

**Traffic Analysis Report for:**

**DEWEY STREET CORRIDOR TRAFFIC STUDY**  
**S. 42<sup>nd</sup> Street (CTH CR) to S. 10<sup>th</sup> Street**

Prepared for:  
**City of Manitowoc**  
**Department of Public Works**

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**Introduction**

OMNNI Associates, Inc. was retained by the City of Manitowoc Department of Public Works to conduct a traffic study and analysis report for the Dewey Street corridor between S. 42<sup>nd</sup> Street (CTH CR) and S. 10<sup>th</sup> Street. Dewey Street traffic volumes have been increasing, specifically at major intersections, and there are concerns of traffic delay, and traffic and pedestrian safety along the corridor.

The purpose of this report is to: 1) review existing intersection capacity and traffic operations; 2) review traffic crash history; 3) conduct traffic signal warrant analyses at study intersections; 4) identify future potential capacity and operational issues; and 5) recommend alternatives that could improve traffic and safety conditions now and for future years.

**Dewey Street Overview**

Figure 1.1 shows the Dewey Street Corridor. The primary intersections of this study include:

- S. 42<sup>nd</sup> Street
- S. 39<sup>th</sup> Street
- S. 35<sup>th</sup> Street
- S. 30<sup>th</sup> Street
- S. 26<sup>th</sup> Street
- S. 23<sup>rd</sup> Street
- S. 18<sup>th</sup> Street
- S. 14<sup>th</sup> Street
- S. 10<sup>th</sup> Street

S. 42<sup>nd</sup> Street and S. 30<sup>th</sup> Street are signalized, while the others are 2-way stop controlled for north/south traffic, except at S. 10<sup>th</sup> Street, where Dewey Street stops. Dewey Street is marked as 4-lanes west of S. 18<sup>th</sup> Street, and is driven as 2-lanes with a parking lane east of S. 18<sup>th</sup> Street. The speed limit is 35 mph west of, and 25 mph east of, S. 18<sup>th</sup> Street.

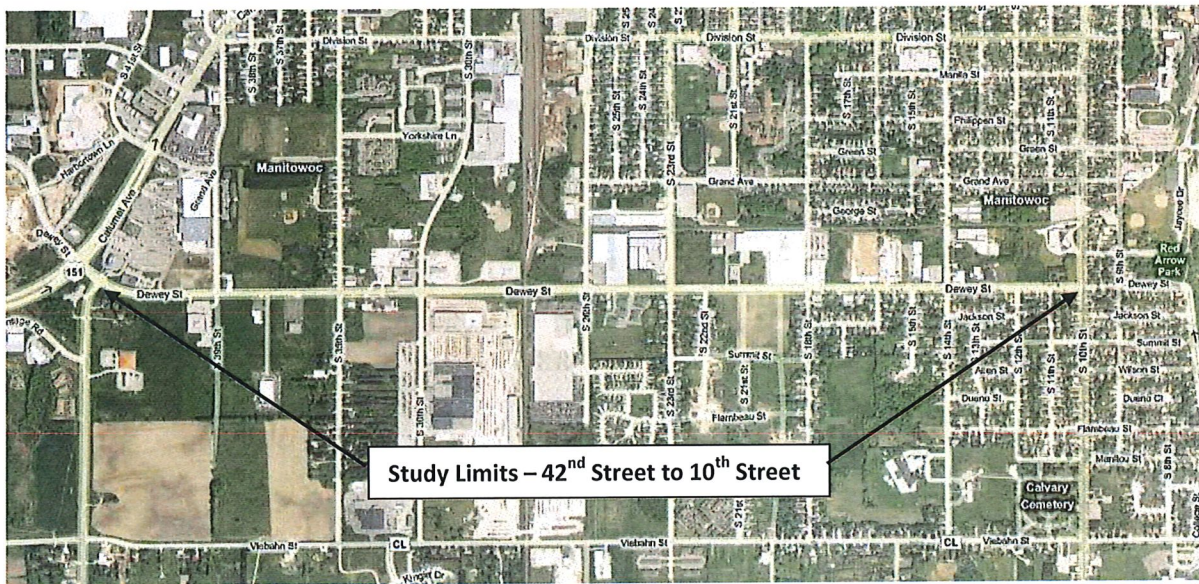


Figure 1.1 – Dewey Street Overview Map (courtesy Microsoft)

The segment between Calumet Avenue (STH 151) and S. 39<sup>th</sup> Street was recently reconstructed due to adjacent commercial developments, with the largest businesses being Wal-Mart and Festival Foods. Signalized intersection improvements were made at S. 42<sup>nd</sup> Street, with the north approach as a signalized driveway for the commercial developments. A primary driveway was built from the Wal-Mart parking lot to access Dewey Street between S. 42<sup>nd</sup> Street and S. 39<sup>th</sup> Street. A short two-way left turn lane was also built in the area to improve access to driveways on both sides of Dewey Street.

At S. 30<sup>th</sup> Street and S. 26<sup>th</sup> Street, Dewey Street has separate left turn lanes for traffic. All other non-signalized intersections do not have turn lane designation. No lane marking currently exists on any of the study cross streets east of 39<sup>th</sup> Street. Most cross streets are wide enough near the intersection for two narrow approach lanes. Right turning vehicles were observed to stop alongside a through or left turning vehicle at a few intersections, including S. 35<sup>th</sup> Street and S. 23<sup>rd</sup> Street. Sidewalks run along the entire corridor. Pedestrian crossings are marked at the major street crossings on Dewey Street.

A number of schools are located near the corridor. Monroe Elementary School is south of Dewey Street at the intersection of S. 14<sup>th</sup> Street and Viebahn Street. The school boundaries are at the railroad tracks just north of Dewey Street, so there are only a few school-aged pedestrians crossing Dewey Street on a daily basis. All other schools are north of Dewey Street. Jefferson Elementary School is at S. 14<sup>th</sup> Street and Division Street; Washington Junior High School and athletic fields are at S. 23<sup>rd</sup> and Grand Avenue; and Lincoln High School is located near Grand Street and S. 8<sup>th</sup> Street. School pedestrian traffic from these schools crossing Dewey Street is low.

The signalized intersection at S. 30<sup>th</sup> Street operates as a two-phase fully actuated isolated intersection. Pedestrian signal indications that are push button actuated are present. The signalized intersection at S. 42<sup>nd</sup> Street is an 8-phase intersection with left turn phasing for northbound, eastbound, and westbound left turns. There is also an overlapping right turn phase for eastbound right turns. S. 42<sup>nd</sup> Street signal is coordinated with the adjacent Calumet Avenue intersection approximately 450 feet west. Pedestrian signals with push buttons are present. Existing signal timing information was provided by the City of Manitowoc and was included in analysis.

#### **Traffic Data**

The City of Manitowoc collected 16-hours (6 am to 10 pm) of traffic turning movement data and pedestrian count data at the study intersections from S. 35<sup>th</sup> Street to S. 10<sup>th</sup> Street. These counts were done in late January and early February 2009. OMNNI collected peak hour traffic turning movement data in May 2009 at S. 42<sup>nd</sup> Street and S. 39<sup>th</sup> Street for traffic analysis. [Appendix A](#) has a summary of the count data used in this analysis.

Based on 2005 Wisconsin Department of Transportation (WisDOT) traffic counts, daily traffic volumes along Dewey Street range from 10,400 AADT west of S. 35<sup>th</sup> Street to 5,400 AADT just west of S. 10<sup>th</sup> Street. The heavy truck percentage of total volume is approximately 3.5%.

Daily traffic forecast data was provided by WisDOT in May 2009. The report forecasts daily volumes to year 2020 and year 2030 for Dewey Street and major cross streets where data was available. OMNNI used this data to develop intersection traffic movement forecasts for future years. Where traffic forecast information was not provided a 1.4% growth rate (compounded yearly) was applied to forecast 2020 traffic volumes and a 1.2% growth rate to forecast from 2020 to 2030 traffic volumes. These rates are similar to those provided by WisDOT. See [Appendix B](#) for forecast information.

For S. 39<sup>th</sup> Street extension to the south of Dewey Street, future traffic was estimated based on available land use information from the City of Manitowoc. The area between Dewey Street and Viebahn Street west of S. 35<sup>th</sup> Street is expected to see commercial and mixed-use development. South of Viebahn is planned residential neighborhood.

eastbound (3), southbound with westbound (2), eastbound with westbound left turns (2), and westbound with eastbound left turns (2). Five rear end crashes on Dewey Street were likely due to vehicles slowing to make turns at 35<sup>th</sup> Street. Crashes may be due to high side street stop delay and drivers taking shorter gaps.

- **S. 30<sup>th</sup> Street (Signalized)** – 5 of 7 angle collisions involved left turn movements. Sideswipe crashes on the side street may result from unmarked approaches at signal. Only 4 injury crashes, but resulted in 8 total injuries.
- **S. 26<sup>th</sup> Street** – 5 angle crashes between various movements resulted in 8 injuries. 2 westbound rear end crashes involved a vehicle slowing to make a turn onto north approach. Some collisions may be due to restricted sight distance with vertical curve at intersection.
- **S. 23<sup>rd</sup> Street** – Large majority of crashes (14 of 20) and injuries (19 of 24) from angle crashes, involving many different combinations of movements: northbound (left turn) with eastbound (5), southbound with eastbound (3), southbound with westbound (2), northbound left turn with westbound (2). Crashes may be due to side street stop delay and drivers taking shorter gaps.
- **S. 18<sup>th</sup> Street** – Angle crashes between eastbound and northbound (2), eastbound and southbound (2), and eastbound with westbound left turns (2). Fatality occurred at this intersection. Crashes may be due to the change in speed limit at this intersection and cross traffic does not anticipate higher speeds of vehicles from the west than east.
- **S. 14<sup>th</sup> Street** – Rear end collisions (4) along Dewey Street likely resulting from vehicles slowing to turn at intersection.
- **S. 10<sup>th</sup> Street** – Angle crashes between eastbound (and eastbound left turns) and northbound (6) and eastbound and southbound (2). Northbound rear end collisions (3) resulting from vehicles slowing/turning at intersection. A retaining wall in the southwest quadrant of intersection may limit sight distance for eastbound and northbound traffic.

The majority of crashes at these intersections are angle collisions. Angle collisions at unsignalized intersections are typically due to restricted sight distance, high intersection traffic movement volumes, or high approach speeds. Possible improvements that could be considered for Dewey Street may include removing sight obstructions near intersections including restriction of parking near corners, channelizing movements at intersections, increasing law enforcement efforts of traffic speeds, and installing traffic signals where warranted.

Intersection	Total Crashes	Total Injuries	Intersection Crash Rate (MVE)
S. 35th Street	24	20	0.94
S. 42nd Street (CTH CR)	22	7	0.76
S. 23rd Street	20	4	0.98
S. 10th Street	19	15	1.01
S. 30th Street	17	22	0.61
S. 39th Street	15	8	0.63
S. 18th Street	10	12	0.57
S. 26th Street	8	5	0.35
S. 14th Street	7	3	0.46

Table 2.1 – Intersection Crash Summary

### Intersection Crash Rates

Intersection crash rates were also reviewed for the project. WisDOT considers an intersection crash rate below 1.5 crashes per one million vehicles entering the intersection (MVE) to be normal. An intersection

crash rate from 1.5 to 2.0 MVE indicates a potential crash problem and the intersection should be watched, while a rate above 2.0 MVE indicates the intersection warrants urgent investigation.

Intersection crash rates for Dewey Street were calculated from WisDOT traffic data where known, while daily traffic volumes on side streets without traffic data were estimated. Table 2.1 shows the intersection crash rates calculated for the study intersections.

Intersections with a high proportion of angle collisions also had the highest intersection crash rates. The Dewey Street & S. 10<sup>th</sup> Street intersection had a crash rate of 1.01 MVE, Dewey Street & S. 23<sup>rd</sup> Street had an intersection crash rate of 0.98 MVE, and Dewey Street & S. 35<sup>th</sup> Street had a crash rate of 0.94 MVE. Although the rates do not indicate an immediate need for improvement, these intersections would likely benefit the most from geometric or traffic control improvements.

**Intersection Recommendation**

Based on the signal warrants alone a traffic signal is not warranted before year 2030.

**S. 10<sup>th</sup> Street Warrant Analysis Summary**

Warrant		Year			
		2009	2010	2020	2030
1A	8-hour minimum volume	NO	NO	NO	YES
1B	8-hour interruption of traffic	NO	NO	NO	NO
1C	80% combination of 1A & 1B	NO	NO	NO	NO
2	4-hour minimum volume	NO	NO	YES	YES
3	Peak hour volume	NO	NO	YES	YES
4	Pedestrian crossing	NO	--	--	--
5	School crossing	NO	--	--	--
6	Coordinated signal system	NO	--	--	--
7	Crash experience	NO	--	--	--
8	Roadway network	NO	--	--	--

Note: "--" indicates warrant not evaluated

Table 3.6 – 10<sup>th</sup> Street Warrant Analysis Summary

Note that Dewey Street is the minor approach at the intersection with S. 10<sup>th</sup> Street. The Dewey Street approaches were considered as one left-through-right lane and all right turns were included.

**Warrant 1 – Eight-hour Vehicular Volume**

Warrant 1A - Minimum Vehicular Volume is not met in year 2009. The threshold volumes are met in five hours in year 2020 and three hours are within 10% of the threshold volumes. Warrant 1A is met by year 2030.

Warrant 1B – Interruption of Continuous Traffic is not met in year 2009, 2020, or 2030.

**Warrant 2 – Four-hour Vehicular Volume**

In 2009 the four-hour vehicular volume threshold is not met, although one hour meets and two more hours are close to the threshold volumes. In years 2020 and 2030, 4 hours exceed the threshold volumes.

**Warrant 3 – Peak Hour**

The peak hour threshold volume is not met in year 2009 at S. 10<sup>th</sup> Street. The peak hour threshold volume is met in years 2020 and 2030.

**Intersection Recommendation**

Based on signal warrants alone a traffic signal could be considered by year 2020 and should be studied more in depth when traffic volumes meet warrants and travel delay has increased to unacceptable levels. An all-way stop may be an alternative solution at this intersection.

### **Future Traffic Conditions – Proposed Improvements Analysis**

The next step was to analyze different types of improvements that could be made to increase capacity and maintain safety on approaches that are experiencing, or are expected to experience, unacceptable delays. Based on the capacity and safety analysis described above, the intersections that would benefit the most with improvements are S. 10<sup>th</sup> Street, S. 23<sup>rd</sup> Street, S. 35<sup>th</sup> Street, and S. 42<sup>nd</sup> Street. The other stop-controlled intersections could have similar intersection improvements made as stated for S. 23<sup>rd</sup> Street or S. 35<sup>th</sup> Street; however, the cost benefit would not be as high at these intersections.

The following is a breakdown of improvement alternatives that were analyzed and could be implemented at key intersections. All level of service and delay values are for the PM peak hour unless otherwise stated. Synchro HCM results are provided in [Appendix G](#).

#### **S. 10<sup>th</sup> Street**

Traffic movements that require the most attention are eastbound left turns and southbound right turns. The preference is to maintain intersection as 2-way stop control for eastbound and westbound traffic, if possible. **The first step is to mark the eastbound approach lanes as left turn only and a shared through-right turn.** The other approaches may remain unmarked. A LOS F (50.6 sec delay/veh) is still expected for eastbound left turn in year 2009 and unacceptable delay by year 2020.

An option with 2-way stop control is to channelize the southbound right turn. This allows all movements to operate at LOS B except the eastbound left turn is still at LOS E (41 sec delay/veh) in year 2009. This option would require reconstruction of northwest corner of intersection, and likely require purchase of right-of-way.

**The next alternative is to change traffic control to an all-way stop. Mark the eastbound approach lanes and northbound approach lanes as left turn only and shared through-right turn.** Mark the southbound approach lanes as shared through-left turn and right turn only. Turn lane lengths of at least 100 feet to be effective. All movements are expected to operate at LOS C or better in year 2009. All movements remain at LOS C or better to 2030, except for northbound through movement is expected operate at LOS D (29.9 sec delay/veh). The addition of the channelized southbound right turn is not necessary for all-way stop control, and only makes levels of service slightly better. This alternative would require new stop signs and pavement markings.

**The most invasive alternative is a traffic signal. This option would allow all movements to operate at LOS C or better in year 2030 and beyond. However, during non-peak times the average vehicle will experience more delay than an all-way stop, due to waiting for the signal to change.** This option may require pavement replacement, although a traffic signal likely could be retrofitted at the existing intersection without total intersection reconstruction. A traffic signal should only be installed after all-way stop control has delay problems or other safety problems, and when traffic volumes are warranted for signals.

A roundabout is another alternative that would provide acceptable levels of service now and into the future. It may be the most ideal at this intersection due to the heavy turn movements. Unlike the traffic signal, a roundabout would minimize travel delay during both peak and non-peak hours. This would be the most costly alternative to build because of full reconstruction of the intersection and each approach.

#### **S. 23<sup>rd</sup> Street**

Southbound right turns and northbound through are the heaviest cross street movements. There is also a comparable volume of eastbound left turns. No improvements can be made to improve cross street



***Dewey Street & S. 23<sup>rd</sup> Street***

The intersection has some operational problems for cross street traffic during the PM peak hour, but otherwise operates acceptably throughout the day. By year 2030 it is expected to have severe delay on the cross street approaches during AM and PM peak hours.

No geometric improvements are recommended at this intersection at this time. No improvements can be made to improve cross street traffic levels of service significantly and maintain the 2-way stop-control without major reconstruction or change in traffic control. All-way stop control is not a viable option at this intersection. A traffic signal is not warranted by year 2030 based on forecast traffic volumes, and is not recommended as an option until such time that traffic volumes warrant a signal.

One improvement that should be made if Dewey Street were reconstructed is to construct separate eastbound and westbound left turn lanes with medians separating the left turns from opposing through movements. This provides separation between eastbound and westbound movements and helps cross traffic better judge gaps in mainline traffic. This should decrease the number and severity of crashes.

***Dewey Street & S. 18<sup>th</sup> Street***

No geometric improvements are recommended at this intersection. The intersection operates acceptably today, but may experience delay problems for northbound and southbound traffic during the PM peak hour in the future. Minimize parking near the intersection to provide sufficient sight distances and to allow cross street vehicles making a right turn to bypass a left turning or through vehicle.

***Dewey Street & S. 14<sup>th</sup> Street***

No geometric improvements are recommended at this intersection. The intersection operates acceptably today, but may experience delay problems for northbound and southbound traffic during the PM peak hour in the future. Minimize parking near the intersection to provide sufficient sight distances and to allow cross street vehicles making a right turn to bypass a left turning or through vehicle.

***Dewey Street & S. 10<sup>th</sup> Street***

The intersection has some operational problems for eastbound traffic during the PM peak hour, but otherwise operates acceptably throughout the day. By year 2030 it is expected to have severe delay for Dewey Street approaches during AM and PM peak hours.

An all-way stop would accommodate traffic safely and efficiently now and into the future. Northbound and southbound traffic would have higher delay than existing, but the overall level of service at the intersection would be greatly improved. Eastbound should be marked as a left turn only lane with 150 feet storage and a shared through-right lane. Northbound should be marked as a left turn only lane with 100 feet storage and a shared through-right lane. Southbound should be marked as a shared left-through and a right turn only lane with 100 feet storage. Westbound may remain unmarked.

This intersection is expected to meet 4-hour and peak hour signal warrants by year 2020, and minimum volume warrants by year 2030. From this analysis, a traffic signal is not necessary to accommodate traffic, and except for the PM peak hour, it likely would create greater delay than all-way stop control for the average vehicle during non-peak hours. A traffic signal should only be installed after all-way stop control has delay problems or other safety problems, and when traffic volumes warrant a signal.

A roundabout is another alternative that should be considered at this intersection. It may be the ideal control at this intersection due to the heavy turn movements. It would minimize travel delay during both peak and non-peak hours. This would be the most costly alternative to build because of full reconstruction of the intersection and each approach.