



# Traffic Engineering, Operations & Safety Manual

## Chapter 4 Signals

### Section 2 Signal Investigation Study

#### 4-4-1 Signal Investigation Study

April 2025

For traffic signals to be considered on the STH-system, a Signal Investigation Study **shall** be developed to document its need.

All supporting discussion, information, and evaluation worksheets **shall** be presented in a standard format. This format will create uniformity in the presentation/review of the Signal Investigation Study for the intersection being evaluated.

The format of the signal investigation study is detailed below:

- I. The cover letter **shall** include:
  - A recommendation and brief discussion of the study.
  - Any/All exceptions to the standards referenced in this manual and the WMUTCD.
  - A discussion of remedial actions tried, or, if none, explanation of need for signal.
  - Related agreements (i.e. railroad, maintenance).
  - Formal correspondence (letters from governmental officials, elected or non-elected, brief mention of local petitions, if any).
  - The local jurisdiction's recommendation and why rural warrants were used (if used).
- II. DT1199 Traffic Control Signal Approval Request **shall** be completed by the Region and submitted with the investigation study to Central Office.
- III. Analysis or signal investigation study stating reason for recommendation, to include statements regarding:
  - a. Reasons / Justification for Signal Request
  - b. Existing Physical Conditions and Control Devices
  - c. Traffic Conditions
  - d. Crash History
  - e. Warrants met
- IV. Appendices:
  - a. Intersection Location Map
  - b. Hourly Intersection Turning Movement Traffic Volume Counts
  - c. Signal Warrant Analysis Worksheets
  - d. Intersection Plan Sheets
  - e. Signalized Intersection Capacity Analysis
  - f. 3-yr Intersection Crash History Data Extract
    - Crash Reports
    - Collision Diagram (if available)

#### 4-4-2 Data Collection

April 2025

##### VEHICULAR/PEDESTRIAN VOLUMES

Vehicular traffic counts and pedestrian volumes **shall** include the periods of the average day when signal control is expected to provide the greatest benefit. The traffic counts **shall** be at least 8 hours in duration; however, 16-hour counts are recommended. The traffic counts **shall** contain the greatest percentage of 24-hour traffic and *should* include 15-minute counts during the A.M. and P.M. peak hour to determine the peak-hour factor (PHF). Typical hourly volume counts are collected from 6:00AM to 6:00PM, however, if volumes remain steady after 6:00PM, counts *should* continue until volumes decrease significantly.

When vehicular volume data is unobtainable during the time when signals *may* be warranted, vehicular volumes *may* be factored to represent peak periods. Traffic volume factors are different in various regions of the state. These factors (seasonal, monthly, daily, or hourly) *may* be available from WisDOT Planning Section in some cases. When volume factors are used, they must be supported and fully explained as to why they are being used in lieu of actual turning movement counts.

Vehicular volume counts **shall** be recorded for each traffic movement by approach. Vehicles *may* be classified by type: heavy trucks, passenger cars, and buses. Refer to Figure 2.1 for an example of the "Vehicle Volume Summary" form.

When pedestrian volumes are significant, the pedestrian volume counts on each crosswalk **shall** be recorded during the same periods as the vehicular volume counts or during hours of highest pedestrian volume. Bicyclists using pedestrian crosswalks *should* be counted as pedestrians and bicyclists using the roadway *should* be counted as vehicles.

A summary of the vehicle and/or pedestrian count information *should* be prepared, using the Department form DT 1902 which can be obtained by contacting the Regional traffic unit or an equivalent summary (i.e., volume counting software). This form and the actual counts summarized hourly *should* be submitted with the signal investigation study. In some cases, it *may* be necessary to break the hourly volumes down into 15-minute intervals, although this is not a requirement.

For proposed developments, projected traffic volumes can be used to determine whether signals *may* be warranted. Volume projection methods *should* be documented, including the trip generation rates and source. Projected traffic volumes *should* be added to existing traffic counts for the location if traffic exists. The analysis of projected traffic volumes must follow all criteria as stated in this manual. A traffic signal installed, based on projected volumes, *should* have a follow-up study completed at the time of expected build-out to determine if actual volumes meet warrants.

Figure 2.1. Vehicle Volume Summary Example

### Intersection Traffic Volume Report

#### 15-Minute Motor Vehicle Data

Schoenhaar Drive and STH 33 - Washington Street

Count Booklet	Page 5 of 13
Start Date: Thursday, January 10, 2019	Weekday
Total Number of Hours Counted: 13	Schools in Session
	No Special Events



#### 15-Minute Motor Vehicle Data

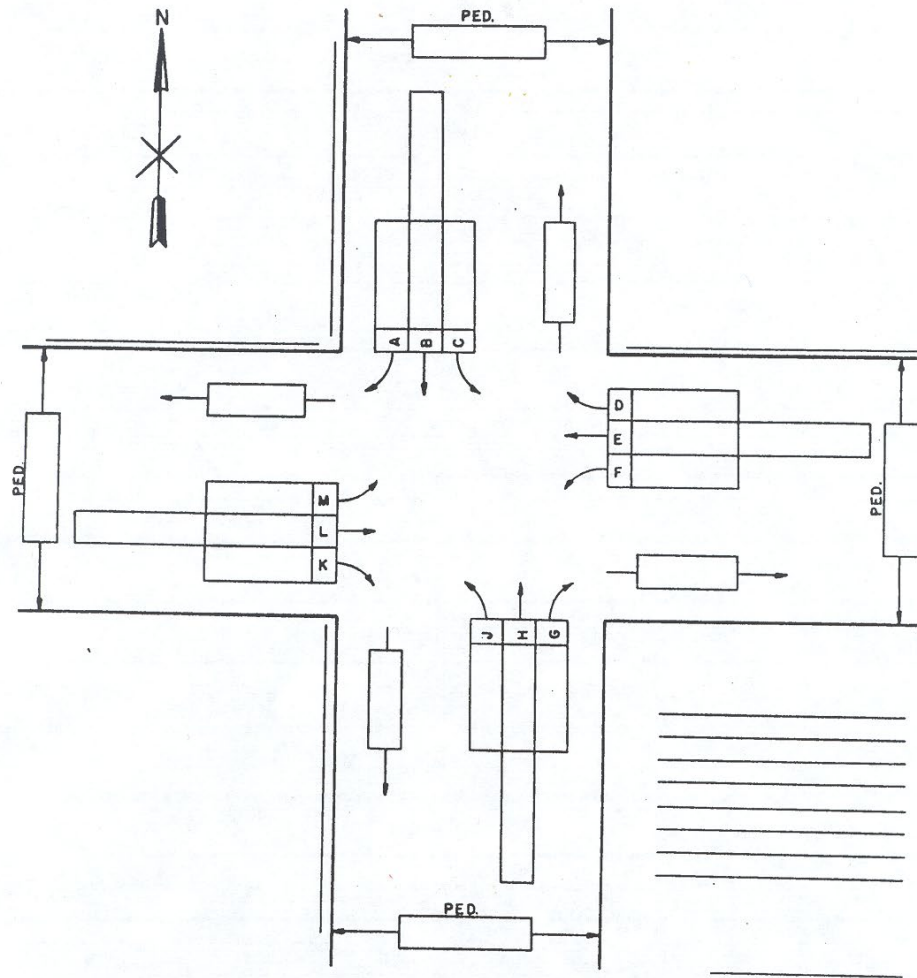
15-Minute Time Period	From North					From East					From South					From West					15-Min Totals	Hourly Sum	PHF	
	Schoenhaar Drive					STH 33 - Washington Street					STH 33 - Washington Street					STH 33 - Washington Street								
	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total				
AM Peak Period	6:00 AM	5	0	5	0	10	2	66	0	0	68	0	0	0	0	0	0	64	7	0	71	149	870	0.78
	6:15 AM	7	0	5	0	12	10	101	0	0	111	0	0	0	0	0	0	76	3	0	79	202	974	0.81
	6:30 AM	7	0	8	0	15	2	130	0	0	132	0	0	0	0	0	0	87	6	0	93	240	1072	0.81
	6:45 AM	12	0	2	0	14	6	171	0	0	177	0	0	0	0	0	0	69	19	0	88	279	1175	0.81
	7:00 AM	11	1	4	0	15	3	108	0	0	111	0	0	0	0	0	0	111	16	0	127	253	1245	0.81
	7:15 AM	12	0	8	0	20	8	156	0	0	164	0	0	0	0	0	0	103	13	0	116	300	1254	0.90
	7:30 AM	18	0	0	0	18	9	199	0	0	208	0	0	0	0	0	0	110	7	0	117	343	1193	0.85
	7:45 AM	10	0	3	0	13	6	206	0	0	212	0	0	0	0	0	0	101	23	0	124	349	1035	0.77
	8:00 AM	15	0	2	0	17	4	126	0	0	130	0	0	0	0	0	0	102	13	0	115	262	897	0.86
	8:15 AM	9	0	3	0	12	3	127	0	0	130	0	0	0	0	0	0	78	19	0	97	239	808	0.85
Midday Peak Period	8:30 AM	12	0	1	0	13	1	89	0	0	90	0	0	0	0	0	0	68	14	0	82	185	741	0.88
	8:45 AM	10	0	3	0	13	6	105	0	0	111	0	0	0	0	0	0	74	13	0	87	211	744	0.88
	9:00 AM	7	0	1	0	8	3	95	0	0	98	0	0	0	0	0	0	59	9	0	68	174	748	0.81
	9:15 AM	9	0	1	0	10	7	85	0	0	92	0	0	0	0	0	0	59	10	0	69	171	772	0.90
	9:30 AM	15	0	3	0	18	1	74	0	0	75	0	0	0	0	0	0	85	10	0	95	188	795	0.91
	9:45 AM	12	0	7	0	19	2	112	0	0	114	0	0	0	0	0	0	67	15	0	82	215	801	0.93
	10:00 AM	14	0	0	0	14	4	87	0	0	91	0	0	0	0	0	0	81	12	0	93	198	772	0.97
	10:15 AM	16	0	1	0	17	2	85	0	0	87	0	0	0	0	0	0	83	7	0	90	194	763	0.98
	10:30 AM	10	0	2	0	12	3	85	0	0	88	0	0	0	0	0	0	88	6	0	94	194	772	0.95
	10:45 AM	4	0	2	0	6	1	98	0	0	99	0	0	0	0	0	0	74	7	0	81	186	796	0.91
PM Peak Period	11:00 AM	6	0	2	0	8	4	78	0	0	82	0	0	0	0	0	0	91	8	0	99	189	810	0.93
	11:15 AM	10	0	3	0	13	4	100	0	0	104	0	0	0	0	0	0	78	8	0	86	203	850	0.83
	11:30 AM	5	0	1	0	6	4	88	0	0	92	0	0	0	0	0	0	110	0	0	110	218	937	0.87
	11:45 AM	8	0	3	0	11	3	86	0	0	89	0	0	0	0	0	0	85	15	0	100	200	959	0.88
	12:00 PM	37	0	4	0	41	5	104	0	0	109	0	0	0	0	0	0	107	12	0	119	269	984	0.91
	12:15 PM	13	0	7	0	20	5	97	0	0	102	0	0	0	0	0	0	101	27	0	128	250	909	0.91
	12:30 PM	9	0	2	0	11	3	107	0	0	110	0	0	0	0	0	0	105	14	0	119	240	897	0.93
	12:45 PM	23	0	4	0	27	6	94	0	0	100	0	0	0	0	0	0	86	12	0	98	225	903	0.97
	1:00 PM	7	0	4	0	11	9	79	0	0	88	0	0	0	0	0	0	78	17	0	95	194	910	0.92
	1:15 PM	13	0	1	0	14	2	101	0	0	103	0	0	0	0	0	0	108	13	0	121	238	973	0.95
1:30 PM	14	0	4	0	18	3	86	0	0	89	0	0	0	0	0	0	123	16	0	139	246	984	0.96	
1:45 PM	14	0	3	0	17	6	90	0	0	96	0	0	0	0	0	0	108	10	1	119	232	1123	0.73	
2:00 PM	16	0	3	0	19	2	96	0	0	98	0	0	0	0	0	0	125	15	0	140	257	1184	0.77	
2:15 PM	15	0	4	0	19	6	111	0	0	117	0	0	0	0	0	0	105	8	0	113	249	1224	0.79	
2:30 PM	30	0	5	0	35	6	138	0	0	144	0	0	0	0	0	0	183	23	0	206	385	1320	0.86	
2:45 PM	10	0	1	0	11	4	116	0	0	120	0	0	0	0	0	0	134	28	0	162	293	1296	0.90	
3:00 PM	25	0	4	0	29	4	115	0	0	119	0	0	0	0	0	0	123	26	0	149	297	1321	0.91	
3:15 PM	14	0	3	0	18	5	156	0	0	161	0	0	0	0	0	0	148	18	0	166	345	1393	0.94	
3:30 PM	33	0	5	0	38	10	117	0	0	127	0	0	0	0	0	0	176	20	0	196	361	1407	0.95	
3:45 PM	12	0	5	0	17	9	128	0	0	137	0	0	0	0	0	0	146	18	0	164	318	1455	0.89	
4:00 PM	17	0	8	0	25	5	124	0	0	129	0	0	0	0	0	0	192	23	0	215	369	1538	0.94	
4:15 PM	20	0	1	0	21	5	130	0	0	135	0	0	0	0	0	0	180	23	0	203	359	1603	0.92	
4:30 PM	27	0	6	0	33	6	150	0	0	156	0	0	0	0	0	0	188	32	0	220	409	1600	0.92	
4:45 PM	12	0	3	0	15	7	148	0	0	155	0	0	0	0	0	0	210	21	0	231	401	1518	0.87	
5:00 PM	23	0	4	0	27	14	155	0	0	169	0	0	0	0	0	0	219	19	0	238	434	1423	0.82	
5:15 PM	13	0	4	0	17	2	148	0	0	150	0	0	0	0	0	0	177	12	0	189	356	1277	0.90	
5:30 PM	19	0	10	0	29	5	133	0	0	138	0	0	0	0	0	0	143	17	0	160	327	1162	0.89	
5:45 PM	10	0	3	0	13	2	109	0	0	111	0	0	0	0	0	0	173	9	0	182	306	1027	0.84	
6:00 PM	5	0	2	0	7	3	120	0	0	121	0	0	0	0	0	0	142	18	0	160	288	881	0.76	
6:15 PM	11	0	7	0	18	4	107	0	0	111	0	0	0	0	0	0	99	13	0	112	241			
6:30 PM	4	0	1	0	5	4	88	0	0	92	0	0	0	0	0	0	86	9	0	95	192			
6:45 PM	6	0	0	0	6	1	57	0	0	58	0	0	0	0	0	0	83	13	0	96	160			
7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
7:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Totals	694	0	179	0	873	241	5861	0	0	6102	0	0	0	0	0	0	5851	756	1	6608	13583			

Figure 2.2. Form DT1902

**TRAFFIC SURVEY VEHICLE VOLUME COUNT**  
**GRAPHIC SUMMARY SHEET**  
 DT1902 2002 (Replaces ET704)

Wisconsin Department of Transportation

Date	Day	Time	To	Sheet	Of
District	County	Rural		City	
Intersection		And			
Weather	Road Condition			Observers	



### CRASH RECORDS/ANALYSIS

Crash reports provide an indication of relative intersection safety. Intersection crash history **shall** be reviewed for a minimum of a three-year period. To help determine trends, crash data *should* be summarized on a collision diagram or an as-built plan. Show crash experience by type, location, direction of movement, severity, pavement condition, time of day, date, and day of week.

To evaluate Warrant 7, Crash Experience, the most recent 12-month period **shall** be investigated prior to any other years. If the crashes at the intersection appear to form a pattern, these findings **shall** be documented in the Investigation Study.

Actual police crash reports *should* be reviewed to determine the driver's intention just prior to the crash. This is important in determining which crashes are susceptible to correction by a traffic signal.

Any improvements or changes to the intersection, which have been completed during or after the three-year period in which crashes are reported, **shall** be fully documented. It is important to note that a change *may* include "negative" improvements such as a driveway addition or new traffic generator. A comparison **shall** be made to the crashes before and after any such improvement or change to determine its effects.

**Figure 2.3. Collision Diagram**

COLLISION DIAGRAM				
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	INDICATE FOR EACH ACCIDENT
       	MOVING VEHICLE BACKING VEHICLE PEDESTRIAN PARKED VEHICLE FIXED OBJECT FATAL ACCIDENT INJURY ACCIDENT REAR END	    	HEAD ON SIDE SWIPE OFF ROAD LEFT TURN  RIGHT ANGLE	1) DATE & TIME 2) WEATHER & PAV'T SURFACE (IF UNUSUAL CONDITION EXISTED) 3) 4) 5)
INTERSECTION OF: _____ & _____				
FROM: _____ TO: _____				
BY: _____ DATE: _____				

### INTERSECTION CHARACTERISTICS

Data collection *should* include the creation of an Intersection Geometric Condition Sketch. This *may* be developed by obtaining an as built plan of the intersection and verifying the intersection layout with a field investigation. Any differences *should* be shown in the Intersection Geometric Condition Sketch. The Condition Sketch *should* show geometry, access point locations, nearest intersections, lane configurations, channelization, parking conditions, sight-distance restrictions, etc.

If aerial imaging is used, lane geometry **shall** be clearly visible.

The geometrics of the intersection **shall** be fully described in the Signal Investigation Study.



**4-4-3 Traffic Signal Warrants****April 2025****STANDARD INVESTIGATION PRACTICES**

The analysis of intersection data **shall** proceed in the order indicated below unless intersection characteristics predicate specific warrant analysis. This order permits the most commonly used warrants to be evaluated first and the more difficult, data intensive (staff time and cost) warrants last, and only if added justification is needed or no other warrants are met. The Department has prepared Warrant worksheets for both urban and rural conditions. These worksheets are based upon the guidance provided in WMUTCD Section 4C and **shall** be utilized to determine whether existing/future intersection characteristics satisfy the warrants outlined in this text.

1. The traffic volumes **shall** be evaluated against the requirements for Warrant 1, (Conditions A, B and C), and Warrant 2.
2. The traffic volumes *may* be evaluated against the requirements for Warrant 3. Meeting Warrant 3 alone is not justification for the installation of a traffic signal. At least one additional warrant *should* also be met.
3. The crash history for the intersection(s) covering at least the past 3 years *should* be used to determine any trends. Any 12-month period (not a 3-year average) is evaluated against the requirements for Warrant 7. Only crash types susceptible to correction by a traffic signal **shall** be included in the Warrant 7 evaluation.
4. The existing and/or projected pedestrian volumes **shall** be evaluated for Warrant 4.
5. If an established school crossing is being investigated, Warrant 5 **shall** be evaluated.
6. The existing intersection characteristics and traffic volumes **shall** be evaluated against the requirements for Warrants 6 and 8. These warrants are used when it is necessary to properly control arterial or system flow. Warrant 6, Coordinated Signal System, is based upon the speed-distance relationship with adjacent signals. Warrant 7, Roadway Network, is used to complete networks on major routes.
7. If traffic signal warrants are expected to be met within 5 years of the completion of an improvement project, signals *may* be installed as a part of the project at the location being analyzed.
8. For T-intersections being analyzed for signals, side street traffic volume warrant thresholds *may* be inflated to 150 percent of the values indicated in the WMUTCD to reflect the lack of turning movements associated with a typical full access intersection, at the discretion of the Region Traffic Engineer.

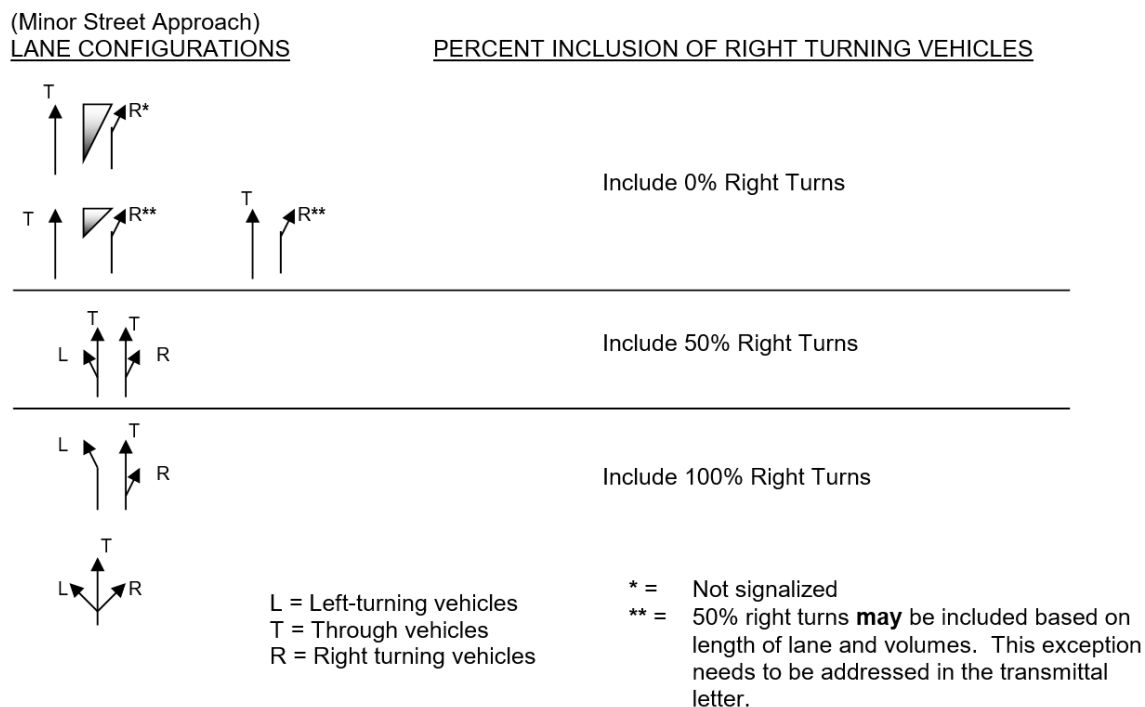
If new signals are proposed at an intersection that will be reconstructed as part of an improvement project, a signal warrant analysis **shall** be completed using the proposed intersection geometrics.

Guidelines for traffic signal warrants based on average daily traffic (ADT) can be found in the [FDM 11-50-50](#), Tables 50.1 & 50.2. These *should not* be used as a justification for signals but rather *should* be used as a preliminary tool in determining if a site investigation study is needed.

**RIGHT-TURN INCLUSIONS**

Before evaluating traffic volumes against warrant criteria, inclusions of right turn vehicles **shall** be considered. The number of right turn vehicles included in the intersection analysis plays an important role in the overall operation of the intersection. The traffic control for the right turning vehicles *should* be known prior to determining the percentage of inclusion. The Department uses three right turn inclusion percentages based on the impact of the right turns on operation of the intersection. Figure 3.4 shows lane configurations and the corresponding percentages. These percentages *should* be applied to the minor street volumes in accordance with the WMUTCD [4C-1](#).

All mainline right turn traffic **shall** be included in the evaluation, unless there are unusual conditions, such as the subject mainline right turn lane being drastically displaced from the intersection. Provide justification for adjustments due to unusual conditions.

**Figure 3.4. Right Turn Inclusion Percentages****4-4-4 Documentation****April 2025**

The following study has been prepared as a sample for this manual.

Sample cover letter (Consultant to Region)

Sample memorandum (Region to Central Office)

Sample Investigation Study

DT1199 Traffic Control Signal Approval Request

Report Outline

- Reason/Need for Study
- Existing Physical Conditions and Control Devices
- Traffic Conditions
- Crash History
- Warrants Met

Appendix

Site Map

Hourly Traffic Volume Counts

Vehicle Volume Count Graphic Summary Sheet

Warrant Analysis Worksheets

Intersection Plan Sheet (Intersection Geometric Condition Sketch)

Signalized Intersection Capacity Analysis

Crash Record Extract

Collision Diagram (If Available)

SAMPLE COVER LETTER  
(CONSULTANT TO REGION)

Date

(Region Office)

Re: Signal Investigation Study  
S.T.H. XX and C.T.H. YY  
Town of Somewhere  
Here County

Dear XXXXXX:

Attached for your review and approval is a signal investigation study for the intersection of S.T.H. XX and C.T.H. YY. The proposed installation is requested due to an increase in traffic, accidents, and congestion. In addition, there have been several requests from area residents to consider a traffic signal at this location.

In the fall of 1993 acceleration and deceleration tapers were installed on STH XX. This was an interim improvement prior to a signal being installed.

Traffic signal warrants 1, 2, 3 and 7 as stated in the *Wisconsin Manual on Uniform Traffic Control Devices (WMUTCD)*, are satisfied for the required number of hours for this location.

A signal capacity analysis was performed based on common signal phasing and timing parameters, existing turning movement counts, and current intersection geometrics. Results of the analysis (included in the appendix) have determined that the intersection will operate with acceptable levels-of-service, and the expected queues will not exceed intersection storage currently provided or planned for.

We recommend approval of this installation.

Sincerely,  
Private Consultant

SAMPLE MEMORANDUM  
(REGION TO BUREAU OF HIGHWAY OPERATIONS)

Date:

To: (State Traffic Signal Engineer)

From: (Regional Traffic Engineer)

Subject: Signal Investigation Study  
Project ID (number)  
S.T.H. XX and C.T.H. YY  
Town of Somewhere  
Here County

Attached for your review and approval is a signal investigation study for the intersection of S.T.H. XX and C.T.H. YY. The proposed installation is requested due to an increase in traffic, accidents, and congestion. In addition, there have been several requests from area residents to consider a traffic signal at this location.

In the fall of 1993 acceleration and deceleration tapers were installed on STH XX. This was an interim improvement prior to a signal being installed. Additional lane capacity with existing control is not possible due to local conditions, therefore a traffic signal is justified.

Traffic signal warrants 1, 2, 3, and 7, as stated in the (WMUTCD), are satisfied for the required number of hours for this location.

A signal capacity analysis was performed based on common signal phasing and timing parameters, existing turning movement counts, and current intersection geometrics. Results of the analysis (included in the appendix) have determined that expected queues will not exceed intersection storage currently provided, and the level of service for each movement will be satisfactory. Based on the analysis, left turn phasing will not need to be provided at this time.

Contracted forces will complete aboveground and underground work. Operations and maintenance of the installation will be at the expense of the Department.

The total estimated cost is \$\_\_, \_\_\_. \_\_.

The project will be funded through (state funding source(s)).

We recommend approval of this installation.

**Figure 4.5. DT 1199 Traffic Control Signal Approval Request****TRAFFIC CONTROL SIGNAL APPROVAL REQUEST**

Wisconsin Department of Transportation

DT1199 8/2012 s.86.32(1) Wis. Stats.

Municipality	County
State Trunk Highway	Intersecting Road

☐ Check if connecting highway – Requires authorized municipal and departmental approval below.  
Approval of installation on the connecting highway system is required under s.86.32(1) Wis. Stats.

The Region requests approval of a traffic control signal at the location indicated above. Traffic volumes, crash experience and physical conditions at the described intersection have been reviewed. A traffic control signal is justified.

Approval Recommended

(Regional Traffic Engineer)

(Date)

Approval Granted

(Bureau of Traffic Operations)

(Date)

**TRAFFIC CONTROL SIGNAL INSTALLATION, OPERATION AND MAINTENANCE AGREEMENT**

The municipality identified above agrees to install, operate and maintain a traffic control signal at the specified intersection for the purpose of controlling the flow of traffic.

The following conditions precedent to approval of the signal are acknowledged and accepted by the municipality:

1. The design, installation and operation of the signal will comply with the Wisconsin Manual on Uniform Traffic Control Devices.
2. The cost of maintenance and operation of the signal will be the responsibility of the municipality or in any case will not be an obligation of the Wisconsin Department of Transportation.
3. Parking will be restricted by the municipality at locations on the identified intersecting streets in accordance with the need to provide adequate capacity and normal flow of traffic. Specific restrictions, if needed, are as follows:
4. The municipality, with the approval or at the request of the Department of Transportation, and at the municipality's expense, shall make such adjustments in the equipment and manner of operation of these signals as are deemed necessary for public safety and facilitation of traffic movement.

☐ Yes☐ No

Further provisions are stated on the back of this document.

☐ Yes☐ No

Attachments

Agreed on behalf of the Municipality

Agreed on behalf of the Department

**X**

(Signature of Authorized Representative for Municipality)

(Date)

**X**

(Signature of Bureau of Traffic Operations)

(Date)



SIGNAL INVESTIGATION STUDY  
MAIN LINE (STH XX) & SIDE ROAD (CTH YY) INTERSECTION

a. REASON/NEED FOR STUDY

The traffic volume in this area has tended to increase rapidly over the last few years. In addition, we have received numerous requests (letters attached), mostly from area residents, to consider the installation of a traffic control signal at the intersection of STH XX and CTH YY. Accidents and congestion are increasing along with the increase in area development and traffic.

b. EXISTING PHYSICAL CONDITIONS AND CONTROL DEVICES

Each of these roadways is a two-lane road with 10-foot shoulders on STH XX and a minimal of 2 to 4-foot shoulders on the CTH YY. The Main Line (STH XX) has 150-ft left-turn bays at the intersection. STH XX has a 55-mph speed limit while CTH YY has 35 mph limits on each side of the intersection. Existing traffic control at the intersection consists of two-way STOP control for CTH YY. New acceleration and deceleration tapers were installed September of 2002 on STH XX as an interim operational improvement prior to a signal being installed. Additional lane capacity is not possible due to local conditions; therefore, congestion cannot be reduced on CTH YY if the Stop Signs remain.

c. TRAFFIC CONDITIONS

A 16-hour manual traffic count was conducted at this intersection on Tuesday, October 21, 2003 and Wednesday, October 22, 2003. The results of this traffic count are summarized in Figure 1 and included in the Appendix along with the actual count data.

d. CRASH HISTORY

The crash history shows an increase in crashes and a minimum of 5 crashes in a 12-month period which are correctable by installation of a traffic control signal. There was one fatality crash at the intersection.

e. WARRANT MET

The following signal warrants are met and are summarized on the Warrant sheets:

Warrant #1 – Eight-Hour Vehicular Volume

    Condition A - Minimum Vehicular Traffic: 8 hours

    Condition B - Interruption of Continuous Traffic: 14 hours

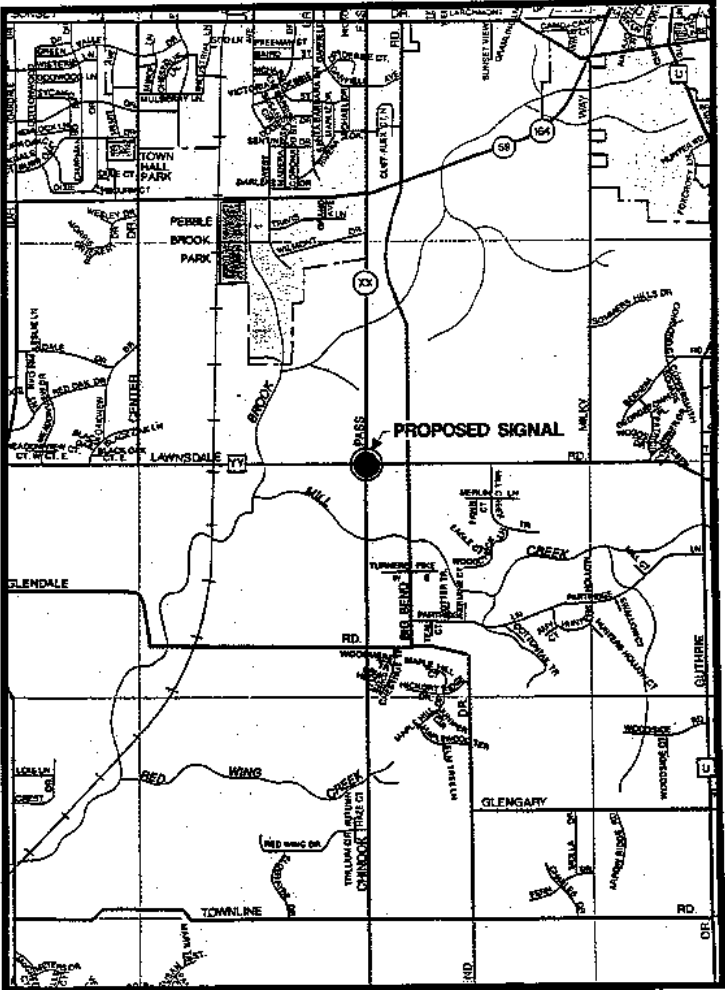
    Condition C - Combination of Warrants: 9 hours

Warrant #2 - Four Hour Warrants: 9 hours

Warrant #3 - Peak Hour Warrant: 7 hours

Warrant #7 - Accident Experience: 8 hours

SITE MAP EXAMPLE



## TRAFFIC VOLUME REPORT EXAMPLE

## Intersection Traffic Volume Report

## Base Information, Observed (13) Hour and Estimated (24) Hour Volume Summaries

Intersection of: STH 164 &amp; Lindsay Road

Count Basics		Version 2011.M3		Page 1 of 13	
Start Date:	Wednesday, March 10, 2021	Weekday	Schools in Session		
Total Number of Hours Counted:	13	Non-Holiday	No Special Events		



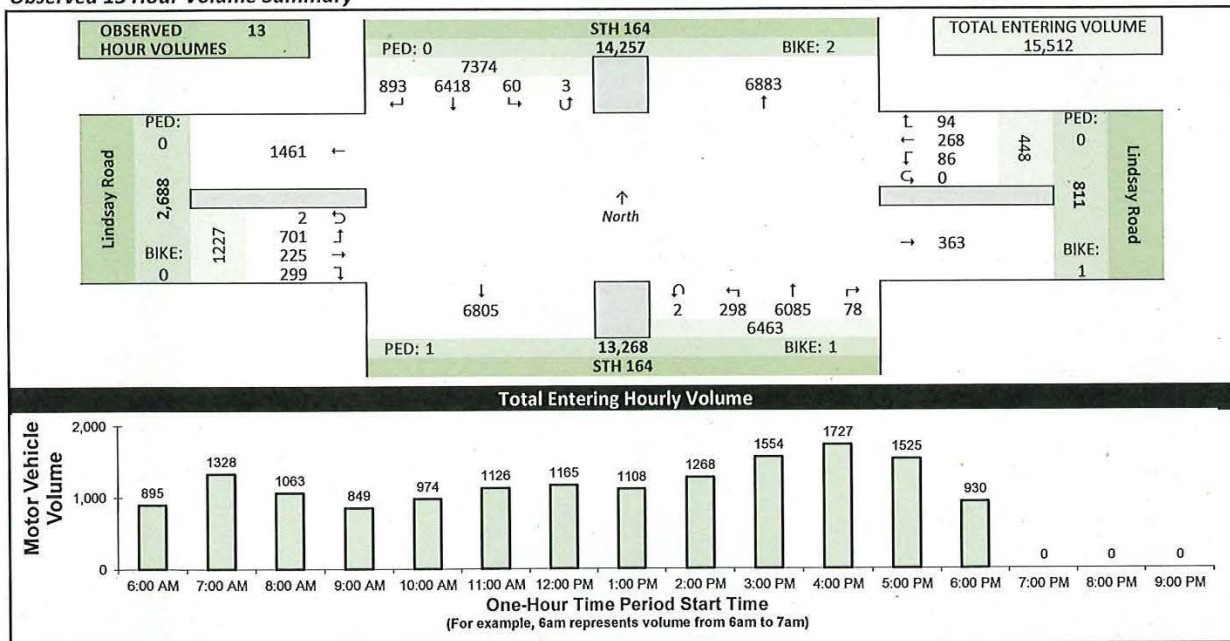
## Site Information

Municipality	Village of Pewaukee
County	Waukesha
WisDOT Region	SE
Traffic Control	Partial Stop Control
Roadway Names	North Direction
North Leg	STH 164
East Leg	Lindsay Road
South Leg	STH 164
West Leg	Lindsay Road
Special Considerations	
Schools	In Session
Holidays	None
Special Events	None
Special Pedestrians Observed	
Pre-school children	None
Elementary school age children	None
Visually impaired (white cane/helper dog)	None
Elderly/disabled (except wheelchairs)	None
Wheelchairs/electric scooters	None
Other (describe)	None

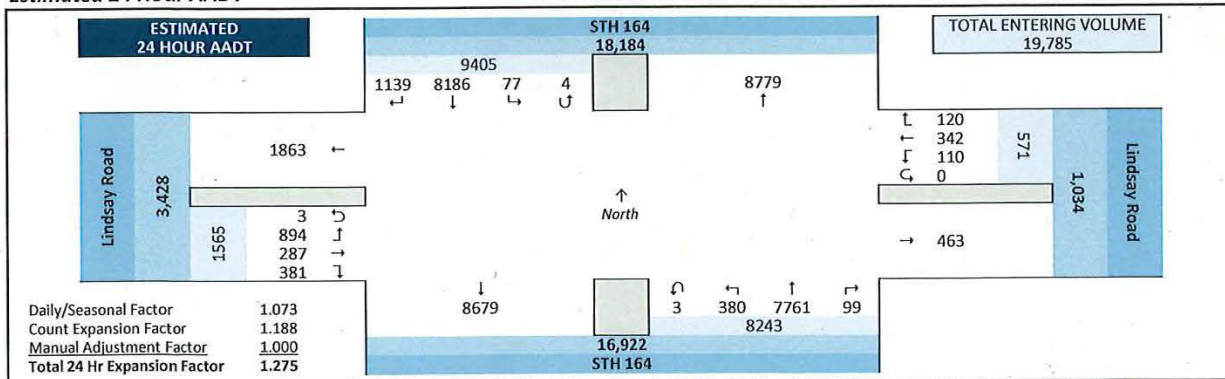
## Count Information

Hrs Counted:	6:00 AM-7:00 PM
1st Day of Count	Wednesday, March 10, 2021
Weather	Clear & Dry
AM Peak Period	Wednesday, March 10, 2021
Midday Peak Period	Wednesday, March 10, 2021
PM Peak Period	Wednesday, March 10, 2021
Calculated Peak Hours	
AM	7:00-8:00am
MD	11:30-12:30am
PM	4:15-5:15pm
Peak Hours Selected for Analysis	
AM	7:00-8:00am
MD	11:30-12:30am
PM	4:15-5:15pm
Daily/Seasonal Adjustment Group	(4) Rural Arterials & Collectors
Count Expansion Group	(4) Rural Arterials & Collectors
Daily/Seasonal Adjustment Factor	1.073
Count Expansion Factor	1.188
Company Name	TranSmart, Inc.
Manual Adj.	1.000
Observers	
AM Peak Period	Miovision Video Recording
Midday Peak Period	Miovision Video Recording
PM Peak Period	Miovision Video Recording
Comments	2019 DOT Seasonal Factors

## Observed 13 Hour Volume Summary



## Estimated 24 Hour AADT



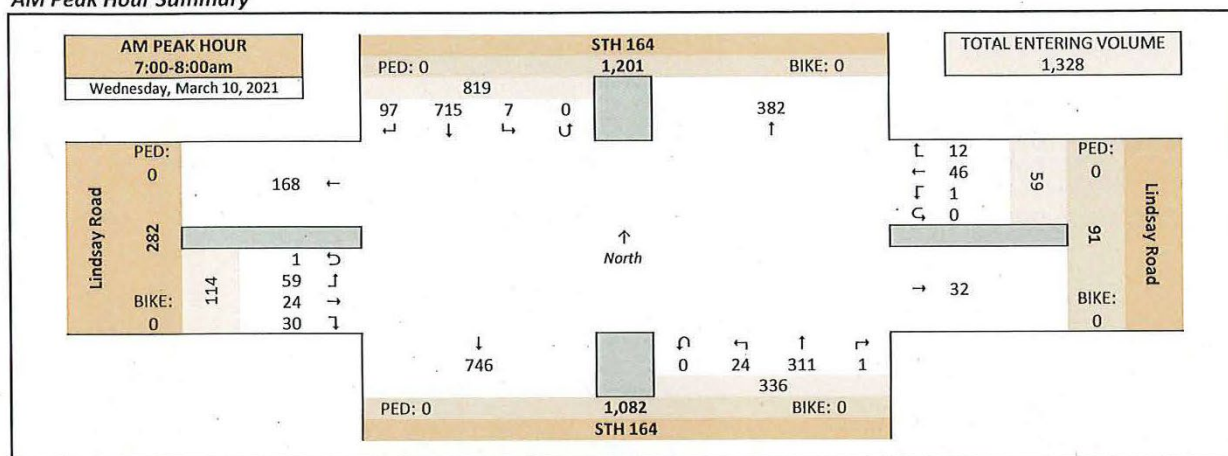
## Intersection Traffic Volume Report

### Peak Hour Volume Graphical Summary

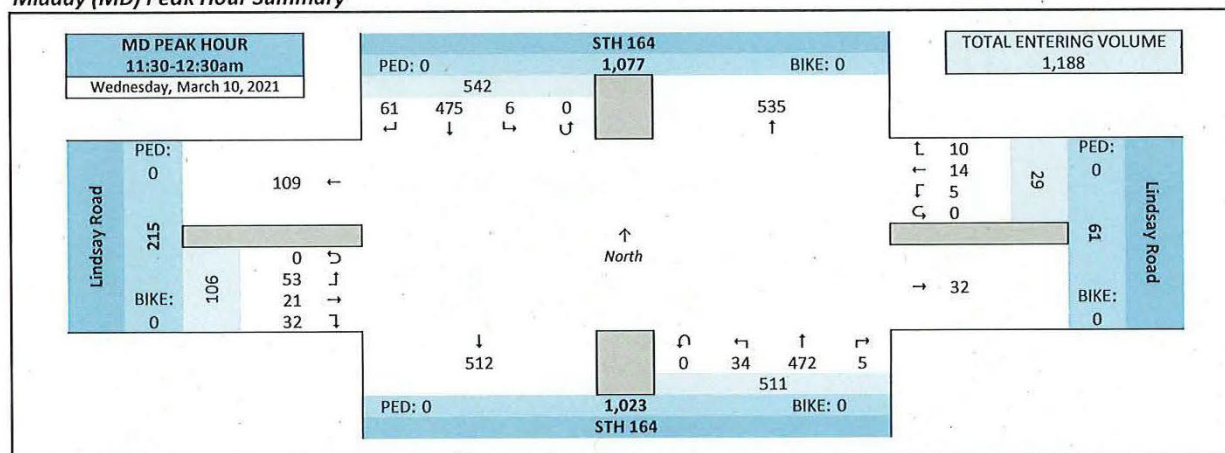
**STH 164 & Lindsay Road**

### AM Peak Hour Summary

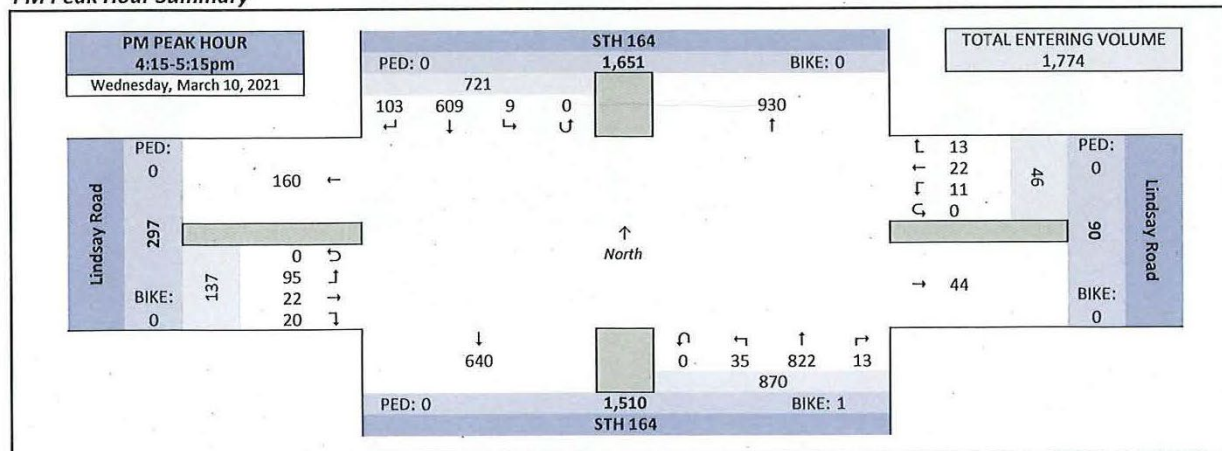
<b>Count Basics</b>			<b>Page 2 of 13</b>
Start Date:	Wednesday, March 10, 2021	Weekday	Schools in Session
Total Number of Hours Counted: 13		Non-Holiday	No Special Events



### Midday (MD) Peak Hour Summary



### PM Peak Hour Summary





## Intersection Traffic Volume Report

## 15-Minute Motor Vehicle Data

STH 164 &amp; Lindsay Road

## 15-Minute Motor Vehicle Data

Count Basics				Page 5 of 13		
Start Date:	Wednesday, March 10, 2021	Weekday		Schools in Session		
Total Number of Hours Counted:	13	Non-Holiday		No Special Events		



15-Minute Time Period	From North					From East					From South					From West					15-Min Totals	Hourly Sum	PHF	
	STH 164					Lindsay Road					STH 164					Lindsay Road								
	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total				
AM Peak Period	6:00 AM	8	76	1	0	85	1	0	0	0	1	0	26	0	0	26	1	5	7	0	13	125	895	0.78
	6:15 AM	8	97	0	0	105	2	2	1	0	5	0	67	1	0	68	0	1	20	0	21	199	1071	0.89
	6:30 AM	16	175	3	0	194	5	1	0	0	6	1	72	1	0	74	5	1	6	0	12	286	1195	0.92
	6:45 AM	29	153	0	0	182	4	10	1	0	15	0	64	4	0	68	5	1	14	0	20	285	1298	0.83
	7:00 AM	20	144	0	0	164	0	10	1	0	11	0	95	3	0	98	4	7	16	1	28	301	1328	0.85
	7:15 AM	30	168	1	0	199	4	9	0	0	13	0	75	4	0	79	8	9	15	0	32	323	1314	0.84
	7:30 AM	25	222	3	0	250	5	17	0	0	22	0	82	10	0	92	4	6	15	0	25	389	1259	0.81
	7:45 AM	22	181	3	0	206	3	10	0	0	13	1	59	7	0	67	14	2	13	0	29	315	1126	0.89
	8:00 AM	26	146	1	1	174	0	4	1	0	5	0	80	6	0	86	5	6	11	0	22	287	1063	0.93
	8:15 AM	19	144	0	0	163	1	5	2	0	8	0	70	1	0	71	8	1	17	0	26	268	976	0.91
	8:30 AM	17	121	0	0	138	0	4	4	0	8	2	89	2	0	93	3	2	12	0	17	256	917	0.90
	8:45 AM	15	129	0	0	144	0	6	0	0	6	0	73	2	0	75	12	5	10	0	27	252	880	0.87
	9:00 AM	14	87	1	0	102	1	4	1	0	6	0	72	1	0	73	5	1	13	0	19	200	849	0.96
	9:15 AM	16	89	1	0	106	1	6	2	0	9	1	81	3	0	85	3	2	4	0	9	209	868	0.98
	9:30 AM	4	111	0	0	115	3	5	2	0	10	2	76	4	0	82	2	6	4	0	12	219	885	0.98
	9:45 AM	11	99	2	0	112	2	1	3	0	6	4	81	3	0	88	5	1	9	0	15	221	937	0.86
Midday Peak Period	10:00 AM	8	121	0	0	129	1	0	3	0	4	2	62	5	0	69	4	2	11	0	17	219	974	0.90
	10:15 AM	12	109	0	0	121	0	2	1	0	3	1	84	4	0	89	4	1	8	0	13	226	1025	0.95
	10:30 AM	9	122	2	0	133	2	8	3	0	13	2	96	3	0	101	8	4	12	0	24	271	1060	0.98
	10:45 AM	13	107	0	0	120	0	3	5	0	8	2	97	4	1	104	7	4	15	0	26	258	1078	0.93
	11:00 AM	11	127	0	0	138	2	2	1	0	5	2	98	7	0	107	4	2	14	0	20	270	1126	0.92
	11:15 AM	16	96	0	0	112	1	4	0	0	5	1	114	5	0	120	4	4	16	0	24	261	1161	0.95
	11:30 AM	25	125	1	0	151	1	4	1	0	6	2	100	5	0	107	8	5	12	0	25	289	1188	0.97
	11:45 AM	11	114	2	0	127	6	3	2	0	11	0	127	5	0	132	14	6	16	0	36	306	1168	0.95
	12:00 PM	16	124	1	0	141	1	2	1	0	4	3	122	13	0	138	6	5	11	0	22	305	1165	0.95
	12:15 PM	9	112	2	0	123	2	5	1	0	8	0	123	11	0	134	4	5	14	0	23	288	1141	0.94
	12:30 PM	13	107	1	0	121	2	5	5	0	12	0	114	4	0	118	5	1	12	0	18	269	1122	0.93
	12:45 PM	14	129	1	0	144	1	3	0	0	4	1	124	4	0	129	8	3	15	0	26	303	1118	0.92
	1:00 PM	11	118	1	0	130	1	3	1	0	5	3	115	4	0	122	9	3	12	0	24	281	1108	0.95
	1:15 PM	17	108	0	0	125	2	2	4	0	8	1	114	6	1	122	2	5	7	0	14	269	1117	0.95
	1:30 PM	22	119	1	0	142	1	4	0	0	5	0	96	3	0	99	6	3	10	0	19	265	1164	0.92
	1:45 PM	12	110	0	0	122	2	6	2	0	10	2	122	7	0	131	7	6	17	0	30	293	1209	0.96
PM Peak Period	2:00 PM	12	134	1	0	147	1	3	1	0	5	2	115	4	0	121	7	1	9	0	17	290	1268	0.90
	2:15 PM	13	107	2	0	122	2	6	1	0	9	1	147	11	0	159	7	5	14	0	26	316	1361	0.89
	2:30 PM	16	119	2	0	137	2	7	1	0	10	2	118	9	0	129	7	14	13	0	34	310	1412	0.92
	2:45 PM	25	106	0	0	131	0	11	0	0	11	1	179	11	0	191	4	3	12	0	19	352	1525	0.90
	3:00 PM	22	120	3	0	145	1	12	1	0	14	2	184	11	0	197	4	7	16	0	27	383	1554	0.92
	3:15 PM	7	126	0	1	134	1	4	3	0	8	3	181	10	0	194	7	4	20	0	31	367	1566	0.93
	3:30 PM	22	158	1	0	181	2	5	1	0	8	3	190	6	0	199	11	6	17	1	35	423	1626	0.95
	3:45 PM	26	130	2	0	158	2	7	4	0	13	2	171	5	0	178	5	9	18	0	32	381	1647	0.93
	4:00 PM	31	135	3	0	169	1	5	3	0	9	2	173	11	0	186	7	8	16	0	31	395	1727	0.94
	4:15 PM	26	141	0	0	167	5	3	1	0	9	2	206	7	0	215	2	7	27	0	36	427	1774	0.96
	4:30 PM	27	161	3	0	191	1	8	4	0	13	2	193	4	0	199	7	4	30	0	41	444	1746	0.95
	4:45 PM	26	142	3	0	171	6	6	3	0	15	6	224	9	0	239	7	7	22	0	36	461	1698	0.92
	5:00 PM	24	165	3	0	192	1	5	3	0	9	3	199	15	0	217	4	4	16	0	24	442	1525	0.86
	5:15 PM	28	130	3	1	162	4	6	1	0	11	2	192	9	0	203	6	4	13	0	23	399	1370	0.86
	5:30 PM	27	124	0	0	151	1	9	1	0	11	0	195	8	0	203	9	6	16	0	31	396	1231	0.78
	5:45 PM	18	112	0	0	130	1	7	2	0	10	2	120	8	0	130	2	5	11	0	18	288	1034	0.90
	6:00 PM	18	110	3	0	131	2	5	2	0	9	2	121	3	0	126	5	5	11	0	21	287	930	0.81
	6:15 PM	10	97	1	0	108	1	6	3	0	10	2	113	5	0	120	3	6	13	0	22	260		
	6:30 PM	5	55	1	0	61	3	3	3	0	9	3	98	6	0	107	8	2	12	0	22	199		
	6:45 PM	11	56	1	0	68	0	0	0	0	0	3	96	4	0	103	3	3	7	0	13	184		
	7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	7:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	7:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	7:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
8:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
9:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Totals	893	6418	60	3	7374	94	268	86	0	448	78	6085	298	2	6463	299	225	701	2	1227	15512			

## Peak Hour All Vehicle Volume Summary

Hourly Time Period	From North					From East					From South					From West	
--------------------	------------	--	--	--	--	-----------	--	--	--	--	------------	--	--	--	--	-----------	--



## Intersection Traffic Volume Report

## Hourly Volume Summary - Motor Vehicle Data

STH 164 &amp; Lindsay Road

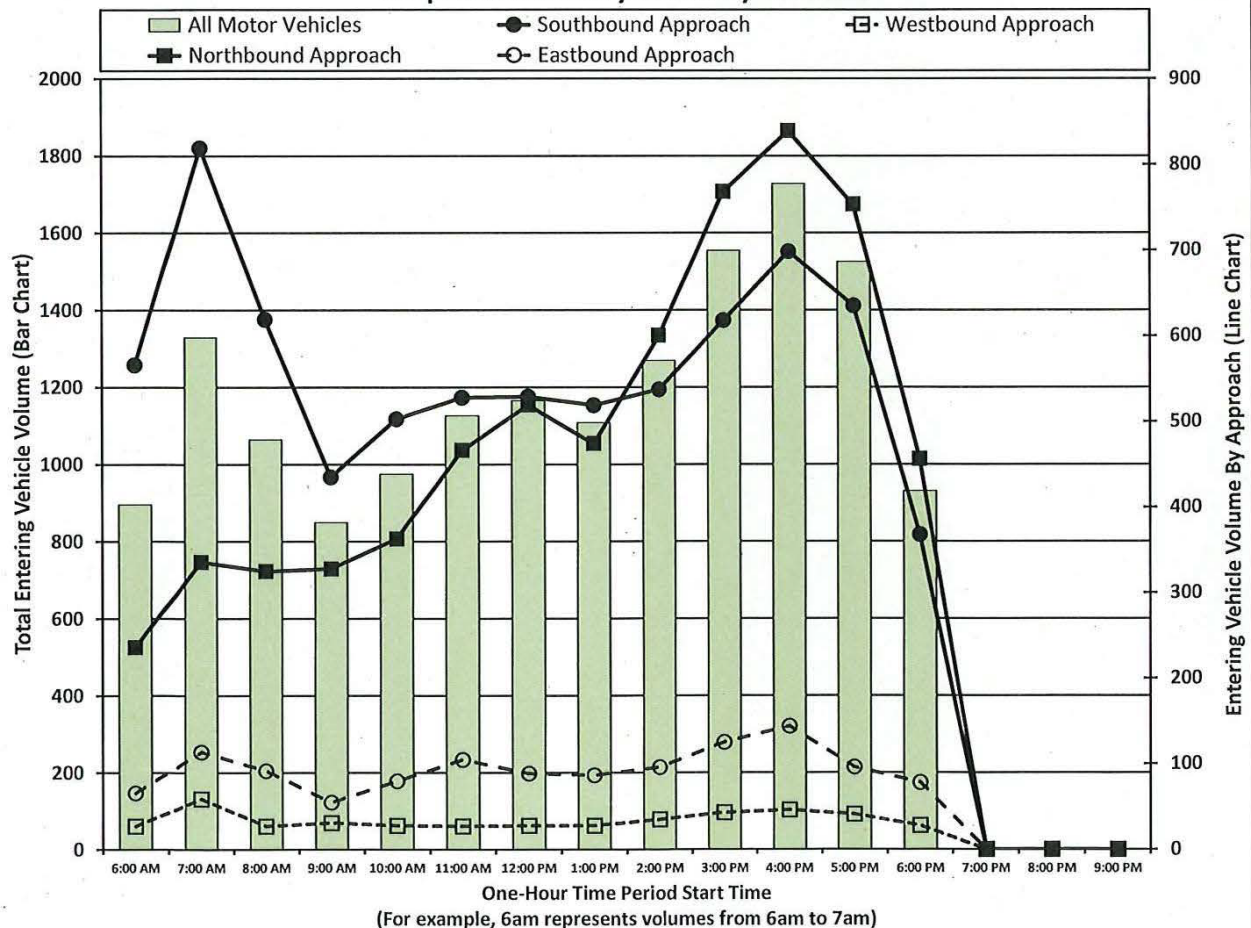
One-Hour Motor Vehicle Data

Count Basics			Page 4 of 13
Start Date:	Wednesday, March 10, 2021	Weekday	Schools in Session
Total Number of Hours Counted:	13	Non-Holiday	No Special Events



One-Hour Time Period Start Time	From North					From East					From South					From West					Total Vehicle Volume	Directional Volume Totals		
	STH 164					Lindsay Road					STH 164					Lindsay Road								
	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total	Right	Thru	Left	U-Tn	Total				
AM	6:00 AM	61	501	4	0	566	12	13	2	0	27	1	229	6	0	236	11	8	47	0	66	895	93	802
	7:00 AM	97	715	7	0	819	12	46	1	0	59	1	311	24	0	336	30	24	59	1	114	1328	173	1155
	8:00 AM	77	540	1	1	619	1	19	7	0	27	2	312	11	0	325	28	14	50	0	92	1063	119	944
	9:00 AM	45	386	4	0	435	7	16	8	0	31	7	310	11	0	328	15	10	30	0	55	849	86	763
MD	10:00 AM	42	459	2	0	503	3	13	12	0	28	7	339	16	1	363	23	11	46	0	80	974	108	866
	11:00 AM	63	462	3	0	528	10	13	4	0	27	5	439	22	0	466	30	17	58	0	105	1126	132	994
	12:00 PM	52	472	5	0	529	6	15	7	0	28	4	483	32	0	519	23	14	52	0	89	1165	117	1048
	1:00 PM	62	455	2	0	519	6	15	7	0	28	6	447	20	1	474	24	17	46	0	87	1108	115	993
PM	2:00 PM	66	466	5	0	537	5	27	3	0	35	6	559	35	0	600	25	23	48	0	96	1268	131	1137
	3:00 PM	77	534	6	1	618	6	28	9	0	43	10	726	32	0	768	27	26	71	1	125	1554	168	1386
	4:00 PM	110	579	9	0	698	13	22	11	0	46	12	796	31	0	839	23	26	95	0	144	1727	190	1537
	5:00 PM	97	531	6	1	635	7	27	7	0	41	7	706	40	0	753	21	19	56	0	96	1525	137	1388
	6:00 PM	44	318	6	0	368	6	14	8	0	28	10	428	18	0	456	19	16	43	0	78	930	106	824
	7:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Totals	893	6418	60	3	7374	94	268	86	0	448	78	6085	298	2	6463	299	225	701	2	1227	15512	1675	13837

## Graphical Summary of Hourly Volumes



## WARRANT ANALYSIS WORKSHEETS

# Wisconsin Department of Transportation Traffic Signal Warrant Summary Worksheet

**100%**

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection:

County:

Select one:

Major Street:

Critical Approach Speed:          mph

Lanes:

Minor Street:

Critical Approach Speed:          mph

Lanes:

% Right Turns Included

From North (SB) 0%

From East (WB) 0%

From South (NB) 0%

From West (EB) 0%

In built-up area of isolated community of &lt; 10,000 population?

Total number of approaches at intersection?

If it is a "T" intersection, inflate minor threshold to 150%?

Manually set volume level?

Analysis based on

volume data.

		Time (HH:MM)			
		From	AM / PM	To	AM / PM

Warrant Evaluation Summary	Warrant Met:
<b>Warrant 1: Eight - Hour Vehicular Volume</b>	N/A
Condition A: Minimum Vehicular Volume	
Condition B: Interruption of Continuous Traffic	
Condition C: Combination: 80% of A and B	
<b>Warrant 2: Four-Hour Volume</b>	N/A
<b>Warrant 3: Peak Hour Volume</b>	N/A
<b>Warrant 4: Pedestrian Volume</b>	N/A
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
<b>Warrant 5: School Crossing</b>	N/A
<b>Warrant 6: Coordinated Signal System</b>	N/A
<b>Warrant 7: Crash Experience</b>	N/A
<b>Warrant 8: Roadway Network</b>	N/A
<b>Warrant 9: Intersection Near a Grade Crossing</b>	N/A

Warrant Analysis Conducted By:

Name:

Agency:

Date:

**Warrant 1: Eight - Hour Vehicular Volume****100%****Warrant Evaluated?**

<b>Condition A :</b>		
Min. Veh. Volume		
Volume Level	100%	80%
Major Rd. Req		
Minor Rd. Req		
Number of Hours	0	0

**Satisfied?**

<b>Condition B:</b>		
Interruption of Continuous Traffic		
Volume Level	100%	80%
Major Rd. Req		
Minor Rd. Req		
Number of Hours	0	0

**Satisfied?**

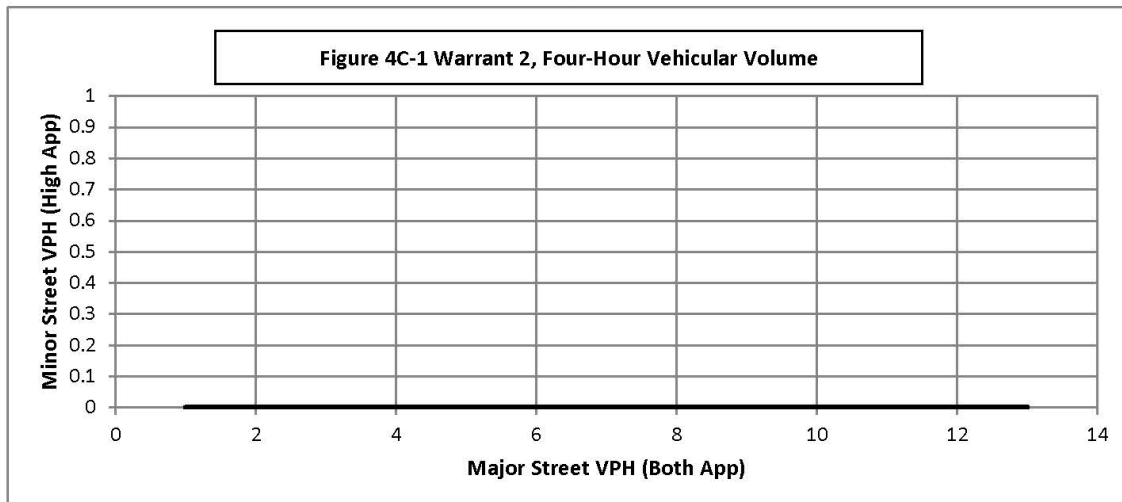
<b>Condition C:</b>		
Combination of A & B at 80%		

**Satisfied?****Warrant Satisfied? N/A****Manually Set To:**

6:00 AM		Enter Start Time (Military Time) (HH:MM)			Total
Time Period	From	To	Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
1	6:00	7:00			
2	7:00	8:00			
3	8:00	9:00			
4	9:00	10:00			
5	10:00	11:00			
6	11:00	12:00			
7	12:00	13:00			
8	13:00	14:00			
9	14:00	15:00			
10	15:00	16:00			
11	16:00	17:00			
12	17:00	18:00			
13	18:00	19:00			
14	19:00	20:00			
15	20:00	21:00			
16	21:00	22:00			

**Warrant 2: Four-Hour Volume****100%**

Hour Start	#N/A	#N/A	#N/A	#N/A
Major Road Vol.	#N/A	#N/A	#N/A	#N/A
Minor Road Vol.	#N/A	#N/A	#N/A	#N/A

**Warrant Evaluated?****Warrant Satisfied? N/A****Manually Set To:**

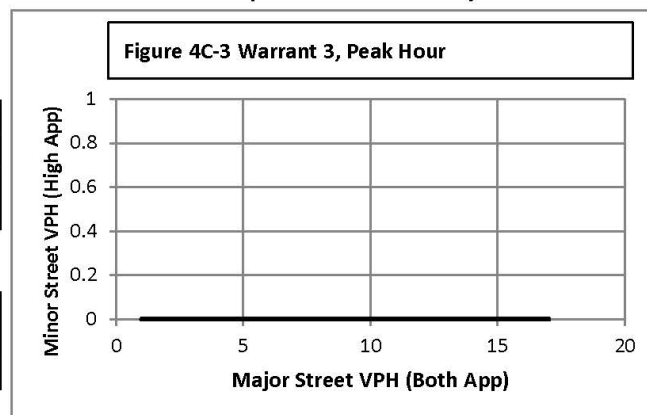
**Warrant 3: Peak Hour Volume****100%****Warrant Evaluated?**

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach		
Volume on Minor Approach		
Total Entering Volume (veh/h)		

**Manually Set Peak Hour?**

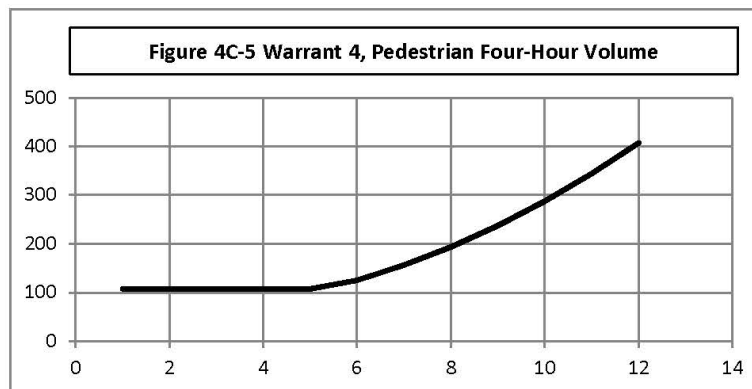
Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
#N/A	#N/A	#N/A

**Warrant Satisfied?** N/A**Manually Set To:****Warrant 4: Pedestrian Volume****100%****Warrant Evaluated?****Warrant Satisfied?** N/A**Manually Set To:****Criterion A: Four Hour**

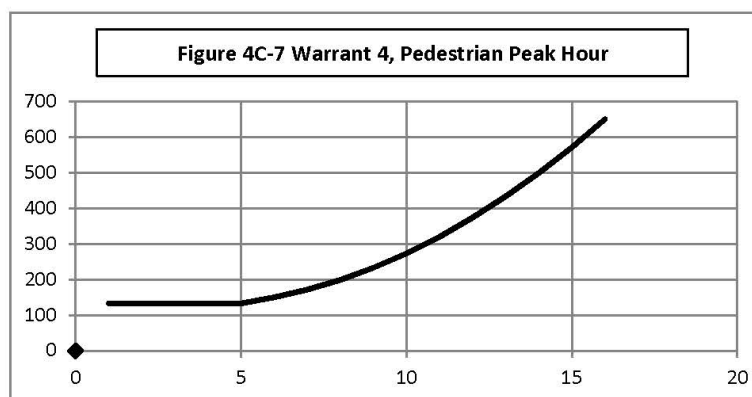
Hour (Start)	Pedestrian Volume	Major Road Vol.
		0
		0
		0
		0

**Manually Set Major Rd Vol?**

Avg. walk speed less than 3.5 ft/s?

**Criterion A Satisfied?****Criterion B: Peak Hour**

Peak Hour	Pedestrian Vol.	Major Road Vol.
0:00	0	0

**Criterion B Satisfied?**

**Warrant 5: School Crossing****100%****Warrant Evaluated?****Warrant Satisfied? N/A****Manually Set To:****Criteria****Fulfilled?**

1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

**Warrant 6: Coordinated Signal System****100%****Warrant Evaluated?****Warrant Satisfied? N/A****Manually Set To:****Criteria****Fulfilled?**

1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

**Warrant 7: Crash Experience****100%****Warrant Evaluated?****Warrant Satisfied? N/A****Manually Set To:****Criteria****Met?****Fulfilled?**

1	Adequate trial of other remedial measures has failed to reduce crash frequency.			
	Measures Tried:			
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.	# of crashes per 12 months		
3	Warrant 1, Condition A (80%)	No		Yes
	Warrant 1, Condition B (80%)	No		
	Warrant 4, Criterion A (80%)	No		
	Warrant 4, Criterion B (80%)	Yes		

**Warrant 8: Roadway Network****100%****Warrant Evaluated?****Warrant Satisfied? N/A****Manually Set To:****Criteria****Met?****Fulfilled?**

1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour		#N/A	#N/A	#N/A
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.			No	
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)				
	Hour				
	Volume				

**Characteristics of Major Routes - Select yes if all intersecting routes have characteristic****Fulfilled?**

1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	
2	Rural or suburban highway outside of, entering, or traversing a city	
3	Appears as a major route on an official plan	



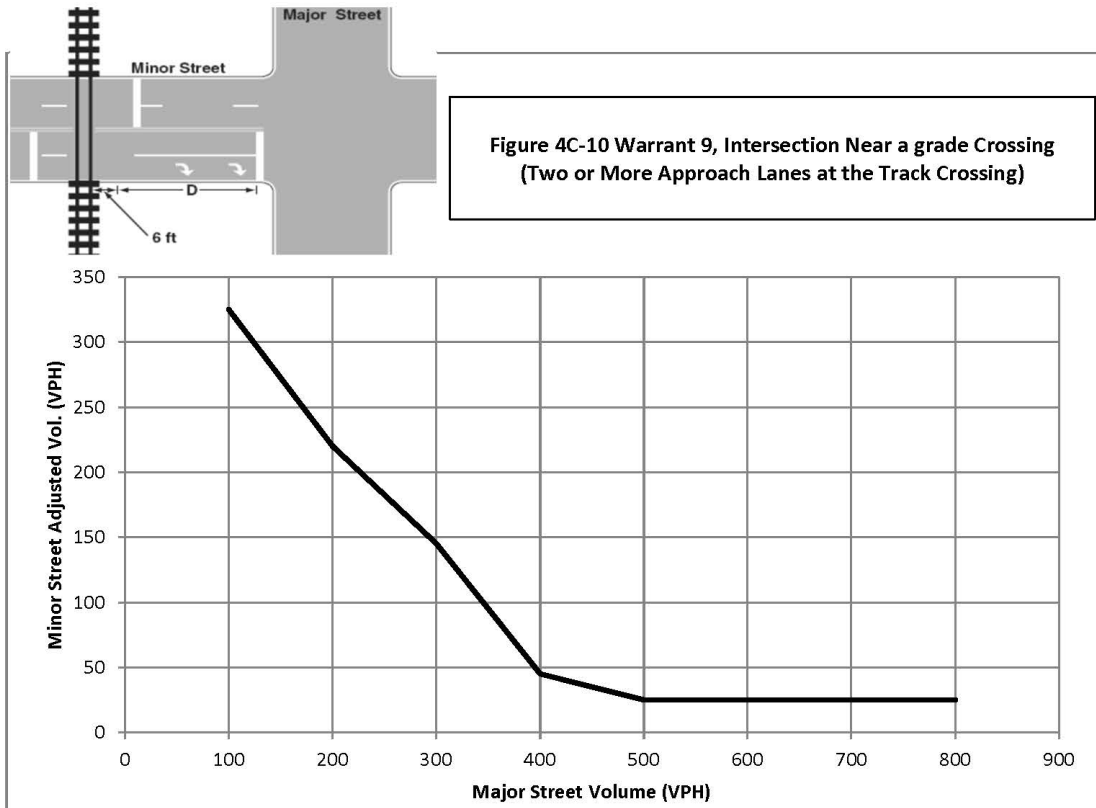
**Warrant 9: Intersection Near a Grade Crossing****100%**

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	#N/A	#N/A	#N/A	#N/A



Conclusions/Comments:

Updated: 12/6/2017





















### Example Intersection Plan Sheet



Conceptual Design  
Traffic Signal Installation  
WIS 164 & Lindsay Road

Lanes, Volumes, Timings  
3: WIS 164 & Lindsay Road

AM Peak  
01/11/2024

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	30	38	1	58	19	30	414	1	10	943	129
Future Volume (vph)	81	30	38	1	58	19	30	414	1	10	943	129
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	250		210	250		200
Storage Lanes	0		0	0		0	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.965			0.967				0.850			0.850
Flt Protected		0.974			0.999		0.950			0.950		
Satd. Flow (prot)	0	1717	0	0	1817	0	1671	3343	1495	1770	3539	1583
Flt Permitted		0.974			0.999		0.950			0.950		
Satd. Flow (perm)	0	1717	0	0	1817	0	1671	3343	1495	1770	3539	1583
Link Speed (mph)		35			35			45			45	
Link Distance (ft)		1442			1336			1442			1508	
Travel Time (s)		28.1			26.0			21.8			22.8	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	4%	4%	4%	1%	1%	1%	8%	8%	8%	2%	2%	2%
Adj. Flow (vph)	95	35	45	1	68	22	35	487	1	12	1109	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	175	0	0	91	0	35	487	1	12	1109	152
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 47.8%	ICU Level of Service A											
Analysis Period (min) 15												



HCM 6th TWSC  
3: WIS 164 & Lindsay Road

AM Peak  
01/11/2024

Intersection												
Int Delay, s/veh	7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕	↕	↕	↕	↕
Traffic Vol, veh/h	81	30	38	1	58	19	30	414	1	10	943	129
Future Vol, veh/h	81	30	38	1	58	19	30	414	1	10	943	129
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	250	-	210	250	-	200
Veh in Median Storage, #	-	2	-	-	2	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	1	1	1	8	8	8	2	2	2
Mvmt Flow	95	35	45	1	68	22	35	487	1	12	1109	152
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1481	1691	555	1153	1842	244	1261	0	0	488	0	0
Stage 1	1133	1133	-	557	557	-	-	-	-	-	-	-
Stage 2	348	558	-	596	1285	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.52	6.52	6.92	4.26	-	-	4.14	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.52	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.52	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.51	4.01	3.31	2.28	-	-	2.22	-	-
Pot Cap-1 Maneuver	~ 85	90	470	154	75	760	516	-	-	1071	-	-
Stage 1	213	272	-	485	513	-	-	-	-	-	-	-
Stage 2	636	505	-	460	235	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 55	83	470	116	69	760	516	-	-	1071	-	-
Mov Cap-2 Maneuver	178	230	-	269	179	-	-	-	-	-	-	-
Stage 1	199	269	-	452	478	-	-	-	-	-	-	-
Stage 2	493	471	-	358	232	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	61.9		32.4		0.8		0.1					
HCM LOS	F		D									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	516	-	-	224	221	1071	-	-				
HCM Lane V/C Ratio	0.068	-	-	0.783	0.415	0.011	-	-				
HCM Control Delay (s)	12.5	-	-	61.9	32.4	8.4	-	-				
HCM Lane LOS	B	-	-	F	D	A	-	-				
HCM 95th %tile Q(veh)	0.2	-	-	5.6	1.9	0	-	-				
Notes												
~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    *: All major volume in platoon												



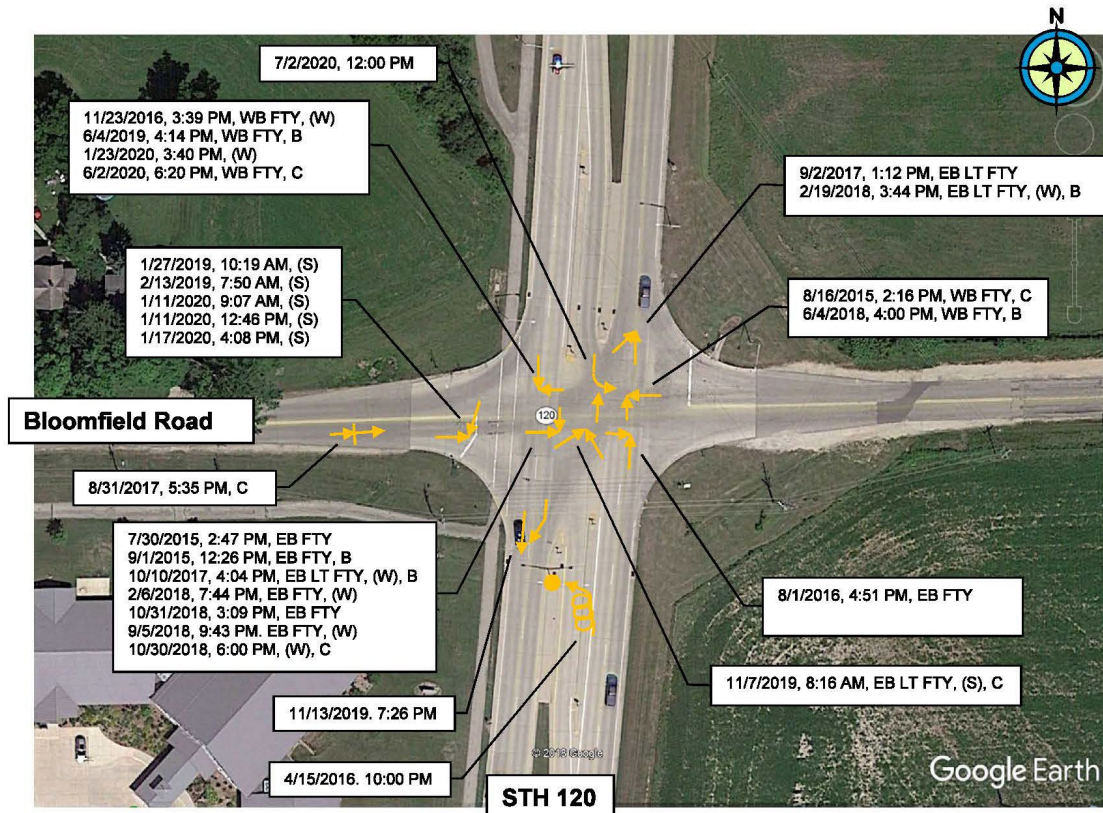
## CRASH REPORT EXAMPLE





















[illegible]

**DTSD – SE Region**  
**Intersection Safety Evaluation**

### Attachment 3: Crash Diagram

**STH 120 & N. Bloomfield Road**  
**Walworth County**

**January 2015-Preliminary 2020**

LEGEND									
 Signal/Sign Post	 Bicycle	 Right Angle	 Out of Control	(S) = SNOW-ICE	K = FATAL				
 Tree/Utility Pole	 Pedestrian	 Left Turn	 Rear-End	(W) = WET	A = SUS. SERIOUS INJURY				
 Non-Fixed Object	 Non-Contact Vehicle	 Right Turn	 Head-On	(F) = FOG-MIST	B = SUS. MINOR INJURY				
 Fixed Object	 Backing Vehicle	 Sideswipe-Same	 Overtake	(DUI) = ALCOHOL	C = POS. INJURY				
 Parked Vehicle	 Moving Vehicle	 Sideswipe-Opp.	 Overturn	OR DRUG USE	BLANK = PROPERTY				