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Memorandum

To:	Suzanne Hanrahan, Dakota County	**Reference:**	CSAH 33 at 140th Street/ Connemara Trail Intersection Improvements Benefit-Cost Analysis
Copies To:		**Project No.:**	14957.000
From:	Bryant Ficek BJF	**Routing:**	
Date:	May 30, 2012		

This memorandum documents the methodology and results of a benefit-cost analysis for two improvement alternatives developed as part of the Intersection Traffic Control Feasibility Study for the intersection of County State Aid Highway (CSAH) 33 (Diamond Path) and 140th Street/Connemara Trail. The analysis accounts for the cost of each alternative and the incremental benefits of each alternative over time in terms of travel time savings (less intersection delay) and safety savings (fewer and/or less severe crashes).

The first alternative proposed by the feasibility study would construct a dual-lane roundabout at the intersection. The roundabout would include two approach lanes, two circulating lanes, and two exit lanes for every approach.

The second alternative proposed would construct a traffic signal at the intersection, along with some associated roadway improvements. The resultant approach lanes for CSAH 33 and 140th Street/Connemara Trail would consist of one left-turn lane, one through lane, and one through/right-turn lane. The two northbound through lanes would extend beyond the intersection for approximately 500 feet before merging to one lane. The signal would operate with protective/permissive left-turn phasing.

In this analysis approach, any quantified benefits greater than or equal to the quantified costs (benefit-cost ratio of 1.0 or greater) represents an economically viable project.

Methodology

The monetary benefit of the project is quantified in terms of reduced vehicle hours traveled (VHT) or less delay at the intersection and the reduced number and severity of estimated crashes over the analysis period between the existing conditions and the two proposed alternatives. The monetary costs include construction, right-of-way, and project delivery costs. Remaining capital values of the roadway features at the end of the analysis period are also subtracted from the total cost of the project.

The results of the analysis provide input for evaluating the overall benefit of the proposed improvements to the intersection. Due to the planning level of detail in the calculations, the exact number is not as important as the magnitude of the value, specifically, that the value is greater or less than one.

The general assumptions for this analysis included:

- Preliminary cost estimates were prepared as part of the Intersection Traffic Control Feasibility Study. For this study, additional costs, such as drainage, were added to those preliminary cost estimates to present a more accurate total cost of each alternative.
- All monetary values were discounted to the 2010 analysis year, which was the base year of study for the Intersection Traffic Control Feasibility Study.
- The 20-year benefit period was based on a 2010 opening through year 2030, corresponding to the analyses in the Intersection Traffic Control Feasibility Study.
- Yearly benefits were calculated on a linear interpolation over the 20-year analysis period.
- Increased delay and/or rerouting of trips during construction were not included.
- Yearly maintenance and operating costs for each alternative were assumed to be approximately equal based on Dakota County data. Dakota County assumes approximately $2,124 per year for a traffic signal (based on $1,500 per year for signal maintenance and operations, $480 per year for signal electrical power, and $144 per year for maintenance and electrical power for two luminaires). Dakota County assumes approximately $1,632 per year for a roundabout (based on maintenance and electrical power for eight luminaires). Due to this minimal yearly difference, maintenance and operating costs were not included in the analysis.

The MnDOT Office of Capital Programs and Performance Measures provided specific assumptions in regard to standard values for this benefit-cost analysis. Table 2, in Appendix A of this memorandum, shows those assumptions.

The traffic assumptions for this analysis included:

- Daily VHT for the intersection's six scenarios (2010 and 2030 existing conditions and 2010 and 2030 alternatives) were developed from the peak hour traffic operation models for the Intersection Traffic Control Feasibility Study and from additional analyses for this memorandum. The a.m. peak hour, p.m. peak hour, and off-peak hour analyses for each scenario and option are provided in Appendix C.
- The Intersection Traffic Control Feasibility Study showed no crashes for the analysis years of that report. Therefore, the yearly crashes and crash rates for the existing condition (all-way stop control) and the signal alternative were calculated based on existing crash rates for similar types of intersections from MnDOT's Intersection Green Sheets.
- The yearly crashes and crash rates for the roundabout alternative were calculated based on formulas from the National Cooperative Highway Research Program.

Benefit-Cost Analysis Results
The following calculation tables, located in Appendix A, provide the details of the benefit-cost analysis for the intersection of CSAH 33 and 140th Street/Connemara Trail:

Table 1 – Benefit-Cost Analysis Summary
Table 2 – Assumptions
Table 3 – Itemized Costs
Table 4 – Vehicle Hours Traveled (VHT) Summary
Table 5 – Vehicle Hours Traveled (VHT) Calculations
Table 6 – Travel Time Benefits
Table 7 – Crash Rates, Severity Rates, and Annual Crash Cost by Facility Type
Table 8 – Crash Benefits

The cost estimate for each alternative and the analyses results are also provided in Appendices B and C, respectively.

As shown in Table 1, the roundabout alternative has a benefit-cost ratio of 24.7; the signal alternative has a benefit-cost ratio 52.1.

The preliminary analysis indicates that the roundabout and signal alternatives for the CSAH 33 and 140th Street/Connemara Trail intersection both have a benefit-cost ratio greater than one. As such, each alternative is expected to be beneficial, with VHT and crash reduction benefits greater than the expected costs associated with each alternative's construction.

The results further indicate that the roundabout alternative provides a greater benefit in terms of travel time savings and safety savings over the 20-year analysis period. However, that greater benefit is offset by a greater cost of more than double the signal alternative. Taking into account the costs and the benefits, the signal alternative provides a greater benefit for the cost of the project.

Appendix A

Benefit-Cost Calculation Tables

Table 1: Benefit-Cost Analysis Summary

Item	Roundabout Alternative	Signal Alternative
Travel Time Benefit (VHT)	$40,423,527	$33,294,192
Crash Benefit	$982,107	($3,259,753)
Total Benefit	$41,405,634	$30,034,439
Total Cost	$1,677,100	$577,000
Benefit-Cost Ratio	**24.7**	**52.1**

Table 2: Assumptions†

Alternatives

Base Condition	No Build
Build Option 1	Roundabout Alternative
Build Option 2	Signal Alternative

Analysis Timeframe

Existing Year	2010
Duration of Benefit Cost Analysis (years)	20
Year of Opening	2010
Design Year	2030
Days Per Year	365.25

Crash Costs

Standard Crash Values

Fatal Type K	$7,200,000
Injury Type A	$420,000
Injury Type B	$138,000
Injury Type C	$92,000
Property Damage Only	$12,000

Operating Costs

Vehicle Miles of Travel

Auto (per mile)	$0.32
Truck (per mile)	$0.95

Time Costs

Vehicle Hours of Travel

Auto (dollars per person hour)	$13.93
Truck (dollars per person hour)	$17.51

Vehicle Occupancy

All Auto Trips (7 County Metro Area - Daily)	1.35
Percentage Autos	97%
Percentage Trucks	3%

Component Service Life (years)

Preliminary Engineering	0
Right of Way	100
Major Structures	60
Grading & Drainage	50
Sub-Base and Base	40
Surface	25

Depreciation Method

Discount Rate	2.7%

†Mn/DOT Office of Capital Programs and Performance Measures

Table 3: Itemized Costs

Item	Roundabout Alternative	Signal Alternative
Surfacing	$349,900	$88,500
Sub-Base / Base	$318,300	$76,700
Grading and Drainage	$410,100	$86,500
Structures/Signals/Miscellaneous	$300,000	$250,000
Right of Way	$91,900	$0
Risk Factor (15%)	$206,900	$75,300
Total Cost	**$1,677,100**	**$577,000**

Table 4: Vehicle Hours Traveled (VHT) Summary

Item	No Build (All-Way)	Roundabout Alternative	Signal Alternative
Daily 2010 VHT	50.9	14.4	60.7
Daily 2030 VHT	790.9	33.7	118.8
Yearly 2010 VHT	18,591	5,260	22,171
Yearly 2030 VHT	288,876	12,309	43,392

Notes: Daily VHT data developed from the AM Peak Hour, PM Peak Hour, and Off Peak Hour analyses using Synchro/SimTraffic for the current all way stop control and the signal alternative. RODEL was used for the roundabout alternative analyses. The hourly percent of 2010 and 2030 ADT was used to group the hourly volumes into three 8-hour categories corresponding to the analysis hours. To create the VHT for each individual hour of the day, the VHT was adjusted based on a ratio of individual hour percentage of ADT to the design hour (AM Peak, PM Peak, Off Peak) for its category. The individual hourly VHT was then summed to determine a daily VHT. See Table 5 Calculations.

Table 5: Vehicle Hours Traveled (VHT) Calculations

Time Period	Volume	Grouping	Percent of Grouping by Volume	No Build (All Way)		Roundabout Alternative		Signal Alternative	
				Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled	Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled	Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled
12 - 1 AM	100	OFF	25.6%	1.5	0.1	0.6	0.1	2.2	0.1
1 - 2 AM	50	OFF	12.8%	0.8	0.1	0.3	0.1	1.1	0.1
2 - 3 AM	50	OFF	12.8%	0.8	0.1	0.3	0.1	1.1	0.1
3 - 4 AM	40	OFF	10.3%	0.6	0.1	0.3	0.1	0.9	0.1
4 - 5 AM	100	OFF	25.6%	1.5	0.1	0.6	0.1	2.2	0.1
5 - 6 AM	360	OFF	92.3%	5.4	0.6	2.1	0.3	7.8	0.8
6 - 7 AM	1070	AM	69.0%	8.8	2.7	2.1	0.7	9.0	2.7
7 - 8 AM	**1550**	**AM**	**100.0%**	**12.7**	**5.5**	**3.0**	**1.3**	**12.9**	**5.6**
8 - 9 AM	1180	AM	76.1%	9.7	3.2	2.3	0.8	9.9	3.3
9 - 10 AM	1040	AM	67.1%	8.6	2.5	2.1	0.7	8.7	2.6
10 - 11 AM	740	AM	47.7%	6.1	1.3	1.5	0.4	6.2	1.3
11 - 12 PM	830	AM	53.5%	6.9	1.6	1.7	0.4	7.0	1.7
12 - 1 PM	880	AM	56.8%	7.3	1.8	1.8	0.5	7.4	1.9
1 - 2 PM	910	AM	58.7%	7.5	1.9	1.8	0.5	7.6	2.0
2 - 3 PM	1130	PM	62.1%	7.8	2.5	2.1	0.7	10.2	3.3
3 - 4 PM	1460	PM	80.2%	10.1	4.1	2.7	1.1	13.1	5.4
4 - 5 PM	1720	PM	94.5%	11.9	5.7	3.2	1.6	15.5	7.5
5 - 6 PM	**1820**	**PM**	**100.0%**	**12.5**	**6.4**	**3.3**	**1.7**	**16.3**	**8.3**
6 - 7 PM	1580	PM	86.8%	10.9	4.8	2.9	1.3	14.2	6.3
7 - 8 PM	1120	PM	61.5%	7.7	2.4	2.1	0.7	10.1	3.2
8 - 9 PM	890	PM	48.9%	6.2	1.6	1.7	0.5	8.0	2.0
9 - 10 PM	650	PM	35.7%	4.5	0.9	1.2	0.3	5.9	1.1
10 - 11 PM	**390**	**OFF**	**100.0%**	**5.8**	**0.7**	**2.2**	**0.3**	**8.4**	**1.0**
11 - 12 AM	180	OFF	46.2%	2.7	0.2	1.1	0.1	3.9	0.2
Daily 2010 Vehicle Hours Traveled (VHT)					**50.9**		**14.4**		**60.7**

Table 5: Vehicle Hours Traveled (VHT) Calculations (cont.)

Time Period	Volume	Grouping	Percent of Grouping by Volume	No Build (All Way)		Roundabout Alternative		Signal Alternative	
				Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled	Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled	Delay per Vehicle (sec.)	Daily Vehicle Hours Traveled
12 - 1 AM	150	OFF	27.8%	1.7	0.1	0.7	0.1	3.9	0.2
1 - 2 AM	90	OFF	16.7%	1.1	0.1	0.4	0.1	2.3	0.1
2 - 3 AM	70	OFF	13.0%	0.8	0.1	0.3	0.1	1.8	0.1
3 - 4 AM	60	OFF	11.1%	0.7	0.1	0.3	0.1	1.6	0.1
4 - 5 AM	140	OFF	25.9%	1.6	0.1	0.6	0.1	3.6	0.2
5 - 6 AM	520	OFF	96.3%	5.9	0.9	2.2	0.4	13.3	2.0
6 - 7 AM	1530	AM	68.3%	60.9	25.9	2.7	1.2	11.7	5.0
7 - 8 AM	**2240**	**AM**	**100.0%**	**89.1**	**55.5**	**3.9**	**2.5**	**17.0**	**10.6**
8 - 9 AM	1720	AM	76.8%	68.5	32.8	3.0	1.5	13.1	6.3
9 - 10 AM	1510	AM	67.4%	60.1	25.3	2.7	1.2	11.5	4.9
10 - 11 AM	1090	AM	48.7%	43.4	13.2	1.9	0.6	8.3	2.6
11 - 12 PM	1170	AM	52.2%	46.6	15.2	2.1	0.7	8.9	2.9
12 - 1 PM	1250	AM	55.8%	49.8	17.3	2.2	0.8	9.5	3.3
1 - 2 PM	1280	AM	57.1%	51.0	18.2	2.3	0.9	9.8	3.5
2 - 3 PM	1610	PM	62.9%	115.1	51.5	4.5	2.1	14.6	6.6
3 - 4 PM	2080	PM	81.3%	148.7	86.0	5.7	3.3	18.8	10.9
4 - 5 PM	2430	PM	94.9%	173.7	117.3	6.7	4.6	22.0	14.9
5 - 6 PM	**2560**	**PM**	**100.0%**	**182.9**	**130.1**	**7.0**	**5.0**	**23.1**	**16.5**
6 - 7 PM	2250	PM	87.9%	160.8	100.5	6.2	3.9	20.4	12.8
7 - 8 PM	1600	PM	62.5%	114.4	50.9	4.4	2.0	14.5	6.5
8 - 9 PM	1260	PM	49.2%	90.1	31.6	3.5	1.3	11.4	4.0
9 - 10 PM	920	PM	35.9%	65.8	16.9	2.6	0.7	8.4	2.2
10 - 11 PM	**540**	**OFF**	**100.0%**	**6.1**	**1.0**	**2.2**	**0.4**	**13.8**	**2.1**
11 - 12 AM	250	OFF	46.3%	2.9	0.3	1.1	0.1	6.4	0.5
Daily 2030 Vehicle Hours Traveled (VHT)					**790.9**		**33.7**		**118.8**

Table 6: Time Travel Benefits

Year	Vehicle Hours Traveled			Annual Time Cost			Travel Time Benefit			Present Value Travel Time Benefit (2010)		
	No Build	Roundabout Alternative	Signal Alternative	No Build	Roundabout Alternative	Signal Alternative	No Build	Roundabout Alternative	Signal Alternative	No Build	Roundabout Alternative	Signal Alternative
2010	**18,591**	**5,260**	**22,171**	$348,895	$98,705	$416,069	$ -	$250,190	-$67,174	$ -	$250,190	-$67,174
2011	32,106	5,612	23,232	$602,512	$105,320	$435,983	$ -	$497,192	$166,529	$ -	$484,121	$162,151
2012	45,620	5,965	24,293	$856,130	$111,935	$455,894	$ -	$744,195	$400,236	$ -	$705,579	$379,468
2013	59,134	6,317	25,354	$1,109,746	$118,549	$475,807	$ -	$991,197	$633,939	$ -	$915,058	$585,243
2014	72,648	6,670	26,415	$1,363,364	$125,164	$495,719	$ -	$1,238,200	$867,645	$ -	$1,113,036	$779,939
2015	86,163	7,022	27,476	$1,616,980	$131,779	$515,632	$ -	$1,485,201	$1,101,348	$ -	$1,299,969	$963,990
2016	99,677	7,374	28,537	$1,870,598	$138,393	$535,543	$ -	$1,732,205	$1,335,055	$ -	$1,476,307	$1,137,827
2017	113,191	7,727	29,598	$2,124,214	$145,008	$555,457	$ -	$1,979,206	$1,568,757	$ -	$1,642,472	$1,301,855
2018	126,705	8,079	30,659	$2,377,832	$151,623	$575,368	$ -	$2,226,209	$1,802,464	$ -	$1,798,881	$1,456,475
2019	140,220	8,432	31,720	$2,631,448	$158,237	$595,281	$ -	$2,473,212	$2,036,167	$ -	$1,945,930	$1,602,062
2020	153,734	8,784	32,781	$2,885,066	$164,852	$615,193	$ -	$2,720,214	$2,269,873	$ -	$2,084,005	$1,738,990
2021	167,248	9,137	33,842	$3,138,682	$171,467	$635,106	$ -	$2,967,215	$2,503,576	$ -	$2,213,473	$1,867,609
2022	180,762	9,489	34,903	$3,392,300	$178,080	$655,017	$ -	$3,214,220	$2,737,283	$ -	$2,334,695	$1,988,265
2023	194,277	9,842	35,964	$3,645,916	$184,696	$674,931	$ -	$3,461,221	$2,970,985	$ -	$2,448,012	$2,101,284
2024	207,791	10,194	37,025	$3,899,534	$191,311	$694,842	$ -	$3,708,223	$3,204,692	$ -	$2,553,758	$2,206,989
2025	221,305	10,547	38,087	$4,153,150	$197,924	$714,755	$ -	$3,955,226	$3,438,395	$ -	$2,652,251	$2,305,680
2026	234,819	10,899	39,148	$4,406,768	$204,539	$734,667	$ -	$4,202,229	$3,672,101	$ -	$2,743,801	$2,397,660
2027	248,334	11,252	40,209	$4,660,384	$211,155	$754,580	$ -	$4,449,229	$3,905,804	$ -	$2,828,702	$2,483,207
2028	261,848	11,604	41,270	$4,914,002	$217,768	$774,492	$ -	$4,696,234	$4,139,511	$ -	$2,907,246	$2,562,601
2029	275,362	11,957	42,331	$5,167,618	$224,383	$794,405	$ -	$4,943,235	$4,373,213	$ -	$2,979,702	$2,636,102
2030	**288,876**	**12,309**	**43,392**	$5,421,235	$230,997	$814,316	$ -	$5,190,238	$4,606,918	$ -	$3,046,340	$2,703,969
								$57,124,491	**$47,667,318**		**$40,423,527**	**$33,294,192**

Table 7: Crash Rates, Severity Rates, and Annual Crash cost by Facility Type

2010 Annual Crash Cost								
Scenario	**Classification**	**Severity**	**Proportion of Crashes**	**Crash Rate**	**ADT - Entering Vehicle Volumes (2010)**	**Avg. Crashes/ Year**	**Cost/Crash**	**Cost/Year**
No Build	All Way Stop	K	0.0%			0.000	$7,200,000	-
		A	1.2%			0.044	$420,000	$18,480
		B	6.0%			0.216	$138,000	$29,808
		C	22.6%			0.820	$92,000	$75,440
		PD	70.2%			2.545	$12,000	$30,540
		Total	100.0%	0.5	19,840	3.625	-	$154,268
Roundabout Alternative	High Volume Multi-Lane	K	0.0%			0.000	$7,200,000	$0
		A	0.0%			0.000	$420,000	$0
		B	0.3%			0.019	$138,000	$2,622
		C	6.1%			0.384	$92,000	$35,328
		PD	93.6%			5.888	$12,000	$70,656
		Total	100.0%	0.9	19,840	6.290	-	$108,606
Signal Alternative	High Volume, High Speed	K	0.4%			0.017	$7,200,000	$122,400
		A	0.8%			0.034	$420,000	$14,280
		B	8.0%			0.348	$138,000	$48,024
		C	26.0%			1.129	$92,000	$103,868
		PD	64.9%			2.822	$12,000	$33,864
		Total	100.0%	0.6	19,840	4.350	-	$322,436

Notes:
Crash costs are from the Mn/DOT Office of Capital Programs and Performance Measures
Crash rates and severity proportion for the all way stop and signal alternative are based on the Mn/DOT intersection green sheets for the year 2009 and for the Metro District
Crash rates and severity proportion for the roundabout alternative based on NCHRP Report 572 for a multi-lane roundabout
Average Crashes/Year have been rounded up to the third decimal place

Table 7: Crash Rates, Severity Rates, and Annual Crash cost by Facility Type (Cont)

2030 Annual Crash Cost								
Scenario	**Classification**	**Severity**	**Proportion of Crashes**	**Crash Rate**	**ADT - Entering Vehicle Volumes (2030)**	**Avg. Crashes/ Year**	**Cost/Crash**	**Cost/Year**
No Build	All Way Stop	K	0.0%			0.000	$7,200,000	$0
		A	1.2%			0.062	$420,000	$26,040
		B	6.0%			0.308	$138,000	$42,504
		C	22.6%			1.170	$92,000	$107,640
		PD	70.2%			3.633	$12,000	$43,596
		Total	100.0%	0.5	28,320	5.173	-	$219,780
Roundabout Alternative	High Volume Multi-Lane	K	0.0%			0.000	$7,200,000	$0
		A	0.0%			0.000	$420,000	$0
		B	0.3%			0.025	$138,000	$3,450
		C	6.1%			0.501	$92,000	$46,092
		PD	93.6%			7.687	$12,000	$92,244
		Total	100.0%	0.8	28,320	8.212	-	$141,786
Signal Alternative	High Volume, High Speed	K	0.4%			0.024	$7,200,000	$172,800
		A	0.8%			0.049	$420,000	$20,580
		B	8.0%			0.496	$138,000	$68,448
		C	26.0%			1.612	$92,000	$148,304
		PD	64.9%			4.028	$12,000	$48,336
		Total	100.0%	0.6	28,320	6.209	-	$458,468

Notes:
Crash costs are from the Mn/DOT Office of Capital Programs and Performance Measures
Crash rates and severity proportion for the all way stop and signal alternative are based on the Mn/DOT intersection green sheets for the year 2009 and for the Metro District
Crash rates and severity proportion for the roundabout alternative based on NCHRP Report 572 for a multi-lane roundabout
Average Crashes/Year have been rounded up to the third decimal place

Table 8: Crash Benefits

	Annual Crash Cost			Crash Benefit			Present Value Crash Benefit (2010)		
Year	No Build	Roundabout Alternative	Signal Alternative	No Build	Roundabout Alternative	Signal Alternative	No Build	Roundabout Alternative	Signal Alternative
2010	**$154,268**	**$108,606**	**$322,436**	$ -	$45,662	($168,168)	$ -	$45,662	($168,168)
2011	$157,544	$110,265	$329,238	$ -	$47,279	($171,694)	$ -	$46,036	($167,180)
2012	$160,819	$111,924	$336,039	$ -	$48,895	($175,220)	$ -	$46,358	($166,128)
2013	$164,095	$113,583	$342,841	$ -	$50,512	($178,746)	$ -	$46,632	($165,016)
2014	$167,370	$115,242	$349,642	$ -	$52,128	($182,272)	$ -	$46,859	($163,847)
2015	$170,646	$116,901	$356,444	$ -	$53,745	($185,798)	$ -	$47,042	($162,626)
2016	$173,922	$118,560	$363,246	$ -	$55,362	($189,324)	$ -	$47,183	($161,355)
2017	$177,197	$120,219	$370,047	$ -	$56,978	($192,850)	$ -	$47,284	($160,039)
2018	$180,473	$121,878	$376,849	$ -	$58,595	($196,376)	$ -	$47,347	($158,681)
2019	$183,748	$123,537	$383,650	$ -	$60,211	($199,902)	$ -	$47,375	($157,283)
2020	$187,024	$125,196	$390,452	$ -	$61,828	($203,428)	$ -	$47,368	($155,850)
2021	$190,300	$126,855	$397,254	$ -	$63,445	($206,954)	$ -	$47,328	($154,383)
2022	$193,575	$128,514	$404,055	$ -	$65,061	($210,480)	$ -	$47,258	($152,885)
2023	$196,851	$130,173	$410,857	$ -	$66,678	($214,006)	$ -	$47,159	($151,360)
2024	$200,126	$131,832	$417,658	$ -	$68,294	($217,532)	$ -	$47,033	($149,809)
2025	$203,402	$133,491	$424,460	$ -	$69,911	($221,058)	$ -	$46,880	($148,235)
2026	$206,678	$135,150	$431,262	$ -	$71,528	($224,584)	$ -	$46,703	($146,640)
2027	$209,953	$136,809	$438,063	$ -	$73,144	($228,110)	$ -	$46,503	($145,026)
2028	$213,229	$138,468	$444,865	$ -	$74,761	($231,636)	$ -	$46,281	($143,396)
2029	$216,504	$140,127	$451,666	$ -	$76,377	($235,162)	$ -	$46,039	($141,752)
2030	**$219,780**	**$141,786**	**$458,468**	$ -	$77,994	($238,688)	$ -	$45,778	($140,095)
					$1,298,388	**($4,271,988)**		**$982,107**	**($3,259,753)**

Appendix B

Detailed Cost Estimates

Roundabout Alternative Cost Estimate

Item Description	Units	Unit Cost	Quantity	Total (rounded)
Paving and Grading Costs				
Common Excavation	CY	$11	13136	$144,496
3" Wear Course Type SP 12.5 (4,F)	TON	$52	1444	$75,088
3" Non Wear Course Type SP 12.5 (3, B)	TON	$45	1444	$64,980
Bituminous Material for Tack Coat	GAL	$3	441	$1,103
9" Aggregate Base (CV) Class 5	CY	$20	3031	$60,620
24" Select Granular Borrow	CY	$14	8083	$113,162
8" Concrete Apron	SY	$46	274	$12,563
Raised Median Concrete	SF	$6	14675	$88,050
4" Concrete Walk	SF	$3	450	$1,247
3" Bituminous Walk	SF	$2	24258	$37,843
Concrete Cub and Gutter-B624	LF	$11	6384	$68,948
Subtotal Paving and Grading				$668,100
Utilities, Removals, Drainage, Etc.				
Remove Bituminous	SY	$2	78997	$164,314
Remove Curb and Gutter	LF	$2	4055	$8,313
Remove Bituminous Walk	SF	$1	21361	$12,176
Sawcut Bituminous	LF	$3	1348	$4,044
4" Broken Line White - Paint	LF	$0	3049	$488
4" Solid Line White - Paint	LF	$0	3307	$298
8" Solid Line White - Paint	LF	$1	192	$108
24" Stop Line White - Paint	LF	$9	0	$0
4" Double Solid Line Yellow - Paint	LF	$0	2561	$564
24" Solid Line Yellow - Paint	LF	$4	290	$1,068
Pavement Message (Rt-Thru Arrow) Epoxy	Each	$195	6	$1,170
Pavement Message (Thru) Epoxy	Each	$125	12	$1,500
Pavement Message (Lt Arrow) Epoxy	Each	$125	0	$0
Pavement Message (Lt-Thru Arrow) Epoxy	Each	$195	10	$1,950
Clear and Grub			1.0%	$6,700
Minor City Utilities			4.0%	$26,800
Signing, Traffic Control			3.0%	$20,100
Erosion Control and Turf Establishment			4.0%	$26,800
Subtotal Utilities, Removals, Drainage, Etc.				$276,393
Drainage				
Storm Sewer			20.0%	$133,700
Subtotal Drainage				$133,700
Structures/Signals/Misc. Cost				
Retaining Wall				$0
Lighting		$15,000	20	$300,000
Signal		$250,000	0	$0
Landscaping				$0
Subtotal Structures/Signals/Misc. Cost				$300,000
Subtotal Construction				**$1,378,193**

Roundabout Alternative Cost Estimate (Cont)

Miscellaneous				
Risk & Contingency			10%	$137,900
Mobilization			5%	$69,000
Subtotal Miscellaneous				$206,900
ROW Cost				
Permanent Right-of-Way	acre	$400,000	0.23	$91,827
Temporary Easement	acre	$100,000	0	$0
Total ROW				$91,827
Total Estimated Cost				**$1,676,920**

Signal Alternative Cost Estimate

Item Description	Units	Unit Cost	Quantity	Total (rounded)
Paving and Grading Costs				
Common Excavation	CY	$11	3165	$34,815
3" Wear Course Type SP 12.5 (4,F)	TON	$52	388	$20,176
3" Non Wear Course Type SP 12.5 (3, B)	TON	$45	388	$17,460
Bituminous Material for Tack Coat	GAL	$3	117	$293
9" Aggregate Base (CV) Class 5	CY	$20	730	$14,600
24" Select Granular Borrow	CY	$14	1948	$27,272
8" Concrete Apron	SY	$46	0	$0
Raised Median Concrete	SF	$6	0	$0
4" Concrete Walk	SF	$3	0	$0
3" Bituminous Walk	SF	$2	14585	$22,753
Concrete Cub and Gutter-B624	LF	$11	2567	$27,724
Subtotal Paving and Grading				$165,093
Utilities, Removals, Drainage, Etc.				
Remove Bituminous	SY	$2	1245	$2,590
Remove Curb and Gutter	LF	$2	2551	$5,230
Remove Bituminous Walk	SF	$1	16218	$9,245
Sawcut Bituminous	LF	$3	2789	$8,367
4" Broken Line White - Paint	LF	$0	3724	$596
4" Solid Line White - Paint	LF	$0	3845	$347
8" Solid Line White - Paint	LF	$1	318	$179
24" Stop Line White - Paint	LF	$9	177	$1,618
4" Double Solid Line Yellow - Paint	LF	$0	4050	$891
24" Solid Line Yellow - Paint	LF	$4	279	$1,027
Pavement Message (Rt-Thru Arrow) Epoxy	Each	$195	7	$1,365
Pavement Message (Thru) Epoxy	Each	$125	7	$875
Pavement Message (Lt Arrow) Epoxy	Each	$125	7	$875
Pavement Message (Lt-Thru Arrow) Epoxy	Each	$195	0	$0
Clear and Grub			1.0%	$1,700
Minor City Utilities			4.0%	$6,700
Signing, Traffic Control			3.0%	$5,000
Erosion Control and Turf Establishment			4.0%	$6,700
Subtotal Utilities, Removals, Drainage, Etc.				$53,305
Drainage				
Storm Sewer			20.0%	$33,100
Subtotal Drainage				$33,100
Structures/Signals/Misc. Cost				
Retaining Wall				$0
Lighting		$15,000	0	$0
Signal		$250,000	1	$250,000
Landscaping				$0
Subtotal Structures/Signals/Misc. Cost				$250,000
Subtotal Construction				**$501,498**

Signal Alternative Cost Estimate (Cont)

Miscellaneous				
Risk & Contingency			10%	$50,200
Mobilization			5%	$25,100
Subtotal Miscellaneous				$75,300
ROW Cost				
Permanent Right-of-Way	acre	$400,000	0	$0
Temporary Easement	acre	$100,000	0	$0
Total ROW				$0
Total Estimated Cost				**$576,798**

Appendix C

Intersection Evaluation Results

3: 140th & CSAH 33 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.2	0.1	0.0	0.5	0.1	0.5	3.1	0.0	0.0	0.3	0.0
Delay / Veh (s)	6.3	10.8	4.2	5.6	11.0	4.9	11.2	19.6	4.3	5.0	9.1	4.0
Total Stops	20	83	107	21	152	108	149	580	41	20	126	38
Travel Time (hr)	0.3	1.2	1.5	0.3	2.2	1.5	2.3	9.5	0.5	0.1	0.6	0.2
Avg Speed (mph)	36	35	36	36	35	36	34	30	36	22	20	21
Vehicles Entered	20	82	106	21	152	107	148	569	40	19	126	39
Vehicles Exited	20	83	107	21	152	108	149	568	40	20	126	38
Hourly Exit Rate	20	83	107	21	152	108	149	568	40	20	126	38
Input Volume	20	90	100	20	150	110	160	570	40	20	130	40
% of Volume	100	92	107	105	101	98	93	100	100	100	97	95
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	5.1
Delay / Veh (s)	12.7
Total Stops	1445
Travel Time (hr)	20.0
Avg Speed (mph)	32
Vehicles Entered	1429
Vehicles Exited	1432
Hourly Exit Rate	1432
Input Volume	1450
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

Total Network Performance

Total Delay (hr)	6.7
Delay / Veh (s)	17.1
Total Stops	1451
Travel Time (hr)	42.5
Avg Speed (mph)	33
Vehicles Entered	1430
Vehicles Exited	1415
Hourly Exit Rate	1415
Input Volume	3752
% of Volume	38
Denied Entry Before	0
Denied Entry After	0

3: 140th & CSAH 33 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.9	0.7	0.1	0.5	0.1	0.4	0.9	0.1	0.2	2.0	0.1
Delay / Veh (s)	9.4	14.8	11.5	7.9	12.2	4.8	12.0	14.1	3.5	7.9	15.0	9.0
Total Stops	42	207	232	52	149	39	131	229	53	109	483	44
Travel Time (hr)	0.6	3.2	3.7	0.7	2.2	0.5	2.0	3.4	0.7	0.6	3.1	0.3
Avg Speed (mph)	33	32	31	34	34	35	33	33	37	18	16	16
Vehicles Entered	41	209	233	52	148	38	130	227	53	109	482	44
Vehicles Exited	42	206	232	52	149	39	131	228	53	109	481	43
Hourly Exit Rate	42	206	232	52	149	39	131	228	53	109	481	43
Input Volume	40	210	240	50	150	40	130	230	50	110	500	40
% of Volume	105	98	97	104	99	98	101	99	106	99	96	108
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	6.1
Delay / Veh (s)	12.5
Total Stops	1770
Travel Time (hr)	21.0
Avg Speed (mph)	30
Vehicles Entered	1766
Vehicles Exited	1765
Hourly Exit Rate	1765
Input Volume	1790
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

Total Network Performance

Total Delay (hr)	8.0
Delay / Veh (s)	16.4
Total Stops	1771
Travel Time (hr)	51.9
Avg Speed (mph)	33
Vehicles Entered	1766
Vehicles Exited	1741
Hourly Exit Rate	1741
Input Volume	4410
% of Volume	39
Denied Entry Before	0
Denied Entry After	0

3: 140th & CSAH 33 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.2	0.0
Delay / Veh (s)	2.8	8.1	2.5	2.8	7.7	1.5	4.9	8.3	1.3	2.8	7.4	2.1
Total Stops	10	49	58	8	32	12	23	67	10	14	85	16
Travel Time (hr)	0.1	0.6	0.7	0.1	0.4	0.1	0.3	0.9	0.1	0.1	0.4	0.1
Avg Speed (mph)	38	37	38	38	37	39	38	37	40	26	22	25
Vehicles Entered	9	48	57	8	32	12	24	66	10	14	85	16
Vehicles Exited	10	49	57	8	32	12	23	66	10	14	85	16
Hourly Exit Rate	10	49	57	8	32	12	23	66	10	14	85	16
Input Volume	10	50	55	10	35	15	25	65	10	15	85	15
% of Volume	100	98	104	80	91	80	92	102	100	93	100	107
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	0.6
Delay / Veh (s)	5.8
Total Stops	384
Travel Time (hr)	4.0
Avg Speed (mph)	36
Vehicles Entered	381
Vehicles Exited	382
Hourly Exit Rate	382
Input Volume	390
% of Volume	98
Denied Entry Before	0
Denied Entry After	0

Total Network Performance

Total Delay (hr)	0.9
Delay / Veh (s)	8.4
Total Stops	384
Travel Time (hr)	10.4
Avg Speed (mph)	36
Vehicles Entered	379
Vehicles Exited	378
Hourly Exit Rate	378
Input Volume	962
% of Volume	39
Denied Entry Before	0
Denied Entry After	0

3: 140th & CSAH 33 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.1	0.4	0.3	0.1	0.7	0.4	9.9	34.4	0.5	0.1	0.7	0.1
Delay / Veh (s)	7.9	12.9	6.7	9.1	13.3	8.3	185.5	174.8	51.1	7.4	11.6	6.7
Total Stops	28	118	137	39	194	155	587	1766	79	40	231	48
Travel Time (hr)	0.4	1.7	2.0	0.6	2.9	2.3	12.3	42.5	1.0	0.2	1.3	0.3
Avg Speed (mph)	34	33	34	34	33	33	8	9	19	19	18	18
Vehicles Entered	28	118	136	39	194	154	201	733	36	40	231	48
Vehicles Exited	28	118	137	38	195	155	185	684	35	40	231	48
Hourly Exit Rate	28	118	137	38	195	155	185	684	35	40	231	48
Input Volume	30	110	140	40	200	150	210	730	40	40	240	50
% of Volume	93	107	98	95	98	103	88	94	88	100	96	96
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	1	3	0	0	0	0

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	47.7
Delay / Veh (s)	89.1
Total Stops	3422
Travel Time (hr)	67.3
Avg Speed (mph)	13
Vehicles Entered	1958
Vehicles Exited	1894
Hourly Exit Rate	1894
Input Volume	1980
% of Volume	96
Denied Entry Before	0
Denied Entry After	4

Total Network Performance

Total Delay (hr)	50.2
Delay / Veh (s)	94.4
Total Stops	3430
Travel Time (hr)	97.6
Avg Speed (mph)	19
Vehicles Entered	1957
Vehicles Exited	1868
Hourly Exit Rate	1868
Input Volume	5134
% of Volume	36
Denied Entry Before	0
Denied Entry After	4

3: 140th & CSAH 33 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.3	2.6	4.0	0.2	0.8	0.1	0.8	2.1	0.1	17.3	86.8	6.6
Delay / Veh (s)	26.9	32.8	47.0	12.7	14.9	7.5	18.8	25.5	5.9	346.0	431.8	530.8
Total Stops	37	290	312	50	205	59	158	299	51	223	725	41
Travel Time (hr)	0.7	5.8	7.9	0.8	3.1	0.8	2.7	5.4	0.7	17.9	88.6	6.8
Avg Speed (mph)	25	24	19	31	32	34	29	27	35	10	3	3
Vehicles Entered	37	286	311	49	204	58	158	296	51	180	736	46
Vehicles Exited	37	282	307	50	204	59	158	294	51	181	712	45
Hourly Exit Rate	37	282	307	50	204	59	158	294	51	181	712	45
Input Volume	40	280	320	50	200	60	170	290	50	210	900	60
% of Volume	92	101	96	100	102	98	93	101	102	86	79	75
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	34	131	9

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	121.8
Delay / Veh (s)	182.9
Total Stops	2450
Travel Time (hr)	141.4
Avg Speed (mph)	13
Vehicles Entered	2412
Vehicles Exited	2380
Hourly Exit Rate	2380
Input Volume	2630
% of Volume	90
Denied Entry Before	0
Denied Entry After	174

Total Network Performance

Total Delay (hr)	134.6
Delay / Veh (s)	203.0
Total Stops	3435
Travel Time (hr)	195.2
Avg Speed (mph)	21
Vehicles Entered	2421
Vehicles Exited	2350
Hourly Exit Rate	2350
Input Volume	6586
% of Volume	36
Denied Entry Before	0
Denied Entry After	174

3: 140th & CSAH 33 Performance by movement

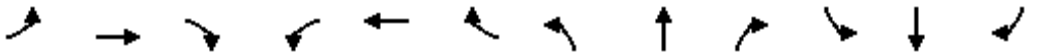
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay (hr)	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.2	0.0
Delay / Veh (s)	3.5	8.5	2.7	3.0	8.1	2.3	5.8	8.9	1.3	3.3	7.5	2.8
Total Stops	9	61	71	15	58	33	38	85	10	25	113	15
Travel Time (hr)	0.1	0.8	0.9	0.2	0.8	0.4	0.5	1.2	0.1	0.1	0.5	0.1
Avg Speed (mph)	39	37	38	38	37	38	37	36	39	25	22	24
Vehicles Entered	9	61	71	15	58	33	38	85	10	24	113	15
Vehicles Exited	9	62	71	15	58	33	38	85	10	25	113	15
Hourly Exit Rate	9	62	71	15	58	33	38	85	10	25	113	15
Input Volume	10	60	70	15	65	30	35	85	10	25	120	15
% of Volume	90	103	101	100	89	110	109	100	100	100	94	100
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

3: 140th & CSAH 33 Performance by movement

Movement	All
Total Delay (hr)	0.9
Delay / Veh (s)	6.1
Total Stops	533
Travel Time (hr)	5.7
Avg Speed (mph)	35
Vehicles Entered	532
Vehicles Exited	534
Hourly Exit Rate	534
Input Volume	540
% of Volume	99
Denied Entry Before	0
Denied Entry After	0

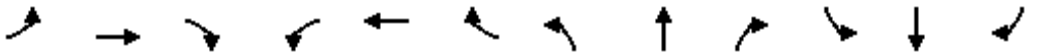
Total Network Performance

Total Delay (hr)	1.3
Delay / Veh (s)	8.9
Total Stops	533
Travel Time (hr)	14.6
Avg Speed (mph)	35
Vehicles Entered	533
Vehicles Exited	528
Hourly Exit Rate	528
Input Volume	1333
% of Volume	40
Denied Entry Before	0
Denied Entry After	0



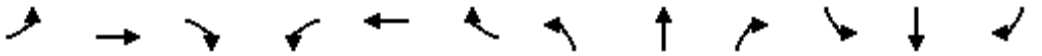
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	90	100	20	150	110	160	570	40	20	130	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.94		1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3260		1770	3314		1770	3505		1770	3415	
Flt Permitted	0.50	1.00		0.62	1.00		0.55	1.00		0.40	1.00	
Satd. Flow (perm)	926	3260		1159	3314		1030	3505		745	3415	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	98	109	22	163	120	174	620	43	22	141	43
RTOR Reduction (vph)	0	92	0	0	102	0	0	4	0	0	25	0
Lane Group Flow (vph)	22	115	0	22	181	0	174	659	0	22	159	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.6	8.5		9.6	8.5		39.3	32.8		26.2	25.2	
Effective Green, g (s)	12.4	9.9		11.6	9.5		40.8	34.3		29.2	26.7	
Actuated g/C Ratio	0.19	0.15		0.18	0.15		0.63	0.53		0.45	0.41	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	210	498		227	486		764	1855		375	1407	
v/s Ratio Prot	c0.00	0.04		0.00	c0.05		c0.04	c0.19		0.00	0.05	
v/s Ratio Perm	0.02			0.01			0.11			0.02		
v/c Ratio	0.10	0.23		0.10	0.37		0.23	0.36		0.06	0.11	
Uniform Delay, d1	21.5	24.1		22.1	25.0		5.1	8.8		9.9	11.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.2	0.5		0.2	0.1		0.1	0.0	
Delay (s)	21.7	24.3		22.3	25.4		5.2	9.0		10.0	11.8	
Level of Service	C	C		C	C		A	A		A	B	
Approach Delay (s)		24.1			25.2			8.2			11.6	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	64.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



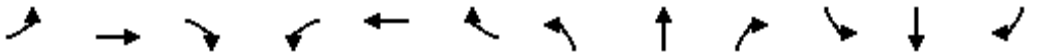
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	210	240	50	150	40	130	230	50	110	500	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.97		1.00	0.97		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3256		1770	3428		1770	3445		1770	3500	
Flt Permitted	0.61	1.00		0.33	1.00		0.34	1.00		0.57	1.00	
Satd. Flow (perm)	1141	3256		606	3428		641	3445		1055	3500	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	228	261	54	163	43	141	250	54	120	543	43
RTOR Reduction (vph)	0	210	0	0	25	0	0	20	0	0	6	0
Lane Group Flow (vph)	43	279	0	54	181	0	141	284	0	120	580	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	14.6	11.1		15.0	11.3		28.7	22.3		28.1	22.0	
Effective Green, g (s)	17.4	12.5		17.0	12.3		31.7	23.8		31.1	23.5	
Actuated g/C Ratio	0.27	0.19		0.26	0.19		0.49	0.37		0.48	0.36	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	355	630		244	653		453	1269		592	1273	
v/s Ratio Prot	0.01	c0.09		c0.02	0.05		c0.04	0.08		0.02	c0.17	
v/s Ratio Perm	0.02			0.04			0.11			0.07		
v/c Ratio	0.12	0.44		0.22	0.28		0.31	0.22		0.20	0.46	
Uniform Delay, d1	17.7	23.0		18.3	22.3		9.3	14.0		9.3	15.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.5		0.5	0.2		0.4	0.1		0.2	0.3	
Delay (s)	17.8	23.5		18.7	22.6		9.7	14.1		9.5	15.9	
Level of Service	B	C		B	C		A	B		A	B	
Approach Delay (s)		23.0			21.8			12.7			14.8	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	64.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



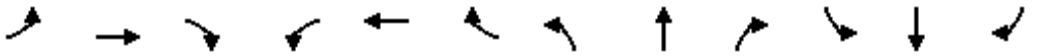
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	50	55	10	35	15	25	65	10	15	85	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.96		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3260		1770	3382		1770	3468		1770	3461	
Flt Permitted	0.68	1.00		0.68	1.00		0.68	1.00		0.70	1.00	
Satd. Flow (perm)	1264	3260		1266	3382		1274	3468		1306	3461	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	54	60	11	38	16	27	71	11	16	92	16
RTOR Reduction (vph)	0	52	0	0	14	0	0	6	0	0	8	0
Lane Group Flow (vph)	11	62	0	11	40	0	27	76	0	16	100	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	6.5	5.6		6.5	5.6		25.0	24.1		25.0	24.1	
Effective Green, g (s)	9.3	7.0		8.5	6.6		28.0	25.6		28.0	25.6	
Actuated g/C Ratio	0.18	0.13		0.16	0.12		0.53	0.48		0.53	0.48	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	244	431		222	422		697	1678		712	1675	
v/s Ratio Prot	c0.00	c0.02		0.00	0.01		c0.00	0.02		0.00	c0.03	
v/s Ratio Perm	0.01			0.01			0.02			0.01		
v/c Ratio	0.05	0.14		0.05	0.09		0.04	0.05		0.02	0.06	
Uniform Delay, d1	18.1	20.3		18.7	20.5		6.0	7.2		5.9	7.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.1	0.1		0.0	0.0		0.0	0.0	
Delay (s)	18.2	20.5		18.8	20.6		6.0	7.2		5.9	7.3	
Level of Service	B	C		B	C		A	A		A	A	
Approach Delay (s)		20.3			20.3			6.9			7.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.07		
Actuated Cycle Length (s)	52.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



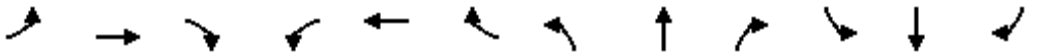
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	110	140	40	200	150	210	730	40	40	240	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.94		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3243		1770	3311		1770	3512		1770	3448	
Flt Permitted	0.43	1.00		0.49	1.00		0.48	1.00		0.31	1.00	
Satd. Flow (perm)	799	3243		915	3311		896	3512		568	3448	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	120	152	43	217	163	228	793	43	43	261	54
RTOR Reduction (vph)	0	126	0	0	133	0	0	4	0	0	18	0
Lane Group Flow (vph)	33	146	0	43	247	0	228	832	0	43	297	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.1	10.7		15.9	12.1		40.6	31.5		29.4	25.8	
Effective Green, g (s)	15.9	12.1		17.9	13.1		42.1	33.0		32.4	27.3	
Actuated g/C Ratio	0.22	0.17		0.25	0.18		0.59	0.46		0.46	0.38	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	231	553		288	611		664	1632		346	1326	
v/s Ratio Prot	0.01	0.04		c0.01	c0.07		c0.05	c0.24		0.01	0.09	
v/s Ratio Perm	0.02			0.03			0.15			0.05		
v/c Ratio	0.14	0.26		0.15	0.40		0.34	0.51		0.12	0.22	
Uniform Delay, d1	21.8	25.6		20.4	25.5		6.9	13.3		10.8	14.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.3		0.2	0.4		0.3	0.3		0.2	0.1	
Delay (s)	22.1	25.8		20.6	26.0		7.2	13.6		11.0	14.8	
Level of Service	C	C		C	C		A	B		B	B	
Approach Delay (s)		25.4			25.4			12.2			14.3	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	71.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	280	320	50	200	60	170	290	50	210	900	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3256		1770	3417		1770	3462		1770	3506	
Flt Permitted	0.51	1.00		0.22	1.00		0.13	1.00		0.50	1.00	
Satd. Flow (perm)	955	3256		414	3417		242	3462		929	3506	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	304	348	54	217	65	185	315	54	228	978	65
RTOR Reduction (vph)	0	213	0	0	29	0	0	14	0	0	5	0
Lane Group Flow (vph)	43	439	0	54	253	0	185	355	0	228	1038	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	20.4	16.8		20.8	17.0		41.3	32.1		41.5	32.2	
Effective Green, g (s)	23.2	18.2		22.8	18.0		44.3	33.6		44.5	33.7	
Actuated g/C Ratio	0.28	0.22		0.27	0.22		0.53	0.40		0.53	0.40	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	315	711		191	737		325	1395		605	1417	
v/s Ratio Prot	0.01	c0.13		c0.02	0.07		c0.07	0.10		0.05	c0.30	
v/s Ratio Perm	0.03			0.06			0.23			0.15		
v/c Ratio	0.14	0.62		0.28	0.34		0.57	0.25		0.38	0.73	
Uniform Delay, d1	22.3	29.5		23.5	27.7		13.2	16.6		10.4	21.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	1.6		0.8	0.3		2.3	0.1		0.4	2.0	
Delay (s)	22.5	31.0		24.3	28.0		15.5	16.7		10.8	23.0	
Level of Service	C	C		C	C		B	B		B	C	
Approach Delay (s)		30.5			27.4			16.3			20.8	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM Average Control Delay	23.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	83.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	60	70	15	65	30	35	85	10	25	120	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.92		1.00	0.95		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3253		1770	3371		1770	3483		1770	3481	
Flt Permitted	0.65	1.00		0.66	1.00		0.63	1.00		0.69	1.00	
Satd. Flow (perm)	1207	3253		1234	3371		1170	3483		1280	3481	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	65	76	16	71	33	38	92	11	27	130	16
RTOR Reduction (vph)	0	66	0	0	29	0	0	5	0	0	8	0
Lane Group Flow (vph)	11	75	0	16	75	0	38	98	0	27	138	0
Turn Type	pm+pt			pm+pt			pm+pt			pm+pt		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	6.6	5.7		6.6	5.7		28.2	26.0		25.6	24.7	
Effective Green, g (s)	9.4	7.1		8.6	6.7		31.2	27.5		28.6	26.2	
Actuated g/C Ratio	0.17	0.13		0.16	0.12		0.57	0.50		0.52	0.48	
Clearance Time (s)	5.4	5.4		5.0	5.0		5.5	5.5		5.5	5.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	230	421		212	411		705	1745		688	1661	
v/s Ratio Prot	0.00	c0.02		c0.00	0.02		c0.00	0.03		0.00	c0.04	
v/s Ratio Perm	0.01			0.01			0.03			0.02		
v/c Ratio	0.05	0.18		0.08	0.18		0.05	0.06		0.04	0.08	
Uniform Delay, d1	19.0	21.3		19.7	21.6		5.2	7.0		6.4	7.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.2	0.2		0.0	0.0		0.0	0.0	
Delay (s)	19.1	21.5		19.9	21.9		5.3	7.0		6.4	7.8	
Level of Service	B	C		B	C		A	A		A	A	
Approach Delay (s)		21.3			21.6			6.6			7.6	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.09		
Actuated Cycle Length (s)	54.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

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*****************************************************************************
*                                                                           *
*                    DAKOTA COUNTY B-C ANALYSIS - 2010 PEAKS                9  *
*****************************************************************************
*                                                 *                         *
* E    (m)    8.00   8.00   8.00   8.00           * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00           * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00           * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00           * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00           * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00           * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0           * FLOW PEAK  am/op/pm    AM  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *               *         *
* SB 33    *1.05*  040  130  020  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* EB 140TH *1.05*  100  080  020  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* NB 33    *1.05*  040  570  160  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* WB CONNEM*1.05*  110  150  020  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
*****************************************************************************
*                                                 *                         *
* FLOW        veh     190    200    770    280   * AVEDEL  s   3.0 *
* CAPACITY    veh    1679   1792   1828   1383   * LOS   SIG     A *
* AVE DELAY  mins    0.04   0.04   0.06   0.05   * LOS UNSIG     A *
* MAX DELAY  mins    0.05   0.05   0.08   0.07   *                 *
* AVE QUEUE   veh       0      0      1      0   * VEHIC HRS   1.2 *
* MAX QUEUE   veh       0      0      1      0   * COST    $    18 *
*****************************************************************************

*****************************************************************************
*                                                                           *
*                    DAKOTA COUNTY B-C ANALYSIS - 2010 PEAKS               10  *
*****************************************************************************
*                                                 *                         *
* E    (m)    8.00   8.00   8.00   8.00           * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00           * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00           * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00           * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00           * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00           * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0           * FLOW PEAK  am/op/pm    PM  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *               *         *
* SB 33    *1.05*  040  500  110  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* EB 140TH *1.05*  240  210  040  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* NB 33    *1.05*  050  230  130  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* WB CONNEM*1.05*  040  150  050  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
*****************************************************************************
*                                                 *                         *
* FLOW        veh     650    490    410    240   * AVEDEL  s   3.3 *
* CAPACITY    veh    1679   1447   1658   1630   * LOS   SIG     A *
* AVE DELAY  mins    0.06   0.06   0.05   0.04   * LOS UNSIG     A *
* MAX DELAY  mins    0.08   0.08   0.06   0.05   *                 *
* AVE QUEUE   veh       1      1      0      0   * VEHIC HRS   1.6 *
* MAX QUEUE   veh       1      1      0      0   * COST    $    24 *
*****************************************************************************
```

```
*****************************************************************************
*                                                                           *
*                    DAKOTA COUNTY B-C ANALYSIS - 2010 PEAKS            11  *
*****************************************************************************
*                                                *                          *
* E    (m)    8.00   8.00   8.00   8.00          * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00          * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00          * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00          * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00          * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00          * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0          * FLOW PEAK  am/op/pm    OP  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *               *         *
* SB 33    *1.10*  015  085  015  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* EB 140TH *1.10*  055  050  010  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* NB 33    *1.10*  010  065  025  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* WB CONNEM*1.10*  015  035  010  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
*****************************************************************************
*                                                *                          *
* FLOW        veh     115    115    100     60  * AVEDEL  s   2.2 *
* CAPACITY    veh    1776   1748   1773   1755  * LOS   SIG     A *
* AVE DELAY  mins    0.04   0.04   0.04   0.04  * LOS UNSIG     A *
* MAX DELAY  mins    0.04   0.04   0.04   0.04  *                 *
* AVE QUEUE   veh       0      0      0      0  * VEHIC HRS   0.2 *
* MAX QUEUE   veh       0      0      0      0  * COST    $     4 *
*****************************************************************************

*****************************************************************************
*                                                                           *
*                    DAKOTA COUNTY B-C ANALYSIS - 2030 PEAKS            15  *
*****************************************************************************
*                                                *                          *
* E    (m)    8.00   8.00   8.00   8.00          * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00          * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00          * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00          * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00          * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00          * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0          * FLOW PEAK  am/op/pm    AM  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *               *         *
* SB 33    *1.05*  050  240  040  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* EB 140TH *1.05*  140  110  030  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* NB 33    *1.05*  040  730  210  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* WB CONNEM*1.05*  150  200  040  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
*****************************************************************************
*                                                *                          *
* FLOW        veh     330    280    980    390  * AVEDEL  s   3.9 *
* CAPACITY    veh    1595   1687   1785   1228  * LOS   SIG     A *
* AVE DELAY  mins    0.05   0.04   0.07   0.07  * LOS UNSIG     A *
* MAX DELAY  mins    0.06   0.05   0.10   0.10  *                 *
* AVE QUEUE   veh       0      0      1      0  * VEHIC HRS   2.1 *
* MAX QUEUE   veh       0      0      2      1  * COST    $    32 *
*****************************************************************************
```

```
*****************************************************************************
*                                                                           *
*                  DAKOTA COUNTY B-C ANALYSIS - 2030 PEAKS                16  *
*****************************************************************************
*                                                *                          *
* E    (m)    8.00   8.00   8.00   8.00          * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00          * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00          * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00          * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00          * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00          * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0          * FLOW PEAK  am/op/pm    PM  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *              *         *
* SB 33    *1.05*  060  900  210  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* EB 140TH *1.05*  320  280  040  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* NB 33    *1.05*  050  290  170  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
* WB CONNEM*1.05*  060  200  050  0          *1.00*85*0.75 1.125 0.75*15 45 75 *
*****************************************************************************
*                                                *                          *
* FLOW        veh    1170    640    510    310   * AVEDEL  s   7.0 *
* CAPACITY    veh    1616   1094   1538   1559   * LOS   SIG     A *
* AVE DELAY  mins    0.15   0.14   0.06   0.05   * LOS UNSIG     A *
* MAX DELAY  mins    0.24   0.23   0.08   0.06   *                  *
* AVE QUEUE   veh       3      2      1      0   * VEHIC HRS   5.1 *
* MAX QUEUE   veh       4      2      1      0   * COST    $    77 *
*****************************************************************************


*****************************************************************************
*                                                                           *
*                  DAKOTA COUNTY B-C ANALYSIS - 2030 PEAKS                17  *
*****************************************************************************
*                                                *                          *
* E    (m)    8.00   8.00   8.00   8.00          * TIME PERIOD     min    90  *
* L'   (m)  100.00 100.00 100.00 100.00          * TIME SLICE      min    15  *
* V    (m)    3.00   3.00   3.00   3.00          * RESULTS PERIOD  min 15 75  *
* RAD  (m)   20.00  20.00  20.00  20.00          * TIME COST      $/hr 15.00  *
* PHI  (d)   30.00  30.00  30.00  30.00          * FLOW PERIOD     min 15 75  *
* DIA  (m)   50.00  50.00  50.00  50.00          * FLOW TYPE   pcu/veh   VEH  *
* GRAD SEP       0      0      0      0          * FLOW PEAK  am/op/pm    OP  *
*****************************************************************************
* LEG NAME *PCU *VEH TURNS (1st exit, 2nd..U)*FLOF*CL*  FLOW RATIO   *FLOW TIME*
*          *    *                            *    *  *              *         *
* SB 33    *1.10*  015  120  025  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* EB 140TH *1.10*  070  060  010  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* NB 33    *1.10*  010  085  035  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
* WB CONNEM*1.10*  030  065  015  0          *1.00*85*1.00 1.000 1.00*15 45 75 *
*****************************************************************************
*                                                *                          *
* FLOW        veh     160    140    130    110   * AVEDEL  s   2.2 *
* CAPACITY    veh    1744   1713   1758   1734   * LOS   SIG     A *
* AVE DELAY  mins    0.04   0.04   0.04   0.04   * LOS UNSIG     A *
* MAX DELAY  mins    0.04   0.04   0.04   0.04   *                  *
* AVE QUEUE   veh       0      0      0      0   * VEHIC HRS   0.3 *
* MAX QUEUE   veh       0      0      0      0   * COST    $     5 *
*****************************************************************************
```