



CITY OF RAPID CITY

Engineering Services

300 Sixth Street
Rapid City, SD 57701-2724

MEMORANDUM

TO: Public Works Committee/Common Council

FROM: Dale Tech, P.E., L.S.
City Engineer

THROUGH: Robert Ellis, P.E., P.T.O.E.
Director of Public Works

SUBJECT: N. LaCrosse St. & E. Monroe St.
Traffic Signal Warrant Analyses
(Continued from July 1, 2008 Meeting)

DATE: July 15, 2008

The following additional information is in response to the Public Works Committee's request:

- 1) Attached is a copy of the most recent "Signalized Intersection Planning List". As noted, none of the intersections currently meet the warrants for the installation of a traffic signal.
- 2) The estimated cost for installing a traffic signal at the intersection is \$238,000 (\$18,000 design costs and \$220,000 construction costs). This estimate is based on the contract unit prices for the recent W. Main St./Sheridan Lake Road signal modernization project.
- 3) Attached is a copy of a concept plan for a pedestrian refuge island at the subject intersection. The island was located to provide adequate left turn storage space for southbound traffic at E. Monroe St. and at the commercial driveway on the east side of N. LaCrosse St. Left turns into the County's driveway would have to be prohibited under this design. The estimated cost of an island is \$3,500 and could be constructed by City staff using rubber curbing and asphalt.



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4) The disadvantages of installing a traffic signal at the subject location include:

- a) To minimize the queue lengths on N. LaCrosse St. the green time allocation for E. Monroe St. would be set as low as possible. This would result in longer average delays for E. Monroe St. traffic waiting to cross or turn left.
- b) A higher probability of rear end crashes occurring on N. LaCrosse St. and E. Monroe St.
- c) Unwarranted traffic signals tend to breed disrespect toward (necessary) signals as well as other traffic control devices.

Attachments

DT:JL



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300 Sixth Street
Rapid City, SD 57701-2724

Telephone: (605) 394-4154 FAX: (605) 394-6636

MEMORANDUM

TO: Public Works Committee/Common Council

FROM: Robert Ellis, P.E., P.T.O.E.
Traffic Engineer

THROUGH: Dirk Jablonski, P.E.
Director of Public Works

SUBJECT: Signalized Intersection Planning List

DATE: August 3, 2007

BACKGROUND

1. Council at its April 16, 2007 meeting directed staff to develop a prioritized list of intersections that may require signalization in the future. The list was to be based on the existing traffic signal planning list.
2. Nationally accepted guidelines for the installation of traffic signals are contained in the Manual on Uniform Traffic Control Devices (MUTCD). These guidelines provide a consistent and rational basis for evaluating the need to install traffic signals since traffic signals serve a specific function, i.e. the assignment of right-of-way at intersections, and the improper installation of a signal can negatively affect both roadway capacity and safety. Additionally, the National Cooperative Highway Research Program (NCHRP) has developed an engineering guide for the evaluation of intersections. This guide includes a procedure for weighting the effect of turning movements at an intersection used in the evaluation of the MUTCD guidelines. The evaluation of the traffic signal planning list utilized both sets of guidelines.



EQUAL OPPORTUNITY EMPLOYER

3. Based on the NCHRP recommendations for weighting turning movements, the intersection of N. LaCrosse Street and E. Monroe Street does not warrant the installation of a traffic signal at this time.
4. This evaluation also reviewed and analyzed crash data at each of the subject intersections for 2004, 2005, and 2006 to determine the need for a traffic signal.
5. Attached is the resulting prioritized list. Note that none of the locations warrant a traffic signal based on current conditions. Staff will continue to monitor and evaluate on a regular basis the locations noted on the list and will report to the Mayor and Council as appropriate.

Attachment

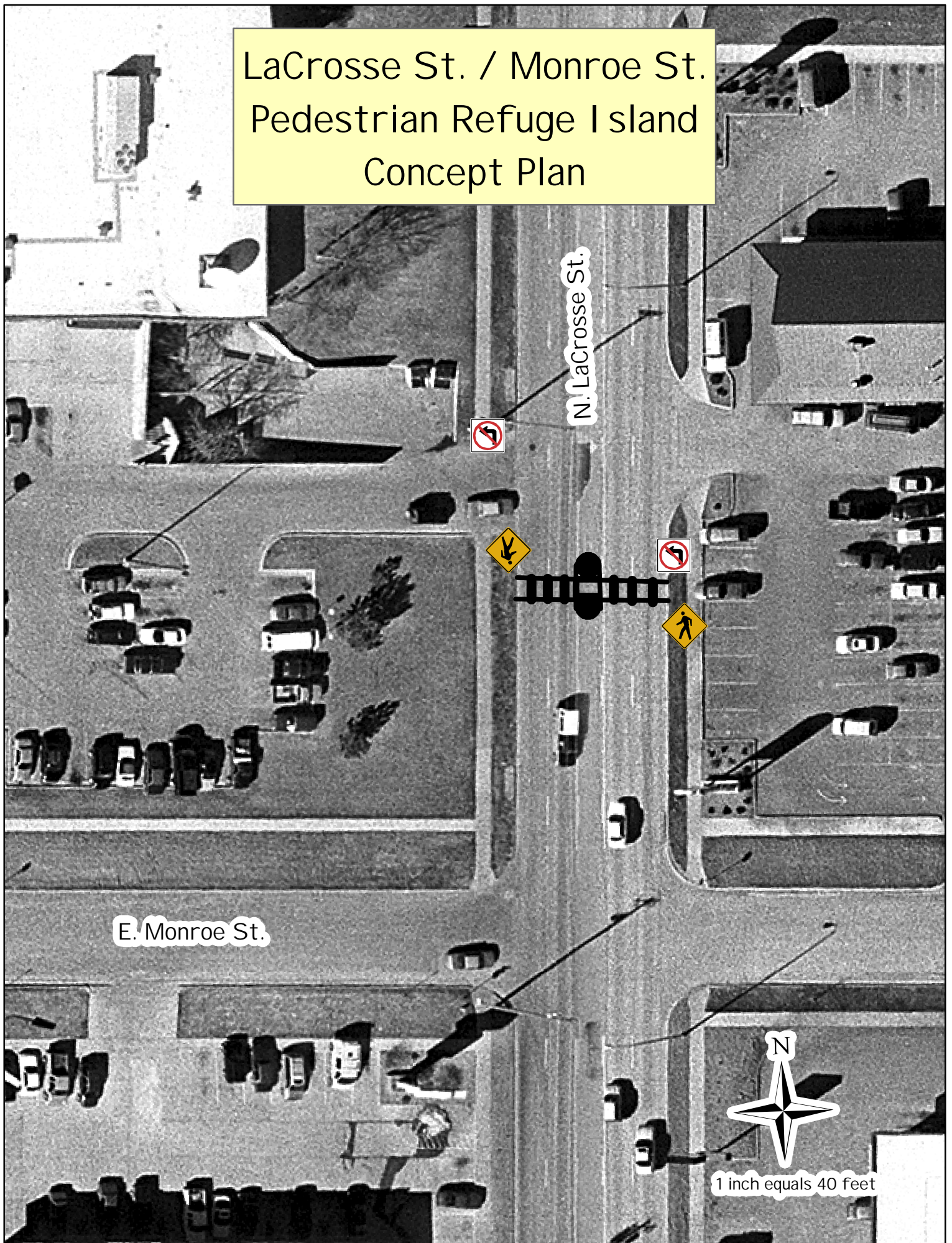
**CITY OF RAPID CITY
TRAFFIC SIGNAL PLANNNNG LIST
2007 EVALUATION**

LOCATION	COMMENTS	TOTAL DAILY ENTERING TRAFFIC	2004-2006 TOTAL CRASHES	AVERAGE ANNUAL # OF CRASHES	ANNUAL CRASH RATE (crashes per million entering vehicles)	2004-2006 CORRECTABLE CRASHES	AVERAGE ANNUAL # OF CORRECTABLE CRASHES	NUMBER OF SIGNAL WARRANTS MET
La Crosse St/ Mall Dr	signal to be installed with FY08 E. Mall Dr project	5135	0	0	0.00	0	0	0
La Crosse St/Monroe St	evaluate annually	29960	12	4	0.37	6	2	0
SD-44/Sedivy Ln	evaluate annually	20460	7	2	0.31	4	1	0
SD-44/South Valley Dr	evaluate annually	20141	12	4	0.54	9	3	0
5th St/ Texas St	evaluate annually	15280	1	0	0.06	0	0	0
Mt Rushmore Rd/ Flormann St		32172	16	5	0.45	11	4	0
5th St/ Quincy St		24909	9	3	0.33	5	2	0
Oakland St/ Cambell St		23003	5	2	0.20	1	0	0
5th St/ St Cloud St		19057	5	2	0.24	1	1	0
Cambell St/ Centre St		17708	11	4	0.57	7	2	0
St Joseph St/ 4th St		16341	6	2	0.34	3	1	0
St Joseph St/ 3rd St		15011	8	3	0.49	0	0	0
Haines Ave/ Mall Dr		12612	11	4	0.80	8	3	0
Soo San Dr/ Range Rd		12416	6	2	0.44	0	0	0
St Patrick St/ Sedivy Ln		10704	3	1	0.26	1	0	0
North St/ W Blvd (N)	intersection to be redone with future SDDOT I-190/Silver St project - total crashes includes bridge hit crashes	7074	18	6	2.32	9	3	0
Elm Ave/Minnesota St	has been evaluated for all-way STOP; warrants not met	8048	5	2	0.57	4	1	0
Elm Ave/Indiana St	has been evaluated for all-way STOP; warrants not met	6641	2	1	0.28	2	1	0
St Patrick St / Elm Ave	existing ALL-WAY STOP functions adequately	15279	12	4	0.72	6	2	0
Maple Ave/ Disk Dr	existing ALL-WAY STOP functions adequately	13087	2	1	0.14	0	0	0

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2007 EVALUATION**

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Maple Ave/ Anamosa St	existing ALL-WAY STOP functions adequately	10020	6	2	0.55	2	1	0
Kansas City St/ West Bl	existing ALL-WAY STOP functions adequately	8868	2	1	0.21	2	1	0
Kansas City St/ 9th St	existing ALL-WAY STOP functions adequately	7987	5	2	0.57	5	2	0
W Main St/ 44th St	existing ALL-WAY STOP functions adequately	7569	1	0	0.12	0	0	0
W. Main/St. Onge St	significant volume reduction expected when Cement Plant Rd is closed to travel	23212	9	3	0.35	5	2	0
W Chicago St/ St Onge St	significant volume reduction expected when Cement Plant Rd is closed to travel	17632	6	2	0.31	6	2	0
5th St/ Flormann St	too close to adjacent signal							
Cathedral Dr/ Tower Rd	too close to adjacent signal							
5th St/Indiana St	too close to adjacent signal							
Haines Ave/ Knollwood Dr	too close to adjacent signal							

LaCrosse St. / Monroe St. Pedestrian Refuge Island Concept Plan



The following documents
were provided at the
July 1, 2008
Public Works Committee
Meeting.

From: Hofland Randa
Sent: Wed 6/11/2008 12:33 PM
To: Council Group
Subject: Stop Light at Lacrosse and Monroe

Dear Council Member:

I am an employee of City/County Alcohol and Drug Programs (aka Detox). I'm sending this email because we desperately need a stoplight on the corner of LaCrosse and Monroe Streets. It is almost impossible to turn left onto LaCrosse Street at any time of the day.

Currently there are over 600 participants in the 24-7 Program, which is housed in our building. Most of these participants come here, twice a day (between 0600-0900 & 1700-2100) – driving or on foot. Traffic during these times is horrific and only slightly better when those participants aren't here.

As you know, LaCrosse Street is a busy and frequently traveled route. It is virtually impossible to cross this street on foot; unless you walk to the corner of East North Street (3 blocks South), or you walk to the corner of Anamosa (over the railroad tracks and 4 blocks North). A stoplight with a cross walk would greatly benefit many people in this area; from neighborhood residents to business' as many people in this part of town are on foot most of the time.

I ask that you please consider this request for the safety of numerous people and to assist drivers trying to enter LaCrosse street traffic.

Sincerely,
Randa Hofland

Randa Hofland
Treatment & Continued Care Coordinator
394-6128 ext 210

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MEMORANDUM

TO: Public Works Committee/Common Council

FROM: Dale Tech, P.E., L.S.
City Engineer

THROUGH: Robert Ellis, P.E., P.T.O.E.

SUBJECT: N. LaCrosse St. & E. Monroe St.
Summary of Signal Warrant Analyses

DATE: June 25, 2008

- 1) A location map of the subject intersection is attached for your reference.
- 2) In October 2006, Engineering Services staff prepared a traffic signal warrant analysis for the intersection. The evaluation of the individual traffic signal warrants considered 100% of the E. Monroe St. traffic volumes. Based on this methodology, two of the (eight) signal warrants were satisfied.
- 3) At any un-signalized intersection, right turns from the side street are generally subject to minimal delays since a driver needs a gap in only one direction of travel. In recognition of this, the Manual on Uniform Traffic Control Devices (MUTCD) allows for subtracting right turns from the side street volumes when evaluating the signal warrants. In an effort to standardize the methodology for quantifying the number of right turns that should be subtracted from the gross side street volumes, the National Cooperative Highway Research Program (NCHRP) developed a recommended practice that was included in their Report 457.
- 4) Current traffic volume information for E. Monroe St. was collected this month using manual and machine counters. Outside of the typical morning and afternoon peak times, these volumes were significantly lower than those collected in 2006. Subsequently, to be most conservative, the higher volumes were used in the traffic signal warrant analyses. The 2006 and 2008 volumes are shown below.



EQUAL OPPORTUNITY EMPLOYER

	N. LaCrosse St.					E. Monroe St.			
	2006	2008	2006	2008		2006	2008	2006	2008
HOURL	NB	NB	SB	SB		EB	EB	WB	WB
0000	62	79	116	82		1	2	5	1
0100	37	38	72	44		3	1	1	1
0200	32	24	45	23		3	0	4	1
0300	27	22	23	21		0	3	2	3
0400	42	55	80	41		1	2	5	0
0500	132	169	195	111		3	6	2	1
0600	345	426	429	305		77	103	9	9
0700	528	567	814	519		81	76	30	20
0800	586	819	719	628		103	107	35	21
0900	665	894	640	618		85	40	50	18
1000	776	1004	723	722		79	44	51	16
1100	976	1325	819	844		87	57	54	30
1200	1141	1429	968	981		85	40	77	31
1300	962	1294	951	996		58	51	72	26
1400	964	1247	929	954		72	49	60	22
1500	1076	1455	953	934		94	55	45	28
1600	1136	1586	897	992		93	81	61	36
1700	1195	1672	1046	976		160	146	51	22
1800	1104	1300	910	860		119	105	47	21
1900	834	1021	833	698		104	66	28	27
2000	637	724	638	602		62	63	18	9
2100	394	532	498	383		11	20	4	4
2200	275	375	305	239		8	9	5	4
2300	161	172	152	112		10	9	3	3
TOTAL	14087	18230	13755	12685		1399	1135	719	354

- 5) When the signal warrants are evaluated using the NCHRP methodology, all of the right turns are subtracted from the side street volumes and none of the traffic signal warrants are satisfied.
- 6) Staff manually collected turning movement counts at the intersection to determine the actual number of right turns occurring from E. Monroe St. The results of these counts are summarized below. When the actual right turning volumes are subtracted from the gross volumes, none of the traffic signal warrants are satisfied.

	E. MONROE ST. EASTBOUND			E. MONROE ST. WESTBOUND	
HOUR BEGINNING	% OF RIGHT TURNS	% OF LEFT TURNS AND THRU		% OF RIGHT TURNS	% OF LEFT TURNS AND THRU
0700	62%	38%		53.3%	46.7%
0800	67.9%	32.1%		80%	20%
0900	58.7%	41.3%		61.1%	38.9%
1000	47.2%	58.2%		55.6%	44.4%
1100	71.7%	28.3%		76.5%	23.5%
1200	65%	35%		87%	13%
1300	59.2%	40.8%		85%	15%
1400	52.9%	47.1%		81%	19%
1500	68.6%	31.4%		75%	25%
1600	73.1%	26.9%		82.8%	17.2%
1700	70.8%	29.2%		88.9%	11.1%

- 7) The signal warrants were also evaluated with 50% of the right turns included in the side street volumes; based on this methodology none of the traffic signal warrants are satisfied.
- 8) The signal warrants were also evaluated with 75% of the right turns included in the side street volumes; based on this methodology none of the traffic signal warrants are satisfied.
- 9) A summary table of the results of the various warrant analyses methods is attached for your reference.
- 10) The most recent available intersection crash data was reviewed and is summarized below. There were not five (5) or more crashes in any 12-month period that were considered correctable by the installation of a traffic signal (Warrant 7).

DATE	CRASH TYPE	CORRECTABLE BY TRAFFIC SIGNAL?
01/28/05	WB-NB LEFT TURN CRASH	YES
04/02/05	EB-SB LEFT TURN CRASH	YES
09/08/05	EB-SB LEFT TURN CRASH	YES
10/11/05	SB-SB REAR END	NO
12/17/05	EB-WB SIDESWIPE	NO
01/13/06	EB HIT PEDESTRIAN IN XWALK	NO
02/22/06	EB-EB REAR END	NO
07/15/05	EB-SB LEFT TURN CRASH	YES
09/04/06	NB HIT FIXED OBJECT	NO
09/15/06	NB-NB REAR END	NO
09/18/06	NB-NB REAR END	NO
02/21/07	EB-SB RIGHT TURN CRASH	NO
03/11/07	SB HIT FIXED OBJECT	NO
03/25/07	SB HIT FIXED OBJECT	NO
04/09/07	EB-SB ANGLE	YES
05/10/07	EB-SB ANGLE	YES
12/06/07	SB-SB REAR END	NO

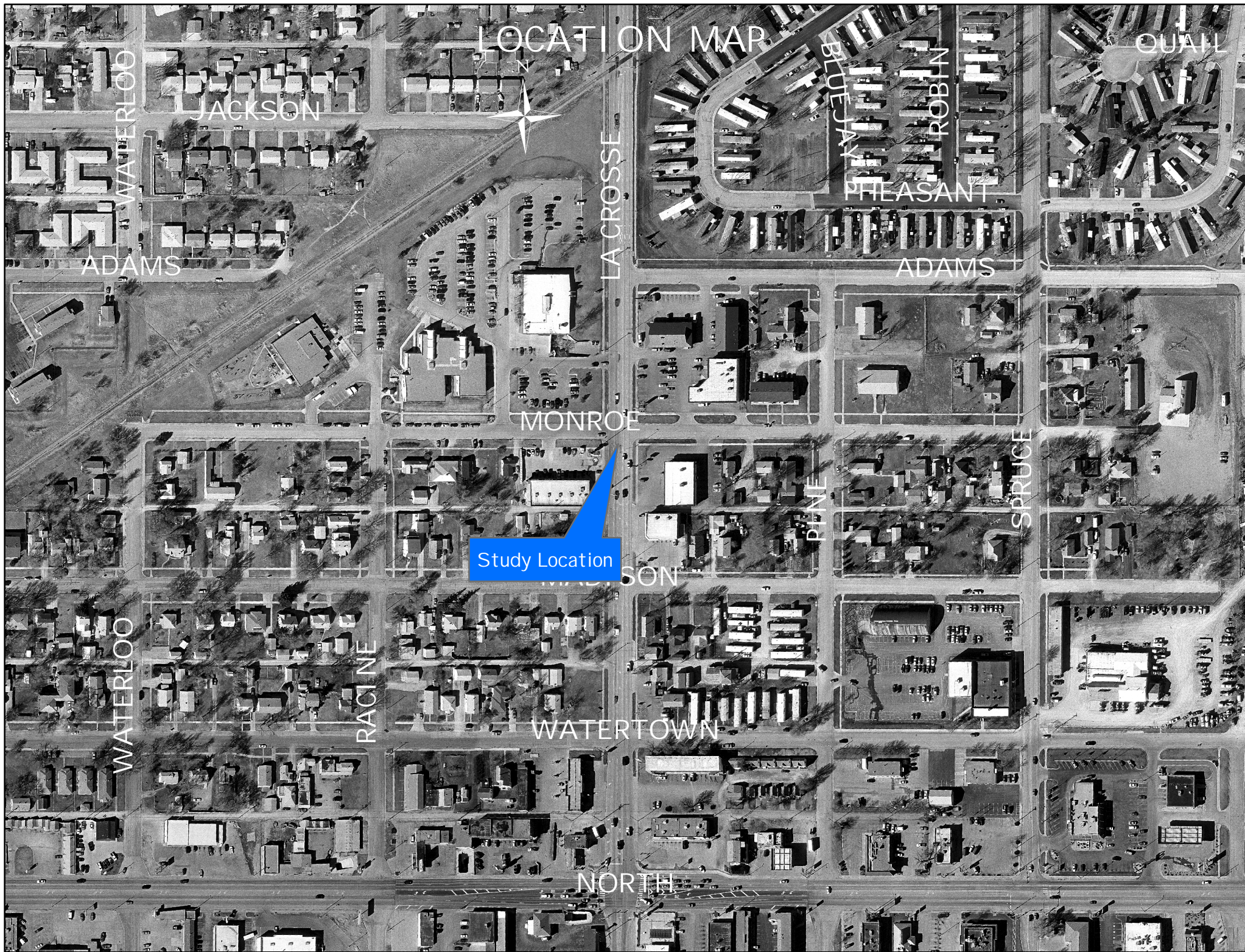
- 11) Based on the proceeding, Engineering Services has not programmed a signal construction project. Crash data will continue to be monitored and periodic traffic counts will be taken on E. Monroe St. to determine if existing conditions have changed sufficiently to warrant the installation of a traffic signal.

Attachments

DT:JL

Summary of Warrant Analyses
N. LaCrosse St. E. Monroe St.

	0% OF RIGHT TURNS INCLUDED IN MONROE ST. VOLUME (AS PER NCHRP REPORT 457)	ACTUAL % OF RIGHT TURNS INCLUDED IN MONROE ST. VOLUME	50% OF RIGHT TURNS INCLUDED IN MONROE ST. VOLUME	75% OF RIGHT TURNS INCLUDED IN MONROE ST. VOLUME	100% OF RIGHT TURNS INCLUDED IN MONROE ST. VOLUME
WARRANT 1A – This warrant requires a combined traffic volume of at least 600 vehicles per hour (vph) for both approaches of Lacrosse Street and at least 150 vph on one approach of Monroe Street.	NOT MET	NOT MET	NOT MET	NOT MET	NOT MET
WARRANT 1B - This warrant requires a combined volume of at least 900 vph for both approaches of Lacrosse Street and at least 75 vph on one approach of Monroe Street.	NOT MET	NOT MET	NOT MET	NOT MET	MET
WARRANT 1C - This warrant consideres a combination of 1A & 1B using 80% of the warrant criteria.	NOT MET	NOT MET	NOT MET	NOT MET	NOT MET
WARRANT 2 - This warrant is satisfied when, for any four hours of the day, the total vehicles per hour on both the approaches of major road and the corresponding vehicles per hour on the higher-volume approach of minor road fall above the curve shown on Figure 4C-1 of the MUTCD.	NOT MET	NOT MET	NOT MET	NOT MET	MET
WARRANT 3 - This warrant is applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
WARRANT 4 - This warrant considers the number of pedestrians crossing a major street at an intersection where sufficient gaps in traffic are not presently available for pedestrians to cross. A minimum of 100 pedestrians for each of four hours is required.	NOT MET	NOT MET	NOT MET	NOT MET	NOT MET
WARRANT 5 - This warrant is intended for application at designated school crossings. A crossing may require a signal if an engineering study reveals that there is less than one gap per minute during the period of crossing usage and there are a minimum of 20 students during the highest crossing hour.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
WARRANT 6 - This warrant considers whether a combination of proposed and existing signals will collectively provide a progressive operation where no progressive movement presently exists.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
WARRANT 7 - This warrant considers the severity and frequency of crashes at an intersection. The need for signalization shall be considered when in any 12-month period there are five or more reported crashes that are considered correctable by installing a traffic signal.	NOT MET	NOT MET	NOT MET	NOT MET	NOT MET
WARRANT 8 - This warrant considers whether installing a traffic signal would encourage concentration and organization of traffic flow on a roadway network and is only applicable to intersections of major routes.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE



LOCATION MAP

MONROE

Study Location

WATERTOWN

NORTH

QUAIL

BLUEJAY

ROBIN

PHEASANT

ADAMS

JACKSON

ADAMS

WATERLOO

WATERLOO

RACINE

PINE

SPRUCE

LA CROSSE