

**Proposed Long-term Improvements at Stagecoach Road, Cleveland Road and Rocky Dell Road**

- Convert Stagecoach Road intersection to right-in/right-out if local circulation can be provided via new local road paralleling US 14
- Provide local connection from Oak Valley Road to Rocky Dell Road to provide additional access to residential neighborhood
- Relocate US 14 and Rocky Dell Road intersection east to existing Cleveland Road intersection to provide safe intersection spacing and create a full access intersection.

In the 2008 AM peak hour, 74 vehicles turned right from northbound Stagecoach Road to eastbound US 14. This number is expected to climb to 111 by 2038. These vehicles could have a difficult time finding sufficient gaps in the eastbound US 14 traffic. The southbound Stagecoach Road vehicles turning left onto US 14 (27 in 2008, 43 expected in 2038) will experience delays for the same reason. Many of the gaps that could be used for the left-turns would likely be used by right-turning vehicles further limiting access to US 14 from the north.

This intersection is not expected to meet the minimum screening criteria for signals (1,700 ADT on Stagecoach Road) prior to 2038. For this reason, it is recommended that, at a minimum, an acceleration lane is added for eastbound US 14 east of Stagecoach Road to accommodate slow moving vehicles. Due to crashes at this intersection, the addition of a bypass lane is also recommended. Long-term considerations include identifying local connections to Rocky Dell Road to provide alternative access to the neighborhood, adding a raised median, and improving intersection spacing. These long-term concepts are shown in exhibit 20 and are also included in Section II, Access Management Plan.

### **3.0 Projected Benefits of Corridor-wide Implementation: Functionality, Travel Times, and Safety**

The strategies recommended in this report are intended to enhance roadway function and safety throughout the corridor. Adding turn lanes and bypass lanes at several unsignalized intersections could reduce crashes. Improving the most congested signalized intersections in the corridor would likely reap large benefits for both safety and functionality. Adding turn lanes at Pleasant View Road, Deming Way, and the US 12 ramps, and the complete reconstruction of the County P intersection should provide adequate level of service out to the year 2038, as well as reduce the number of crashes and crash severity at these locations.

#### **Level of service improvements**

Level of service improvements are expected to occur primarily at the corridor’s signalized intersections. Table 48 details the projected LOS, delays, and queues for signalized intersections along US 14 in 2038, with and without improvements. The LOS shown is for the overall intersection; the queue data shown is for the movement that had the worst queue.

Table 48 Peak-hour LOS ratings at selected signalized intersections in 2038, with and without proposed improvements (AM/PM)

Intersections	With improvements			Without improvements		
	LOS	Delay (seconds)	Queue (feet)	LOS	Delay (seconds)	Queue (feet)
County P, Cross Plains	C/C	28/25	452/306	F/F	337/102	2,314/1,138
Pleasant View Road, Middleton	D/C	47/35	788/401	E/F	72/95	1006/877
Deming Way, Middleton	D/D	48/50	686/516	D/F	52/212	738/1084
US 12 eastbound ramps	D/C	48/30	700/631	F/E	83/77	794/1098

Note: Longest queue in AM is eastbound through and longest in PM is westbound through.

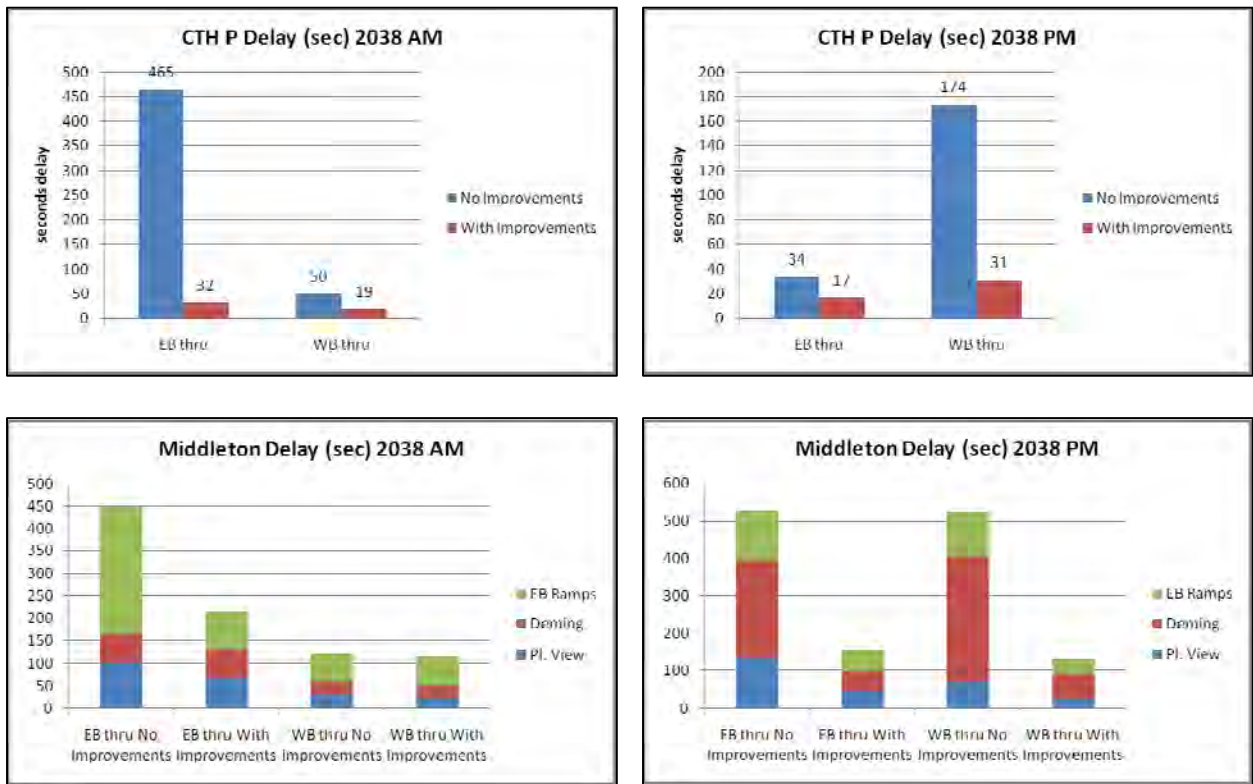


### Travel time improvements

Analysis was conducted to determine the effects of proposed improvements on US 14 corridor travel time. It is anticipated that, in the absence of capacity expansion, virtually any improvement in total corridor travel time and level of service would be due to improvements at County P and the signalized intersections in the city of Middleton. Improvements at unsignalized intersections and driveways within the corridor, while improving safety, are not expected to have a noticeable impact on corridor travel time.

The bar graphs below in figure 21 illustrate the extent that travel through key signalized intersections at County P and in Middleton could be improved by 2038 compared to a 2038 no-build scenario during AM and PM peak hours. Travel time improvements are measured in seconds in each of the graphs.

Figure 21 Estimated delay at County P and Middleton intersections with and without improvements



As the graphs show, improvements would have significant impact for eastbound traffic in the morning and westbound traffic in the afternoon. During the AM peak hour in 2038, the recommended improvements at County P could reduce delay by up to 433 seconds (a 93% reduction in delay) for the eastbound through movement and 31 seconds (62% reduction) for the westbound through movement. During the PM peak hour in 2038, improvements could reduce delay by 17 seconds (50% reduction) for the eastbound through movement and 143 seconds (82% reduction) for the westbound through movement.

Implementation of the recommended improvements at Pleasant View Road, Deming Way, and the eastbound ramps at US 12 would likely have greater positive impact for PM peak-hour travel. During the AM peak hour in 2038, improvements could reduce total delay by 233 seconds (52%) for the eastbound through movement and 5 seconds (4%) for the westbound through movement. During the PM peak hour in 2038, improvements could reduce delay by 371 seconds (70%) for the eastbound through movement and 391 seconds (75%) for the westbound through movement.

Table 49 below summarizes the effects that improvements could have on corridor travel time by 2038. Total corridor eastbound morning peak-hour travel time could be reduced by 666 seconds, or about 11 minutes; total corridor eastbound PM peak-hour travel time could be reduced by about six and a half minutes. Traveling westbound, total corridor travel time could be reduced by about half a minute in the morning peak hour, and about nine minutes during the PM peak hour.

Table 49 Possible travel time savings due to improvements (seconds)

Location	Eastbound		Westbound	
	A.M.	P.M.	A.M.	P.M.
County P	433	17	31	143
Middleton	233	371	5	391
Total savings	666	388	36	534

### **Safety improvements**

Improvements to the US 14 mainline and its intersections would likely result in reductions to the number and severity of crashes. FHWA has developed a resource to help estimate the reduction in crashes, entitled *Desktop Reference for Crash Reduction Factors*. This reference guide is a compilation of the results of various studies that examined the impacts of the implementation of geometric and operational safety countermeasures on mainline highways and intersections. The results are not to be interpreted as a guarantee of the success of a potential improvement. Rather, the results provide generic estimates that may be used to guide the selection of specific countermeasures that reduce crashes and improve safety.

The reference provides Crash Reduction Factors (CRFs) for each countermeasure or improvement. As defined in the reference, the CRF is “the percentage crash reduction that might be expected after implementing a given countermeasure.” While one CRF may be displayed, there are standard errors and ranges to consider, so it may be more appropriate to consider a CRF of 15 percent as a point in the middle of a range, for example, between 10 and 20 percent.

Most of the CRFs are shown for specific, individual improvements, such as adding a right-turn lane at an intersection. It is important to understand that potential projects at a given location could include a number of individual improvements, such as adding turn lanes, improving alignments and sight distances, adding traffic signals, installing medians, etc. The expected result of all of the improvements is not necessarily cumulative. Nevertheless, combinations of improvements may have

some measure of complementary benefit. Two or more improvements in combination may be expected to produce a better result than any of them individually, but less than the sum of their CRF values.

The following sections of the report provide Crash Reduction Factor estimates for the proposed improvements throughout the portion of the US 14 corridor covered by this study. The results are divided into three sections: mainline, signalized intersections, and unsignalized intersections.

### Mainline US 14

Mainline improvements have been proposed along the corridor to bring the road to WisDOT standards, primarily straightening horizontal curves and adding medians. The realignment proposals for the segment of US 14 located between Mazomanie and Black Earth include changes to the mainline highway and individual intersections.

Deficient horizontal curves in the corridor are most prominent near Wisconsin Heights High School, near WIS 78 (west), and between Cleveland Road and Twin Valley Road. Depending on the amount of curve straightening, proposed improvements could reduce several crash types and yield the following CRFs:

- Rear-end: 24 to 73%
- Vehicle overturning: 24 to 73%
- Head-on: 64 to 67%
- Fixed-object: 68 to 87%
- Run-off-road: 79 to 90%
- Fatal / injury: up to 87%

An additional proposed countermeasure would extend the existing median that currently stretches from Pleasant View Road to US 12 in Middleton. Extending the raised median westward through the intersections of US 14 with Pinehurst Drive, Capitol Court, Schwartz Road, and Wayside Road would be expected to reduce all crash types along this segment 20 to 25 percent, and reduce head-on crashes by about 75 percent.

### Signalized Intersections

There are currently seven signalized intersections in the corridor. As previously mentioned, improvements are proposed at four of these intersections. At a fifth, WIS 78 (east)/Mills Street in Black Earth, changes to driveway access in the vicinity of the intersection are recommended, but specific CRFs are not yet available for this type of improvement.

The four signalized intersections recommended for improvements include the intersections of US 14 with County P, Pleasant View Road, Deming Way, and the US 12 eastbound ramps. Additional turn lanes are recommended for all of these intersections. Channelization and approach realignments are recommended at County P, Pleasant View Road, and Deming Way. At County P, additional through lanes are recommended, while the intersection itself is a candidate for possible conversion to a roundabout. The expected reductions in crashes for these improvements are as follows:

- Addition of left-turn lane
  - All crash types: 10%
  - Involving left-turning vehicles: 13%
- Addition of right-turn lane: 4%
- Addition of channelized right-turn lane: 35% reduction in fatal/injury crashes
- Dual left-turn lanes
  - Fatal/injury crashes involving left-turning vehicles: 47%
  - Property-damage-only crashes involving left-turning vehicles: 71%
- Conversion to roundabout
  - All crash types: 35 to 67%
  - Fatal/injury crashes: 32 to 80%

### Unsignalized Intersections

Discussion of unsignalized intersections falls into two categories: those that have been identified as candidates for signalization, and those that are not candidates for signalization. Intersections were evaluated only at a preliminary level to identify candidates; *a full evaluation of intersections according to FHWA guidelines would be necessary to reach a final conclusion.* See the signal risk assessment in the Traffic Operations Analysis section for more details of the intersection evaluation.

The three intersections on the corridor that have been identified as candidates for potential signalization include the intersections of US 14 with WIS 19/78 (west) in Mazomanie, Brewery Road in Cross Plains, and Pinehurst Drive in Middleton. Detailed studies and design of the intersections would be required before the installation of signals was undertaken; these studies would identify additional specific geometric and/or operational improvements that would be needed. In general, however, the expected reduction in crashes that would result from the conversion of an intersection from stop-controlled to signal-controlled would be as follows:

- All crash types: 28 to 36%
- Fatal/injury crashes: 43 to 53%
- Right-angle crashes: 74%

As discussed in previous sections, there are a number of unsignalized intersections in the corridor that have one or more geometric, operational, and/or safety deficiencies, but that are not candidates for signalization within the timeframe of this study. However, there are a number of other improvements that have been recommended to mitigate the deficiencies, such as addition of turn lanes, medians, and curb-and-gutter; flattening of curves and gradients; and improvements to approach angles and sightlines.

These types of improvements have been recommended at the intersections of US 14 with County F, Heidi's Lane, Kahl Road, Schultz Road, South Valley Road, Carya Road, Scherbel Road, County KP, and Stagecoach Road. Specific recommendations at each intersection were discussed in detail in the previous section. Multiple recommendations have been crafted for some of the intersections. The expected CRFs for each type of improvement are detailed as follows:

- Correction of intersection skew (improve approach angles to, or closer to, 90 degrees): 7 to 25% reduction
- Improve sight distance by relocating intersection or removing obstructions
  - All crashes: 5 to 17%
  - Fatal/injury crashes: 36 to 57%
- Addition of right-turn lane
  - All crashes: 14 to 26%
  - Fatal/injury crashes: 23 to 40%
  - Crashes involving right-turning vehicles: 50 to 56%
  - Rear-end crashes: 65%
- Addition of turn and bypass lane
  - All crashes: 5%
  - Injury crashes: 18 to 36%
- Addition of left-turn lane
  - All crashes: 28 to 48%
  - Fatal/injury crashes: 35 to 58%
  - Crashes involving left-turning vehicles: 37 to 68%
- Addition of median
  - All crashes: 25 to 27%
  - Fatal/injury crashes: 25%
- Addition of acceleration lane
  - All crashes: 10 to 26%
  - Rear-end crashes: 75%

Specific improvements could reduce the number and severity of crashes at certain unsignalized intersections in the US 14 corridor. In the 2002 to 2006 study period, Rocky Dell Road and Stagecoach Road had the highest crash rates amongst the unsignalized intersections in the corridor. Both of these intersections are located in rural locations where the speed limit is 55 miles per hour. Because higher crash speeds generally result in a greater likelihood of crashes and severe injury or fatality in the event of crashes, undertaking specific improvement strategies, detailed previously in this report, could yield large crash rate reductions at these locations.

In the five-year study period, the intersection at Rocky Dell Road experienced five non-deer crashes, of which four involved eastbound vehicles on US 14 waiting to turn left onto Rocky Dell Road. Injuries resulted in each of these four crashes. Adding a protected left-turn lane could reduce both the crash rate and crash severity rate at this intersection.

The intersection at Stagecoach Road experienced four non-deer crashes, three of which involved a westbound vehicle waiting to turn left. Of these three, one crash led to a fatality and two non-fatal injuries and another crash resulted in injury. Based on information in the crash reports, a protected left-turn lane could reduce the number of crashes involving westbound left-turning vehicles. Therefore, adding a protected left-turn lane could reduce the intersection's crash rate and possibly the crash severity rate at this location.