

GRAND FORKS – EAST GRAND FORKS CENTRAL BUSINESS DISTRICT TRAFFIC CIRCULATION STUDY

Prepared for:

Cities of Grand Forks and East Grand Forks
Metropolitan Planning Organization

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1.0 EXECUTIVE SUMMARY

A study was completed in the Central Business District (CBD) of Grand Forks, North Dakota and East Grand Forks, Minnesota to address concerns regarding traffic and pedestrian mobility through the CBD. The study consisted of conducting operational analyses and safety evaluations at 18 key intersections in the CBD, as well as evaluating pedestrian mobility at several locations. For the purposes of this study, intersections located in Grand Forks are not specifically named as being in Grand Forks; however, intersections located in East Grand Forks are specifically named as being in East Grand Forks.

1.1 Traffic Operations

The traffic operations analyses concluded that individually, each intersection operates below capacity during peak times; however, the density of signals results in lower than desired travel speeds throughout the CBD. Under the direction of the Grand Forks – East Grand Forks Metropolitan Planning Organization (MPO) Technical Advisory Committee, eight different alternatives were developed, consisting of removing some unnecessary traffic signals, and interconnecting the signals in order to provide a coordinated system. Based on the analysis of alternatives, the most efficient traffic control strategy in the CBD area would involve:

- Removal of the All-Way STOP at DeMers Avenue / 3rd Street in EGF.
- Removal of traffic signals at South 5th Street / Bruce Avenue in GF, 4th Street / 3rd Avenue in EGF, and DeMers Avenue / Riverboat Road.
- Interconnect the remaining traffic signals (11 total)

With the removal of traffic signals, each roadway should have the following signal budget:

- | | |
|----------------------------------|--|
| 1. DeMers Avenue: | East Grand Forks – 2 signals
Grand Forks – 3 signals
Total – 5 signals |
| 2. North 5 th Street: | Grand Forks – 6 signals |

An additional traffic analysis was completed for the potential Point Bridge closure scenarios. The traffic study indicated that a new bridge at 17th Avenue S or 32nd Avenue S in favor of the Point Bridge would result in congestion levels that are expected in 2025 to occur immediately in the CBD. In general, each individual intersection would still have some amount of reserve capacity, however, the overall system performance would be noticeably impacted.

If the Point Street Bridge were closed and no new bridge were constructed, the estimated ADT on DeMers Avenue would exceed the capacity of a two-lane roadway.

The “optimum” signal configuration would operate at congested levels under this volume scenario, as there would be queuing through adjacent signalized intersections. This would result in the creation of a “fatal flaw” with vehicles forced to turn through a queue of traffic. Such conditions would result in potential gridlock, as well as increased crashes as a result of queuing through intersections.

1.2 Safety Analysis

Traffic safety was another key component of this study. To identify potential safety deficiencies, historical crash data were obtained at all 18 key intersections. A systematic approach of calculating crash rates and comparing them to observed values at other similar intersections was used to determine if each intersection experienced crash problems. The only intersection within the CBD which experienced higher than anticipated crashes is the All-Way STOP at DeMers Avenue / 3rd Street in EGF.

1.3 Pedestrian Issues

The third key component of the CBD study was to analyze pedestrian mobility, specifically as it related to crossing the Red River, crossing of DeMers Avenue near Cabela’s and the Sorlie Bridge, bike lanes, and school areas.

1.3.1 Crossing the Red River

The Sorlie Bridge currently provides the only pedestrian connection between Grand Forks and East Grand Forks. Based on current design guidelines, the sidewalks across the bridge are too narrow to accommodate existing and future pedestrian needs. Structurally, the rebuilding of these sidewalks to satisfy the design guidance would be extremely costly and would result in the replacement of most of the sub-structure. However, because the Sorlie Bridge is an existing structure, it is not required to meet these design guidelines.

The construction of a new pedestrian bridge appears to be the most cost-effective strategy for meeting pedestrian mobility needs. If this new bridge were constructed, it would be required to meet the design guidelines found in the *AASHTO Guide for Development of Bicycle Facilities*.

1.3.2 Crossing DeMers Avenue

Gap studies were conducted for pedestrians crossing DeMers Avenue near Cabela’s and at the west end of the Sorlie Bridge. The studies found that there are an adequate number of gaps in vehicle traffic for a pedestrian to cross DeMers Avenue near Cabela’s. However, at the west end of the Sorlie Bridge, the study suggests that there are not an adequate number of gaps to safely cross the DeMers Avenue.

There are many different forms of traffic control that could be implemented to improve pedestrian safety in crossing DeMers Avenue, which include:

- Install roadway signing – includes in-road signage, double-posted pedestrian crossing signs (mounted on both sides of the road), installation of fluorescent-yellow green signs, advance warning signing, etc.
- Install high-visibility pavement markings – “zebra” crosswalks, advance placement of STOP and YIELD limit lines, etc.
- Install overhead signs – static, illuminated, or LED.
- Install pedestrian railings – channelize pedestrians to more controlled crossing locations (e.g. signalized intersections).
- Install lighting at crossing location – suitable at locations where there are high levels of pedestrian activity at night.
- Install curb extensions.
- Install automated pedestrian detection – detection device activates flashing beacon/LED sign when a pedestrian is present.

The installation of any of these alternatives can be used in combination with each other. Typically, installation of signing and striping is the least expensive and the most widely used form of pedestrian/traffic control. It is recommended that if any of the other alternatives listed were installed, the device(s) should be used in conjunction with proper signing and striping of pedestrian crossing(s).

1.4 Bike Lanes

Exclusive bike lanes could be installed on DeMers Avenue across the Sorlie Bridge. If a bike lane were installed in Grand Forks, on-street parking would need to be removed. Due to the slight narrowing of DeMers Avenue near Cabela’s in East Grand Forks, installation of a bike lane is not feasible east of the river. The GF-EGF Metropolitan Planning Organization (MPO) has created a map that documents the existing and planned pedestrian and bicycle paths in the Cities of Grand Forks and East Grand Forks. The current bike routes into the CBD, aside from the river paths, are on University Avenue to 3rd Street (connecting to the ex-NP bridge), and on DeMers Avenue to Kittson Avenue. DeMers Avenue is not advantageous as a bike route.

1.5 School Areas

Due to the close proximity to Central High School, the intersections of North 5th Street / 2nd Avenue North and North 4th Street / 1st Avenue North meet the pedestrian signal warrant as documented in the Manual on Uniform Traffic Control Devices (MUTCD). However, studies have shown that installing/maintaining of a traffic signal purely on meeting the pedestrian warrant results in an adversely impacted quality of traffic flow with mixed benefits for pedestrians.

An additional capacity analysis of the two intersections that met the pedestrian warrant indicated that an All-Way STOP controlled intersection would continue to operate at LOS A during AM, Noon, and PM peak hour conditions at a much lower cost for the City. In addition, the safety characteristics of an All-Way STOP controlled intersection are greater than a traffic signal.

2.0 PURPOSE OF STUDY

The Grand Forks – East Grand Forks Metropolitan Planning Organization (MPO) decided to study the traffic circulation within the central business district (CBD) in Grand Forks, North Dakota and East Grand Forks, Minnesota in order to address concerns expressed by the local business community. The objectives of the study were to improve the traffic circulation and pedestrian safety by:

- Conducting a review of traffic signal operation (i.e. timing), as well as an analysis of the location and number of signals in the CBD, and
- Understanding pedestrian / auto conflicts generally and specifically on DeMers Avenue in the area of Cabela's / Riverwalk Centre and on 5th Street North near Central High School. In addition, determine the quality of pedestrian mobility in these areas, as well as crossing the Red River of the North.

To complete the CBD traffic circulation study, the Grand Forks – East Grand Forks MPO retained the engineering services of Howard R. Green Company to perform the study, document the process and conclusions, and provide recommendations for meeting the objectives of the study.

3.0 EXISTING CONDITIONS

The purpose of this section is to document the existing conditions that affect the quality of traffic operations and pedestrian mobility in the Grand Forks – East Grand Forks Central Business District (GF – EGF CBD) area. The study area consists of examining North 5th Street from 5th Avenue North to Bruce Avenue and examining DeMers Avenue from North 6th Street in Grand Forks to 4th Street in East Grand Forks.

All of the traffic signals within the CBD area were studied as part of this analysis (14 intersections total). Aside from those on 5th Street or DeMers Avenue, there were also two additional signalized intersections included in the study (4th Street & 3rd Avenue in EGF and 4th Street & 1st Avenue in GF). Two key unsignalized intersections were also included in this study, namely the intersections of DeMers Avenue with North 6th Street (& Kittson Avenue) and 1st Avenue North. A listing of the intersections that were analyzed is documented in **Table 3-1**. (**Figure 3-1** illustrates the location of the signalized intersections included in the CBD area.)

The analysis of the existing conditions consisted of the following steps (a flow chart detailing the analytical process is shown in **Figure 3-2**):

- Identify existing roadway characteristics in the GF – EGF CBD area, including intersection traffic control, intersection lane configuration, and signal phasing.
- Identify existing traffic volumes in the GF – EGF CBD area including Average Daily Traffic (ADT) volumes for the roadway segments and the AM peak, Noon peak, and PM peak hour turning movement volumes at selected key intersections.
- Conduct a traffic operations analysis of the existing conditions for the GF – EGF CBD area. The analysis consists of peak hour capacity analyses at selected key intersections and an arterial capacity analysis for the North 5th Street and DeMers Avenue corridors.
- Conduct crash analyses at each of the selected key intersections.
- Examine pedestrian issues relating the GF – EGF CBD area.

3.1 Roadway Characteristics and Traffic Data

This section summarizes the existing roadway characteristics and traffic volumes for the Grand Forks – East Grand Forks CBD area. Key roadway characteristics include intersection lane configuration, intersection control, and signal phasing. The traffic data includes Average Daily Traffic (ADT) volumes for the GF – EGF CBD area and the AM peak, Noon peak, and PM peak hour turning movement volumes at each key intersection.

3.1.1 Intersection Traffic Control and Lane Configuration

Intersection lane configuration and intersection traffic control (i.e. signal timing and phasing) are two of the three of the primary factors that determine the capacity of an intersection (with the third key factor being traffic volume). The number of lanes allocated to each movement determines the absolute capacity of that movement. Intersection traffic control refers to the type of traffic control device that is utilized at an intersection. For example, the primary types of intersection traffic control are a traffic signal, a Two-Way STOP (or Through-STOP), and an All-Way STOP.

At signalized intersections, the key factors that affect the quality of traffic operations are signal timing and signal phasing. Signal timing determines how much “green” time is given to each movement. Signal phasing determines how right of way is allocated to each of the turning movements. A modification to the number of lanes, to the alignment of the lanes, to the intersection control, or to the signal phasing can significantly effect the operations at an intersection.

Table 3-2 documents the existing geometry (or lane configuration), traffic control, and signal phasing at each of the key intersections in the CBD area. This information was provided by the Grand Forks - East Grand Forks Metropolitan Planning Organization (MPO) and by the City of Grand Forks. In general, the major intersections are controlled by traffic signals and the minor intersections are controlled by Through-STOP conditions. The North 5th Street corridor has seven signalized intersections and the DeMers Avenue corridor has 6 signalized intersections (including the intersection with North 5th Street). There are also two additional signals included in the study that are not located along either of these corridors.

3.1.2 Traffic Data

Figure 3-3 documents the Year 2000 Average Daily Traffic (ADT) volumes for the Grand Forks – East Grand Forks CBD. This information was obtained from the Year 2000 Grand Forks Traffic Volume Map. On North 5th Street, the traffic volumes range from approximately 5,300 vehicles per day (vpd) to 6,200 vpd. On DeMers Avenue, the traffic volumes range from approximately 6,300 vpd in East Grand Forks to 19,200 vpd in Grand Forks.

AM peak, Noon peak, and PM peak turning movement volumes were collected at each of the key intersections by the GF – EGF MPO in Spring 2001. **Tables 3-3 through 3-5** show the turning movement volumes for each of these time periods. These turning movement volumes at each of the intersections remain approximately the same between the three peak hours studied.

3.2 Traffic Operations Analysis

The purpose of a traffic operations analysis is to evaluate the traffic conditions resulting from identified roadway characteristics and traffic volumes. A traffic operations analysis was conducted at each of the 14 signalized intersections and four unsignalized intersections included in the study (See **Table 3-1** for Listing of Studied Intersections).

This capacity analysis examined traffic operations during the AM peak, Noon peak, and PM peak time periods. An arterial roadway capacity analysis was also conducted to examine the operations of the entire roadway. The use of these traffic analysis techniques provides greater insight into the operational characteristics of the roadways.

3.2.1 Level of Service Summary

The approach to the traffic operations analysis is derived from the established methodologies documented in the *Highway Capacity Manual* (TRB, 2000). *The Highway Capacity Manual* (HCM) contains a series of analysis techniques that are used to evaluate the operation of transportation facilities under specific conditions.

The results of an HCM analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative estimate of the operational efficiency or effectiveness. The letter grade determined by the HCM analysis is referred to as level-of-service (LOS). By definition, LOS A conditions represent high-quality operations (i.e., motorists experience very little delay or interference) and LOS F conditions represent very poor operations (i.e., extreme delay or severe congestion). **Figure 3-4** illustrates the mathematical relationship between various Levels of Service.

In most large urban areas (for example, the Twin Cities), state and local agencies define the onset of congestion as the LOS D/E boundary. This study used the C/D boundary as the indicator of congestion as directed by the Grand Forks – East Grand Forks MPO.

Level of Service at roadway intersections is primarily a function of peak hour turning movement volumes, intersection lane configuration, and traffic control measures. For intersection analysis, HCM defines level of service in terms of the average control delay at the intersection in seconds per vehicle. From the HCM, the level of service for signalized and unsignalized intersections is:

LOS	Signalized Intersection	Unsignalized Intersection
A	≤ 10 sec.	≤ 10 sec.
B	10 – 20 sec.	10 – 15 sec.
C	20 – 35 sec.	15 – 25 sec.
D	35 – 55 sec.	25 – 35 sec.
E	55 – 80 sec.	35 – 50 sec.
F	> 80 sec.	> 50 sec.

Source: Tables 16-2 and 17-2, 2000 Highway Capacity Manual.

The threshold values for unsignalized intersections are slightly less than for signalized intersections because driver expectation of the intersection performance varies for different types of traffic control. Also, for the purposes of this study, the level of service reported for unsignalized intersections is based on at least one of the movements at the intersection operating at a LOS D or greater and does not necessarily mean that the

operations of the entire intersection is over the LOS D threshold value. For a thru-STOP controlled intersection, the movements that most often experience significant delays include: minor street through, minor street left turn onto major street, and major street left turn onto the minor street. Typical mitigative strategies to address long minor street delays could involve installing a traffic signal at the intersection or prohibiting some of the minor street movements as part of a comprehensive access management plan for the corridor.

Arterial roadway level-of-service is a function of traffic volume, traffic flow characteristics, roadway cross-sections, traffic signal spacing, and traffic signal timing. For arterial roadway analysis, HCM defines level of service in terms of the average peak hour travel speed along a segment, including delay and stops. The HCM has different level of service criteria for several different classes of roadway. Based on free-flow speeds between 25 and 35 MPH, the roadways have been classified as Class IV arterials for the basis of this study. From the HCM, the level of service criteria for a Class IV arterial is:

LOS A: ≥ 25 mph
LOS B: 19 – 25 mph
LOS C: 13 – 19 mph
LOS D: 9 – 13 mph
LOS E: 7 – 9 mph
LOS F: < 7 mph

It is important to note that level-of-service is defined differently for the two HCM analysis techniques applied in this study. The intersection analysis focuses on the average control delay for all traffic at an intersection, and the arterial roadway analysis focuses on the average travel speed along a roadway segment, which may include several intersections. It is therefore possible to have an efficient intersection located along a poorly operating roadway segment, or a poorly operating intersection along an otherwise free-flowing arterial.

3.2.2 Intersection Capacity Analysis

Table 3-6 shows the existing intersection level of service at each of the key intersections for each time period studied. Each signalized and unsignalized intersection within the CBD is operating below capacity during the AM peak, Noon peak, and PM peak hours. However, due to the high density of signalized intersections in a small area, combined with “isolated” signal operations (i.e. not interconnected), the roadway system as a whole experiences capacity problems.

3.2.3 Arterial Roadway Capacity Analysis

Because the roadway system as a whole experiences congestion, segment level of service was also analyzed for the following roadways:

- North 5th Street from 5th Avenue North to Bruce Avenue
- DeMers Avenue from 6th Street in Grand Forks to 4th Street in East Grand Forks

With the current configuration of traffic signals and STOP signs, the overall speed on each of the roadways in the CBD area is approximately 13 miles per hour (mph), which corresponds to a LOS C/D (**Table 3-7**). By definition, this operation is at the boundary of congestion (LOS D), as selected by the GF-EGF MPO. Therefore, deficiencies would be expected to occur in the future on a system-wide basis unless mitigations are implemented.

3.2.4 Impacts of Left Turn Phasing

An additional analysis was conducted to determine if left turn phasing at the signalized intersections on DeMers Avenue in Grand Forks would improve traffic operations.

Tables 3-8 and 3-9 show a comparison of the individual movement level of service and the overall intersection level of service without and with left turn phasing for both the existing conditions and forecast Year 2025 conditions. The analysis found that there was no significant improvement in overall operations or traffic flow. Although left turning vehicles do benefit from the addition of a left turn phase, a greater number of through vehicles experience greater delay as a result. Even though left turn phasing does not improve overall operations at key locations such as DeMers Avenue and North 5th Street, overall delay is not substantially increased. It should also be noted that during the peak hours, the left turning movements on DeMers Avenue do not currently, nor are they expected to operate at levels of delay that are considered deficient. If future traffic patterns change, the addition of left turn phasing can be implemented with only minor modifications at any of the signals along DeMers Avenue in Grand Forks (3rd, 4th, or 5th Streets). Again, such modifications are not necessary now, but may become more desirable in the future if traffic patterns change.

3.3 Safety Analysis

For each of the intersections in the Grand Forks - East Grand Forks CBD included in the study, historical crash data was examined to determine if intersections were experiencing crash frequencies indicative of safety deficiencies. The crash data was supplied by each of the cities (Grand Forks: 1998 - 1999 data and East Grand Forks: 1998 - 2000 data).

Figures 3-5 and 3-6 show the crash rates for the signalized and unsignalized intersection included in the study. The statistical analysis concluded that almost every intersection within the CBD area was at or below the expected crash rate for similar signalized and unsignalized intersections. The only exception was the intersection of DeMers Avenue and 3rd Street in East Grand Forks, which is the only All-Way STOP along DeMers Avenue or North 5th Street in the CBD area. The crash rate at the DeMers Avenue / 3rd Street intersection is 0.7 crashes per million entering vehicles (MEV), which is greater than the typical crash rate for unsignalized All-Way STOP intersections of 0.6 crashes per MEV. However, the crash rate at this intersection is less than the critical crash rate of 0.9 crashes per MEV for similar intersections. The crash rate at this intersection may be higher than the average crash rate because the All-Way

STOP control may violate driver's expectations or simply because of the random nature of crashes.

3.4 Pedestrian Issues

In 2000, the pedestrian bridge (former railroad bridge) located north of DeMers Avenue, which crossed the Red River, was removed. This pedestrian bridge served as a primary pedestrian/bicyclist connection between Grand Forks and East Grand Forks. As a result of the removal of this bridge, the only pedestrian connection between downtown Grand Forks and East Grand Forks is on DeMers Avenue across the Sorlie Bridge.

A pedestrian capacity analysis was conducted to determine if the existing sidewalks across the Sorlie Bridge could accommodate existing and future pedestrians. The capacity analysis found that the sidewalks on the existing bridge could accommodate existing and expected future pedestrian volumes; however, this analysis cannot account for the mix of pedestrians, bicyclists, rollerbladers, etc. that would also now be using this bridge. Currently, the sidewalks across the bridge are 6' 8" wide. Based on current design guidelines found in the *AASHTO Guide for Development of Bicycle Facilities*, a minimum of ten-foot sidewalks would be recommended to accommodate the mix of two-way pedestrian traffic. Therefore, the existing Sorlie Bridge sidewalks do not meet the current design guidelines to accommodate mixed, two-way pedestrian traffic. However, because the Sorlie Bridge is an existing structure, it is not required to meet these guidelines.

At the same time that the turning movement volumes were collected, pedestrian volumes were also collected at each of the key intersections. **Figure 3-7** shows these pedestrian volumes along with the peak hour pedestrian warrant of 190 pedestrians per hour (*Manual on Uniform Traffic Control Devices - MUTCD*). There are two intersections located within the CBD area that have pedestrian volumes greater than the peak hour pedestrian warrant, which include the North 5th Street / 2nd Avenue North intersection and the North 4th Street / 1st Avenue north intersection. These intersections have the greatest number of pedestrians because they are located near Central High School, which is a large generator of walking students. Because these two intersections meet the MUTCD guidance for peak hour pedestrian volumes, a traffic signal could be warranted at these locations.

In addition to collecting pedestrian volumes, a pedestrian gap study was conducted at two locations: at the west end of the Sorlie Bridge on DeMers Avenue and at the crossing between Cabela's and Riverwalk Center also on DeMers Avenue. A gap study involves determining the critical gap in vehicle traffic for a pedestrian to cross the major roadway. A pedestrian would reject any gaps less than the critical gap and accept gaps greater than or equal to the critical gap. **Table 3-10** shows the results of this gap study. The gap study indicated that there was only a marginally acceptable number of gaps at the Cabela's crossing, and there was not an adequate number of gaps at the west end of the Sorlie Bridge during the peak times.

3.5 Summary

- The results of the traffic analysis for existing conditions show that all intersections included in the study operate without any significant delay. However, due to the high density and closely spaced traffic signals, combined with “isolated” signal operations, the roadway as a whole experiences congestion.
- The arterial roadway capacity analysis found that the North 5th Street and DeMers Avenue corridors have travel speeds of approximately 13 mph each, which corresponds to a LOS C/D. By definition, this operation is at the boundary of congestion (LOS D), as selected by the GF-EGF MPO.
- The addition of left turn phasing on DeMers Avenue is not expected to improve the overall operations or traffic flow along DeMers Avenue and would not be expected to significantly improve traffic safety. However, any new or revised signals should be designed to accommodate future addition of left turn phasing.
- The safety analysis found that only the DeMers Avenue / 3rd Street (East Grand Forks) intersection has a crash rate (0.7 crashes per MEV) greater than the expected crash rate (0.6 crashes per MEV). The crash rate at this intersection may be higher than the average crash rate because the All-Way STOP control may violate driver’s expectations or because of the random nature of crashes.
- The existing Sorlie Bridge sidewalks (6’ 8” wide) do not meet the current design guidelines (10 feet wide minimum) to accommodate mixed pedestrian/bicycle traffic. However, because the Sorlie Bridge is an existing structure, it is not required to meet these guidelines.
- The North 5th Street / 2nd Avenue North and the North 4th Street / 1st Avenue north intersections meet the MUTCD guidance for peak hour pedestrian volumes. Therefore, a traffic signal could be warranted at these locations based on meeting this guidance. However, from the traffic operations analysis, these intersections would also be expected to operate at acceptable levels with STOP-sign control. If the STOP-sign control is installed at these intersections, pedestrian safety can be improved by constructing curb extensions or implementing other forms of traffic control.
- A pedestrian gap study indicated that there was only a marginally acceptable number of gaps at the Cabela’s crossing of DeMers Avenue, and there was not an adequate number of gaps at the west end of the Sorlie Bridge during the peak times.

TABLE 3-1 Listing of Studied Intersections

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

	MAJOR STREET	MINOR STREET
1.	North 5th Street	5th Avenue North
2.	North 5th Street	University Avenue
3.	North 5th Street	2nd Avenue North
4.	North 5th Street	1st Avenue North
5.	DeMers Avenue	North 5th Street
6.	South 5th Street	Kittson Avenue
7.	South 5th Street	Bruce Avenue
8.	North 4th Street	1st Avenue North
9.	DeMers Avenue	North 4th Street
10.	DeMers Avenue	North 3rd Street
11.	DeMers Avenue	Riverboat Road
12. ⁽¹⁾	DeMers Avenue	Riverstreet Road (East Grand Forks)
13.	DeMers Avenue	2nd Street (East Grand Forks)
14. ⁽²⁾	DeMers Avenue	3rd Street (East Grand Forks)
15.	DeMers Avenue	4th Street (East Grand Forks)
16.	4th Street	3rd Avenue (East Grand Forks)
17. ⁽¹⁾	DeMers Avenue	North 6th Street (Kittson)
18. ⁽¹⁾	DeMers Avenue	1st Avenue North

Note: (1) Currently unsignalized thru-STOP intersection
(2) Currently unsignalized All-Way STOP intersection

Figure 3-1 Traffic Signal Locations (Chris)

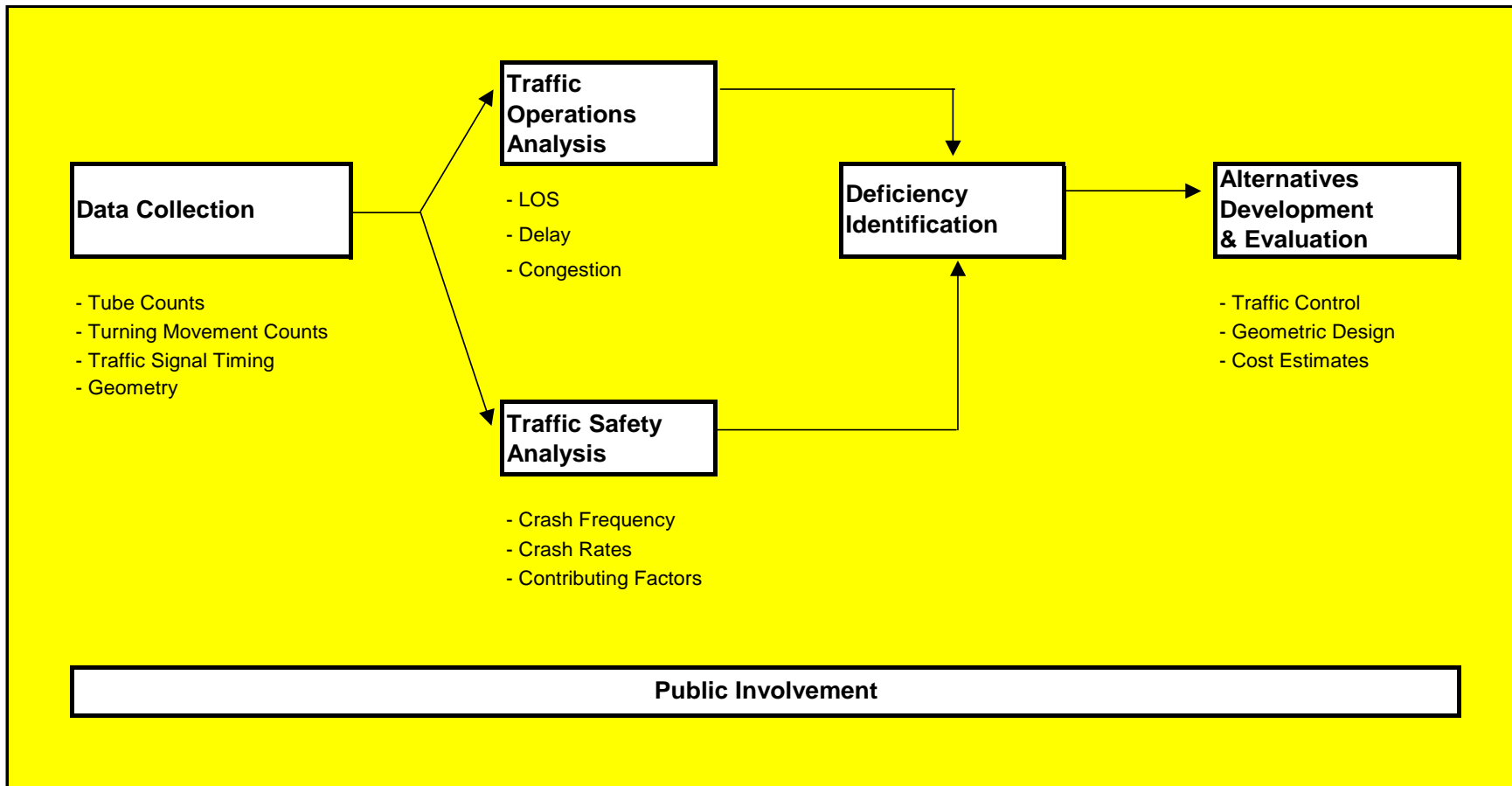


FIGURE 3-2
Analytical Process

*Grand Forks - East Grand Forks Central Business District
 Traffic Circulation Study*

TABLE 3-2

Existing Intersection Geometry and Traffic Control

Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study

INTERSECTION	NORTH APPROACH	EAST APPROACH	SOUTH APPROACH	WEST APPROACH	TRAFFIC CONTROL	MAINLINE LEFT TURN PHASING	SIDE STREET LEFT TURN PHASING
North 5th Street / 5th Avenue North					Signal	Permitted	Permitted
North 5th Street / University Avenue					Signal	Permitted	Permitted
North 5th Street / 2nd Avenue North		NA			Signal	Permitted	Permitted
North 5th Street / 1st Avenue North					Signal	Permitted	Permitted
DeMers Avenue / North 5th Street					Signal	Permitted	Permitted
South 5th Street / Kittson Avenue					Signal	Permitted	Permitted
South 5th Street / Bruce Avenue					Signal	Permitted	Permitted
North 4th Street / 1st Avenue North					Signal	Permitted	Permitted
DeMers Avenue / North 4th Street					Signal	Permitted	Permitted
DeMers Avenue / North 3rd Street					Signal	Permitted	Permitted
DeMers Avenue / Riverboat Road			NA		Signal	Permitted	Permitted
DeMers Avenue / Riverstreet Road (EGF)					Thru-STOP	NA	NA
DeMers Avenue / 2nd Street (EGF)					Signal	Permitted	Permitted
DeMers Avenue / 3rd Street (EGF)					All-Way STOP	NA	NA
DeMers Avenue / 4th Street (EGF)					Signal	Permitted	Permitted
4th Street / 3rd Avenue (EGF)					Signal	Permitted	Permitted
DeMers Avenue / North 6th Street (Kittson)					Thru - STOP	NA	NA
DeMers Avenue / 1st Avenue North			NA		Thru - STOP	NA	NA

Source: Grand Forks - EGF MPO and City of Grand Forks

Note: DeMers Avenue assumed to be East-West and 5th Street assumed to be North-South

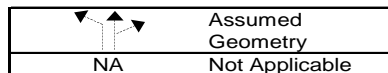


Figure 3-3 2000 ADT Volumes (Chris)

TABLE 3-3

Existing AM Peak Hour Turning Movement Volumes ⁽¹⁾

*Grand Forks - East Grand Forks Central Business District
Traffic Study*

Location	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
N 5th St / 5th Ave N	19	16	13	5	8	6	10	161	3	3	234	25
N 5th St / University Ave	19	111	57	14	116	31	58	135	27	31	202	50
N 5th St / 2nd Ave N	13	3	29	0	0	0	27	195	1	0	214	52
N 5th St / 1st Ave N	22	91	31	7	40	41	29	146	33	22	161	31
N 5th St / Demers Ave	42	326	48	23	295	14	24	207	26	17	122	26
S 5th St / Kittson Ave	1	77	52	7	17	16	13	292	4	29	184	1
S 5th St / Bruce Ave	115	90	31	2	10	5	11	185	10	16	171	3
N 4th St / 1st Ave N	66	38	36	3	15	0	13	59	4	16	117	84
Demers Ave / 1st Ave N	200	537	4	0	357	3	1	0	0	0	0	60
Demers Ave / N 6th St (Kittson)	24	412	79	3	324	15	19	1	1	5	11	13
Demers Ave / N 4th St	17	302	53	14	242	12	75	89	14	13	112	44
Demers Ave / N 3rd St	19	323	15	25	315	56	10	43	42	33	21	16
Demers Ave / Riverboat Rd	10	296	0	0	311	5	0	0	0	11	0	41
Demers Ave / River Street Rd (EGF)	11	296	61	1	311	30	30	6	4	0	0	42
Demers Ave / 2nd St (EGF)	4	300	5	2	284	5	27	1	2	2	1	5
Demers Ave / 3rd St (EGF)	12	166	36	10	177	3	42	6	8	0	6	1
Demers Ave / 4th St (EGF)	19	122	54	4	95	6	56	106	11	9	146	56
4th St / 3rd Ave (EGF)	9	9	8	4	30	16	27	166	2	8	169	21

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

TABLE 3-4

Existing Midday Peak Hour Turning Movement Volumes ⁽¹⁾

*Grand Forks - East Grand Forks Central Business District
Traffic Study*

Location	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
N 5th St / 5th Ave N	14	19	8	1	7	4	7	182	5	2	168	18
N 5th St / University Ave	23	115	74	15	129	29	51	129	33	24	156	29
N 5th St / 2nd Ave N	17	0	35	0	0	0	28	211	0	0	214	11
N 5th St / 1st Ave N	23	64	25	20	71	20	8	179	28	23	192	24
N 5th St / Demers Ave	46	369	33	24	366	46	77	128	29	73	169	42
S 5th St / Kittson Ave	4	39	56	9	11	24	7	188	5	37	168	3
S 5th St / Bruce Ave	91	54	19	11	34	22	14	106	6	30	157	9
N 4th St / 1st Ave N	40	66	32	7	46	8	15	71	16	14	102	39
Demers Ave / 1st Ave N	87	568	6	2	553	2	1	0	8	4	0	103
Demers Ave / N 6th St (Kittson)	22	480	74	0	507	34	18	6	4	8	12	8
Demers Ave / N 4th St	32	362	54	13	317	17	89	69	28	17	69	45
Demers Ave / N 3rd St	29	421	21	54	403	54	21	43	44	46	26	31
Demers Ave / Riverboat Rd	70	340	0	0	399	12	0	0	0	5	0	59
Demers Ave / River Street Rd (EGF)	61	400	46	1	435	11	9	0	0	4	1	62
Demers Ave / 2nd St (EGF)	36	346	21	12	399	6	42	6	7	6	4	36
Demers Ave / 3rd St (EGF)	17	237	35	12	220	14	51	8	20	10	11	40
Demers Ave / 4th St (EGF)	48	167	51	14	141	10	87	92	7	20	100	49
4th St / 3rd Ave (EGF)	7	23	17	2	19	6	42	137	4	18	117	21

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

TABLE 3-5

Existing PM Peak Hour Turning Movement Volumes ⁽¹⁾

*Grand Forks - East Grand Forks Central Business District
Traffic Study*

Location	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
N 5th St / 5th Ave N	9	10	10	8	9	2	8	156	7	3	202	19
N 5th St / University Ave	22	96	69	20	123	38	81	159	18	14	154	47
N 5th St / 2nd Ave N	29	0	40	1	0	0	26	221	0	0	245	19
N 5th St / 1st Ave N	46	51	38	33	77	36	14	117	12	37	202	27
N 5th St / Demers Ave	19	447	24	45	455	36	73	132	40	43	224	29
S 5th St / Kittson Ave	4	22	29	10	18	14	7	168	9	22	216	1
S 5th St / Bruce Ave	61	27	15	25	65	28	14	97	4	21	153	11
N 4th St / 1st Ave N	55	46	48	6	30	18	14	59	17	13	95	52
Demers Ave / 1st Ave N	66	419	5	1	426	5	7	1	0	1	0	78
Demers Ave / N 6th St (Kittson)	23	510	60	5	529	22	31	6	1	11	15	30
Demers Ave / N 4th St	57	423	43	9	389	14	81	61	13	21	19	28
Demers Ave / N 3rd St	32	440	23	33	382	56	35	44	35	63	33	20
Demers Ave / Riverboat Rd	55	336	0	0	302	9	0	0	0	1	0	33
Demers Ave / River Street Rd (EGF)	54	410	62	7	400	10	12	0	3	1	1	31
Demers Ave / 2nd St (EGF)	14	374	22	9	342	8	44	4	7	6	4	26
Demers Ave / 3rd St (EGF)	9	293	47	5	243	12	56	5	32	12	12	14
Demers Ave / 4th St (EGF)	75	170	77	11	130	14	101	103	10	13	139	54
4th St / 3rd Ave (EGF)	12	31	19	2	34	17	45	157	3	18	162	31

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

Figure 3-4

Intersection Level of Service Description

Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study

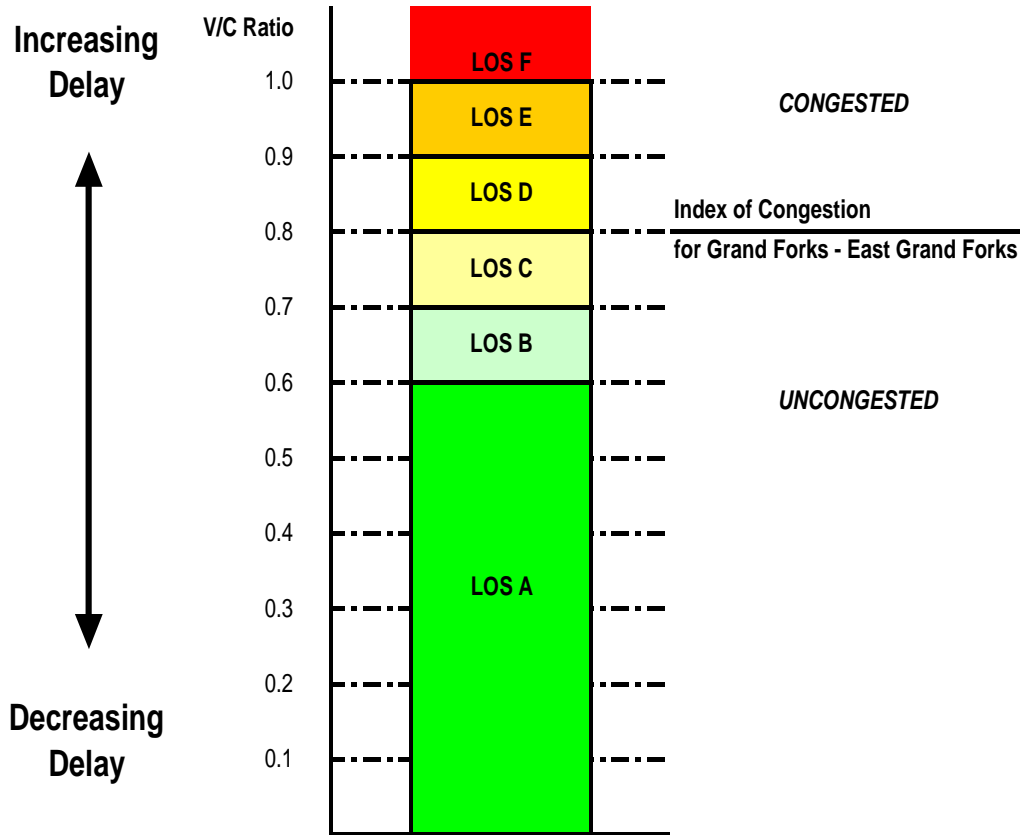


TABLE 3-6
Existing Intersection Level of Service Summary

*Grand Forks - East Grand Forks Central Business District
 Traffic Circulation Study*

INTERSECTION	LEVEL OF SERVICE ⁽¹⁾		
	AM PEAK HOUR	NOON PEAK HOUR	PM PEAK HOUR
	2001	2001	2001
North 5th Street / 5th Avenue North	A	A	A
North 5th Street / University Avenue	A	A	A
North 5th Street / 2nd Avenue North	A	A	A
North 5th Street / 1st Avenue North	A	A	A
DeMers Avenue / North 5th Street	A	A	A
South 5th Street / Kittson Avenue	A	A	A
South 5th Street / Bruce Avenue	A	A	A
North 4th Street / 1st Avenue North	A	A	A
DeMers Avenue / North 4th Street	B	B	B
DeMers Avenue / North 3rd Street	B	B	B
DeMers Avenue / Riverboat Road	B	B	B
DeMers Avenue / 2nd Street (EGF)	B	B	B
DeMers Avenue / 4th Street (EGF)	A	A	A
4th Street / 3rd Avenue (EGF)	A	A	A
DeMers Avenue / North 6th Street (Kittson) ⁽²⁾	C	C	C
DeMers Avenue / 1st Avenue North ⁽²⁾	B	A	B

Source: Howard R. Green Company using Synchro and HCS

Notes:

(1) The level of service reported for unsignalized intersections represents the worst movement level of service.

(2) Unsignalized intersection.

TABLE 3-7
Existing Segment Level of Service Summary

*Grand Forks - East Grand Forks Central Business District
 Traffic Circulation Study*

Year 2001

SEGMENT	AM PEAK HOUR		NOON PEAK HOUR		PM PEAK HOUR	
	LOS	(mph)	LOS	(mph)	LOS	(mph)
5th Street (Bruce Street to 5th Avenue N)	D	12.9	C	13	D	12.9
DeMers Avenue (6th Street to 4th Avenue - EGF)	C	13.4	C	13.2	D	12.3

Source: Howard R. Green Company using Synchro

TABLE 3-8

Year 2001 Impacts of Left Turn Phasing on DeMers Avenue

Level of Service by Intersection

Year 2001 PM Peak Hour

Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study

A - Denotes a decrease in LOS

A -Denotes an increase in LOS

No Left Turn Phasing on DeMers Avenue

Location	Minor Street						DeMers Avenue						Intersection LOS
	North Approach			South Approach			East Approach			West Approach			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
DeMers Avenue / 5th Street	B	B	A	B	B	A	B	B	A	B	B	B	B
DeMers Avenue / 4th Street	C	C	C	C	C	C	A	A	A	A	A	A	A
DeMers Avenue / 3rd Street	C	C	C	C	B	B	A	A	A	A	A	A	A

With Left Turn Phasing on DeMers Avenue

Location	Minor Street						DeMers Avenue						Intersection LOS
	North Approach			South Approach			East Approach			West Approach			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
DeMers Avenue / 5th Street	C	C	B	B	B	A	A	B	A	A	A	A	B
DeMers Avenue / 4th Street	C	C	C	C	C	C	A	A	A	A	A	A	A
DeMers Avenue / 3rd Street	C	C	C	C	B	B	A	A	A	A	A	A	A

TABLE 3-9

Year 2025 Impacts of Left Turn Phasing on DeMers Avenue

Level of Service by Intersection

Year 2025 PM Peak Hour

Grand Forks - East Grand Forks Central Business District

Traffic Circulation Study

A - Denotes a decrease in LOS
A - Denotes an increase in LOS

No Left Turn Phasing on DeMers Avenue

Location	Minor Street						DeMers Avenue						Intersection LOS
	North Approach			South Approach			East Approach			West Approach			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
DeMers Avenue / 5th Street	B	B	A	B	B	A	B	B	A	B	B	B	B
DeMers Avenue / 4th Street	C	B	B	C	C	C	A	A	A	A	A	A	A
DeMers Avenue / 3rd Street	C	B	B	C	B	B	A	A	A	A	A	A	A

With Left Turn Phasing on DeMers Avenue

Location	Minor Street						DeMers Avenue						Intersection LOS
	North Approach			South Approach			East Approach			West Approach			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
DeMers Avenue / 5th Street	C	C	B	C	B	A	A	B	A	A	A	A	B
DeMers Avenue / 4th Street	C	B	B	C	C	C	A	A	A	A	A	A	A
DeMers Avenue / 3rd Street	C	B	B	C	B	B	A	A	A	A	A	A	A

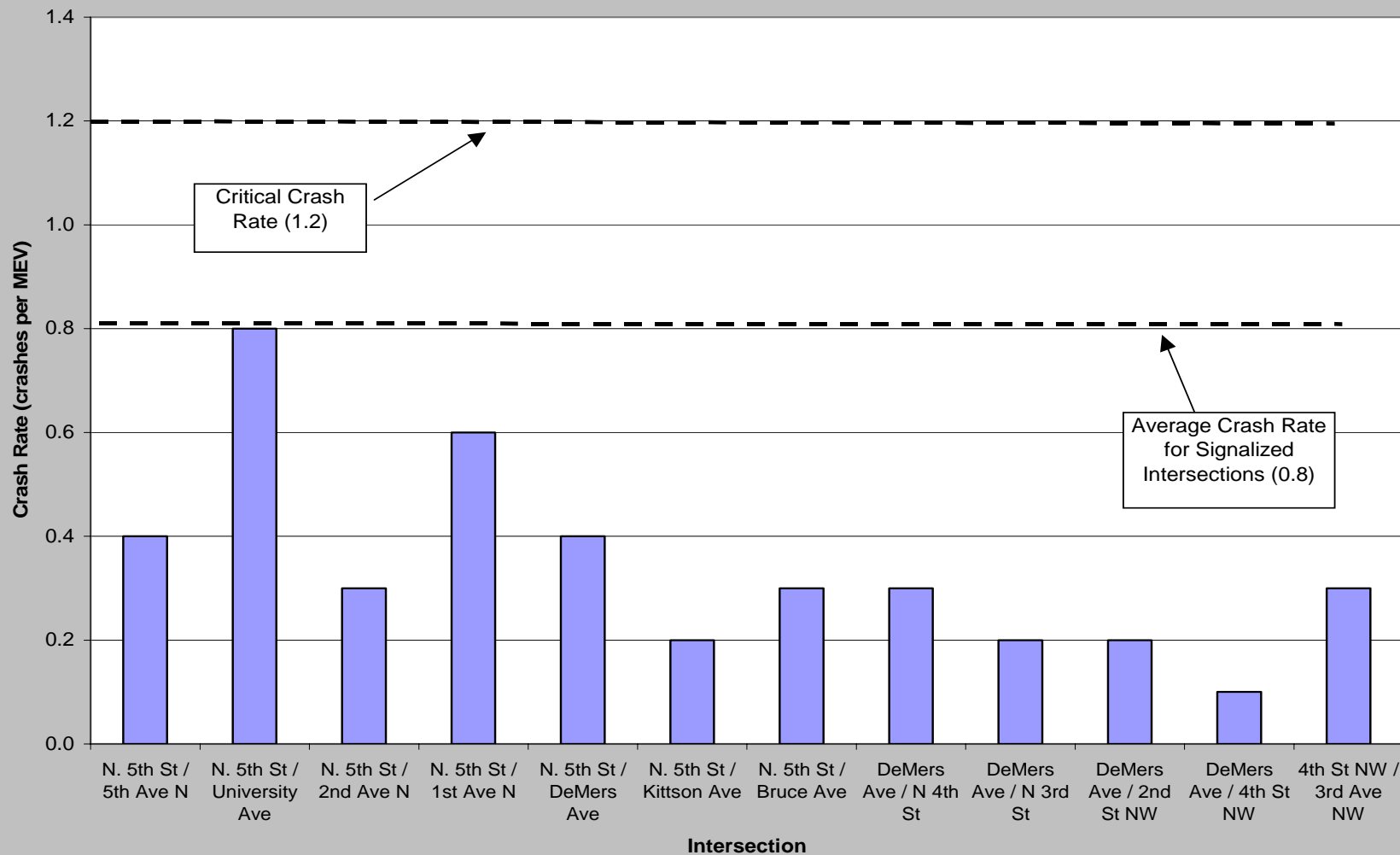


Figure 3-5
Crash Rates for Signalized
Intersections

*Grand Forks - East Grand Forks CBD
 Traffic Circulation Study*

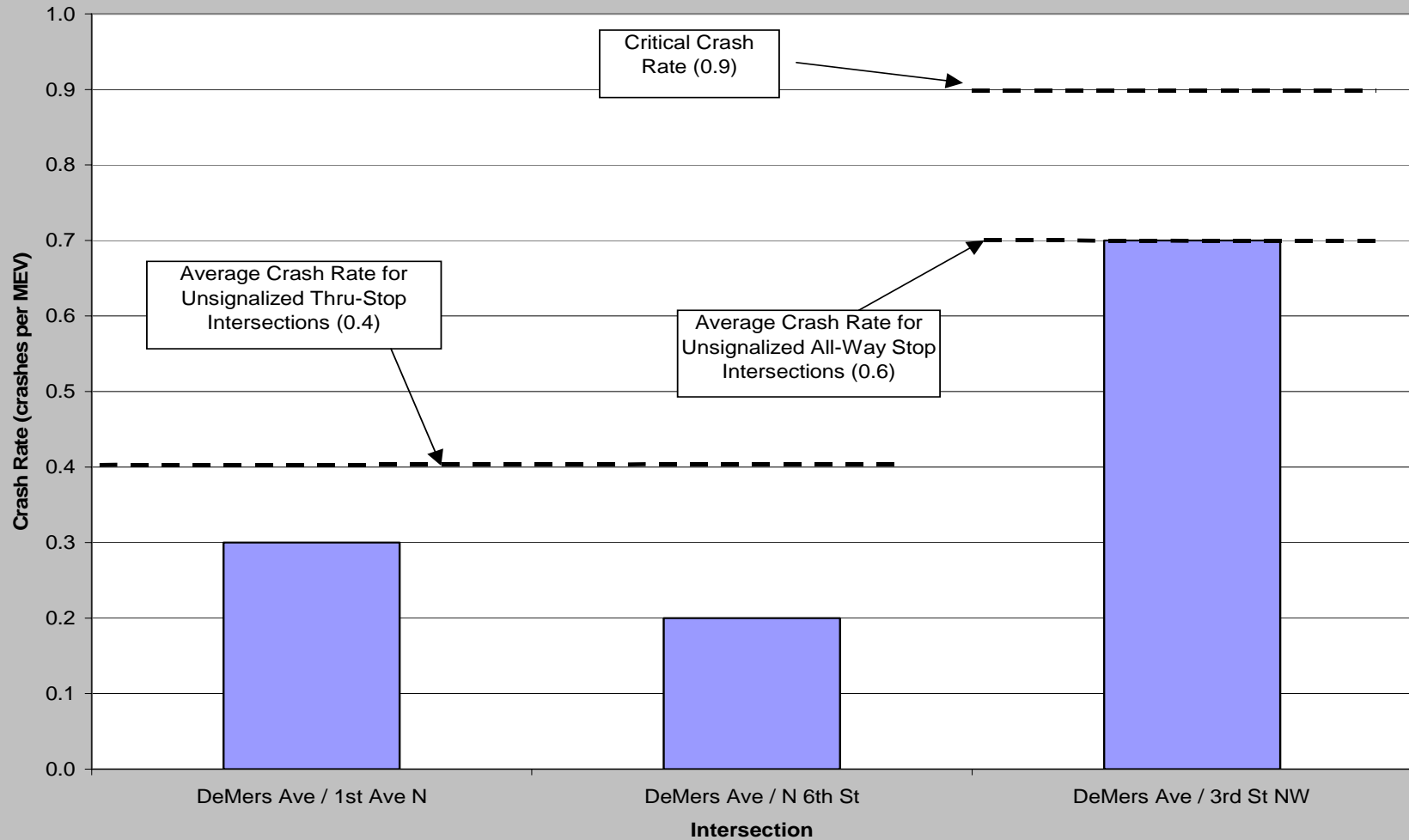


Figure 3-6
Crash Rates for Unsignalized
Intersections

*Grand Forks - East Grand Forks CBD
 Traffic Circulation Study*

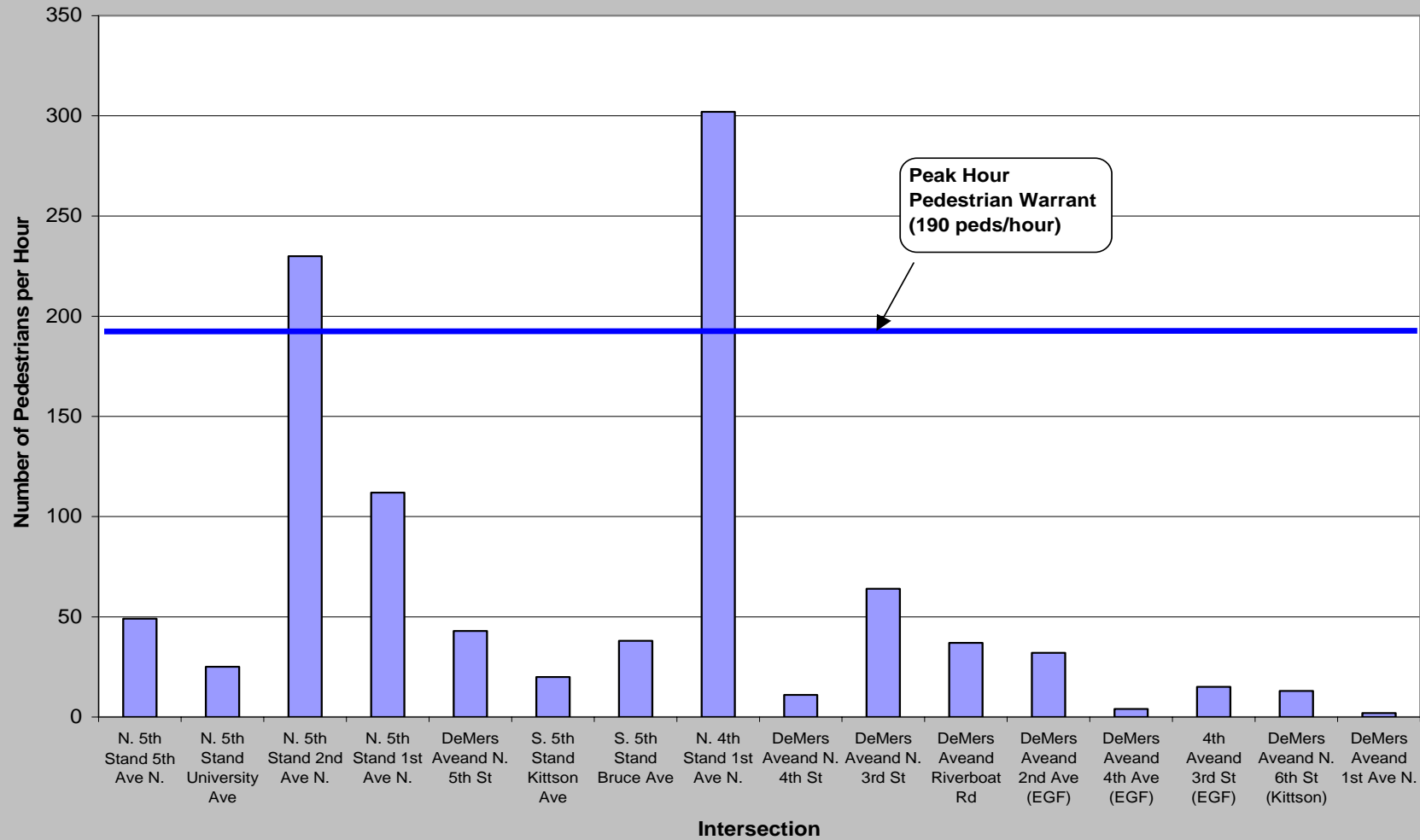


FIGURE 3-7
Existing Pedestrian Volumes

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

TABLE 3-10
Pedestrian Gap Study

Grand Forks - East Grand Forks Central Business District
 Traffic Circulation Study

Location: DeMers Avenue at West End of Sorlie Bridge

Vehicle Gap (seconds)	Number of Vehicle Gaps		
	Noon Peak Hour	PM Peak Hour	
>10 sec.	33	27	Gaps 10 seconds or greater are considered adequate
10 sec.	12	21	
9 sec.	6	12	
8 sec.	18	6	
7 sec.	33	15	
6 sec.	30	15	
5 sec.	36	39	
4 sec.	75	54	
3 sec.	132	129	
2 sec.	174	243	
1 sec.	201	291	Less than 60 adequate gaps per hour is considered deficient
0 sec.	138	252	
Total Gaps per Hour	888	1104	
Total Adequate Gaps per Hour (10 sec.)	45	48	
<i>Min. Gaps (Guidance)</i>	<i>60</i>	<i>60</i>	

Location: DeMers Avenue at Cabela's Crossing (EGF)

Vehicle Gap (seconds)	Number of Vehicle Gaps		
	Noon Peak Hour	PM Peak Hour	
>10 sec.	54	42	Gaps 10 seconds or greater are considered adequate
10 sec.	9	18	
9 sec.	15	9	
8 sec.	24	21	
7 sec.	27	12	
6 sec.	18	33	
5 sec.	33	27	
4 sec.	36	48	
3 sec.	75	93	
2 sec.	189	132	
1 sec.	168	177	Less than 60 adequate gaps per hour is considered deficient
0 sec.	138	186	
Total Gaps per Hour	786	798	
Total Adequate Gaps per Hour (10 sec.)	63	60	
<i>Min. Gaps (Guidance)</i>	<i>60</i>	<i>60</i>	

4.0 FORECAST YEAR 2025

The consideration of future traffic operations in the Grand Forks – East Grand Forks CBD area is a critical element in the overall analysis of this area. As a result, forecasts of expected future traffic volumes were prepared. This section describes the process that was used to prepare the forecasts of the turning movement volumes at the key intersections and the analysis results using these volumes with the existing roadway geometry and intersection control.

4.1 Forecast 2025 Traffic Volumes

Year 2025 forecast ADT volumes for the CBD area were provided by the Grand Forks – East Grand Forks MPO. Comparison of the existing ADT volumes to the forecast volumes indicates that a 1.0 percent per year growth in traffic volumes is expected to occur. This growth rate was then applied to the existing turning movement volumes to develop Year 2025 forecast turning movement volumes. **Tables 4-1 through 4-3** show the forecast Year 2025 turning movement volumes for the AM peak, Noon peak, and PM peak hours.

4.2 Forecast 2025 Capacity Analysis

Using the forecast turning movement volumes combined with the existing lane geometry and intersection control, the forecast intersection level of service for each of the peak hours was determined and is shown in **Table 4-4**. Each of the signalized intersections within the CBD is expected to operate at or below capacity during the AM peak, Noon peak, and PM peak hours. However, at the unsignalized intersections, the left turn movement from the minor street onto the major street is expected to operate at a LOS D or greater (This movement LOS is shown as the intersection LOS in **Table 4-4**). Typical mitigative strategies to address long minor street delays could involve installing a traffic signal at the intersection or prohibiting some of the minor street movements as part of a comprehensive access management plan for the corridor. However, based on the forecast volumes at these unsignalized intersections, installation of a traffic signal is not expected to be warranted, but the City should monitor these intersections in case future traffic patterns change.

Again, similar to the existing conditions, due to the high density of signalized intersections in a small area, combined with “isolated” signals (i.e. not interconnected), the roadway system as a whole is expected to experience capacity deficiencies.

With the expected increase in traffic volumes, speeds along each of the roadways (North 5th Street and DeMers Avenue) are also expected to further decrease below the desired threshold if the signals are not interconnected. **Table 4-5** shows the forecast Year 2025 speeds and corresponding level of service for each time period.

TABLE 4-1

Year 2025 AM Peak Hour Turning Movement Volumes ⁽¹⁾

**Grand Forks - East Grand Forks Central Business District
Traffic Study**

A growth rate of 1.00% per year was used to develop forecast volumes.

Location	Time Period	West Approach			East Approach			South Approach			North Approach		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
N 5th St / 5th Ave N	2001	19	16	13	5	8	6	10	161	3	3	234	25
	2025	24	20	17	6	10	8	13	204	4	4	297	32
N 5th St / University Ave	2001	19	111	57	14	116	31	58	135	27	31	202	50
	2025	24	141	72	18	147	39	74	171	34	39	256	63
N 5th St / 2nd Ave N	2001	13	3	29	0	0	0	27	195	1	0	214	52
	2025	17	4	37	0	0	0	34	248	1	0	272	66
N 5th St / 1st Ave N	2001	22	91	31	7	40	41	29	146	33	22	161	31
	2025	28	116	39	9	51	52	37	185	42	28	204	39
N 5th St / Demers Ave	2001	42	326	48	23	295	14	24	207	26	17	122	26
	2025	53	414	61	29	375	18	30	263	33	22	155	33
S 5th St / Kittson Ave	2001	1	77	52	7	17	16	13	292	4	29	184	1
	2025	1	98	66	9	22	20	17	371	5	37	234	1
S 5th St / Bruce Ave	2001	115	90	31	2	10	5	11	185	10	16	171	3
	2025	146	114	39	3	13	6	14	235	13	20	217	4
N 4th St / 1st Ave N	2001	66	38	36	3	15	0	13	59	4	16	117	84
	2025	84	48	46	4	19	0	17	75	5	20	149	107
Demers Ave / 1st Ave N	2001	200	537	4	0	357	3	1	0	0	0	0	60
	2025	254	682	5	0	453	4	1	0	0	0	0	76
Demers Ave / N 6th St (Kittson)	2001	24	412	79	3	324	15	19	1	1	5	11	13
	2025	30	523	100	4	411	19	24	1	1	6	14	17
Demers Ave / N 4th St	2001	17	302	53	14	242	12	75	89	14	13	112	44
	2025	22	383	67	18	307	15	95	113	18	17	142	56
Demers Ave / N 3rd St	2001	19	323	15	25	315	56	10	43	42	33	21	16
	2025	24	410	19	32	400	71	13	55	53	42	27	20
Demers Ave / Riverboat Rd	2001	10	296	0	0	311	5	0	0	0	11	0	41
	2025	0	0	0	0	0	0	0	0	0	0	0	0
Demers Ave / River Street Rd (EGF)	2001	11	296	61	1	311	30	30	6	4	0	0	42
	2025	14	376	77	1	395	38	38	8	5	0	0	53
Demers Ave / 2nd St (EGF)	2001	4	300	5	2	284	5	27	1	2	2	1	5
	2025	5	381	6	3	361	6	34	1	3	3	1	6
Demers Ave / 3rd St (EGF)	2001	12	166	36	10	177	3	42	6	8	0	6	1
	2025	15	211	46	13	225	4	53	8	10	0	8	1
Demers Ave / 4th St (EGF)	2001	19	122	54	4	95	6	56	106	11	9	146	56
	2025	24	155	69	5	121	8	71	135	14	11	185	71
4th St / 3rd Ave (EGF)	2001	9	9	8	4	30	16	27	166	2	8	169	21
	2025	11	11	10	5	38	20	34	211	3	10	215	27

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

TABLE 4-2
Year 2025 Midday Peak Hour Turning Movement Volumes ⁽¹⁾
Grand Forks - East Grand Forks Central Business District
Traffic Study

A growth rate of 1.00% per year was used to develop forecast volumes.

Location	Time Period	West Approach			East Approach			South Approach			North Approach		
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
N 5th St / 5th Ave N	2001	14	19	8	1	7	4	7	182	5	2	168	18
	2025	18	24	10	1	9	5	9	231	6	3	213	23
N 5th St / University Ave	2001	23	115	74	15	129	29	51	129	33	24	156	29
	2025	29	146	94	19	164	37	65	164	42	30	198	37
N 5th St / 2nd Ave N	2001	17	0	35	0	0	0	28	211	0	0	214	11
	2025	22	0	44	0	0	0	36	268	0	0	272	14
N 5th St / 1st Ave N	2001	23	64	25	20	71	20	8	179	28	23	192	24
	2025	29	81	32	25	90	25	10	227	36	29	244	30
N 5th St / Demers Ave	2001	46	369	33	24	366	46	77	128	29	73	169	42
	2025	58	469	42	30	465	58	98	163	37	93	215	53
S 5th St / Kittson Ave	2001	4	39	56	9	11	24	7	188	5	37	168	3
	2025	5	50	71	11	14	30	9	239	6	47	213	4
S 5th St / Bruce Ave	2001	91	54	19	11	34	22	14	106	6	30	157	9
	2025	116	69	24	14	43	28	18	135	8	38	199	11
N 4th St / 1st Ave N	2001	40	66	32	7	46	8	15	71	16	14	102	39
	2025	51	84	41	9	58	10	19	90	20	18	130	50
Demers Ave / 1st Ave N	2001	87	568	6	2	553	2	1	0	8	4	0	103
	2025	110	721	8	3	702	3	1	0	10	5	0	131
Demers Ave / N 6th St (Kittson)	2001	22	480	74	0	507	34	18	6	4	8	12	8
	2025	28	609	94	0	644	43	23	8	5	10	15	10
Demers Ave / N 4th St	2001	32	362	54	13	317	17	89	69	28	17	69	45
	2025	41	460	69	17	403	22	113	88	36	22	88	57
Demers Ave / N 3rd St	2001	29	421	21	54	403	54	21	43	44	46	26	31
	2025	37	535	27	69	512	69	27	55	56	58	33	39
Demers Ave / Riverboat Rd	2001	70	340	0	0	399	12	0	0	0	5	0	59
	2025	0	0	0	0	0	0	0	0	0	0	0	0
Demers Ave / River Street Rd (EGF)	2001	61	400	46	1	435	11	9	0	0	4	1	62
	2025	77	508	58	1	552	14	11	0	0	5	1	79
Demers Ave / 2nd St (EGF)	2001	36	346	21	12	399	6	42	6	7	6	4	36
	2025	46	439	27	15	507	8	53	8	9	8	5	46
Demers Ave / 3rd St (EGF)	2001	17	237	35	12	220	14	51	8	20	10	11	40
	2025	22	301	44	15	279	18	65	10	25	13	14	51
Demers Ave / 4th St (EGF)	2001	48	167	51	14	141	10	87	92	7	20	100	49
	2025	61	212	65	18	179	13	110	117	9	25	127	62
4th St / 3rd Ave (EGF)	2001	7	23	17	2	19	6	42	137	4	18	117	21
	2025	9	29	22	3	24	8	53	174	5	23	149	27

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

TABLE 4-3

Year 2025 PM Peak Hour Turning Movement Volumes ⁽¹⁾

*Grand Forks - East Grand Forks Central Business District
Traffic Study*

A growth rate of 1.00% per year was used to develop forecast volumes.

Location	Time Period	West Approach			East Approach			South Approach			North Approach			
		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
N 5th St / 5th Ave N	2001	9	10	10	8	9	2	8	156	7	3	202	19	
	2025	11	13	13	10	11	3	10	198	9	4	256	24	
N 5th St / University Ave	2001	22	96	69	20	123	38	81	159	18	14	154	47	
	2025	28	122	88	25	156	48	103	202	23	18	196	60	
N 5th St / 2nd Ave N	2001	29	0	40	1	0	0	26	221	0	0	245	19	
	2025	37	0	51	1	0	0	33	281	0	0	311	24	
N 5th St / 1st Ave N	2001	46	51	38	33	77	36	14	117	12	37	202	27	
	2025	58	65	48	42	98	46	18	149	15	47	256	34	
N 5th St / Demers Ave	2001	19	447	24	45	455	36	73	132	40	43	224	29	
	2025	24	568	30	57	578	46	93	168	51	55	284	37	
S 5th St / Kittson Ave	2001	4	22	29	10	18	14	7	168	9	#	22	216	1
	2025	5	28	37	13	23	18	9	213	11	28	274	1	
S 5th St / Bruce Ave	2001	61	27	15	25	65	28	14	97	4	21	153	11	
	2025	77	34	19	32	83	36	18	123	5	27	194	14	
N 4th St / 1st Ave N	2001	55	46	48	6	30	18	14	59	17	13	95	52	
	2025	70	58	61	8	38	23	18	75	22	17	121	66	
Demers Ave / 1st Ave N	2001	66	419	5	1	426	5	7	1	0	1	0	78	
	2025	84	532	6	1	541	6	9	1	0	1	0	99	
Demers Ave / N 6th St (Kittson)	2001	23	510	60	5	529	22	31	6	1	11	15	30	
	2025	29	648	76	6	672	28	39	8	1	14	19	38	
Demers Ave / N 4th St	2001	57	423	43	9	389	14	81	61	13	21	19	28	
	2025	72	537	55	11	494	18	103	77	17	27	24	36	
Demers Ave / N 3rd St	2001	32	440	23	33	382	56	35	44	35	63	33	20	
	2025	41	559	29	42	485	71	44	56	44	80	42	25	
Demers Ave / Riverboat Rd	2001	55	336	0	0	302	9	0	0	0	1	0	33	
	2025	0	0	0	0	0	0	0	0	0	0	0	0	
Demers Ave / River Street Rd (EGF)	2001	54	410	62	7	400	10	12	0	3	1	1	31	
	2025	69	521	79	9	508	13	15	0	4	1	1	39	
Demers Ave / 2nd St (EGF)	2001	14	374	22	9	342	8	44	4	7	6	4	26	
	2025	18	475	28	11	434	10	56	5	9	8	5	33	
Demers Ave / 3rd St (EGF)	2001	9	293	47	5	243	12	56	5	32	12	12	14	
	2025	11	372	60	6	309	15	71	6	41	15	15	18	
Demers Ave / 4th St (EGF)	2001	75	170	77	11	130	14	101	103	10	13	139	54	
	2025	95	216	98	14	165	18	128	131	13	17	176	69	
4th St / 3rd Ave (EGF)	2001	12	31	19	2	34	17	45	157	3	18	162	31	
	2025	15	39	24	3	43	22	57	199	4	23	206	39	

Notes:

(1) Volumes were field collected by GF-EGF MPO in May, 2001

TABLE 4-4
Intersection Level of Service Summary

Years 2001 and 2025

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

INTERSECTION	LEVEL OF SERVICE ⁽¹⁾					
	AM PEAK HOUR		NOON PEAK HOUR		PM PEAK HOUR	
	2001	2025	2001	2025	2001	2025
North 5th Street / 5th Avenue North	A	B	A	B	A	B
North 5th Street / University Avenue	A	B	A	B	A	B
North 5th Street / 2nd Avenue North	A	A	A	A	A	A
North 5th Street / 1st Avenue North	A	A	A	A	A	A
DeMers Avenue / North 5th Street	A	A	A	A	A	A
South 5th Street / Kittson Avenue	A	A	A	A	A	A
South 5th Street / Bruce Avenue	A	B	A	A	A	B
North 4th Street / 1st Avenue North	A	A	A	A	A	A
DeMers Avenue / North 4th Street	B	B	B	B	B	B
DeMers Avenue / North 3rd Street	B	B	B	B	B	B
DeMers Avenue / Riverboat Road	B	B	B	B	B	B
DeMers Avenue / 2nd Street (EGF)	B	B	B	B	B	B
DeMers Avenue / 4th Street (EGF)	A	A	A	A	A	A
4th Street / 3rd Avenue (EGF)	A	A	A	A	A	A
DeMers Avenue / North 6th Street (Kittson) ⁽²⁾	C	D	C	E	C	F
DeMers Avenue / 1st Avenue North ⁽²⁾	B	E	A	E	B	C

Source: Howard R. Green Company using Synchro and HCS

Notes:

(1) The level of service reported for unsignalized intersections represents the worst movement level of service.

(2) Unsignalized intersection.

TABLE 4-5
Year 2025 Segment Level of Service Summary

*Grand Forks - East Grand Forks Central Business District
 Traffic Circulation Study*

Year 2001

SEGMENT	AM PEAK HOUR		NOON PEAK HOUR		PM PEAK HOUR	
	LOS	(mph)	LOS	(mph)	LOS	(mph)
5th Street (Bruce Street to 5th Avenue N)	D	12.9	C	13	D	12.9
DeMers Avenue (6th Street to 4th Avenue - EGF)	C	13.4	C	13.2	D	12.3

Year 2025

SEGMENT	AM PEAK HOUR		NOON PEAK HOUR		PM PEAK HOUR	
	LOS	(mph)	LOS	(mph)	LOS	(mph)
5th Street (Bruce Street to 5th Avenue N)	D	12.7	D	12.9	D	12.7
DeMers Avenue (6th Street to 4th Avenue - EGF)	C	13.2	D	12.8	D	12.2

Source: Howard R. Green Company using Synchro

5.0 ALTERNATIVES ANALYSIS

The results of the traffic operations, safety analysis, and pedestrian issues review for the Grand Forks – East Grand Forks CBD area identified a number of current and future roadway deficiencies. As a result, a variety of alternative mitigative strategies were developed and evaluated based on their ability to address a specific deficiency and the estimated implementation cost.

5.1 Alternatives

Through coordination with the Grand Forks – East Grand Forks MPO, eight different alternative strategies were developed and evaluated. These alternatives focused on improving traffic flow through the Grand Forks - East Grand Forks CBD area. **Table 5-1** provides a matrix of the alternatives examined. **Figure 5-1** shows the potential removal of signals that do not currently meet signal warrants and **Figure 5-2** provides a graphical representation of the potential alternative traffic concepts at each impacted intersection that were examined.

5.2 Year 2001 Traffic Operations

The existing AM peak, Noon peak, and PM peak hour turning movement volumes were used to determine the impacts or improvements associated with each of the different alternative strategies, which were also compared to the existing conditions.

Tables 5-1 through 5-3 show the intersection level of service for each of the alternatives analyzed during the three peak hour time periods. Because the individual intersections are currently operating at acceptable levels, the alternatives evaluated did not have a significant impact on the operations of the intersections. Therefore, all intersections included in the study are expected to operate below capacity during peak hours for each alternative.

Figures 5-3 through 5-5 show the North 5th Street and DeMers Avenue arterial speeds for each analyzed alternative during each peak time period. By interconnecting the existing signals, speeds on each roadway can be increased by approximately three miles per hour. Speeds along North 5th Street remain relatively constant at approximately 15.5 mph after Alternative 4. Removing the signals not meeting warrants and removing the All-Way STOP at the DeMers Avenue / 3rd Street (EGF) intersection and replacing it with a traffic signal or thru-STOP condition is expected to allow traffic volumes to obtain the greatest speed of approximately 17 mph on DeMers Avenue.

5.3 Year 2025 Traffic Operations

The forecast Year 2025 AM peak, Noon peak, and PM peak hour turning movement volumes were also used to determine the impacts or improvements associated with each of the different alternative strategies.

Tables 5-4 through 5-6 show the intersection level of service for each of the alternatives analyzed during the three peak hour time periods. Again, all signalized intersections are expected to operate at acceptable levels during the peak hours for each analyzed alternative. However, at several of the unsignalized intersections, an individual movement from the minor street is expected to operate at a deficient level and that movement level of service is reported in the tables. As stated previously, installation of a traffic signal is not expected to be warranted based on the forecast volumes at these unsignalized intersections. However, the City should monitor these intersections in case future traffic patterns change.

Figures 5-6 through 5-8 show the North 5th Street and DeMers Avenue arterial speeds for each analyzed alternative during each peak time period. With the addition of future traffic, the speeds for each alternative are lower than the speeds determined in the 2000 traffic operations analysis (Section 5.2). However, the same conclusions apply:

- By interconnecting the existing signals, speeds on each roadway can be increased by approximately three miles per hour; and,
- Removing the signals not meeting warrants and removing the All-Way STOP at the DeMers Avenue / 3rd Street (EGF) intersection and replacing it with a traffic signal or thru-STOP condition is expected to provide the greatest travel speed on DeMers Avenue (approximately 17 mph).

5.4 Evaluation of Mitigation Alternatives

Based on the results of analyzing each of the different alternatives listed above, there are three key changes that could be made to significantly improve traffic flow through the Grand Forks – East Grand Forks CBD area.

1. Removal of All-Way STOP Control

The All-Way STOP at the DeMers Avenue / 3rd Street (EGF) intersection is inconsistent with the current system of signalized or thru-STOP intersections along the arterials of the CBD. The All-Way stop breaks apart any progression that may be formed with existing or future signal timing through East Grand Forks. **Figure 5-9** shows the signals that would be interconnected if the All-Way STOP were replaced with a traffic signal or a thru-STOP condition.

In addition, this intersection has one of the highest crash rates for all of the intersections included in the study, which is unusual for All-Way STOP intersections.

2. Interconnection of Traffic Signals

Due to the high density of traffic signals in the GF – EGF CBD area, an effective method to improve traffic flow is to interconnect the signals. Interconnection refers to signals that are connected to each other by means of a communication system, that have identical cycle lengths, and that work together to provide smooth progression of vehicles through the system. Interconnecting the signals

along North 5th Street and along DeMers Avenue is expected to increase speeds by approximately three miles per hour. **Figure 5-9** shows the signals that would be interconnected if no other changes were made to the existing signal locations.

As stated above, the DeMers Avenue / 3rd Street (EGF) intersection is currently controlled by an All-Way STOP condition. Because of this intersection control condition, the two signals on DeMers Avenue in East Grand Forks would not be able to accommodate the progression of vehicles through the system. Therefore, only the three signals on DeMers Avenue in Grand Forks should be interconnected. This means that there would be no communication between signal systems in each city and that the two signals on DeMers Avenue in East Grand Forks would still operate as isolated intersections.

Currently, the City of Grand Forks utilizes 170 Signal Controllers to operate their signals and the City of East Grand Forks utilizes NEMA Signal Controllers. Because the two cities utilize different types of signal controllers, difficulties would occur in trying to interconnect these systems. As of today, there is only one known on-street master controller that will work with both 170 and NEMA Signal Controllers, manufactured by Multi-Sonics and is available from Traffic & Transportation Products, Ltd. According to the distributor, there are some limitations to these controllers, including:

1. Requires custom installation of OSAM software into on-street master;
2. Is only compatible with Multi-Sonics NEMA 820 controllers;
3. Limited number of NEMA's can be run (won't be a problem with EGF's limited number); and,
4. System would require further modification if wireless interconnect is installed.

Based on this information, the controllers in East Grand Forks would need to be replaced with the NEMA 820 controllers. Through discussions with the City, the entire premise of using a master controller for the 170 and NEMA controllers was that the controllers in EGF would not have to be replaced.

From a system compatibility and maintenance perspective, the signal systems within the Cities of Grand Forks and East Grand Forks would then become somewhat of an anomaly with some intersections using 170 controllers, some using NEMA controllers, and some using Multi-Sonics NEMA controllers. With an interconnected system, there are always adjustments and maintenance to be performed, and thus using something that the local agencies are familiar with would be advantageous. Therefore, if the signals in EGF are to be included in the interconnected system, installation of 170 controllers at these signals is recommended.

3. Removal of Unwarranted Signals

The removal of unwarranted signals is beneficial for several reasons:

- Reduced maintenance / power costs
- Decrease in total vehicle delay and fuel consumption
- Higher system speed (mobility)
- Eliminates need for future upgrades
- Increase in funds available for other high priority needs

Since there are variations of signal types, the actual operation and maintenance costs for each individual signal varies. Typically, the cost for operating and maintaining a traffic signal is between \$15-20 per day, or approximately \$5,000-\$8,000 per year. This estimate does not include the hidden costs of vehicle delay and excess fuel consumption for the motorists. The cost to remove a signal is a one-time cost typically between \$5,000-\$10,000. **Figure 5-1** shows the potential removal of unwarranted intersections.

In order to remove a traffic signal in the States of North Dakota and Minnesota, the respective DOT's for each state require an engineering study and report recommending the removal. The ultimate decision for removal is made by the agency with jurisdiction over the roadway.

5.5 Removal of Point Bridge

Based on an Average Daily Traffic (ADT) volume comparison between different scenarios involving closure of the Point Bridge, a preliminary analysis was completed to determine the estimated impact on the Sorlie Bridge. The scenarios included (with ADT on Sorlie Bridge):

- Close Point Bridge – New Bridge at 17th Avenue S (ADT = 17,000)
- Close Point Bridge – New Bridge at 32nd Avenue S (ADT = 17,700)
- Close Point Bridge – No New Bridge (ADT = 21,000)

A traffic analysis was completed for the Point Bridge closure scenarios using the “optimum” signal configuration in the CBD (i.e. this would be the “best case” scenario for CBD traffic). The conclusion of the traffic study indicated that a new bridge at 17th Avenue S or 32nd Avenue S in favor of the Point Bridge would result in congestion levels that are expected in 2025 to occur immediately in the CBD. In general, each individual intersection would still have some amount of reserve capacity, however, the overall system performance would be noticeably impacted.

If the Point Street Bridge were closed and no new bridge were constructed, the estimated ADT on DeMers Avenue would be approximately 21,000 – which exceeds the capacity of a two-lane roadway. The “optimum” signal configuration would operate at congested levels under this volume scenario, as there would be queuing through adjacent signalized intersections. This would result in a lowered benefit of signal coordination, as well as creation of a “fatal flaw” with vehicles forced to turn through a queue of traffic. Such conditions would result in potential gridlock, as well as increased crashes as a result of queuing through intersections.

Based on the percentage growth at the Sorlie Bridge, an equivalent growth rate was analyzed at Bruce Avenue / 5th Street to determine if that intersection may meet signal warrants if the Point Bridge were closed. Based on these estimates, the signal at this location would still not satisfy MUTCD warrants, although it would be closer to meeting warrants prior to the closure. Prior to potential removal of the signal at Bruce Avenue / 5th Street, it is recommended that a study which estimates the diversion of traffic to 5th Street (versus 4th and 3rd Streets) be completed to more accurately answer this question. A travel-demand model would most likely provide a best estimate for the diversion of traffic.

**Table 5-1
Matrix of Alternatives**

Alternative ⁽¹⁾	Removal of Signals Not Meeting Warrants ⁽²⁾	Inclusion of Additional Signals	Total Number of Signals		Interconnect System		General
			North 5th Street	DeMers Avenue	North 5th Street	DeMers Avenue	
Alternative 1	none	none	7	5	5th Ave N to Bruce St	N 5th St to N 3rd St (EGF)	
Alternative 2	<u>4 Signals</u> : N 5th St/5th Ave N; N 5th St/Bruce Ave; DeMers Ave/2nd St (EGF); 4th St/3rd Ave (EGF)	none	5	GF - 3 EGF - 2	none	none	
Alternative 3	<u>4 Signals</u> : N 5th St/5th Ave N; N 5th St/Bruce Ave; DeMers Ave/2nd St (EGF); 4th St/3rd Ave (EGF)	none	5	GF - 3 EGF - 1	University Ave to Kittson Ave	N 5th St to N 3rd St (GF)	Alternative does not include interconnect system in EGF.
Alternative 4	<u>3 Signals</u> : N 5th St/Bruce Ave; DeMers Ave/2nd St (EGF); 4th St/3rd Ave (EGF)	none	6	GF - 3 EGF - 1	5th Ave N to Kittson Ave	N 5th St to N 3rd St (GF)	Alternative does not include interconnect system in EGF.
Alternative 5	<u>2 Signals</u> : N 5th St/Bruce Ave; 4th St/3rd Ave (EGF)	none	6	GF - 3 EGF - 2	5th Ave N to Kittson Ave	N 5th St to N 3rd St (GF)	Alternative does not include interconnect system in EGF.
Alternative 6	<u>2 Signals</u> : N 5th St/Bruce Ave; 4th St/3rd Ave (EGF)	DeMers Ave/3rd St (EGF)	6	GF - 3 EGF - 2/3 ⁽³⁾	5th Ave N to Kittson Ave	N 5th St to 4th St (EGF)	Alternative includes replacing All-Way STOP condition at DeMers Ave/3rd St (EGF) with a traffic signal or Thru-STOP.
Alternative 7	<u>2 Signals</u> : N 5th St/Bruce Ave; 4th St/3rd Ave (EGF)	DeMers Ave/3rd St (EGF) and DeMers Ave/River St (EGF)	6	GF - 3 EGF - 3/4 ⁽³⁾	5th Ave N to Kittson Ave	N 5th St to 4th St (EGF)	Alternative includes replacing All-Way STOP condition at DeMers Ave/3rd St (EGF) with a traffic signal or Thru-STOP.
Alternative 8	<u>3 Signals</u> : N 5th St/Bruce Ave; DeMers Ave/2nd St (EGF); 4th St/3rd Ave (EGF)	DeMers Ave/3rd St (EGF)	6	GF - 3 EGF - 1/2 ⁽³⁾	5th Ave N to Kittson Ave	N 5th St to 4th St (EGF)	Alternative includes replacing All-Way STOP condition at DeMers Ave/3rd St (EGF) with a traffic signal or Thru-STOP.

Notes:

(1) For all alternatives, the DeMers Avenue / Riverboat Road intersection was removed and not included in the analysis.

(2) Removed signals were replaced with Thru-STOP conditions

(3) The first number represents a thru-STOP condition at DeMers Ave/3rd St (EGF). The second number represents a signalized condition at this intersection.

Figure 5-1 Removal Unwarranted Signals (Chris)

Figure 5-2 Alternative Traffic Control Concepts

TABLE 5-2
AM Peak Hour Intersection Level of Service
Year 2001

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	A	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	A	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	A	A	A	A	A	A
DeMers Avenue / N 5th Street	Signal	A	B	A	B	B	B	B	B	B
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	A	B	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	B	B	B	B	B	B	B	B
DeMers Avenue / N 3rd Street	Signal	B	A	A	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	C	C	C	C	C	C	C	A ^(S)	C
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	C ^(U)	C ^(U)	C ^(U)	A	A	A	C ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	A	A	A	A	A	A	A ^(S)	A ^(S)	A
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	C	C	C	C	C	C	C	C	C
DeMers Avenue / 1st Avenue N	Thru-STOP	B	B	B	B	B	B	B	B	B

** For unsignalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.

TABLE 5-3
Noon Peak Hour Intersection Level of Service
Year 2001

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	A	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	A	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	B	B	B	B	B	B
DeMers Avenue / N 5th Street	Signal	A	B	A	B	B	B	B	B	B
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	A	B	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / N 3rd Street	Signal	B	A	A	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	C	C	C	C	C	C	C	A ^(S)	C
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	C ^(U)	C ^(U)	C ^(U)	A	A	A	C ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	A	A	A	A	A	A	A ^(S)	A ^(S)	A
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	C	C	C	C	C	C	C	C	C
DeMers Avenue / 1st Avenue N	Thru-STOP	A	A	A	A	A	A	A	A	A

** For unsignalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.

TABLE 5-4
PM Peak Hour Intersection Level of Service
Year 2001

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	A	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	A	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	B	B	B	B	B	B
DeMers Avenue / N 5th Street	Signal	A	B	A	B	B	B	B	B	B
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	A	B	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / N 3rd Street	Signal	B	A	A	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	C	C	C	C	C	C	C	A ^(S)	C
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	C ^(U)	C ^(U)	C ^(U)	A	A	A	C ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	A	A	A	A	A	A	A ^(S)	A ^(S)	A
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	C	C	C	C	C	C	C	C	C
DeMers Avenue / 1st Avenue N	Thru-STOP	B	B	B	B	B	B	B	B	B

** For unsignalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.

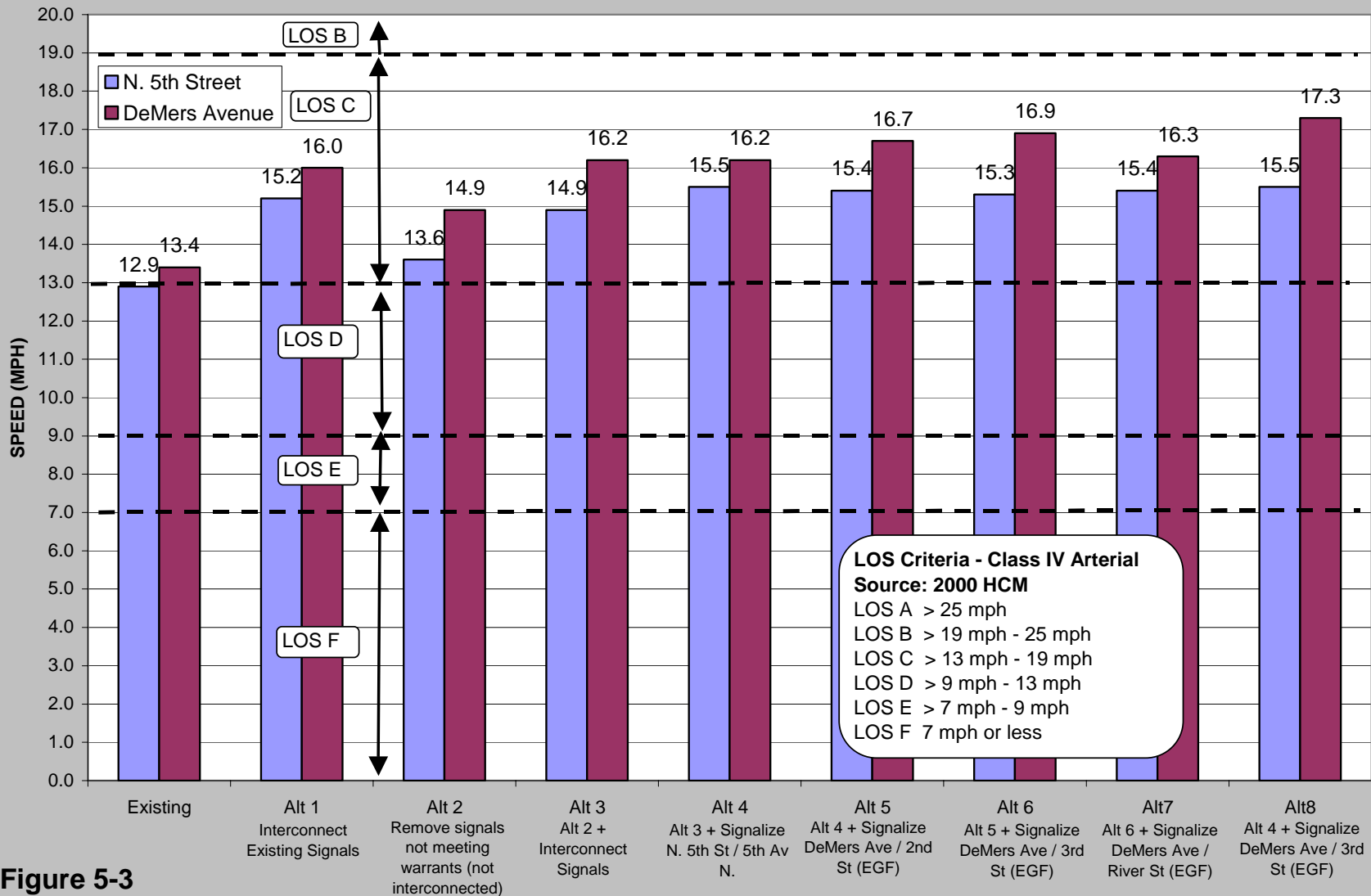


Figure 5-3
Year 2001 AM Peak Hour Travel
Speed Comparisons

SCENARIO

Grand Forks - East Grand Forks CBD
Traffic Circulation Study

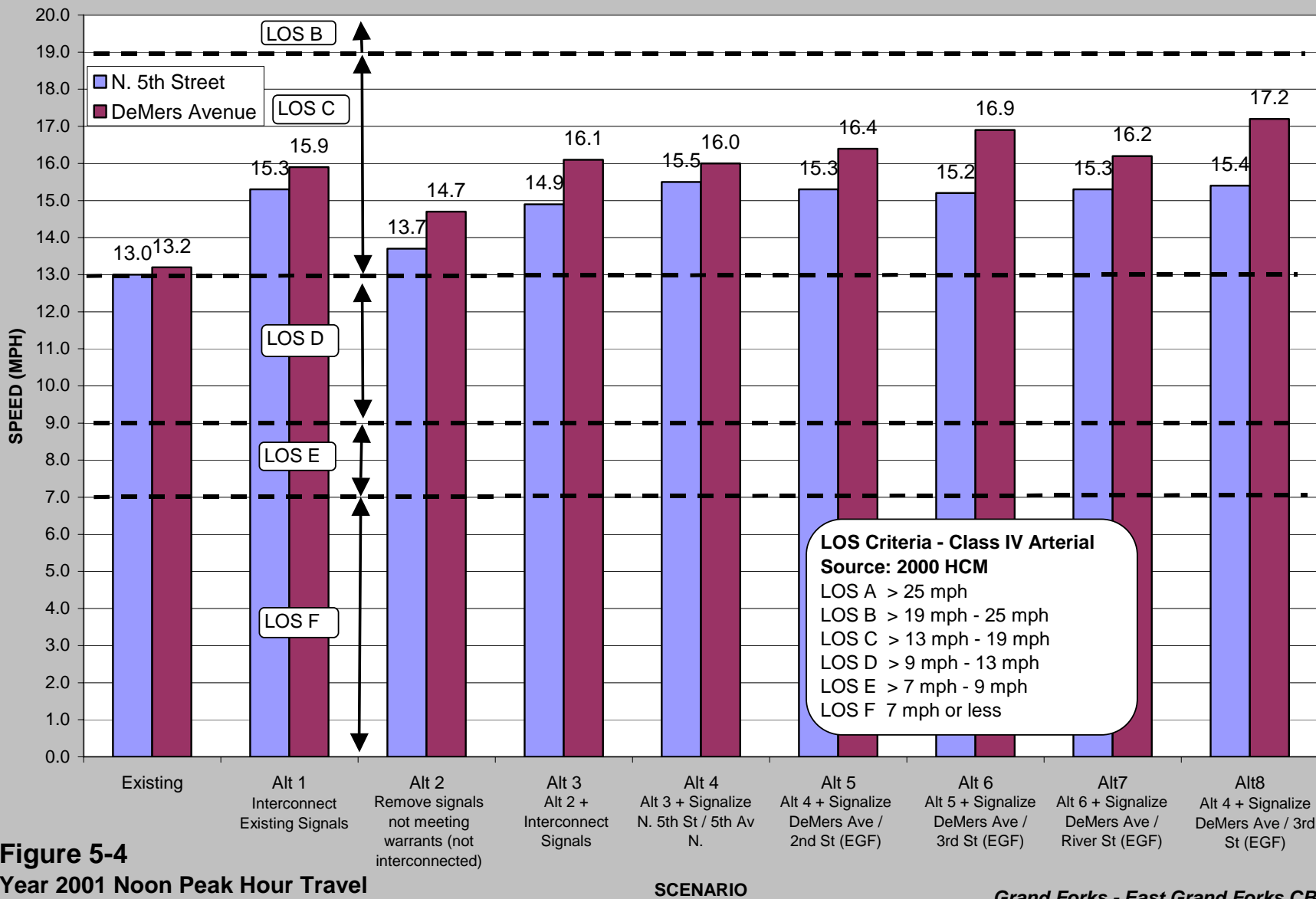


Figure 5-4
Year 2001 Noon Peak Hour Travel
Speed Comparisons

SCENARIO

Grand Forks - East Grand Forks CBD
Traffic Circulation Study

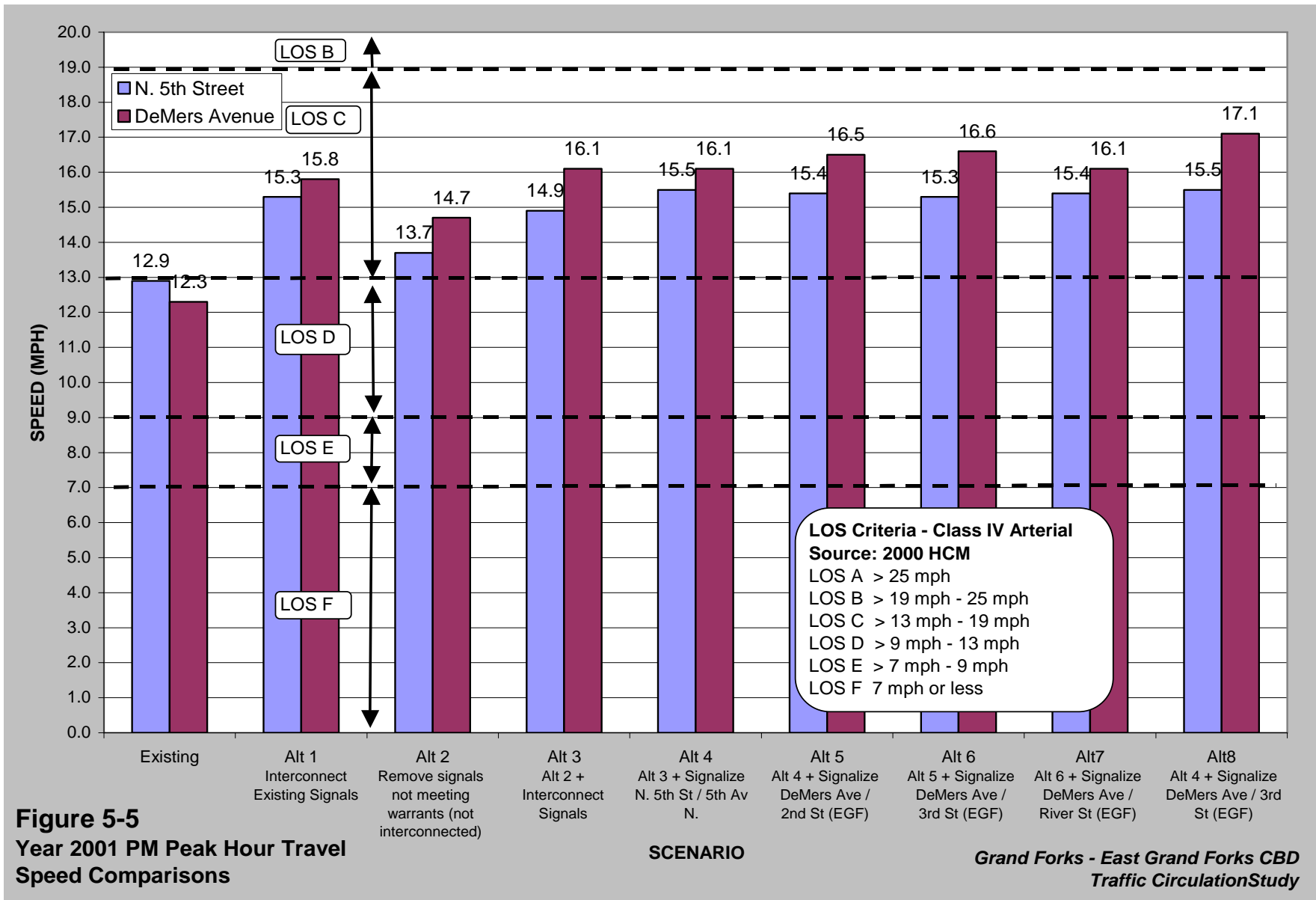


TABLE 5-5
AM Peak Hour Intersection Level of Service
Forecast Year 2025

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	B	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	B	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	A	A	A	A	A	A
DeMers Avenue / N 5th Street	Signal	A	B	A	B	B	B	B	B	B
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	B	B	E ^(U)	E ^(U)	E ^(U)	E ^(U)	E ^(U)	E ^(U)	E ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	B	B	B	B	B	B	B	B
DeMers Avenue / N 3rd Street	Signal	B	A	A	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	C	C	C	C	C	C	C	A ^(S)	C
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	C ^(U)	C ^(U)	C ^(U)	A	A	A	C ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	A	A	A	A	A	A	A ^(S)	A ^(S)	A ^(S)
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	D	D	D	D	D	D	D	D	D
DeMers Avenue / 1st Avenue N	Thru-STOP	E	E	E	E	E	E	E	E	E

** For signalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.

TABLE 5-6
Noon Peak Hour Intersection Level of Service
Forecast Year 2025

*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	B	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	B	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	B	B	B	B	B	B
DeMers Avenue / N 5th Street	Signal	A	B	A	A	A	A	B	B	A
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	A	B	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / N 3rd Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	F	F	F	F	F	F	F	A ^(S)	F
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	F ^(U)	F ^(U)	F ^(U)	A	A	A	F ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	B	B	B	B	B	B	A ^(S)	A ^(S)	A ^(S)
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)	B ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	E	E	E	E	E	E	E	E	E
DeMers Avenue / 1st Avenue N	Thru-STOP	E	E	E	E	E	E	E	E	E

** For unsignalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.

TABLE 5-7
PM Peak Hour Intersection Level of Service
Forecast Year 2025

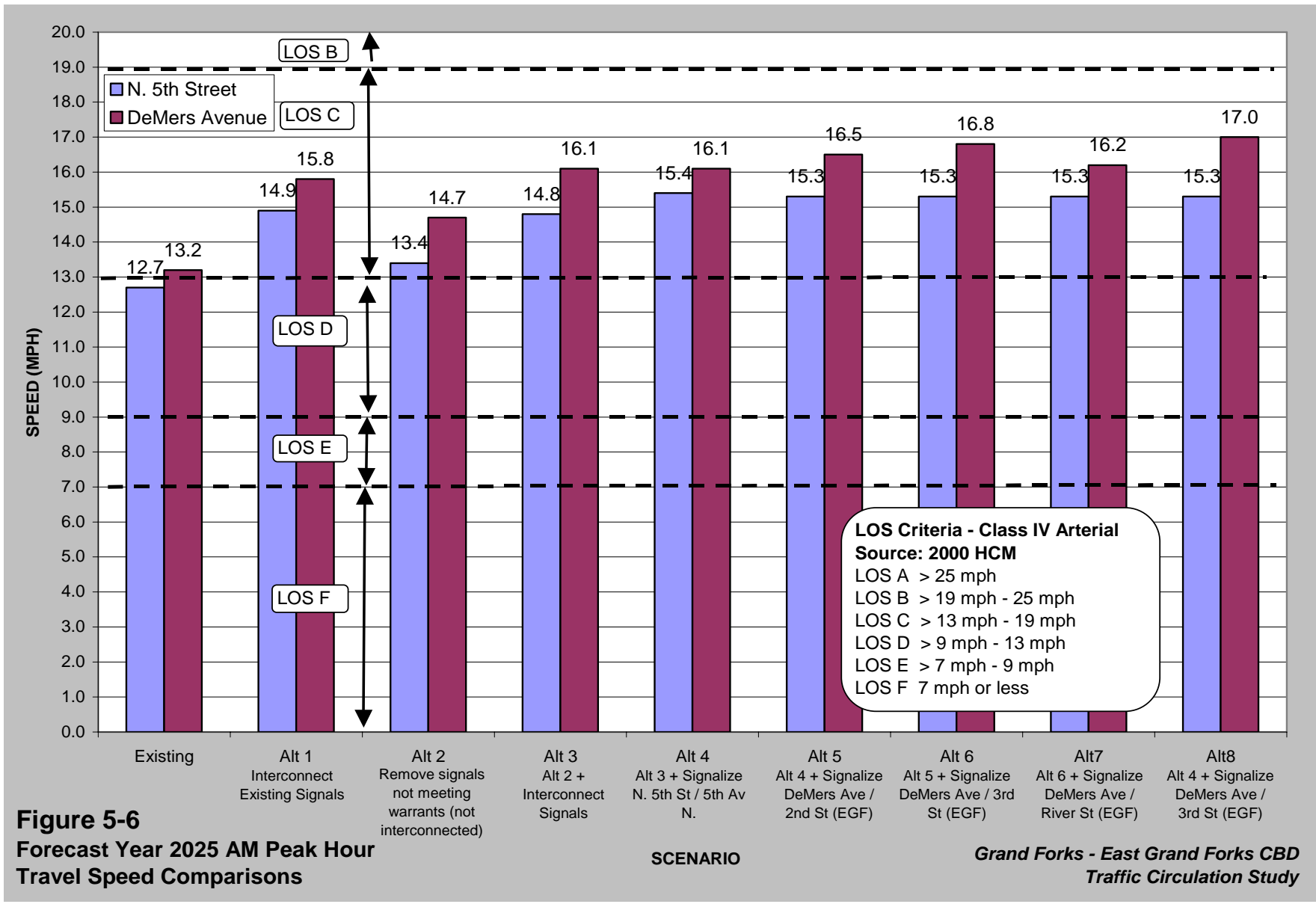
*Grand Forks - East Grand Forks Central Business District
Traffic Circulation Study*

Intersection	Existing Traffic Control	Level of Service								
		Existing	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8
N 5th Street / 5th Avenue N	Signal	B	A	B ^(U)	B ^(U)	A	A	A	A	A
N 5th Street / University Avenue	Signal	B	B	A	B	B	B	B	B	B
N 5th Street / 2nd Avenue N	Signal	A	A	A	A	A	A	A	A	A
N 5th Street / 1st Avenue N	Signal	A	B	A	B	B	B	B	B	B
DeMers Avenue / N 5th Street	Signal	A	B	A	B	B	B	B	B	B
S 5th Street / Kittson Avenue	Signal	A	A	A	A	A	A	A	A	A
S 5th Street / Bruce Avenue	Signal	B	B	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
N 4th Street / 1st Avenue N	Signal	A	A	A	A	B	B	B	B	B
DeMers Avenue / N 4th Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / N 3rd Street	Signal	B	A	B	A	A	A	A	A	A
DeMers Avenue / Riverboat Road	Signal	B	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
DeMers Avenue / River Street Road (EGF)	Thru-STOP	E	E	E	E	E	E	E	A ^(S)	E
DeMers Avenue / 2nd Street (EGF)	Signal	B	A	E ^(U)	E ^(U)	E ^(U)	A	A	A	E ^(U)
DeMers Avenue / 3rd Street (EGF)	All-Way Stop	C	C	C	C	C	C	A ^(S)	A ^(S)	A ^(S)
DeMers Avenue / 4th Street (EGF)	Signal	A	A	A	A	A	A	B	B	B
4th Street / 3rd Avenue (EGF)	Signal	A	A	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)	C ^(U)
DeMers Avenue / N 6th Street (Kittson)	Thru-STOP	F	F	F	F	F	F	F	F	F
DeMers Avenue / 1st Avenue N	Thru-STOP	C	C	C	C	C	C	C	C	C

** For unsignalized intersections, the level of service shown is for the worst movement not for the entire intersection.

(U) - Denotes existing intersection was signalized, but was analyzed as an unsignalized thru-STOP condition for the main street.

(S) - Denotes existing intersection was unsignalized, but was analyzed as signalized.



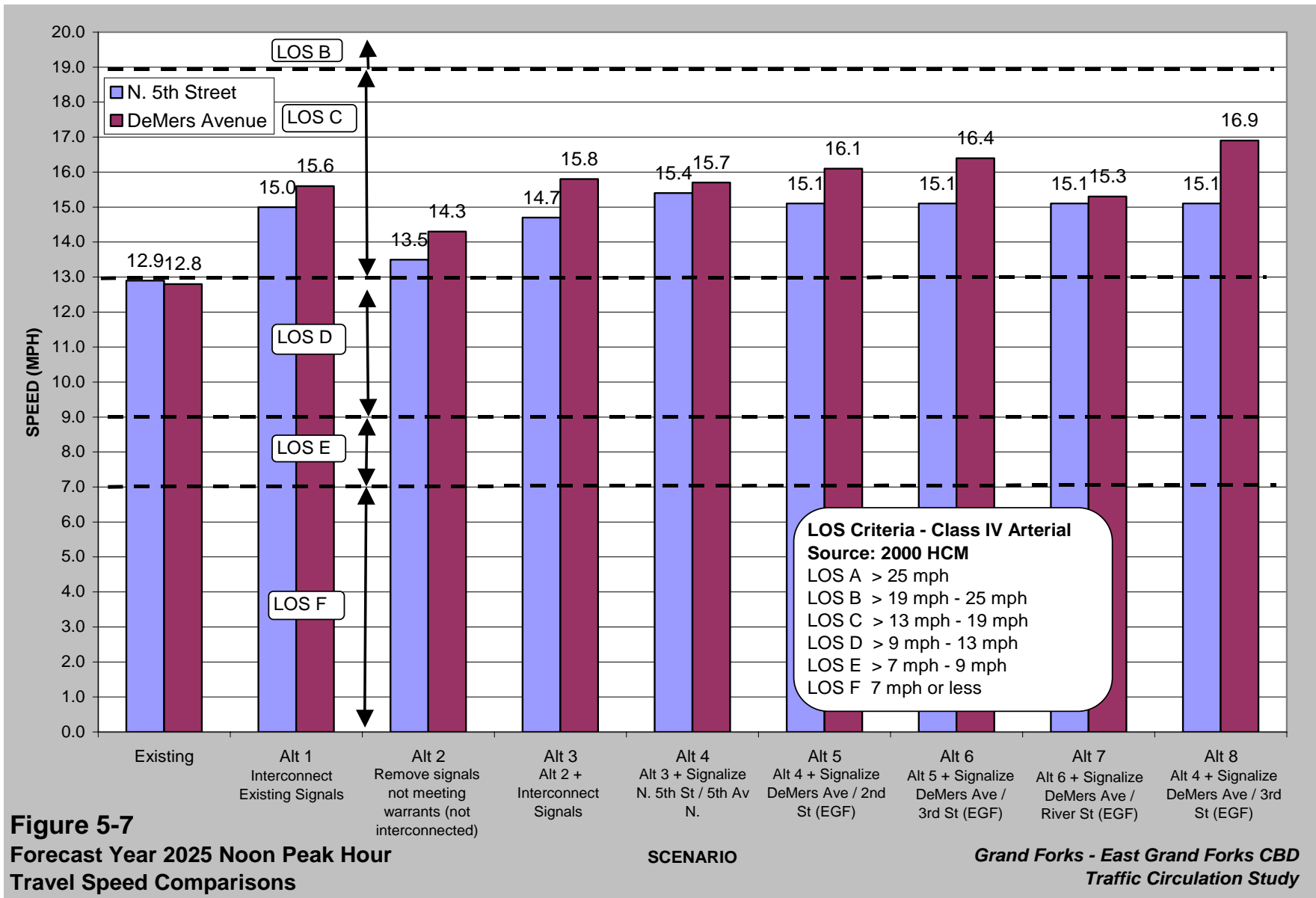


Figure 5-7
Forecast Year 2025 Noon Peak Hour
Travel Speed Comparisons

SCENARIO

Grand Forks - East Grand Forks CBD
Traffic Circulation Study

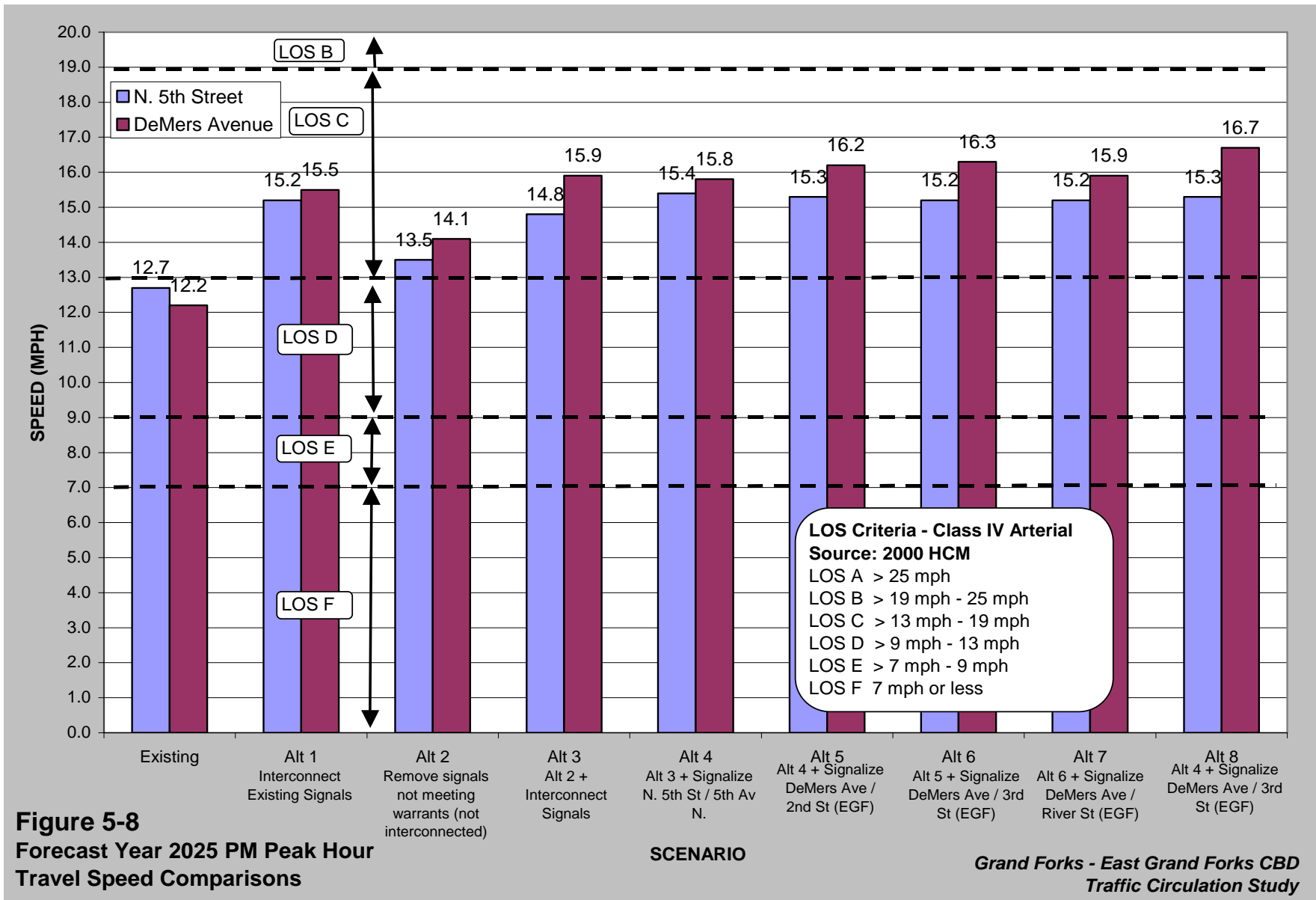


Figure 5-9 Optimum Traffic Control Concept – Signal Interconnection (Chris)

Figure 5-10 Alternative Traffic Control Concept Signal Interconnection with All Existing Signals (Chris)

6.0 PEDESTRIAN ALTERNATIVES

The purpose of this section is to identify possible improvements that could be made to the surrounding roadway system to better accommodate pedestrian traffic.

6.1 Crossing the Red River

As previously documented, one of the main pedestrian constraints in the CBD area is the crossing of the Red River between the two downtown areas. Because the pedestrian bridge north of DeMers Avenue was removed in Year 2000, pedestrians must now cross the Red River via DeMers Avenue. Based on current design guidelines, the sidewalks on the Sorlie Bridge are too narrow to adequately accommodate mixed-use, two-way pedestrian / bicycle traffic. There are several options that can be considered:

- Do nothing (Because the Sorlie Bridge is an existing structure, it is not required to meet the current design guidelines.);
- Install signs that direct bicyclists and other high-speed users to one side of the bridge and walkers/runners to the other side. Although in theory this would be advantageous, pedestrian adherence to the signs would likely be low, as well as creating potential crossing conflicts on DeMers Avenue;
- Install signs that direct eastbound pedestrian/bicycle traffic to use the south side of the bridge and westbound pedestrian/bicycle traffic to use the north side of the bridge;
- Create bicycle lanes across the bridge, such that higher speed users are not on the sidewalk and are on the regular bridge deck with vehicle traffic. However, due to the current roadway cross-section along DeMers Avenue on either side of the bridge, there would be no continuity of an on-street bike lane without the removal of parking;
- Expand the sidewalks on one or both sides of the Sorlie Bridge. However, based on a structural review of the bridge, adding an adequate amount of sidewalk to each side would be extremely labor intensive and costly. The existing bridge structure can adequately accommodate the current roadway and sidewalk configuration; however, a complete redesign of the underside of the bridge would be required to add sidewalk width.
- Construct a new exclusive pedestrian bridge across the Red River, which would be required to meet the current design guidelines found in the *AASHTO Guide for Development of Bicycle Facilities*.

6.2 Crossing DeMers Avenue

Based on the pedestrian gap study that was conducted, there was only a marginally acceptable number of gaps at the Cabela's crossing of DeMers Avenue, and there was not an adequate number of gaps at the west end of the Sorlie Bridge during the peak times. There are many forms of traffic control that could be utilized to improve pedestrian safety at these uncontrolled crossing locations.

The Institute of Transportation Engineers (ITE) recently published a report entitled “Alternative Treatments for At-Grade Pedestrian Crossings”. This report provides documentation of different types of pedestrian/traffic control for different situations (e.g. signalized intersections, unsignalized intersections, uncontrolled locations, etc.) and the potential advantages and disadvantages of each. Some of the alternatives listed in this report include:

- Install roadway signing – includes in-road signage, double-posted pedestrian crossing signs (mounted on both sides of the road), installation of fluorescent-yellow green signs, advance warning signing, etc.
- Install high-visibility pavement markings – “zebra” crosswalks, advance placement of STOP and YIELD limit lines, etc.
- Install overhead signs – static, illuminated, or LED.
- Install pedestrian railings – channelize pedestrians to more controlled crossing locations (e.g. signalized intersections).
- Install lighting at crossing location – suitable at locations where there are high levels of pedestrian activity at night.
- Install curb extensions.
- Install automated pedestrian detection – detection device activates flashing beacon/LED sign when a pedestrian is present.

The installation of any of these alternatives can be used in combination with each other. Typically, installation of signing and striping is the least expensive and the most widely used form of pedestrian/traffic control. It is recommended that if any of the other alternatives listed were installed, the device(s) should be used in conjunction with proper signing and striping of pedestrian crossing(s).

At the west end of the Sorlie Bridge on DeMers Avenue, the studies indicated that there were not an adequate number of gaps for pedestrians. Specific forms of traffic control that could be implemented and that would be expected to improve pedestrian safety in crossing DeMers Avenue at this location include installation of curb extensions, installation of additional signing and pavement markings, or redirection of pedestrian traffic.

Installation of Curb Extensions

Installation of curb extensions along DeMers Avenue would reduce the distance that is required for a pedestrian to cross the roadway. Shortening this distance decreases the amount of time that the pedestrian is exposed to traffic. The curb extensions would also improve visibility of pedestrians for vehicles on DeMers Avenue. In addition, construction of the curb extensions would require the removal of some on-street parking near the intersections (**Figure 6-1** shows an example of a pedestrian curb extension on DeMers Avenue).

Based on the existing width (approximately 40 feet at Sorlie Bridge or 50 feet west of Riverboat Road) of the DeMers Avenue roadway, a gap of 10 seconds or greater in vehicular traffic is considered adequate for the pedestrian to cross the roadway. If curb extensions were installed, the width of the roadway would be

decreased to a total width of 32 feet. This reduction in roadway width would then allow a pedestrian to cross DeMers Avenue in a shorter time. Using an average walking rate of 4 feet/second, a pedestrian would be expected to be able to cross DeMers Avenue in approximately 8 seconds. Therefore, with the construction of the curb extensions, there would be an adequate number of gaps during both the Noon peak (69 gaps) and PM peak (66 gaps) hours at the West End of the Sorlie Bridge.

Installation of Additional Signing and Pavement Markings

At the west end of the Sorlie Bridge and at the crossing between Cabela's and Riverwalk Center on DeMers Avenue, the unmarked pedestrian crossings could be converted to marked crosswalks with appropriate signing and pavement markings. Recent pedestrian campaigns have had success with driver education techniques such as temporarily placing in-road signage that re-affirms that pedestrians have the right-of-way. However, this may be difficult since both State DOT's have potential concerns with marked pedestrian crossings on DeMers Avenue

Redirection of Pedestrian Traffic

Currently, there is a pedestrian/bike trail that goes under the Sorlie Bridge on the west side of the Red River (in Grand Forks). Pedestrians/bicyclists wishing to cross DeMers Avenue at the west end of the bridge could be directed, through the usage of proper signing, to go under the bridge rather than attempt to cross DeMers Avenue. Or pedestrians could be directed, through signing or installation of pedestrian railings, to cross at the adjacent signalized intersection.

6.3 Bike Lanes

Bike lanes through the CBD area were also considered as part of this study. Crossing the Sorlie Bridge, DeMers Avenue can be restriped to accommodate bike lanes. However, constraints limit bicycle use on both the Grand Forks and East Grand Forks sides of the bridge.

In Grand Forks, the installation of bike lanes would require the removal of on-street parking on DeMers Avenue. Therefore, it is understood that DeMers Avenue is not a desirable bike lane route for these reasons. There are existing pedestrian/bike trails that run north-south along each side of the Red River. These paths will be further enhanced with the Greenway project, which is currently underway. With the closure of the pedestrian bridge (ex-NP railroad bridge) north of DeMers Avenue, bicyclists crossing the Red River currently have no other crossing options in the CBD.

In East Grand Forks, the narrowing of DeMers Avenue near Cabela's makes the installation of an adequate bike lane not feasible. If a bike route is desired through East Grand Forks, alternate routes, such as 3rd Avenue, should be considered.

The GF-EGF Metropolitan Planning Organization (MPO) has created a map (**Figure 6-2**) that documents the existing and planned pedestrian and bicycle paths in the Cities of Grand Forks and East Grand Forks. The current bike routes into the CBD, aside from the river paths, are on University Avenue to 3rd Street (connecting to the ex-NP bridge), and on DeMers Avenue to Kittson Avenue.

6.4 Pedestrians at Intersections

Pedestrian counts were collected at key intersections around Central High School in spring 2001. The pedestrian counts were used to identify those intersections that would likely meet the pedestrian signal warrant as documented in the Manual on Uniform Traffic Control Devices (MUTCD). Two intersections were identified as meeting this warrant:

- North 5th Street / 2nd Avenue North
- North 4th Street / 1st Avenue North

These intersections experienced high peaks in pedestrian volumes which corresponded with the beginning / ending times for Central High School.

Several studies have documented the actual effects of installation of pedestrian signals – based on the satisfaction of the pedestrian signal warrant in the MUTCD. In most cases, the quality of traffic flow is adversely impacted with mixed benefits for pedestrians. These studies have proven that the key deficiency with traffic signals for the benefit of pedestrians is that many pedestrians either do not utilize the push buttons or they actuate the push button but then do not wait for the WALK indication before entering the intersection / crosswalk.

In addition, there is a common misconception that installing / maintaining a traffic signal for purposes of pedestrians improves overall safety. The benefits of safety associated with a signal are a direct response of the adherence of road users of the traffic control device. When pedestrians cross without signal confirmation, or when the signal serves pedestrians when there is no demand, it promotes disregard for the signal.

This study identified the need for either removing or upgrading the signal at North 4th Street / 1st Avenue North, which is one of the key intersections for Central High School. A capacity analysis indicated that an All-Way STOP controlled intersection would continue to operate at LOS A during AM, Noon, and PM peak hour conditions at a much lower cost for the City. In addition, the safety characteristics of an All-Way STOP controlled intersection are greater than a traffic signal. Pedestrian bump-outs are also a consideration for this intersection to lower the crossing time and further physically identify the crosswalk to motorists.

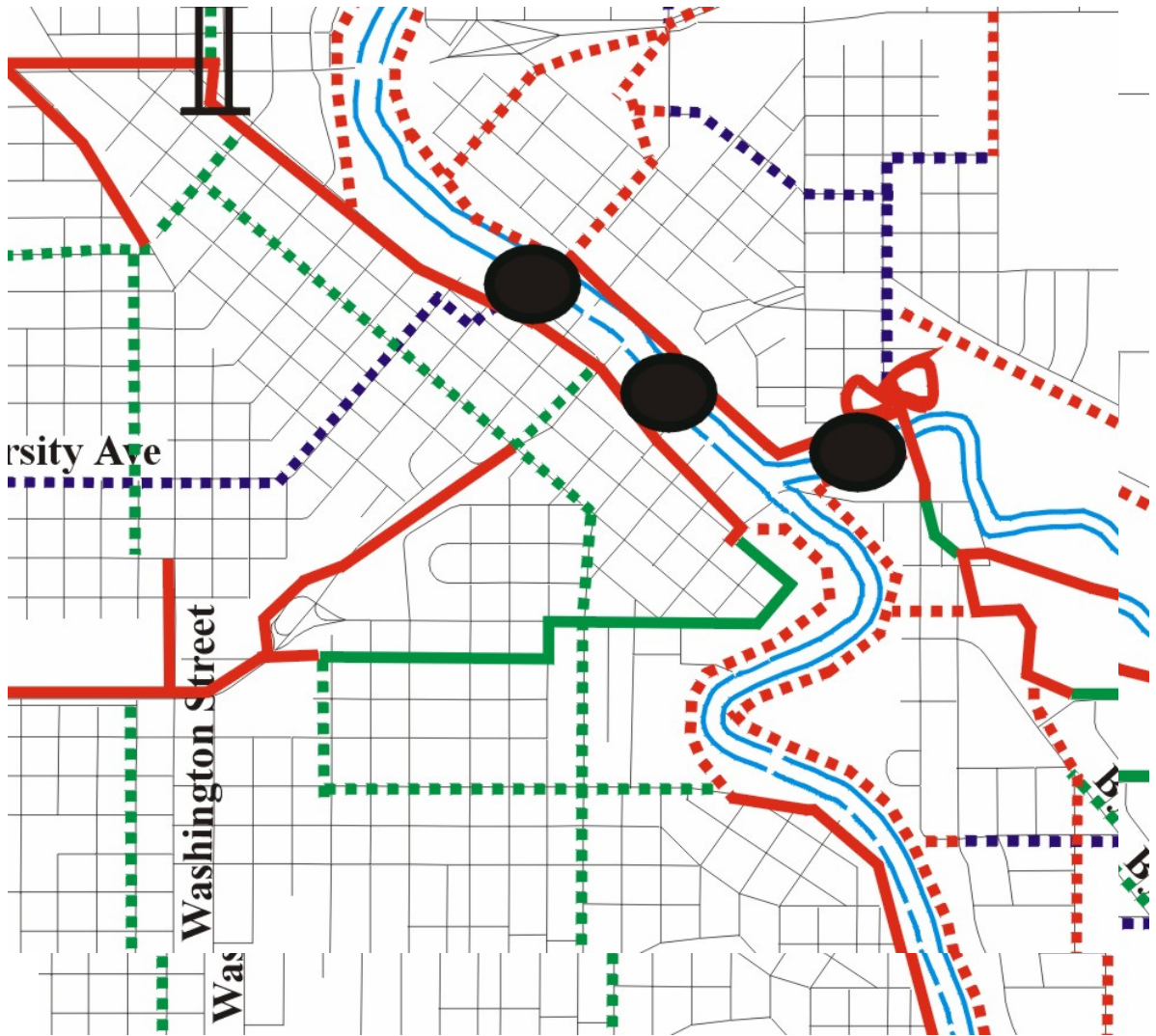
A problem that is common to many other high schools, as well, is the pedestrian conflicts that arise from large peaking characteristics occurring simultaneously with peaks in bus traffic and arriving / departing students by automobile. The keys to addressing these conflicts are best accommodated by separating on-site functions of pedestrians, bus

loading / unloading, pick-up / drop-off, and parking. The current configuration of Central High School is somewhat limited in options for spaces; however, the primary parking is separated from bus operations – yet the pedestrian conflict does still exist.

One of the only measures that can effectively direct and channelize pedestrians is physical measures, such as decorative fencing / barriers or shrubbery. As recommended for crossings along DeMers Avenue, the same methodology would apply to divert pedestrians to the desired locations.

Figure 6-1 Example of Pedestrian Bump-Out on DeMers Avenue

Figure 6-2
Existing and Proposed Bike Routes
Grand Forks – East Grand Forks



Source: Grand Forks – East Grand Forks MPO

7.0 ESTIMATED COSTS

The purpose of this section is to identify the estimated costs associated with implementing each of the different alternatives.

7.1 Cost Estimates

The cost to remove an existing signal (includes only removal of all above ground equipment) is approximately \$5,000 per intersection. The majority of the existing signals operate in a fixed-time manner. In order to operate the “isolated,” fixed-timed signals as an interconnected system, some of the existing signal equipment will need to be upgraded and new additional equipment will need to be installed. Some of this equipment includes: upgrading the existing controller and cabinet and installing a new video detection system and wireless interconnect equipment. **Table 7-1** shows the costs estimates for each alternative analyzed. The estimated costs range from approximately \$25,000 to \$500,000 per alternative.

7.2 Potential Cost Savings

With the removal of traffic signals, there is a potential savings in costs associated with supplying power, maintenance, and operations. Typically, the cost to operate a signal is approximately \$5,000 per year. As stated above, the cost to remove a signal is a one-time cost of approximately \$5,000. Assuming that a signal will operate for approximately 15 years before it needs to be replaced, a capital recovery factor (CRF) can be applied to this one-time cost to determine the cost per year. Assuming a 6 percent interest rate (typical) over 15 years, the yearly costs to remove a signal is approximately \$500. If the signal is removed, STOP sign control must be used in its place. The yearly cost to install STOP signs at an intersection is approximately \$120 with annual maintenance costs of approximately \$100. Therefore, the total cost savings of removing a signal is approximately \$4,300 per year. This estimate does not include the hidden costs of vehicle delay and excess fuel consumption for the motorists at signalized intersections. If all potential unwarranted signals were removed, there would be an approximate cost savings of \$21,500 per year.

Because of the age and current condition of the traffic signals at the intersections of North 5th Street / 5th Avenue North and at North 4th Street / 1st Avenue North, these signals may need to be replaced in the next couple of years. Replacing the old signals with new signals would cost approximately \$200,000 per intersection. Based on a traffic operations and safety analysis, these intersections are expected to operate at acceptable levels without signals. Therefore, there is another potential one-time cost savings of approximately \$400,000.

**TABLE 7-1
Cost Estimates**

Grand Forks - East Grand Forks CBD
Traffic Study Circulation

Item Description	Item Unit	Unit Cost	Alternative 1 ⁽¹⁾		Alternative 2		Alternative 3 ⁽²⁾		Alternative 4 ⁽³⁾		Alternative 5 ⁽³⁾	
			Signal Estimate Quantity	Signal Estimate Cost	Signal Estimate Quantity	Signal Estimate Cost	Signal Estimate Quantity	Signal Estimate Cost	Signal Estimate Quantity	Signal Estimate Cost	Signal Estimate Quantity	Signal Estimate Cost
Remove Signal Equipment	Per Intersection	\$5,000	1	\$5,000	5	\$25,000	5	\$25,000	4	\$20,000	3	\$15,000
F&I Video Detection	Per Intersection	\$28,000	9	\$252,000	0	\$0	7	\$196,000	8	\$224,000	8	\$224,000
F&I Wireless Interconnect	Per Intersection	\$3,000	9	\$27,000	0	\$0	7	\$21,000	8	\$24,000	8	\$24,000
F&I 170 Controller and Signal Cabinet	Per Intersection	\$10,000	8	\$80,000	0	\$0	6	\$60,000	7	\$70,000	7	\$70,000
F&I 170 Controller and Signal Cabinet (Master)	Per Intersection	\$12,000	1	\$12,000	0	\$0	1	\$12,000	1	\$12,000	1	\$12,000
Controller Software	Per Intersection	\$2,500	9	\$22,500	0	\$0	7	\$17,500	8	\$20,000	8	\$20,000
Subtotal				\$398,500		\$25,000		\$331,500		\$370,000		\$365,000

Notes:

- (1) Assumes interconnect on DeMers Ave from N. 5th St to N. 3rd St (GF) and on N. 5th St from 5th Ave N. to Bruce Ave and removal of DeMers Ave / Riverboat Rd signal.
- (2) Assumes interconnect on DeMers Ave from N. 5th St to N. 3rd St (GF) and on N. 5th St from University Ave N. to Kittson Ave
- (3) Assumes interconnect on DeMers Ave from N. 5th St to N. 3rd St (GF) and on N. 5th St from 5th Ave N to Kittson Ave
- (4) Assumes interconnect on DeMers Ave from N. 5th St to 4th St (EGF) and on N. 5th St from 5th Ave N. to Kittson Ave

8.0 PUBLIC INVOLVEMENT

Opportunities for public participation were sought at several times throughout the Study's preparation. On July 11, 2001 a meeting was held in the Grand Forks Herald Building to solicit input on issues and needs from residents and other interested parties concerning traffic circulation within the Grand Forks-East Grand Forks central business district. Existing conditions were presented at the meeting including intersection geometry, traffic control, peak hour turning movements, peak hour intersection level of service, segment level of service, and a signal warrant summary. Eight interested persons and technical staff attending the meeting.

A second meeting was held on October 9, 2001 at the East Grand Forks Campbell Library to present alternatives and recommendations of the Study to citizens. Eleven people attended the meeting, and offered their input. Notices of both meetings were published in the area's official newspaper, *The Grand Forks Herald*. In addition, the public had the opportunity to participate in Study review and adoption at local city council meetings and regular meetings of the Grand Forks – East Grand Forks Metropolitan Planning Organization policy and technical committees.

9.0 CONCLUSIONS

- Existing conditions show that all intersections operate at acceptable levels. However, the roadway system as a whole experience congestion due to “isolated” intersection operations. The speeds on North 5th Street and DeMers Avenue are currently at the boundary of congestion (LOS D), as selected by the GF-EGF MPO.
- The addition of left turn phasing on DeMers Avenue in Grand Forks is not expected to provide a significant improvement to the operations at the intersections and would not be expected to improve traffic safety.
- The safety analysis concluded that only the DeMers Avenue / 3rd Street (EGF) intersection has a crash rate greater than the average crash rate for similar intersections. The crash rate at this intersection may be higher than the average crash rate because the All-Way STOP control may violate driver’s expectations or because of the random nature of crashes.
- Interconnecting signals, potentially removing unwarranted signals, and removing the All-Way STOP control at the DeMers Avenue / 3rd Street (EGF) intersection within the Grand Forks – East Grand Forks CBD area are expected to have a positive impact on traffic mobility without having an adverse impact on traffic operations, access, and pedestrian needs.
- Grand Forks and East Grand Forks utilize different signal controllers to operate their signals. If the signals were to be interconnected, these two types of controllers would need to be able to communicate. There is a Signal Controller and Software package available that would allow this communication; however, installation of this equipment would still require the removal of the controllers at the intersections in EGF. Therefore, instead of adding a third type of controller to the signal system, installation of 170 Controllers (similar to GF) at the intersections in EGF is recommended.
- The current operation of the traffic signals within the CBD area is not as effective or efficient as it could be due to three key factors:
 1. The traffic signals are “isolated” (i.e. not interconnected);
 2. The All-Way STOP condition at the DeMers Avenue / 3rd Street intersection in East Grand Forks; and
 3. Too many signalized intersections (14) spaced too closely together.
- With or without the removal of unwarranted traffic signals, the installation of an interconnect system for the CBD area signals provides a positive impact on traffic mobility. The systems would include signals on DeMers Avenue and North 5th Street. However, if East Grand Forks chooses to leave the All-Way STOP at the DeMers Avenue / 3rd Street intersection, the interconnect system on DeMers Avenue

- A gap study concluded that there were possibly not an adequate number of gaps for pedestrians crossing DeMers Avenue at the west end of the Sorlie Bridge. Possible options to improve this condition include:
 1. Construct pedestrian curb extensions along DeMers Avenue. Installation of curb extensions would minimize the distance a pedestrian must go to cross DeMers Avenue and increase the number of acceptable gaps for pedestrians. However, construction of the curb extensions would require the removal of some on-street parking near the intersections.
 2. At the west end of the Sorlie Bridge and at the crossing between Cabela's and Riverwalk Center on DeMers Avenue, provide marked pedestrian crosswalks with appropriate signing. However, this may be difficult since both State DOT's have potential concerns with marked pedestrian crossings on DeMers Avenue.
 3. Direct pedestrians/bicyclists, through the usage of proper signing, wishing to cross DeMers Avenue at the west end of the Sorlie Bridge to go under the bridge rather than attempt to cross DeMers Avenue or encourage pedestrians to cross only at the adjacent signalized intersections.

- Exclusive bike lanes could be installed on DeMers Avenue across the Sorlie Bridge. If a bike lane were installed in Grand Forks, on-street parking would need to be removed. Due to the slight narrowing of DeMers Avenue near Cabela's in East Grand Forks, installation of a bike lane is not feasible east of the river. The GF-EGF Metropolitan Planning Organization (MPO) has created a map that documents the existing and planned pedestrian and bicycle paths in the Cities of Grand Forks and East Grand Forks. The current bike routes into the CBD, aside from the river paths, are on University Avenue to 3rd Street (connecting to the ex-NP bridge), and on DeMers Avenue to Kittson Avenue. DeMers Avenue is not advantageous as a bike route.

- Due to the close proximity to Central High School, the intersections of North 5th Street / 2nd Avenue North and North 4th Street / 1st Avenue North meet the pedestrian signal warrant as documented in the Manual on Uniform Traffic Control Devices (MUTCD). However, studies have shown that installing/maintaining of a traffic signal purely on meeting the pedestrian warrant results in an adversely impacted quality of traffic flow with mixed benefits for pedestrians.

- An additional capacity analysis of the two intersections that met the pedestrian warrant indicated that an All-Way STOP controlled intersection would continue to operate at LOS A during AM, Noon, and PM peak hour conditions at a much lower cost for the City. In addition, the safety characteristics of an All-Way STOP controlled intersection are greater than a traffic signal.

- The estimated implementation costs associated with each alternative ranges from approximately \$25,000 to \$500,000 per alternative.

- There is a potential total cost savings of approximately \$21,500 per year with the removal of five signals. Also, because of the age and current condition of the signals at the intersections of North 5th Street / 5th Avenue North and at North 4th Street / 1st Avenue North these signals may need to be replaced in next couple of years. Replacing the old signals with new signals would cost approximately \$200,000 per intersection. Therefore, there is a potential one-time cost savings of approximately \$400,000.
- Opportunities for public participation were sought at several times throughout the Study's preparation. Two public meetings were held. At the first meeting, the initial results of the analysis were presented. The alternatives and recommendations of the study were presented in the second meeting. Notices of the meeting were published in *The Grand Forks Herald*.