

I-43 Ozaukee County Median Crossover Crash Report January 2001 - June 2006

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**TRAFFIC OPERATIONS AND SAFETY LABORATORY
University of Wisconsin-Madison**

Department of Civil and Environmental Engineering

**I-43 Ozaukee County
Median Crossover Crash Report
January 2001 – June 2006**

by

David A. Noyce, Ph.D., P.E.

Assistant Professor

Department of Civil and Environmental Engineering

University of Wisconsin – Madison

Co-Director

Traffic Operations and Safety Laboratory

and

Adrian Witte

Graduate Research Assistant

Department of Civil and Environmental Engineering

University of Wisconsin, Madison

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TRAFFIC OPERATIONS AND SAFETY LABORATORY

University of Wisconsin-Madison

Department of Civil and Environmental Engineering

1415 Engineering Drive

Madison, WI 53706

www.topslab.wisc.edu

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EXECUTIVE SUMMARY

The Wisconsin Department of Transportation (WisDOT) sought to determine the magnitude of median crossover crashes on the section of Interstate 43 (I-43) located in Ozaukee County, Wisconsin. A survey was conducted of crash reports for this section of I-43, which extends from approximately County Line Road in the south to County Highway D in the north. Crash reports from January 1, 2001 through to June 18, 2006 were reviewed to identify those crashes meeting the criteria of a median crossover crash, that is, crashes that occurred on a median divided highway in which a vehicle left the roadway in the direction of travel, entered the median, and either partially or fully entered into the opposing direction lanes of travel or traveled beyond the opposite direction travel lanes. Selected crashes were documented and electronic images of the crash reports produced. Median width and ADT data were collected for each selected crash site and added to the data obtained from the crash report.

A total of 22 median crossover crashes occurred along I-43 in Ozaukee County during this approximately 66 month period. Six crashes involved property damage only, 11 crashes involved injuries, and five crashes involved fatalities. The combination of these crashes resulted in a total of 25 injuries and 7 fatalities. Median width varies from 60 to 90 feet along the length of I-43 and is subject to between 24,800 and 47,500 vehicle trips per day (vpd) (2004). Note that current Wisconsin guidelines do not warrant a median barrier for a roadway with a median width greater than 60 feet. None of the median crossover crashes occurred at Average Daily Traffic (ADT) and median width combinations that warranted median barrier treatment under these guidelines. Nevertheless, median barrier currently exists from the south Ozaukee County line to the Mequon Road interchange.

Crashes were plotted on a county-wide highway map and spatially analyzed to establish locations of median crossover crash concentrations. Crash rates for each of these locations were then calculated and compared to the current benchmarks of 0.50 median crossover crashes per mile per year and 0.12 median crossover fatalities per mile per year, with at least three crashes in a five year period, initially established by CALTRANS. Note that the CALTRANS benchmarks are currently adopted guidelines for identifying median crossover crash concentrations based on national best practices. Sites that exceed these benchmarks are considered candidates for median safety countermeasures.

It was found that the section of I-43 between Mequon Road and State Highway 60 (Section 1) exceeds the median crossover crash rate threshold. This same section also exceeds the fatal median crossover crash rate threshold. The remainder of I-43 in Ozaukee County did not exceed either threshold. It is recommended that safety countermeasures are considered on I-43 between Mequon Road and State Highway 60.

1 INTRODUCTION

The Wisconsin Department of Transportation (WisDOT) continues to monitor the frequency and magnitude of median crossover crashes on the divided highway system statewide. This report focuses on a section of Interstate 43 (I-43) located in Ozaukee County, Wisconsin. A survey was conducted of crash reports for this section of I-43, which extends from approximately County Line Road in the south to County Highway D in the north. A map of Ozaukee County is presented in Figure 1.

Crash reports from January 1, 2001 through to June 18, 2006 were reviewed to identify those crashes meeting the criteria of a median crossover crash. Median crossover crashes were crashes that occurred on a median divided highway in which a vehicle left the roadway in the direction of travel, entered the median, and either partially or fully entered into the opposing direction lanes of travel or traveled beyond the opposite direction travel lanes.

Crashes in Wisconsin are documented by local Police, County Sheriffs, or State Patrol Troopers on the Wisconsin Motor Vehicle Accident Report (WMVAR). The form contains a variety of data from each crash that is scanned and then archived into searchable databases including location and time of day, drivers and vehicles involved, weather and road conditions, presence of alcohol, and type of crash. Absent from the form, however, is a field to report crashes that involve vehicles that cross over the median of a divided highway and enter the opposing lane of traffic. Therefore, details pertaining to median crossover crashes were obtained by manual searches of the narrative and diagrams provided in the accident report. Selected crashes were documented and electronic images of the crash reports produced.

Median crossover crashes identified along I-43 in Ozaukee County during the study period were analyzed in terms of temporal distribution (month and year), severity, median width, crash vehicle type, extent, and initial causation. Median width and ADT data were collected for each selected crash site and added to the data obtained from the crash report.

The median width varies from 60 to 90 feet along this length of the I-43 in Ozaukee County. Average Daily Traffic (ADT) volumes of 47,500 vpd, between County Highway C and State Highway 60, and 24,800 vpd, between County Highway H and County Highway D, were recorded in 2004 (Wisconsin Highway Traffic Volume Data 2005). Current Wisconsin guidelines do not warrant a median barrier for a roadway with a median width greater than 60 feet. Therefore, all of the identified median crossover crashes occurred at ADT and median width combinations that did not warrant median barrier treatment under these guidelines.

Crashes were plotted on a county-wide highway map and spatially analyzed to establish median crossover crash concentrations. Crash rates for each of these locations were then calculated and compared to the current benchmarks of 0.5 median crossover crashes per mile per year and 0.12 median crossover fatalities per mile per year, with at least three crashes over a five year period, initially established by California Department of Transportation (CALTRANS). Note that the CALTRANS benchmarks are currently adopted guidelines for identifying median crossover crash concentrations based on national best practices. Sites that exceed these benchmarks are considered candidates for safety countermeasures.

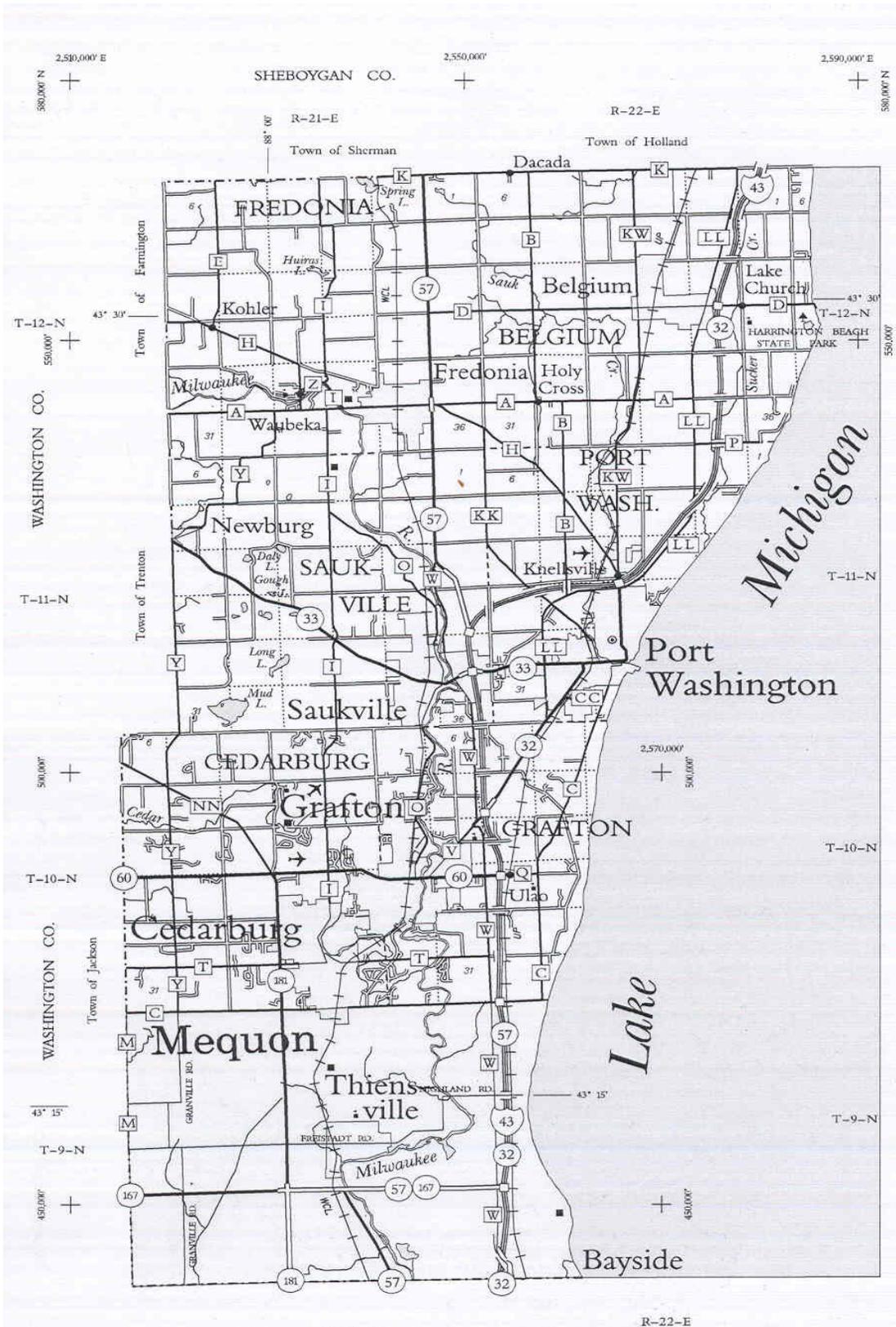


Figure 1 Ozaukee County, Wisconsin Map

2 DATA SUMMARY

A total of 22 median crossover crashes were reported on I-43 (Ozaukee) between January 1, 2001 and June 18, 2006 (see Appendix A). Of these, 6 crashes resulted in property damage, 11 crashes in injuries, and 5 crashes resulted in fatalities. Table 1 summarizes these crashes by year and severity.

TABLE 1 I-43 Ozaukee County Median Crossover Crashes by Year and Severity

Year	Severity			
	Property Damage Only	Injury	Fatality	Total
2001	0	4	1	5
2002	0	1	1	2
2003	0	0	0	0
2004	2	4	0	6
2005	3	1	1	5
2006 ¹	1	1	2	4
Total	6	11	5	22

¹ The period between January 1, 2006 and June 18, 2006 was reviewed using the preliminary crash database.

Table 1 shows that five or more crossover crashes occurred in each of 2001, 2004, and 2005; however, only two crossover crashes occurred in 2002, and no crossover crashes were recorded on I-43 in Ozaukee County during 2003. The period between January 1, 2006 and June 18, 2006 yielded 4 median crossover crashes. A distribution of the 22 median crossover crashes by month is included in Figure 2.

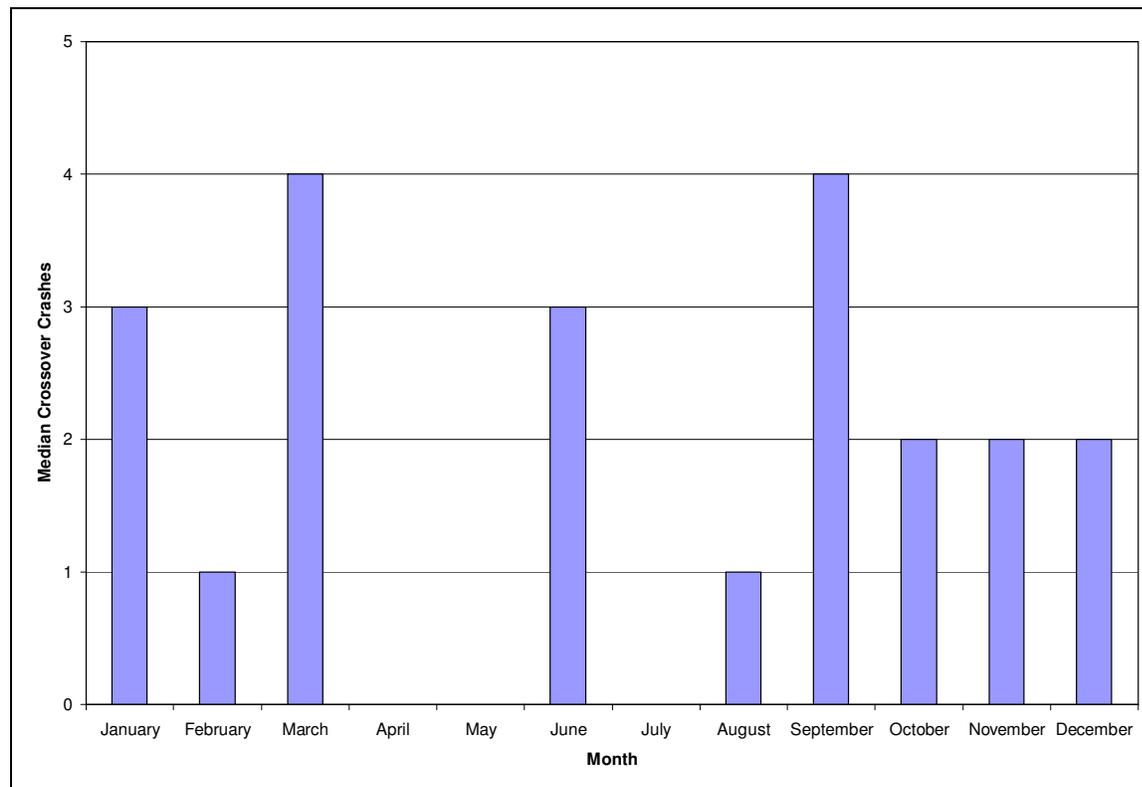


FIGURE 2 I-43 Ozaukee County Median Crossover Crashes by Month

Median widths for the section of I-43 within Ozaukee County were obtained from the Wisconsin State Trunk Highway Log and from discussions with WisDOT officials as follows:

- County Line Road to Mequon Road: 60 feet;
- Mequon Road to State Highway 32/County Highway V: 70 feet; and
- State Highway 32/County Highway V to the northern extent: 90 feet.

Table 2 shows the distribution of median crossover crashes for each recorded median width. The majority of I-43 median crossover crashes occurred at median widths of 70 feet. Figure 3 shows the current median barrier warrant guidelines for Wisconsin. Note that the combination of median width and ADT values on I-43 do not warrant median barrier treatment.

TABLE 2 I-43 Ozaukee County Median Crossover Crashes by Median Width

Median Width (ft)	Crossover Crashes	
	Number	Percent
60 – 70	14	63.6
90	8	36.4



FIGURE 3 Wisconsin Median Barrier Warrant Guidelines

The median crossover crashes summarized in Table 1 have been spatially represented on a map of Ozaukee County. Figures 4 to 6 show total, fatal, and injury median crossover crashes on I-43 for the study period. The distribution of all median crossover crashes that occurred on I-43 (see Figure 4) shows that there are three distinct concentrations:

1. Mequon Road (from the existing median barrier terminal) – State Highway 60 Interchange: 13 total crashes, 6 injury crashes and 4 fatal median crossover crashes (note that a fifth fatal crash took place just south of the Mequon Road interchange);
2. State Highway 57 – County Highway B: 4 median crossover crashes; and
3. County Highway D - County Highway K: 4 median crossover crashes.

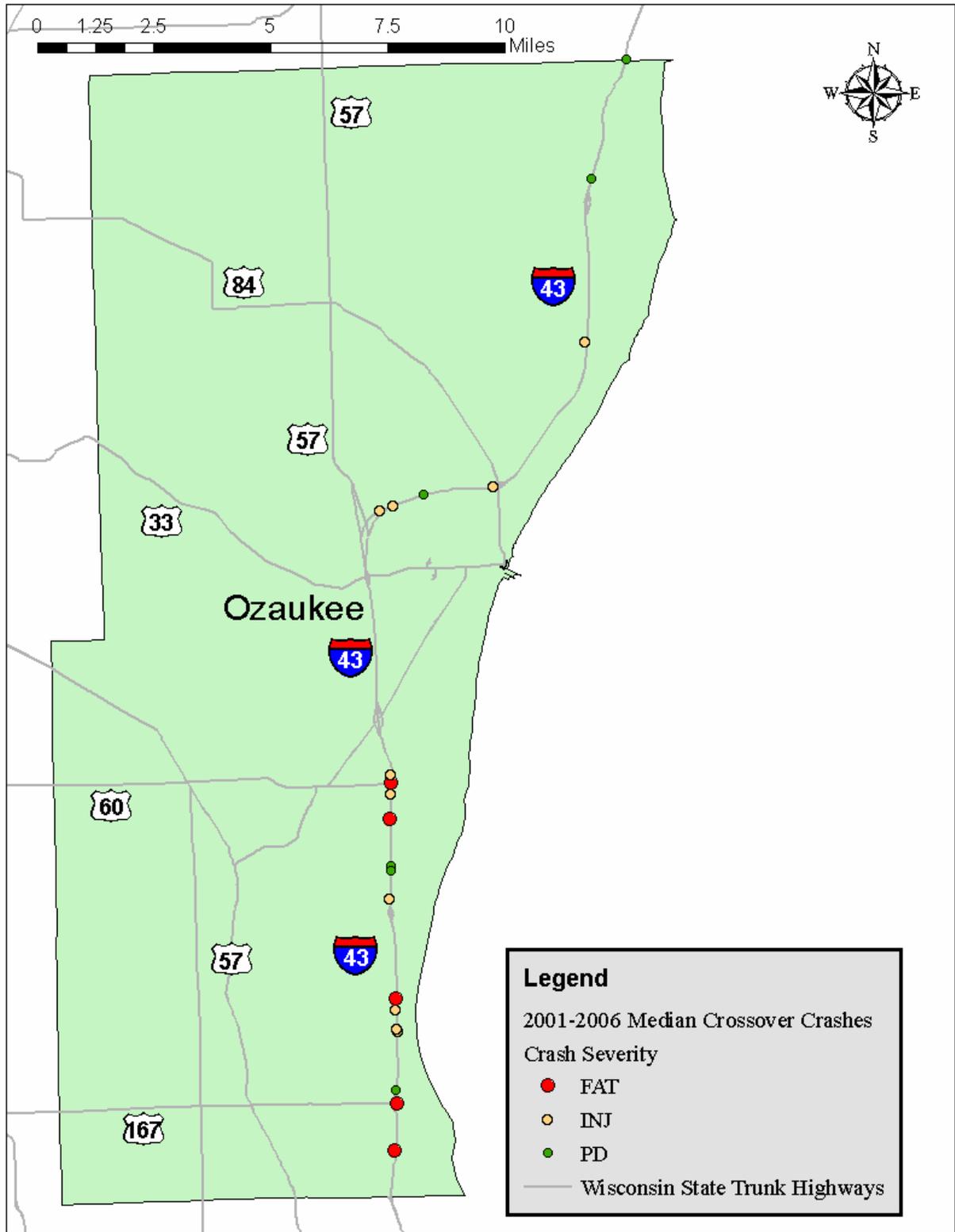


FIGURE 4 I-43 Ozaukee County Total Median Crossover Crashes (January 1, 2001 to June 18, 2006)

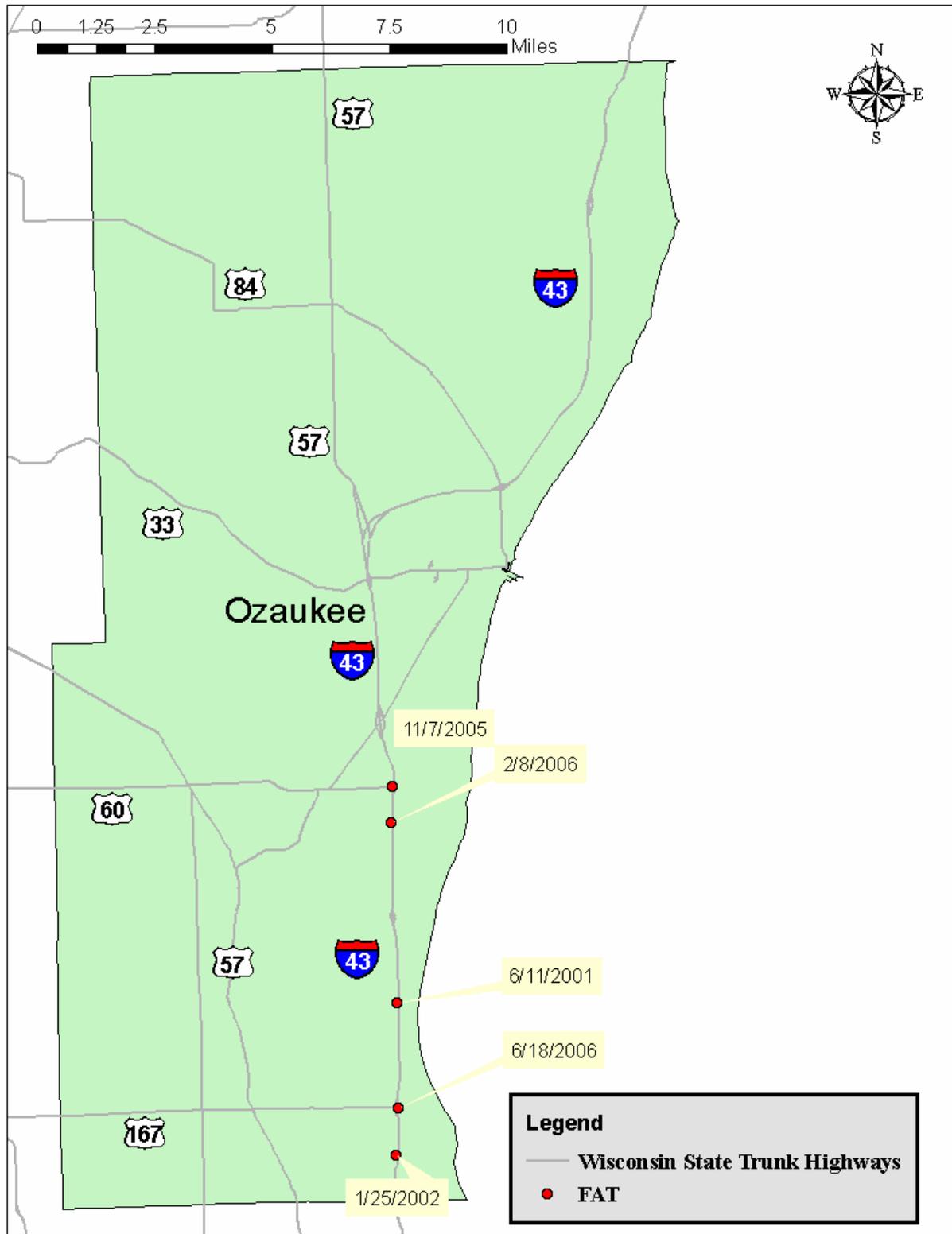


FIGURE 5 I-43 Ozaukee County Fatal Median Crossover Crashes (January 1, 2001 to June 18, 2006)

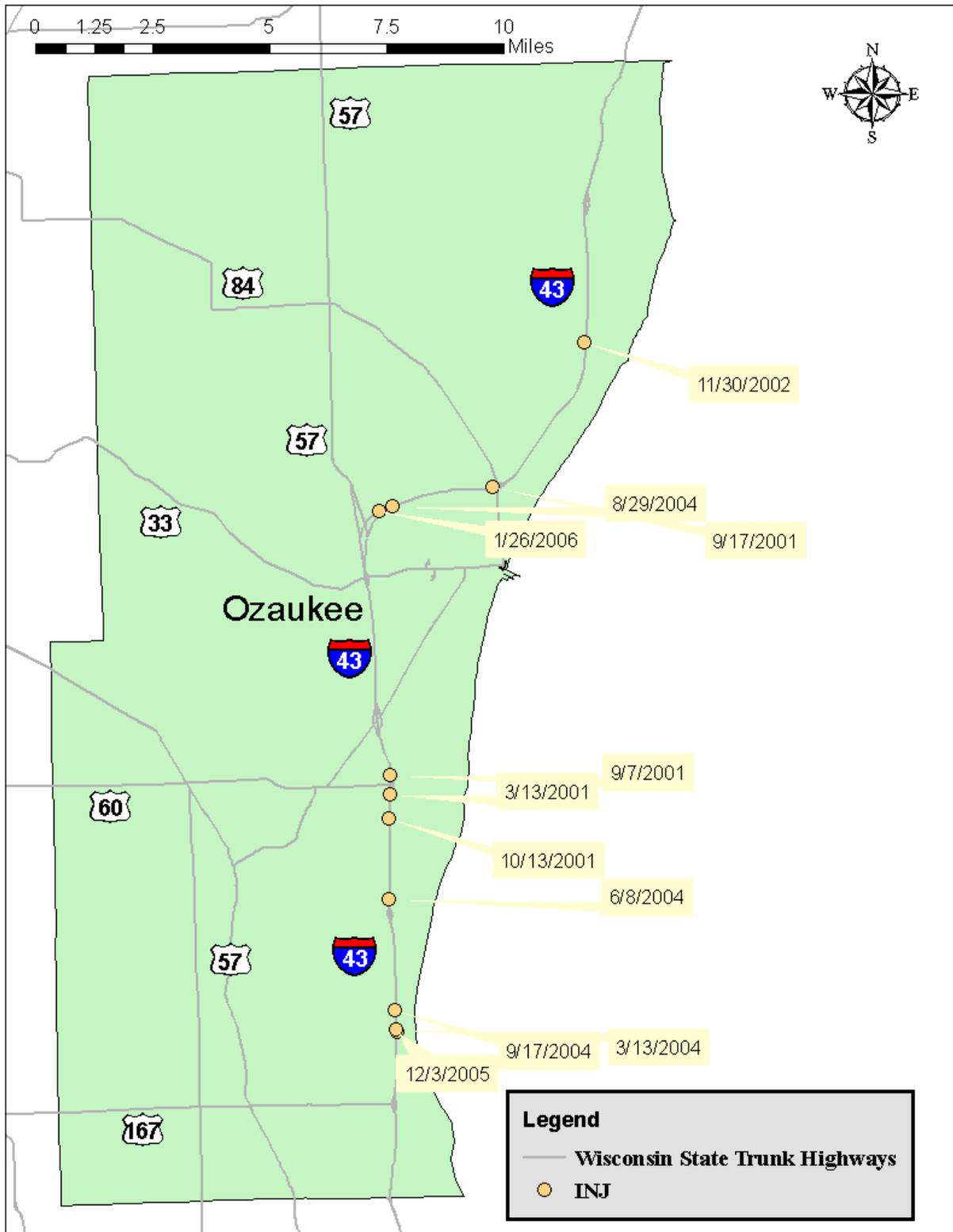


FIGURE 6 I-43 Ozaukee County Injury Median Crossover Crashes (January 1, 2001 to June 18, 2006)

Table 3 summarizes the vehicle types involved in median crossover crashes on I-43. Fifty percent (11 crashes) of these crashes were single vehicle crossover crashes, i.e., a single vehicle unit (either a passenger car or a truck) crossed the median and was not struck by a vehicle in the opposing direction. The other 50 percent were multiple vehicle crashes that involved either a passenger car or truck crossing the median and impacting a passenger car or truck traveling in the opposite direction. Table 3 shows that all five fatal median crossover crashes on I-43 were multi-vehicle crashes. Three crashes involved a passenger car impacting with another passenger car and two crashes involved a combination of a passenger car and a truck.

TABLE 3 I-43 Ozaukee County Median Crossover Crashes by Crash Vehicle Type

Crossover Crash Vehicle Type	Property Damage	Personal Injury	Fatal	Total (%)
<i>Single Vehicle Total</i>				<i>11 (50.0%)</i>
Passenger Car	3	7	0	10
Truck	1	0	0	1
<i>Multiple Vehicle Total</i>				<i>11 (50.0%)</i>
Passenger Car – Passenger Car	1	2	3	6
Passenger Car – Truck	0	2	2	4
Truck – Truck	1	0	0	1
<i>Total Median Crossover Crashes</i>	<i>6</i>	<i>11</i>	<i>5</i>	<i>22 (100%)</i>

Table 4 summarizes additional attributes of the fatal median crossover crashes on I-43 and is an add-on to Table 22 prepared as part of the 2001-2003 statewide study published by the Traffic Operations and Safety (TOPS) Laboratory in 2005.

TABLE 4 Median Barrier Warranted Fatal Median Crossover Crashes

HW	County	Fatal	Initial Event	Fatality Reason	Crash Type ¹	Road Cond	Median Width	Month Year	Driver Age
I-43	Ozaukee	1	Lost Control	Impact with Opposing Direction Vehicle	PCPC	Dry	70	June 01	49
		2	Lost Control	Two Passengers Killed on Impact with Opposing Direction Vehicle	PCPC	Dry	60	Jan. 02	78
		1	Lost Control ²	Impact with Opposing Direction Truck ²	PCT ²	-. ²	70	Nov 05	-. ²
		2	Lost Control	Impact with Opposing Direction Vehicle	PCPC	Dry	70	Feb 06	42
		1	Weather	Impact with Opposing Direction Vehicle	PCT	Wet	70	Jun 06	42

¹ Crash type codes:

PCPC: Passenger Car – Passenger Car

PCT: Passenger - Truck

² Preliminary information obtained from newspaper articles only. Police report of incident not available.

The extent to which vehicles crossed the median is shown in Table 5. Fifteen crashes involved the crossing vehicle stopping in or impacting a vehicle in the opposing direction lanes of travel. Five crashes crossed beyond the opposing direction travel lanes and two crashes involved vehicles only partially penetrating the opposing direction travel lanes. Figure 7 represents this same information by severity.

TABLE 5 I-43 Ozaukee County Median Crossover Crashes by Extent

Crossover Crash Extent	Crossover Crashes	
	Number	Percent
Partial	2	9.1
Into	15	68.2
Beyond	5	22.7
<i>Total Median Crossover Crashes</i>	22	100%

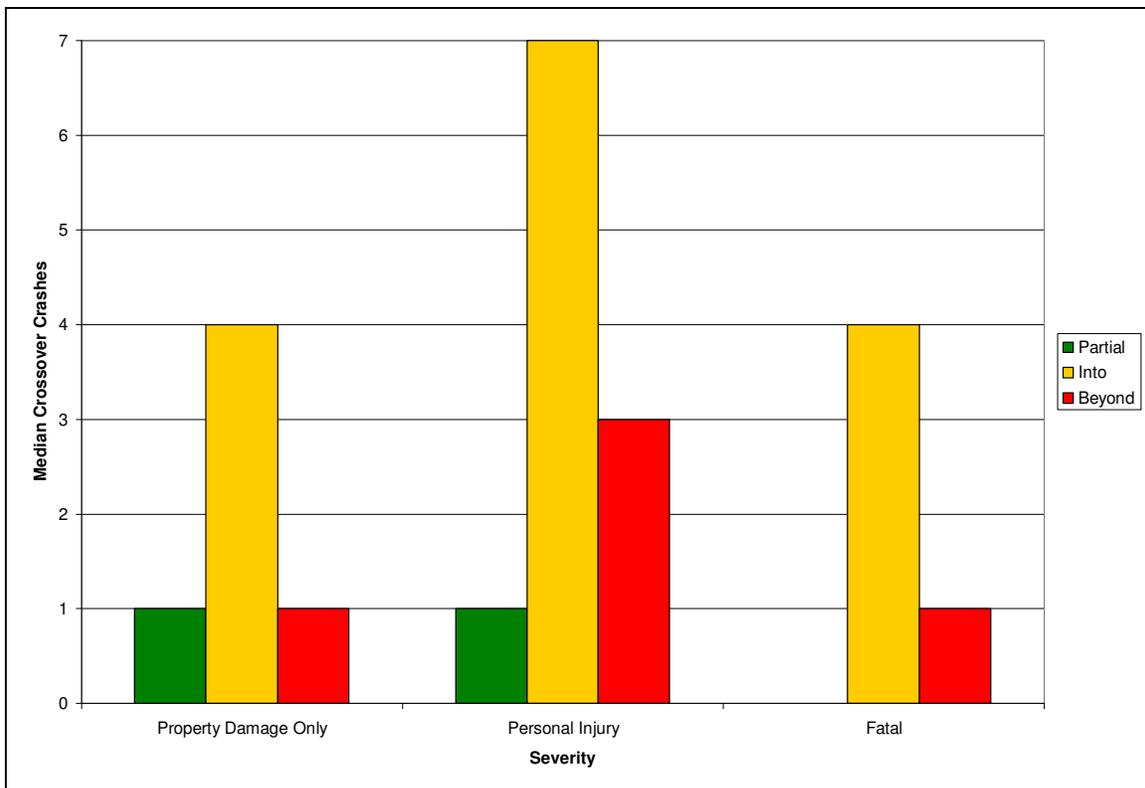


FIGURE 7 I-43 Ozaukee County Median Crossover Crash Extent by Crash Severity

An analysis of the initial cause of each of the I-43 median crossover crashes is summarized in Table 6. Approximately 54.6 percent (12 crashes) of I-43 median crossover crashes were a result of the driver losing control of the vehicle under dry pavement conditions, including four of the fatal crashes. The next most common crash cause was lost control due to weather, which accounted for 36.4 percent (8 crashes) and included ice (1 crash), snow (3 crashes), and wet (4 crashes) roadway conditions. A prior impact with another vehicle in the same direction and crossing the median as a result of an impact with an outside barrier each accounted for 1 crash.

TABLE 6 I-43 Ozaukee County Median Crossover Crash Initial Causation by Crash Severity

Initial Cause of Crash	Property Damage Only	Personal Injury	Fatal	Crossover Crashes (%)
Lost Control on Dry Pavement	0	8	4	12 (54.6%)
Lost Control Due to Weather	5	2	1	8 (36.4%)
<i>Ice</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>
<i>Snow</i>	<i>1</i>	<i>2</i>	<i>0</i>	<i>3</i>
<i>Wet</i>	<i>3</i>	<i>0</i>	<i>1</i>	<i>4</i>
Vehicle Collision	1	0	0	1 (4.5%)
Barrier	0	1	0	1 (4.5%)
Total Vehicle Crossovers	6	11	5	22 (100%)

3 CRASH RATE ANALYSIS

Median crossover crash locations were described in Section 2. Crash rates for each of these concentrations were then calculated for each year using milepost information and compared to the benchmarks of 0.5 median crossover crashes per mile per year and 0.12 median crossover fatalities per mile per year, with a least three crashes in a five year period.

A summary of median crossover injury and fatal crashes is included in Tables 7 and 8, respectively. It is noted that all fatalities were recorded in section 1 and hence no fatal median crossover crash rates were calculated for sections 2 or 3. The results show that Section 1 exceeds both the injury and fatal crash thresholds and is a candidate for median safety countermeasures. Injury crashes were concentrated between mile markers 87 and 90 in 2004 and 2005, and between mile marker 90 and 93 near the STH interchange in 2001.

TABLE 7 I-43 Ozaukee County Median Crossover Injury Crashes

Year	2001	2002	2003	2004	2005	2006	Exceed Threshold?
Section 1 (MP 84.63 – 92.50)	3	-	-	2	1	-	Yes
Section 2 (MP 98.50 – 100.92)	1	-	-	1	-	1	No
Section 3 (MP 103.49 – 110.9)	-	1	-	1	-	-	No

TABLE 8 I-43 Ozaukee County Median Crossover Fatal Crash Rates

Year	2001	2002	2003	2004	2005	2006	Exceed Threshold?
Section 1 (MP 84.63 – 92.50)	1	1	-	-	1	2	Yes

4 CONCLUSIONS AND RECOMMENDATIONS

The WisDOT Facilities Design Manual (FDM) does not warrant median barrier placement at locations with a median width greater than 60 feet. I-43 in Ozaukee County has median widths of 70 and 90 feet north of the Mequon Road interchange. I-43 south of Mequon Road has a median width of 60 feet; however, AADT is below the required values. Therefore, median barriers are not currently warranted on I-43 in Ozaukee County. Nevertheless, median barriers exist from the south Ozaukee County line to the Mequon Road interchange.

Analysis of the crash data found 22 reported median crossover crashes in Ozaukee County over a 66 month period. Each crash was spatially located. Using the criteria described, a section of I-43 between mile posts 84.63 – 92.50 exceeded the benchmarks for both injury and fatal crash frequencies. Hence, this segment of I-43 is a candidate for median safety countermeasures. No other sections of I-43 were found to have crash rates that exceed the designated benchmarks.

It is recommended that the southern section of I-43 between the existing terminal of the median barrier at Mequon Road and State Highway 60 be considered for median safety countermeasures (see Figure 8). It is also recommended that all of I-43 be re-evaluated with the results of a statewide research study currently being conducted.

Report Note:

Prior to the completion of this analysis and report, the Governor of Wisconsin signed an Executive Order to require median safety improvements in I-43 in Ozaukee County from Mequon Road to STH 32. WisDOT plans to install cable guard in this location.

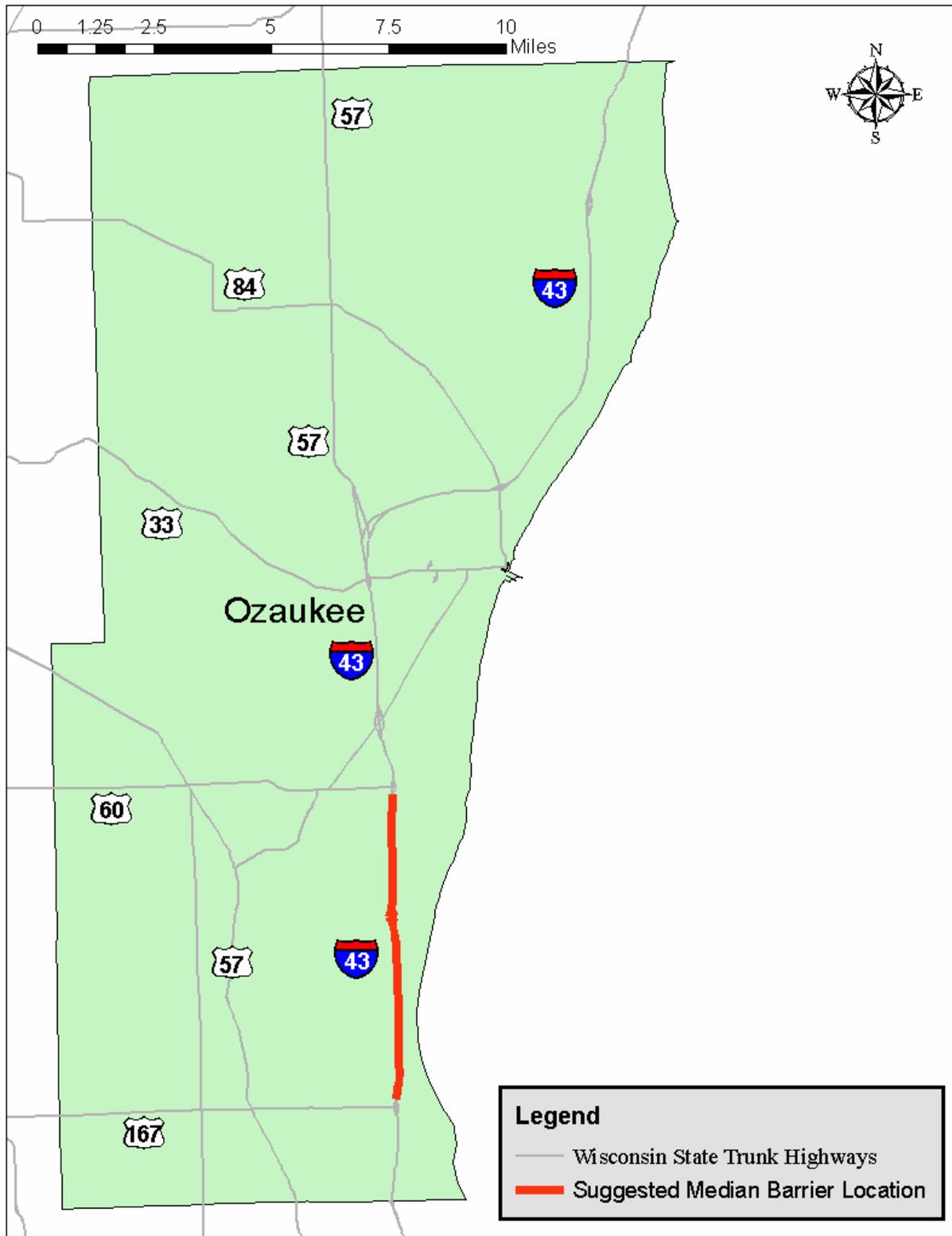


FIGURE 8 I-43 Ozaukee County Median Barrier Warranted Sections

APPENDIX A I-43 (OZAUKEE COUNTY) CRASH DATA JANUARY 2001 – JUNE 2006

COUNTY	MUNICIPALITY	ONHWY	ONHWYDIR	RPNMBR	RPDIS	INTDIR	INTDIS	ATHWY	ATSTR	MILE MRKR	ACCDATE	ACCDSVR	TOTINJ	TOTFATL	CRASH NMBR	VEHICLES	EXTENT	CAUSE	ROAD COND	MED WIDTH
OZAUKEE	GRAFTON	43	S	095D	0.20	S	20	60	WASHINGTON ST	92.03	3/13/2001	INJ	1	0	010302596	PC	I	W	S	70
OZAUKEE	MEQUON	43	N	090D	0.25	N	25		HIGHLAND RD	87.6	6/11/2001	FAT	1	1	010600367	PCPC	I	LC		70
OZAUKEE	GRAFTON	43	N	095K	0.01	N	20	60		92.42	9/7/2001	INJ	1	0	010902784	PC	I	LC		70
OZAUKEE	PORT WASHINGTON	43	N	103M	0.1	S	10	H		100.92	9/17/2001	INJ	1	0	010907445	PC	B	LC		90
OZAUKEE	GRAFTON	43	N	092G	0.91	S	10		LAKEFIELD RD	90.33	10/13/2001	INJ	1	0	011004149	PC	I	LC		70
OZAUKEE	MEQUON	43	N	087G	0.29	N	29		DONGES BAY RD	84.63	01/25/02	FAT	2	2	021113990	PCPC	I	LC		60
OZAUKEE	BELGIUM	43	S	107K	0.10	S	10		PIONEER RD	104.71	11/30/2002	INJ	1	0	020100037	PC	P	B		90
OZAUKEE	PORT WASHINGTON	43	N	101D	0.88	S	10	KK		99.25	8/29/2004	INJ	1	0	040809634	PC	I	LC		90
OZAUKEE	GRAFTON	43	N	092G	0.71	S	10		LAKEFIELD RD	90.26	10/23/2004	PD	0	0	041008641	PCPC	I	W	W	70
OZAUKEE	GRAFTON	43	N	092G	0.1	N	30	C	PIONEER RD	89.65	6/8/2004	INJ	2	0	040605483	PCT	B	LC		90
OZAUKEE	MEQUON	43	N	088K	0.14	N	30	167		85.74	12/21/2004	PD	0	0	041209559	PC	B	W	S	70
OZAUKEE	MEQUON	43	N	088K	1.45	S	40		HIGHLAND RD	87.07	3/13/2004	INJ	1	0	040304428	PC	B	LC		70
OZAUKEE	MEQUON	43	S	105T	0.25	N	85		HIGHLAND RD	103.49	9/17/2004	INJ	3	0	040908212	PCPC	I	LC		70
OZAUKEE		43				N	0.1	KK		98.50	3/1/2005	PD	0	0		T	I	W	I	90
OZAUKEE	BELGIUM	43				S	1		PEBBLE BEACH RD	110.90	3/10/05	PD	0	0	50303247	TT	I	W	W	90
OZAUKEE	BELGIUM	43				N	50	D		107.80	9/29/05	PD	0	0	50909031	PC	P	VC		90
OZAUKEE	MEQUON	43				S	40		HIGHLAND RD	87.58	12/3/05	INJ	2	0	51207275	PCPC	I	W	S	70
OZAUKEE*		43						60		92.50	11/7/05	FAT	2	1	newspaper	PCT	I	LC		70
OZAUKEE		43	S			N	0.4M		FALLS ROAD	91.40	2/8/06	FAT	1	2		PCPC	I	LC		70
OZAUKEE	GRAFTON	43				S	10		LAKEFIELD RD	90.3	1/2/06	PD	0	0	7174255	PC	I	W	W	70
OZAUKEE	PORT WASHINGTON	43				N	10		NORTHWOODS RD	99.3	1/26/06	INJ	3	0	7937189	PCT	I	LC	D	90
OZAUKEE		43				N	0.5M	167		85.40	6/18/06	FAT	2	1		PCT	B	W	W	70