide morning and evening peak hour turning movement volumes at the Terrace Drive intersection with Bluemound Road, along with an analysis of a 55% increase in traffic diversion to existing northbound and southbound traffic on Terrace Drive.

## **Conclusions**

It is recognized that the Wisconsin Department of Transportation has the authority to restrict full access to intersecting streets and driveways to maximize safety and traffic efficiency on its state highway system.

From the review of technical reports prepared by TADI and TES it is apparent that the only feasible alternatives to controlling traffic on Pilgrim Parkway between Bluemound Road and a future extension of Wisconsin Avenue involves removal of the existing traffic signal at

Watertown Plank Road and prohibiting westbound left turns from Watertown Plank Road to Pilgrim Road Scenario 4.

*The technical traffic report prepared by TADI recommends implementing Scenario 4A which includes traffic signal control at the Wisconsin Avenue/Ace Hardware intersection. In comparison, the analysis conducted by TES recommends realignment of Watertown Plank Road to the north of Ace Hardware and roundabout construction with the Wisconsin Avenue extension intersection.*

#### **AYRES RECOMMENDATION**

*Based on a review of the technical analysis of these two alternatives prepared by TADI and TES it is Ayres Associates' recommendation that the extension of Wisconsin Avenue should intersect with a realigned Watertown Plank Road that includes construction of a roundabout intersection control with a Wisconsin Avenue extension. This will require redesign of the Ace Hardware parking lot as a realigned Watertown Plank Road cannot run through the existing parking lot. It is Ayres Associates' opinion that Scenario 4 creates unnecessary traffic conflicts and rerouting of traffic from Watertown Plank Road to a U-turn movement at a new Wisconsin Avenue intersection and traffic diversion to other Village neighborhood streets such as Terrace Drive. It is recognized that Scenario 5B has the highest cost estimate range of \$3,725,000 to \$5,230,000 compared to the Scenario 4 traffic control options.*

*Since there may be serious environmental, residential and business impacts from either Scenarios 4 or 5 it is also recommended that a detailed 'Environmental Assessment' with an appropriate public involvement program be initiated that includes a detailed design for a realigned Watertown Plank Road. Ayres Associates has only seen a concept design for Scenario 4A. This is in keeping with the National Environmental Policy Act requirements when environmental wetland and navigable waterways may be potentially impacted by a roadway construction project.*

*It is also recommended that a detailed micro-traffic simulation model be developed for each of the Scenario 4 and 5 traffic control options to reflect the interaction between intersection operation along Pilgrim Parkway and public understanding of each scenario.*