Grand Forks - East Grand Forks
Metropolitan Planning Organization

Agenda

SPECIAL TECHNICAL ADVISORY COMMITTEE MEETING

WEDNESDAY, NOVEMBER 1ST, 2017 – 10:00 A.M.

EAST GRAND FORKS CITY HALL TRAINING ROOM

MEMBERS

Kadrmas/Lang _____	Laesch/Konickson__	West _____
Ellis _____	Johnson/Hanson _____	Magnuson _____
Bail/Emery _____	Kuharenko/Williams/Yavarow _____	Sanders _____
Gengler/Erickson _____	Bergman/Rood _____	
Riesinger/Audette _____	Christianson _____	

1. CALL TO ORDER
2. CALL OF ROLL
3. DETERMINATION OF A QUORUM
4. MATTER OF FUTURE RED RIVER CROSSINGS ..... HAUGEN
5. OTHER BUSINESS
6. ADJOURNMENT

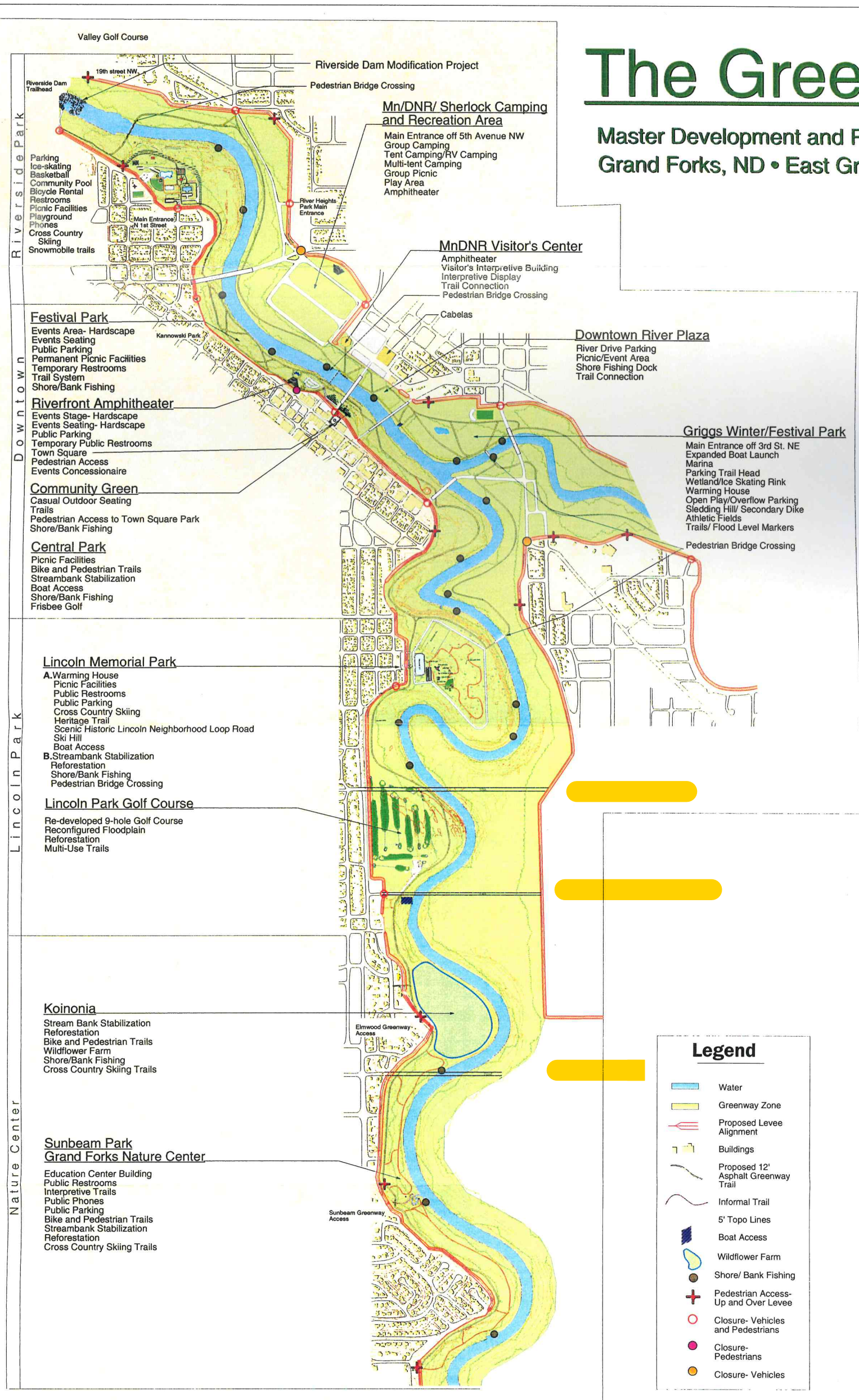
ANY INDIVIDUAL REQUIRING A SPECIAL ACCOMMODATION TO ALLOW ACCESS OR PARTICIPATION AT THIS MEETING IS ASKED TO NOTIFY EARL HAUGEN, MPO EXECUTIVE DIRECTOR AT (701) 746-2660 OF HIS/HER NEEDS FIVE (5) DAYS PRIOR TO THE MEETING. ALSO, MATERIALS CAN BE PROVIDED IN ALTERNATIVE FORMATS: LARGE PRINT, BRAILLE, CASSETTE TAPE, OR ON COMPUTER DISK FOR PEOPLE WITH DISABILITIES OR WITH LIMITED ENGLISH PROFICIENCY (LEP) BY CONTACTING THE MPO EXECUTIVE DIRECTOR (701) 746-2667 FIVE (5) DAYS PRIOR TO THE MEETING.

Special TAC Meeting on Future Red River Bridges

- AGENDA
  - Greenway
  - Basic Bridge Design
  - Bridge Locations
    - North?
    - South?
      - Current 32nd Ave
        - Add?
  - High and Dry v. Floodable
  - What Information to Update for Merrifield/32nd/?/?
    - Future ADT impacts to system
      - TDM forecast and corridor operations forecast (SYNCHRO/SIMTraffic)
    - Cost
    - Profile
    - Benefit/Cost Ratio
    - Cost Effectiveness
    - NEPA “Stoppers”

The Greenway

Master Development and Restoration Plan
Grand Forks, ND • East Grand Forks, MN



Date Prepared:
July, 2000

Prepared For:
Greater Grand Forks Greenway Alliance

Prepared By:
GREENWAYS INCORPORATED

NORTH

Scale: 1" = 600' - 0"

Legend

- Water
- Greenway Zone
- Proposed Levee Alignment
- Buildings
- Proposed 12' Asphalt Greenway Trail
- Informal Trail
- 5' Topo Lines
- Boat Access
- Wildflower Farm
- Shore/ Bank Fishing
- Pedestrian Access- Up and Over Levee
- Closure- Vehicles and Pedestrians
- Closure- Pedestrians
- Closure- Vehicles

Master Plan Information

Grand Forks

Paved Trail Length	44386' 8.4 miles
Informal Trail Length	20701' 3.9 miles
Boat Access Points	3

East Grand Forks

Paved Trail Length	24901' 4.7 miles
Boat Access Points	1

Verbally
Concurred
4-17-99

6 April, 1999

Mr. Wayne McCullam
Acting Division Administrator
FHWA – Bismarck Division
1471 Interstate Loop
Bismarck, ND 58501-0567
ATTN: Cal Larson

RE: Section 4(f) Determination

Dear Mr. McCullam:

In our efforts to adopt a long range transportation plan for our metropolitan area, we have a keen interest in the possibility of establishing a corridor through a former golf course for highway purposes. We respectfully request your concurrance with our finding.

First, a brief history of the issue. Since the first metropolitan-wide transportation plan done in 1969, our metropolitan area has tried to establish an additional bridge over the Red River. The two cities – Grand Forks and East Grand Forks – have had difficulty agreeing to a location in recent history. Basically, East Grand Forks desires a location more northerly than the location desired by Grand Forks. However, since the flood of 1997, changes in the land use along the Red River may "open" land for transportation purposes. Specifically, the Lincoln Golf Course will be purchased by the City of Grand Forks for flood protection purposes. As part of the purchase agreement, the City and Park District will build a new golf course at another location away from the Red River.

In the past planning efforts, the golf course's existence has prevented a possible highway/bridge corridor being designated over the property because of the Section 4(f) considerations. However, in researching the FHWA's Section 4(f) Policy Paper (September 24, 1987 revised June 7 1989), it appears that this section need no longer apply to this property. While the land will be publicly owned, a new plan will be established for its change in use. It seems that, in preparing the new plans for this land, a strip of tract can be reserved for a highway/bridge corridor at the time the new development plan is established. You should be aware that the re-use plans will in all likely hood, call for recreation use (including reshaping the golf course down to a nine hole configuration) of the remaining property not designated for highway/bridge corridor. This highway/bridge corridor would then not be subject to Section 4(f) at this time nor

would it apply to the subsequent highway/bridge construction of the reserved right of way as previously planned. This is our "finding" on this issue.

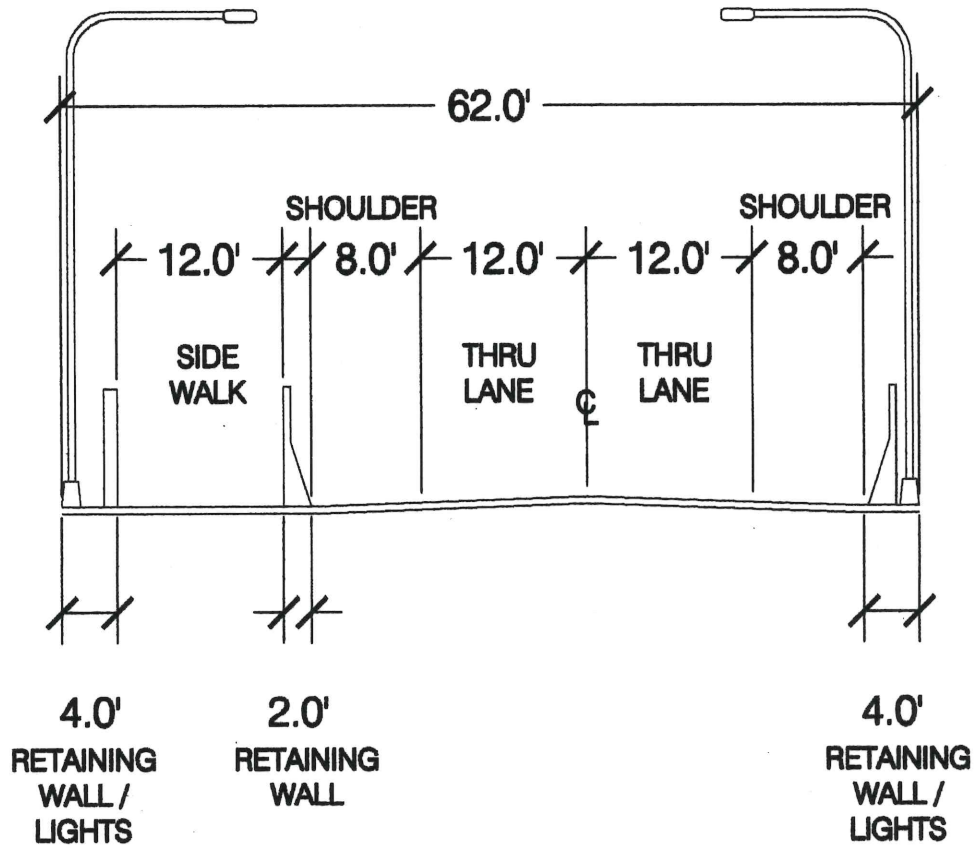
Do you concur?

Sincerely,

Earl T. Haugen
Senior Planner/Interim Executive Director

Cc: MPO Executive Board
MPO Technical Advisory Committee
Kathy Briscoe, MNDOT OIM

Basic Bridge Design



TYPICAL BRIDGE SECTION

LONG RANGE TRANSPORTATION UPDATE
GRAND FORKS / EAST GRAND FORKS MPO

HWS Consulting Group Inc

TYPICAL SECTION

FIGURE 1

North Location

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40th Avenue
69th Street
55th Street
29
40th Avenue
River Road
Mill Road
see figure A
Red River
River Road NW
N
1"=2500'
Central Avenue
Section Line Road
23rd St NW

27th Avenue N
69th Street
55th Street
29
Mill Road
see figure B
Red River
River R
Centra
N
1"=2500'
23rd St NW
2
PRELIMINARY

GRANDFORKS / EAST GRANDFORKS TRANSPORTATION PLAN UPDATE
GRANDFORKS / EAST GRANDFORKS MPO

HMS Consulting Group Inc

0 500' 1000' 1500' 2000' 2500'

NORTH BYPASS

LEGEND:
- NEW CURBS, MEDIANS & ISLANDS
- NEW BRIDGE
- PROPOSED LEVEE

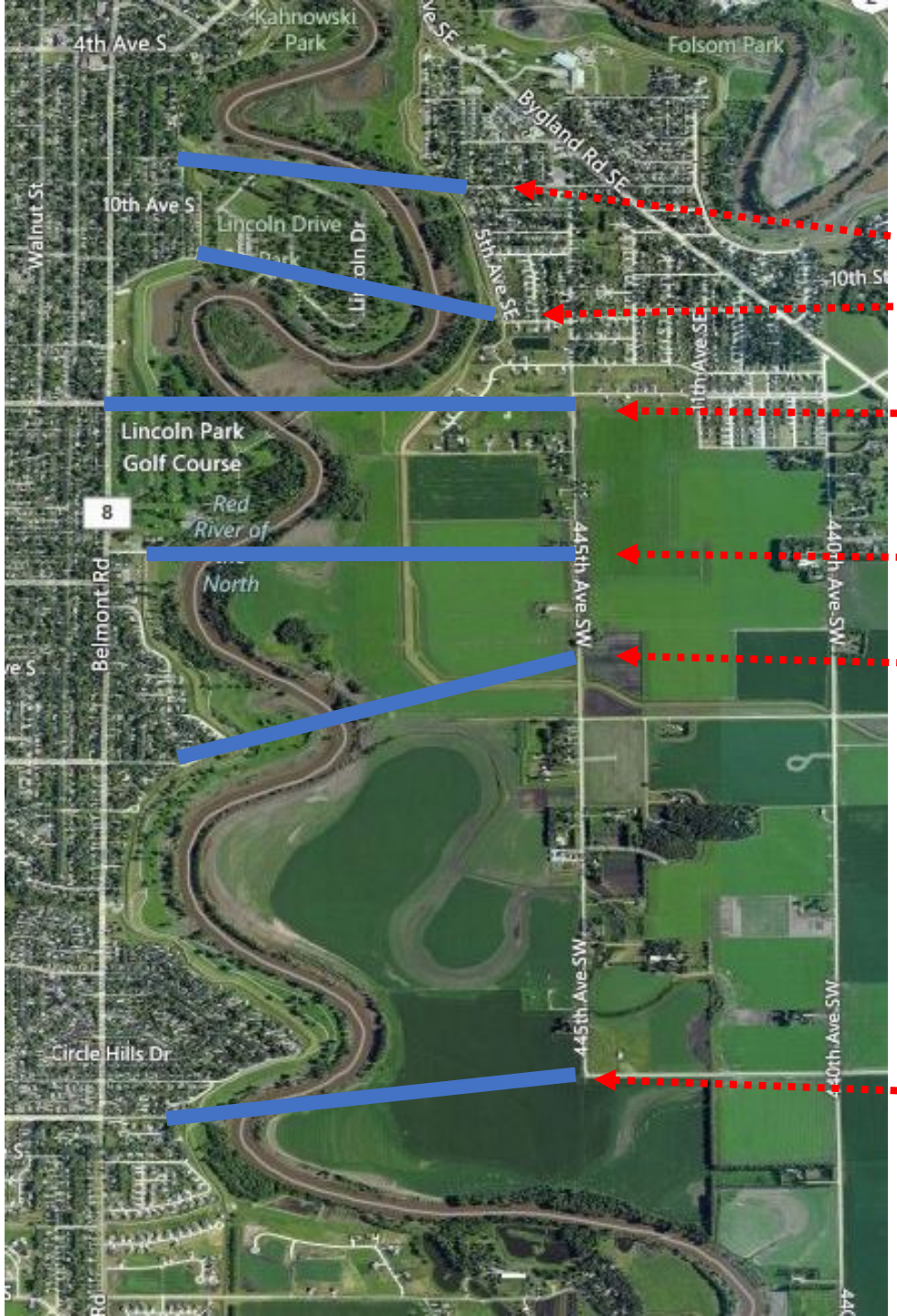
South Locations

Past Locations Bridges have
Been studied at one time
Or another in past 30+
Years.

Past focus has been on area
Between 17th Ave S and
32nd Ave S.

Past Study of 47th Ave S was
In consideration as “south
Bypass” location option.

Merrifield Rd location has
Historically been identified
As “south bypass” spot.



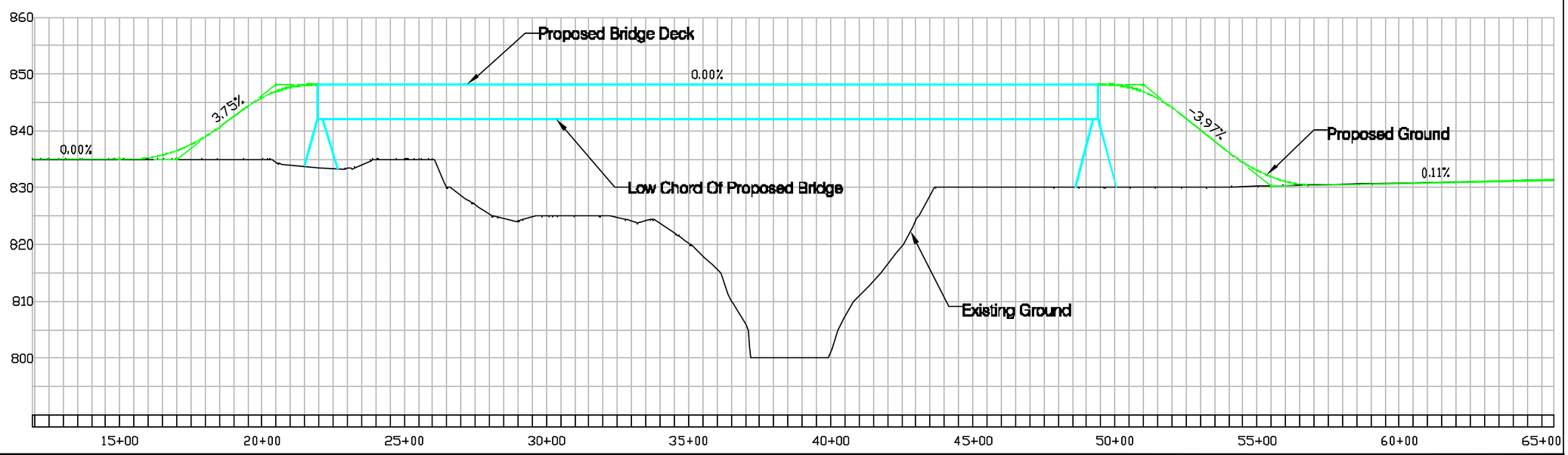
8th Ave S
13th Ave S
17th Ave S
24th Ave S
32nd Ave S
47th Ave S.


Lincoln Drive Park
Lincoln Dr
Lincoln Dr
River of the North
9th St SE
6th Ave SE
11th St SE
12th
Richard Dr SE
13th St SE
13th
12th Ave S
Walnut St
13th Ave S
Belmont Rd
15th Ave S
8
17th Ave S
Lincoln Park Golf Course
Laurel Dr SE
45th Ave SW
182nd St SW
Chestnut St
Park Dr
Elks Dr
24th Ave S


Elks Dr
th Ave S
25th Ave S
27th Ave S
Belmont Rd
Olson Dr
Cleo Ct
8
W Elmwood Dr
E Elmwood Dr
d Ave S
32nd Ave S
34th Ave S
Terrace Dr
Red River of the North
445th Ave SW
190th St SW
190th St SW
445th Ave SW


39th Ave S
40th Ave S
Belmont Rd
Northridge Hills Ct
Circle Hills Dr
Plain Hills Dr
8
Walnut St
Leeward Hills Ln
Windward Hills Ave
Inland Hills Ct
Sandy Hills Ln
Sloping Hills Cir
Grassy Hills Ln
Loamy Hills Pl
47th Ave S
Oxbow Oaks Circle
49th Ave S
Belmont Rd
Rivercrest Rd
Rivers Edge Dr
52nd Ave S
Desiree Dr
Christian Dr
Jackson St
Chestnut St
445th Ave SW
Red River of the North
Red River of the North

High and Dry v. Floodable



GRANDFORKS / EAST GRANDFORKS TRANSPORTATION PLAN UPDATE
GRANDFORKS / EAST GRANDFORKS MPO

HORIZONTAL SCALE 1"=400'
VERTICAL SCALE 1"=40'

32nd AVENUE RIVER CROSSING
ALTERNATIVE 1

LEGEND:
- BACK OF CURB
- SIDEWALK
- BRIDGE STRUCTURE
- PROPOSED LEVEE
- BRIDGE RAIL
- ROADWAY CENTERLINE PROFILE
- BRIDGE CENTERLINE PROFILE
- RELOCATIONS

FIGURE X

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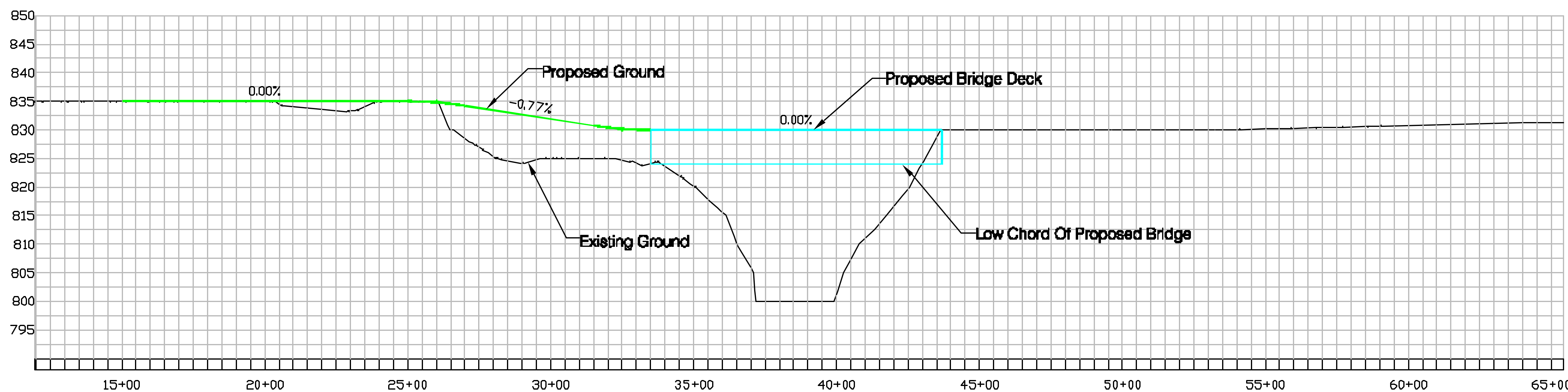


GRANDFORKS / EAST GRANDFORKS TRANSPORTATION PLAN UPDATE
GRANDFORKS / EAST GRANDFORKS MPO

HMS

HORIZONTAL SCALE 1"=400'
VERTICAL SCALE 1"=40'

32nd AVENUE RIVER CROSSING
ALTERNATIVE 2

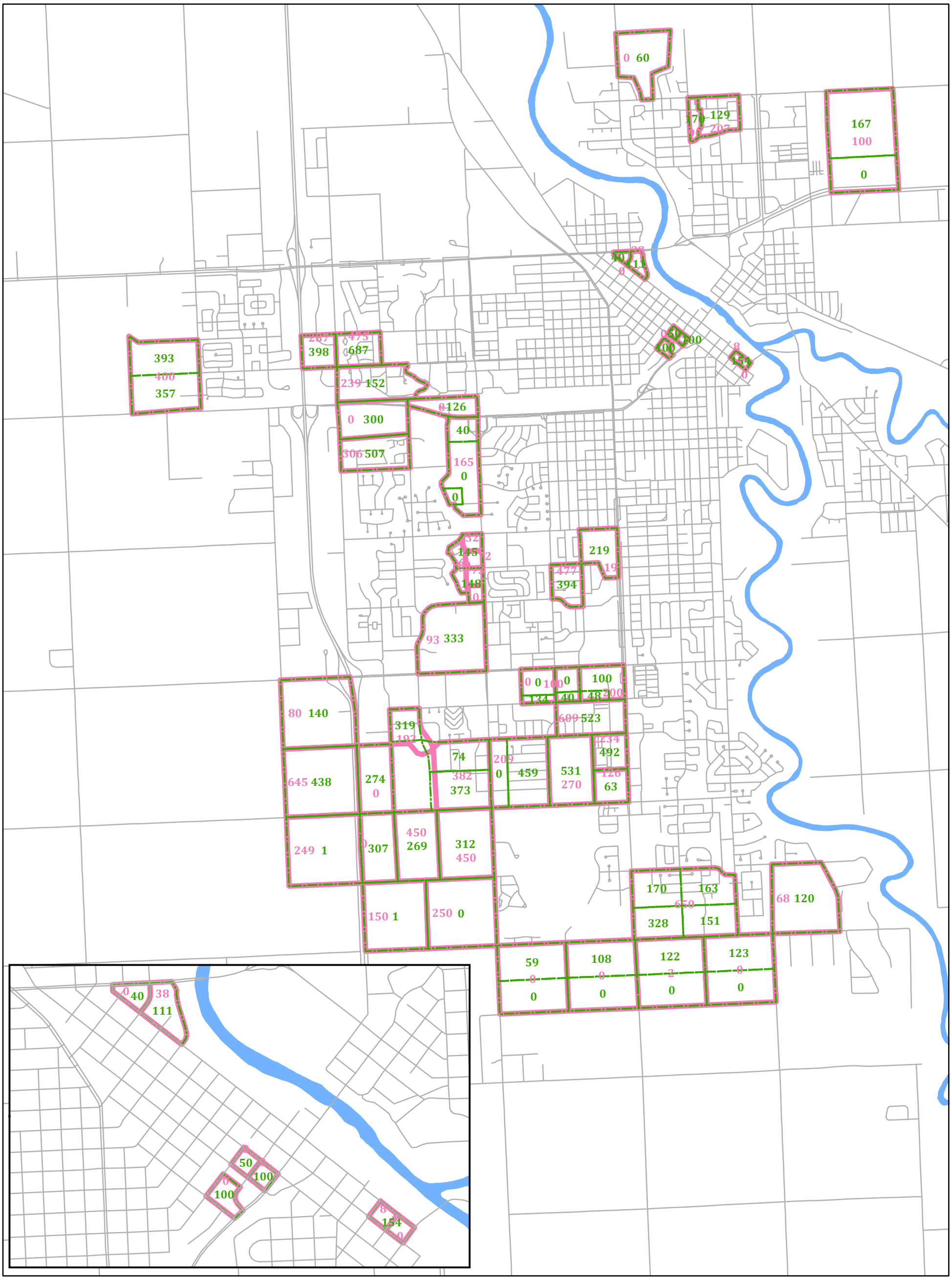
LEGEND:

- BACK OF CURB
- SIDEWALK
- BRIDGE STRUCTURE
- PROPOSED LEVEE
- BRIDGE RAIL
- ROADWAY CENTERLINE PROFILE
- BRIDGE CENTERLINE PROFILE
- RELOCATIONS

FIGURE X

Update Information

Significantly Changed Housing Totals Between 2040 & 2045



2045 TAZs

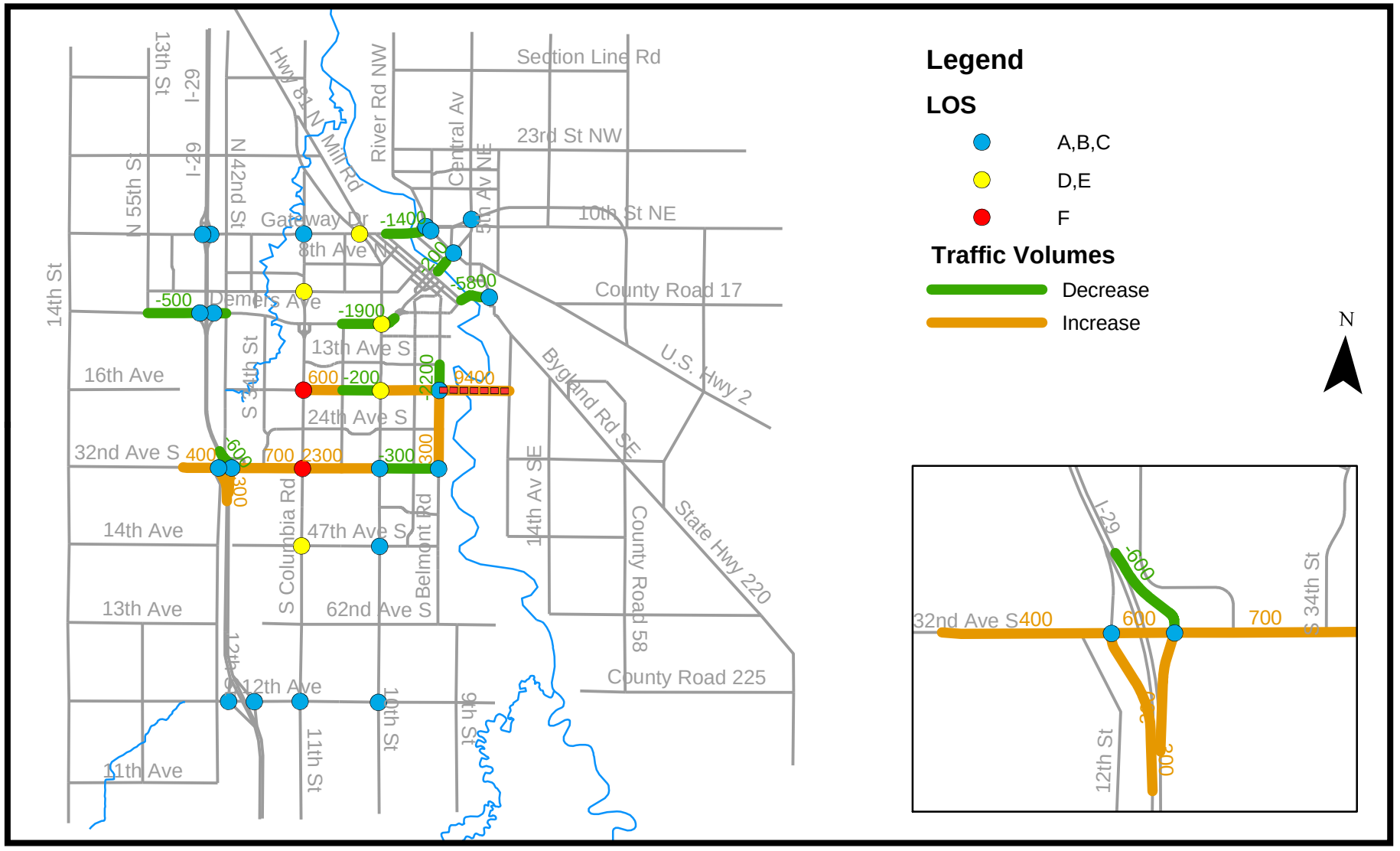
2040 TAZs

0 0.5 1 Miles

Grand Forks - East Grand Forks Metropolitan Planning Organization

N W E S

17th Avenue River Crossing



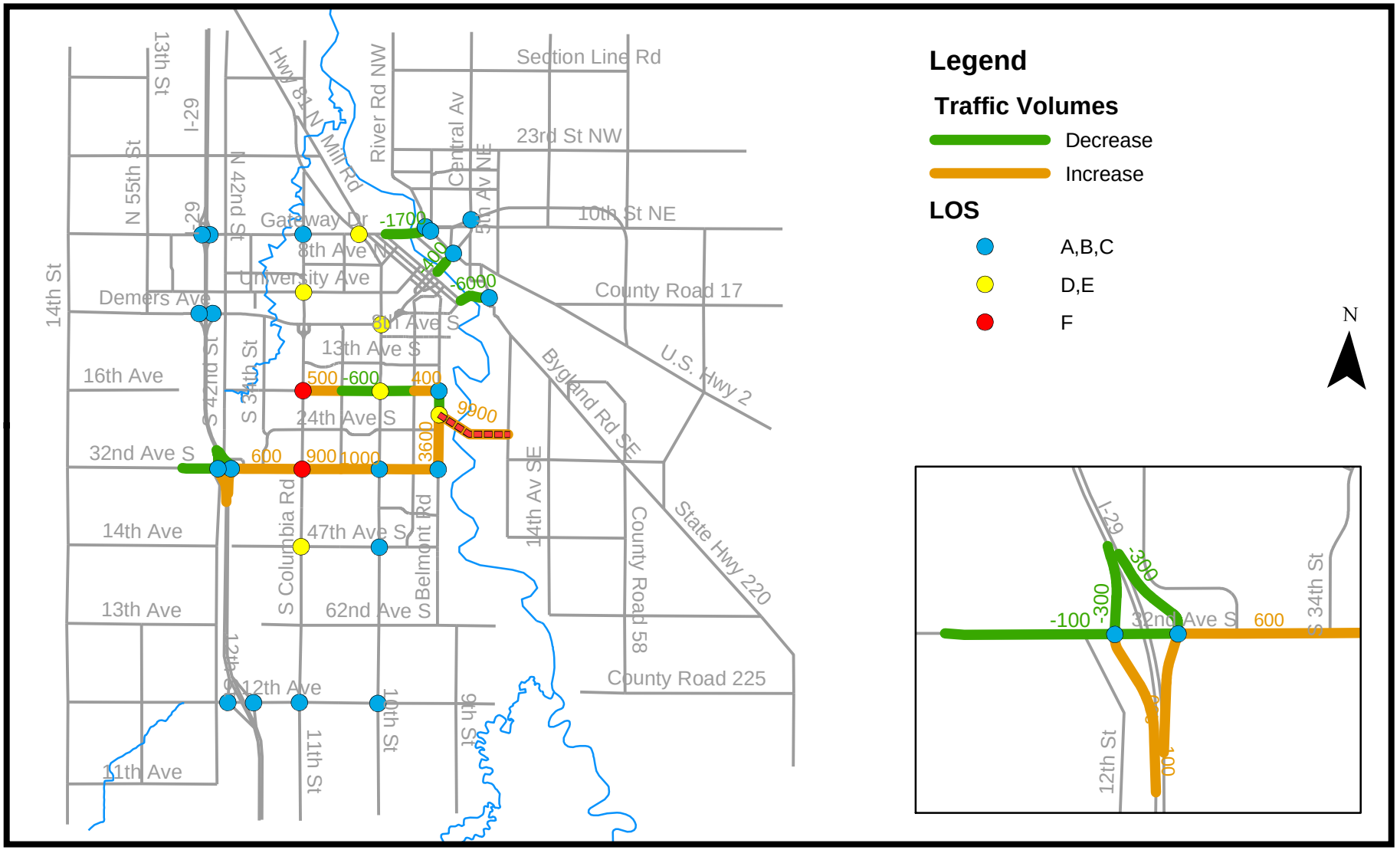
HWS Consulting Group Inc.

0 5,000 10,000 20,000 Feet

1 inch equals 10,000 feet

Figure 4

Elks Drive River Crossing



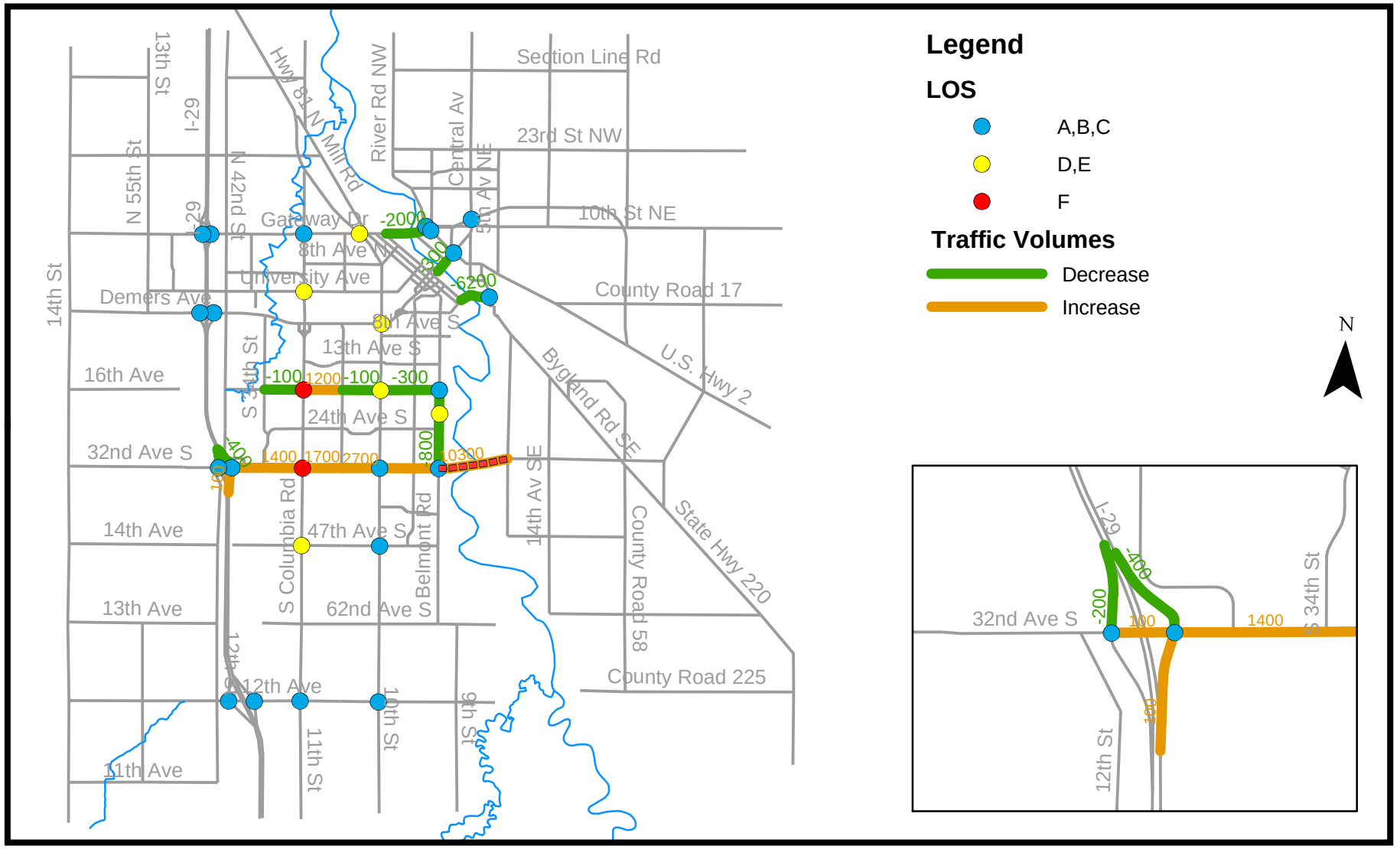
HWS Consulting Group Inc.

0 5,000 10,000 20,000 Feet

1 inch equals 10,000 feet

Figure 3

32nd Avenue River Crossing



HWS Consulting Group Inc.

0 5,000 10,000 20,000 Feet

1 inch equals 10,000 feet

Figure 6

TDM Forecast Capacity
V.
Traffic Operations Capacity

Experience of I-29 Study difference between these two for 32nd Ave S Corridor - 6 lanes v. not even 8 lanes

MERRIFIELD RIVER CROSSING

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,683	(189)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,496,748	(3,177)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$11.6 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	1.46	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	0	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A

ELKS DRIVE RIVER CROSSING

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,633	(239)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,490,118	(9,807)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$8.6 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	3.16	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	0	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A

17TH AVENUE RIVER CROSSING

Alternative #1

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,672	(200)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,493,016	(6,909)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$30.2 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	0.93	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	0	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A

Alternative #2

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,672	(200)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,493,016	(6,909)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$15.1 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	1.73	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	0	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A

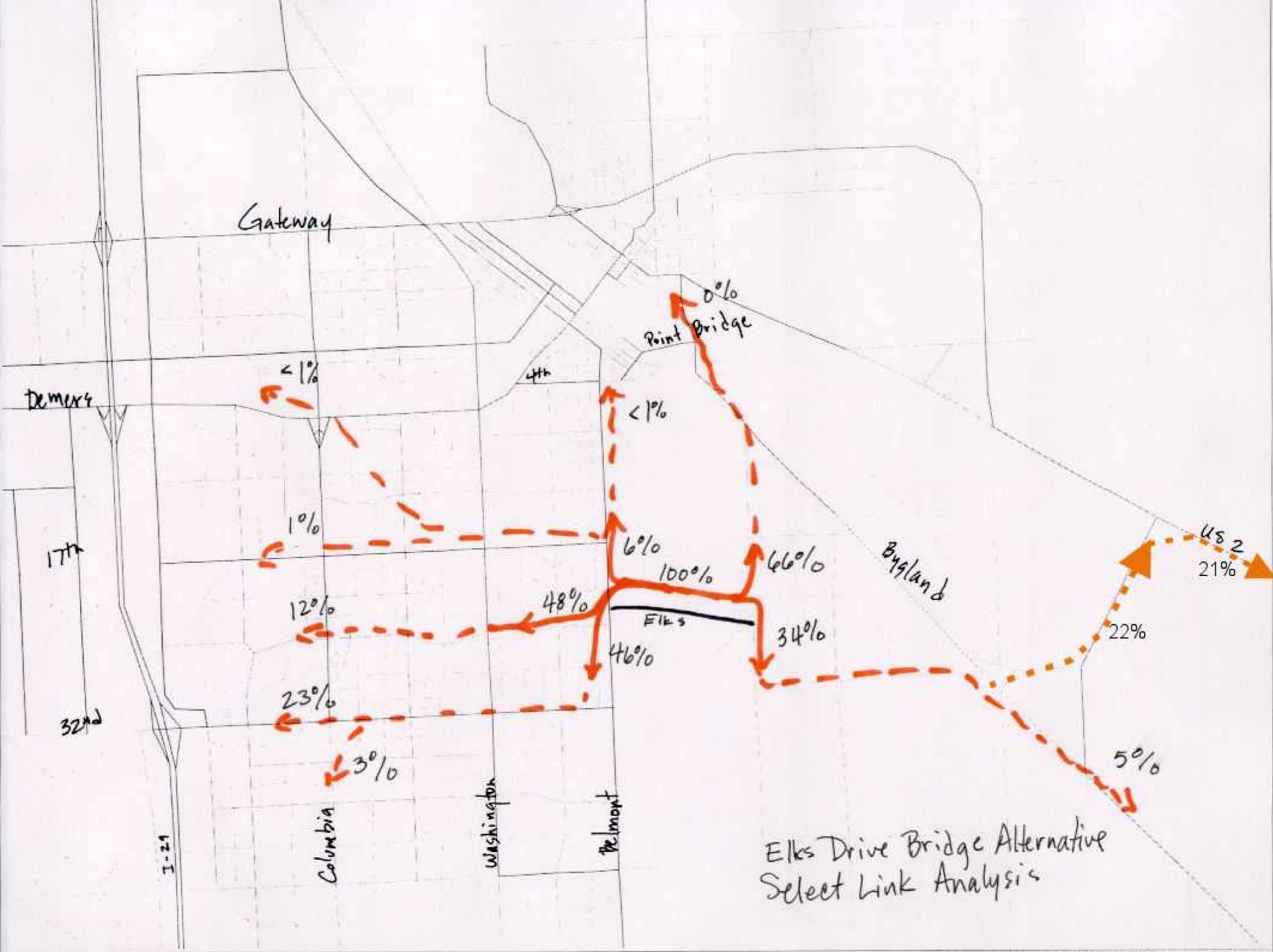
32ND AVENUE RIVER CROSSING

Alternative #1

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,501	(371)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,489,150	(10,775)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$27.1 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	1.45	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	4	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A

Alternative #2

ID#	ISSUES	METHOD OF MEASUREMENT	UNITS	VALUE	CHANGE FROM BASE CONDITIONS
T.0	**TRAFFIC OPERATION FACTORS**				
T.1	Traffic Flow and Congestion	VHT statistics from travel demand model	Daily vehicle hours traveled	46,501	(371)
T.2	Reduced Trip Length	VMT statistics from travel demand model	Daily vehicle miles traveled	1,489,150	(10,775)
C.0	**PROJECT COSTS**				
C.1	Construction Costs	Estimated cost of construction in 2002 dollars	Dollars	$14.6 Million	N/A
S.0	**SOCIO ECONOMIC FACTORS**				
S.1	Roadway User Economic Analysis	Use VMT and VHT statistics to determine benefits compared to construction costs	B/C ratio	2.55	N/A
S.2	Number of Houses Purchased	Number of houses within 25' of new right-of-way	Houses	3	N/A
S.3	Number of Business Purchased	Number of businesses within 25' of new right-of-way	Businesses	0	N/A



The results from **Table 1** document the construction of a Merrifield Bridge (Red River Crossing) leads to a reduction of nearly 9 crashes (8.73) per year, including the increase in crashes along Merrifield Road where traffic volumes would increase (neglecting modification in geometry). These benefits can be monetized using values from Mn/DOT that are based on severity (**Table 2**).

Table 2: Crash Costs (2004 dollars)

Mn/DOT Crash Values	Dollars per crash
Fatal	$3,600,000
Injury Type A only	$280,000
Injury Type B only	$61,000
Injury Type C only	$30,000
Property Damage Only (PDO)	$4,400

Source: Mn/DOT Benefit Cost Analysis Guidance (June 2005)

The distribution of the types of crashes are not known, however Mn/DOT's *Traffic Safety Fundamentals Handbook* documents that on average, fatal, injury, and property damage only crashes account for an average of 0.6%, 34% and 65.4% of all crashes at intersections. These proportions were used in calculating the total annual crash benefits (**Table 3**).

Table 3: Values used in Annual Cost Savings (Annual Benefits)

Crash type	percent of crashes	Average Cost	Annual number of crashes	Annual Cost Savings
Fatal	0.6%	$3,600,000	0.052	$187,200
Injury (A-C)	34.0%	$123,667	2.97	$367,291
PDO	65.4%	$4,400	5.71	$25,124
Total Annual Cost Savings (Benefit)				$581,055

Source: HDR Engineering Inc. using *Mn/DOT Traffic Safety Fundamentals Handbook*

The values used in the re-analysis were converted to 2004 dollars as documented in **Table 4**.

Table 4: Comparison of Values Used in the Benefit-Cost Analysis

	Initial Analysis	Mn/DOT Analysis (September 2005)
Traffic Growth Factor:	1%	1%
Discount Rate	4.5%	3.4%
Year of Analysis	2012	2004
Year Constructed	2012	2012
car value of time	$11.50/hr	$10.46/hr
truck value of time	$25.00/hr	$19.39/hr
Travel Time Savings	$ 1,070,000	$ 669,687
American Crystal Sugar	$ 240,335	$ -
Roadway Safety	$ 71,105	$ 581,055
Flood Protection	$ 89,116	$ 62,665
Total Benefits	**$ 1,470,556**	**$ 1,313,407**

Similar to Table 7-3 on pages 61-62 of the Merrifield Road Red River Bridge Feasibility Study, an amortization table for the 50 year analysis period is documented on the following pages (**Table 5**).

Table 5: 50-Year Amortization Table

Year	Annual Society Benefits (2004$)	Present Worth Benefits (2004$)	Annual Project Costs (2004$)	Present Worth Costs (2004$)	Notes
2012	$ -	$ -	$ 14,500,000	$ 11,096,952	1
2013	$ 1,313,407	$ 972,108	$ 2,000	$ 1,480	
2014	$ 1,325,914	$ 949,096	$ 2,000	$ 1,432	
2015	$ 1,338,547	$ 926,633	$ 2,000	$ 1,385	
2016	$ 1,351,305	$ 904,705	$ 2,000	$ 1,339	
2017	$ 1,364,192	$ 883,300	$ 2,000	$ 1,295	
2018	$ 1,377,207	$ 862,406	$ 2,000	$ 1,252	
2019	$ 1,390,352	$ 842,009	$ 2,000	$ 1,211	
2020	$ 1,403,629	$ 822,098	$ 2,000	$ 1,171	
2021	$ 1,417,039	$ 802,662	$ 2,000	$ 1,133	
2022	$ 1,430,583	$ 783,688	$ 2,000	$ 1,096	
2023	$ 1,444,262	$ 765,166	$ 2,000	$ 1,060	
2024	$ 1,458,078	$ 747,085	$ 2,000	$ 1,025	
2025	$ 1,472,032	$ 729,434	$ 2,000	$ 991	
2026	$ 1,486,126	$ 712,203	$ 2,000	$ 958	
2027	$ 1,500,360	$ 695,382	$ 746,000	$ 345,753	2
2028	$ 1,514,737	$ 678,960	$ 2,000	$ 896	
2029	$ 1,529,258	$ 662,929	$ 2,000	$ 867	
2030	$ 1,543,924	$ 647,280	$ 2,000	$ 838	
2031	$ 1,558,736	$ 632,002	$ 2,000	$ 811	
2032	$ 1,573,697	$ 617,087	$ 2,000	$ 784	
2033	$ 1,588,807	$ 602,526	$ 2,000	$ 758	
2034	$ 1,604,069	$ 588,311	$ 2,000	$ 734	
2035	$ 1,619,483	$ 574,433	$ 2,000	$ 709	
2036	$ 1,635,051	$ 560,885	$ 2,000	$ 686	
2037	$ 1,650,775	$ 547,659	$ 2,000	$ 664	
2038	$ 1,666,656	$ 534,746	$ 2,000	$ 642	
2039	$ 1,682,696	$ 522,140	$ 2,000	$ 621	
2040	$ 1,698,896	$ 509,832	$ 2,000	$ 600	
2041	$ 1,715,259	$ 497,817	$ 2,000	$ 580	
2042	$ 1,731,785	$ 486,086	$ 5,101,000	$ 1,431,775	3
2043	$ 1,748,476	$ 474,634	$ 2,000	$ 543	
2044	$ 1,765,334	$ 463,453	$ 2,000	$ 525	
2045	$ 1,782,360	$ 452,536	$ 2,000	$ 508	
2046	$ 1,799,557	$ 441,879	$ 2,000	$ 491	
2047	$ 1,816,926	$ 431,474	$ 2,000	$ 475	
2048	$ 1,834,469	$ 421,315	$ 2,000	$ 459	
2049	$ 1,852,187	$ 411,397	$ 2,000	$ 444	
2050	$ 1,870,082	$ 401,713	$ 2,000	$ 430	
2051	$ 1,888,156	$ 392,259	$ 2,000	$ 415	
	CONTINUED	CONTINUED	CONTINUED	CONTINUED	

	CONTINUED	CONTINUED	CONTINUED	CONTINUED	
2052	$ 1,906,411	$ 383,028	$ 2,000	$ 402	
2053	$ 1,924,849	$ 374,016	$ 2,000	$ 389	
2054	$ 1,943,471	$ 365,217	$ 2,000	$ 376	
2055	$ 1,962,279	$ 356,626	$ 2,000	$ 363	
2056	$ 1,981,275	$ 348,238	$ 2,000	$ 352	
2057	$ 2,000,461	$ 340,049	$ 746,000	$ 126,809	2
2058	$ 2,019,839	$ 332,053	$ 2,000	$ 329	
2059	$ 2,039,411	$ 324,246	$ 2,000	$ 318	
2060	$ 2,059,178	$ 316,624	$ 2,000	$ 308	
2061	$ 2,079,143	$ 309,182	$ 2,000	$ 297	
2062	$ 2,099,308	$ 301,915	$ 2,000	$ 288	4

Totals = **$ 28,702,520** **$13,036,019**

(B) **(C)**

B/C= 2.2

Notes:
1. Assumes Combined Project at 840.0, Alignment 1 ($14,500,000 in 2004 US$)
2. Assumes Overlay of Deck at cost of $15/SF
3. Assumes reconstruction of roadway & bridge redecking ($5.1M in 2004 US$)
4. Assumes no salvage value to bridge, highway, or other elements
5. Does not assume impact of 32nd Avenue South bridge

The reanalysis concluded the project is expected to have a benefit-cost ratio of approximately 2.2. This ratio indicates that this project can provide benefits to society and could compete well with other potentially earmark projects. This value is based on an assumed 50-year life cycle with the following parameters:

- A combined diversion project / roadway project / bridge project is pursued using the most cost-effective means of each element (i.e. lowest cost alignments)
- Construction would be complete in 2012
- Bridge redecking is performed in 2027 and 2057 with roadway reconstructed in 2042 – including bridge deck reconstruction
- No salvage value of any elements are assumed
- No impacts of the 32nd Avenue South bridge are included in the analysis
- All benefits and costs are discounted to the present (2004) assuming a discount rate of 3.4% per year, at Mn/DOT's request
- No accounting for environmental documentation, design, or construction observation was assumed in the analysis – these values combined are typically near 30% of the initial construction cost

Screening Process

Example: Merrifield Interchange

$$\frac{Project\ Cost}{Per\ Unit\ Reduction} = \frac{\$14.4\ Million}{74.7\ Million\ Miles} = \$0.19\ per\ Mile\ Reduced$$

$$(8\%\ Trucks\ \times \$1.09) + (92\%\ Autos\ \times \$0.28) = \$0.34\ per\ Mile\ Traveled$$

Cost Effectiveness Analysis

Weighted Per Unit Cost > $\frac{Project\ Cost}{Per\ Unit\ Reduction}$