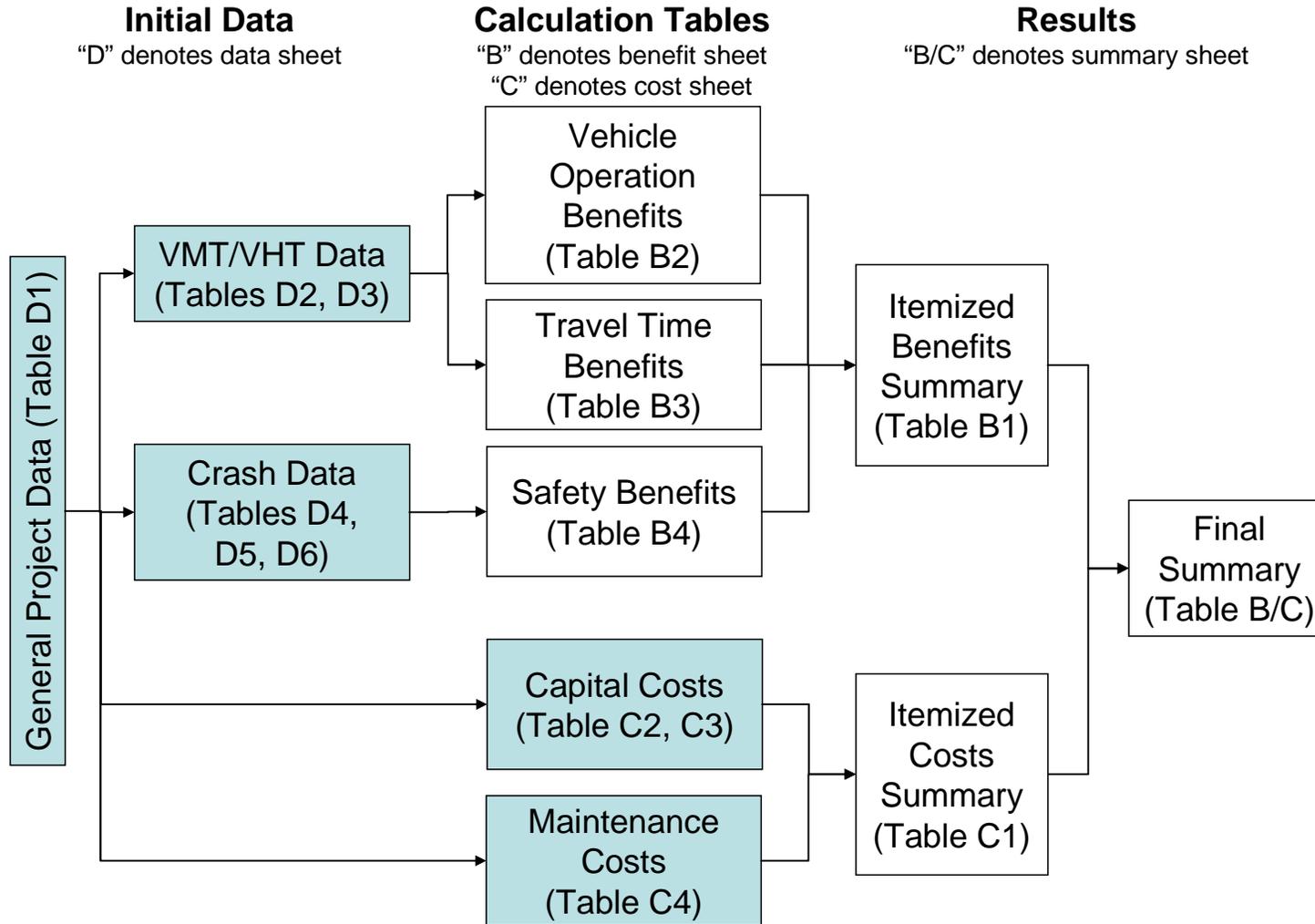


Benefit-Cost Calculation Spreadsheet Flow Chart



Notes:

- Shaded boxes indicate substantial input data is required.
- Minimum input data needed for white boxes.

TABLE B/C: BENEFIT-COST SUMMARY
Highway Alternative

SRF PROJECT NUMBER: **4686**
 PROJECT NAME: **Highway Alternative**
 B/C ANALYSIS BASE YEAR: **2011**
 B/C ANALYSIS FUTURE YEAR: **2030**

BENEFIT-COST ANALYSIS

SUMMARY RESULTS ^(a)

Net Cost of Project (mil. \$)	\$173.11
Present Value of Benefits (mil. \$)	\$1,055.86
Net Present Value (mil. \$)	\$882.75
Benefit / Cost Ratio:	6.10

PRESENT VALUE OF ITEMIZED BENEFITS (mil. \$)	
VMT Savings	\$96.97
VHT Savings	\$915.47
Accident Reduction Benefits	\$43.42
PRESENT VALUE OF TOTAL BENEFITS (mil. \$)	\$1,055.86

PRESENT VALUE OF ITEMIZED COSTS (mil. \$)	
Capital Cost Differential	\$258.17
Maintenance Cost Differential	-\$2.79
Remaining Capital Value Differential ^(a)	\$82.27
PRESENT VALUE OF TOTAL COSTS (mil. \$)	\$173.11

(a) Remaining capital value was considered a reduction of cost in this analysis and was subtracted from construction and maintenance costs to obtain a net cost.

TABLE B1: ITEMIZED BENEFITS SUMMARY - BUILD VS. BASE CASE (d)
Highway Alternative

Year	PRESENT VALUE OF USER BENEFITS ^{(c) (d)}			Present Value of Total User Benefits ^(c)		
	VMT Benefits ^(a)	VHT Benefits ^(a)	Accident Reduction Savings ^{(b) (c)}			
2011	1	\$5,531,183	\$24,470,220	\$4,131,675	\$ 34,133,078	
2012	2	\$5,374,516	\$26,286,614	\$3,825,232	\$ 35,486,363	
2013	3	\$5,222,292	\$28,030,672	\$3,534,791	\$ 36,787,754	
2014	4	\$5,074,384	\$29,704,382	\$3,259,618	\$ 38,038,384	
2015	5	\$4,930,669	\$31,309,687	\$2,999,013	\$ 39,239,370	
2016	6	\$4,791,029	\$32,848,483	\$2,752,307	\$ 40,391,819	
2017	7	\$4,655,348	\$34,322,620	\$2,518,856	\$ 41,496,825	
2018	8	\$4,523,514	\$35,733,904	\$2,298,047	\$ 42,555,465	
2019	9	\$4,395,416	\$37,084,098	\$2,089,292	\$ 43,568,806	
2020	10	\$9,952,680	\$118,380,135	\$3,851,143	\$ 132,183,958	
2021	11	\$10,071,777	\$114,076,974	\$3,628,392	\$ 127,777,143	
2022	12	\$4,032,504	\$40,785,134	\$1,529,840	\$ 46,347,477	
2023	13	\$3,918,325	\$41,907,758	\$1,363,909	\$ 47,189,992	
2024	14	\$3,807,382	\$42,977,487	\$1,207,451	\$ 47,992,321	
2025	15	\$3,699,584	\$43,995,843	\$1,060,015	\$ 48,755,443	
2026	16	\$3,594,841	\$44,964,310	\$921,170	\$ 49,480,321	
2027	17	\$3,493,067	\$45,884,336	\$790,503	\$ 50,167,906	
2028	18	\$3,394,177	\$46,757,334	\$667,621	\$ 50,819,131	
2029	19	\$3,298,089	\$47,584,681	\$552,145	\$ 51,434,915	
2030	20	\$3,204,724	\$48,367,724	\$443,715	\$ 52,016,163	
Total for Project Life		2011-2030	\$96,965,501	\$915,472,397	\$43,424,737	\$ 1,055,862,636 ^(c)

NOTES:

- (a) All daily VMT and VHT data was derived using a transportation forecast model of this region (see Tables D2, D3, and Appendix E).
- (b) Statewide crash data for each facility type was gathered from Mn/DOT sources for a three year period from 1999-2001. This data was used to find a crash rate per 100 million vehicle miles and severity distribution. These two factors were used to estimate crash data benefits for 2010 and 2030 (Positive benefits would be obtained if the alternatives shifted VMT to facilities with lower crash rates and severity distribution as compared to the Base Case).
- (c) Present value of savings during the life of the project in terms of 2004 dollars.
- (d) The analysis used regional forecast model data for years 2010 and 2030. The B/C analysis was derived from these results and is for the twenty year period between years 2011 - 2030. The analysis is comparing the Base Case with the Alternative, as described in the accompanying memorandum.

TABLE B2: VEHICLE MILES TRAVELED (VMT) - BUILD VS. BASE CASE (d)
Highway Alternative

Additional savings:
 200000

Year	DAILY VMT ^(a) (veh-miles/day)		DIFFERENCE IN VMT (veh-miles/day)	Annual Savings in Constant Dollars ^(b)	Present Value of Savings (dollars) ^(c)	
	Base Case	Alternative ^(e)				
2011	1	93,437,392	93,356,924	80,468	\$7,037,209	\$5,531,183
2012	2	93,990,033	93,909,095	80,939	\$7,077,212	\$5,374,516
2013	3	94,545,944	94,464,531	81,412	\$7,117,448	\$5,222,292
2014	4	95,105,142	95,023,253	81,889	\$7,157,919	\$5,074,384
2015	5	95,667,647	95,585,279	82,368	\$7,198,627	\$4,930,669
2016	6	96,233,479	96,150,630	82,850	\$7,239,574	\$4,791,029
2017	7	96,802,659	96,719,324	83,334	\$7,280,760	\$4,655,348
2018	8	97,375,204	97,291,382	83,822	\$7,322,187	\$4,523,514
2019	9	97,951,136	97,866,824	84,312	\$7,363,856	\$4,395,416
2020	10	98,648,778	98,445,668	203,110	\$17,257,808	\$9,952,680
2021	11	99,240,671	99,027,937	212,734	\$18,075,571	\$10,071,777
2022	12	99,699,451	99,613,650	85,801	\$7,490,332	\$4,032,504
2023	13	100,289,129	100,202,826	86,303	\$7,532,985	\$3,918,325
2024	14	100,882,296	100,795,488	86,808	\$7,575,887	\$3,807,382
2025	15	101,478,971	101,391,655	87,316	\$7,619,040	\$3,699,584
2026	16	102,079,174	101,991,348	87,827	\$7,662,446	\$3,594,841
2027	17	102,682,928	102,594,588	88,340	\$7,706,106	\$3,493,067
2028	18	103,290,253	103,201,396	88,857	\$7,750,021	\$3,394,177
2029	19	103,901,170	103,811,793	89,377	\$7,794,193	\$3,298,089
2030	20	104,515,700	104,425,800	89,900	\$7,838,623	\$3,204,724
Total Benefits During Project Life (2011 - 2030)						\$96,965,501 ^(c)

NOTES:

(a) All daily VMT data was derived using a transportation forecast model of this region (see Table D3 and Appendix E).

(b) Using the composite cost per mile found in Table D1.

(c) Present value of savings during the life of the project in terms of 2004 dollars.

(d) The analysis used regional forecast model data for years 2010 and 2030. The B/C analysis was derived from these results and is for the twenty year period between years 2011 - 2030.

(e) Alternative VMT results consider the growth of both existing trips and previously unserved trips during the course of the 20 year analysis period (2011 - 2030).

**TABLE B3: VEHICLE HOURS TRAVELED (VHT) - BUILD VS. BASE CASE (d)
Highway Alternative**

Year	DAILY VHT ^(a) (veh-hours/day)		DIFFERENCE IN VHT (veh-hours/day)	Annual Savings in Constant Dollars ^(b)	Present Value of Savings (dollars) ^(c)	
	Base Case	Alternative ^(e)				
2011	1	2,643,108	2,635,761	7,348	\$31,132,953	\$24,470,220
2012	2	2,687,035	2,678,788	8,247	\$34,614,451	\$26,286,614
2013	3	2,731,691	2,722,517	9,175	\$38,202,929	\$28,030,672
2014	4	2,777,090	2,766,960	10,130	\$41,900,965	\$29,704,382
2015	5	2,823,243	2,812,128	11,115	\$45,711,196	\$31,309,687
2016	6	2,870,164	2,858,034	12,129	\$49,636,313	\$32,848,483
2017	7	2,917,864	2,904,689	13,174	\$53,679,070	\$34,322,620
2018	8	2,966,356	2,952,106	14,250	\$57,842,275	\$35,733,904
2019	9	3,015,655	3,000,297	15,358	\$62,128,800	\$37,084,098
2020	10	3,102,321	3,049,275	53,046	\$205,269,502	\$118,380,135
2021	11	3,151,959	3,099,052	52,907	\$204,731,157	\$114,076,974
2022	12	3,168,521	3,149,642	18,880	\$75,757,945	\$40,785,134
2023	13	3,221,180	3,201,057	20,123	\$80,567,720	\$41,907,758
2024	14	3,274,714	3,253,312	21,402	\$85,516,126	\$42,977,487
2025	15	3,329,137	3,306,420	22,717	\$90,606,424	\$43,995,843
2026	16	3,384,465	3,360,395	24,070	\$95,841,947	\$44,964,310
2027	17	3,440,712	3,415,251	25,461	\$101,226,098	\$45,884,336
2028	18	3,497,894	3,471,002	26,892	\$106,762,352	\$46,757,334
2029	19	3,556,026	3,527,664	28,363	\$112,454,260	\$47,584,681
2030	20	3,615,125	3,585,250	29,875	\$118,305,448	\$48,367,724
Total Benefits During Project Life (2011 - 2030)						\$915,472,397 ^(c)

Additional savings:
2700000

NOTES:

- (a) All daily VHT data was derived using a transportation forecast model of this region (see Table D2 and Appendix E).
- (b) Using the composite cost per hour found in Table D1.
- (c) Present value of savings during the life of the project in terms of 2004 dollars.
- (d) The analysis used regional forecast model data for years 2010 and 2030. The B/C analysis was derived from these results and is for the twenty year period between years 2011 - 2030.
- (e) Alternative VHT results consider the growth of both existing trips and previously unserved trips during the course of the 20 year analysis period (2011 - 2030).

TABLE B4: ACCIDENT REDUCTION BENEFITS - BUILD VS. BASE CASE (c)
Highway Alternative

Additional savings: 67000

Year	ANNUAL VMT ^(a) (veh-miles/year)		ANN. EST. CRASH COST TOTAL ^(b) (\$)		Annual Savings Safety User Benefits (\$)	Present Value of Savings (\$) ^(d)	
	Base Case	Alternative	Base Case	Alternative			
2011	1	93,437,392	93,356,924	\$513,609,791	\$508,420,147	\$5,256,645	\$4,131,675
2012	2	93,990,033	93,909,095	\$516,832,773	\$511,862,672	\$5,037,101	\$3,825,232
2013	3	94,545,944	94,464,531	\$520,055,754	\$515,305,198	\$4,817,557	\$3,534,791
2014	4	95,105,142	95,023,253	\$523,278,736	\$518,747,723	\$4,598,013	\$3,259,618
2015	5	95,667,647	95,585,279	\$526,501,717	\$522,190,248	\$4,378,469	\$2,999,013
2016	6	96,233,479	96,150,630	\$529,724,699	\$525,632,774	\$4,158,925	\$2,752,307
2017	7	96,802,659	96,719,324	\$532,947,680	\$529,075,299	\$3,939,381	\$2,518,856
2018	8	97,375,204	97,291,382	\$536,170,661	\$532,517,825	\$3,719,837	\$2,298,047
2019	9	97,951,136	97,866,824	\$539,393,643	\$535,960,350	\$3,500,293	\$2,089,292
2020	10	98,648,778	98,445,668	\$546,080,704	\$539,402,875	\$6,677,829	\$3,851,143
2021	11	99,240,671	99,027,937	\$549,357,188	\$542,845,401	\$6,511,787	\$3,628,392
2022	12	99,699,451	99,613,650	\$549,062,587	\$546,287,926	\$2,841,661	\$1,529,840
2023	13	100,289,129	100,202,826	\$552,285,569	\$549,730,452	\$2,622,117	\$1,363,909
2024	14	100,882,296	100,795,488	\$555,508,550	\$553,172,977	\$2,402,573	\$1,207,451
2025	15	101,478,971	101,391,655	\$558,731,531	\$556,615,503	\$2,183,029	\$1,060,015
2026	16	102,079,174	101,991,348	\$561,954,513	\$560,058,028	\$1,963,485	\$921,170
2027	17	102,682,928	102,594,588	\$565,177,494	\$563,500,553	\$1,743,941	\$790,503
2028	18	103,290,253	103,201,396	\$568,400,476	\$566,943,079	\$1,524,397	\$667,621
2029	19	103,901,170	103,811,793	\$571,623,457	\$570,385,604	\$1,304,853	\$552,145
2030	20	104,515,700	104,425,800	\$574,846,439	\$573,828,130	\$1,085,309	\$443,715
Total Benefits During Project Life (2011 - 2030)^{(c) (d)}						\$43,424,737	

NOTES:

- (a) Based on projected daily VMT values found in Tables D2, D3, D5, and D6.
- (b) Based on the crash data shown in Table D4 split by major facility type: freeway and non-freeway.
- (c) Statewide crash data for each facility type was gathered from Mn/DOT sources for a three year period from 1999-2001. This data was used to find a crash rate per 100 million vehicle miles and severity distribution. These were then used to estimate crash data for 2010 and 2030. The B/C analysis was derived from these results and is for the twenty year period between 2011 - 2030.
- (d) Present value of savings during the life of the project in terms of 2004 dollars.

TABLE C1: ITEMIZED COST SUMMARY - ALTERNATIVE VS. BASE CASE (d)
Highway Alternative

	Year	PRESENT VALUE OF COSTS (d)						Present Value of Net Annual Costs (d) (e) (f)
		Capital Cost (a)		Maintenance Cost (b)		Remaining Capital Value (c)		
		Base Case	Alternative	Base Case	Alternative	Base Case	Alternative	
2008	-	\$0	\$94,115,754			\$0	\$0	\$94,115,754
2009	-	\$0	\$90,933,096			\$0	\$0	\$90,933,096
2010	-	\$0	\$87,858,064			\$0	\$0	\$87,858,064
2011	1	\$0	\$0	\$391,887	\$218,226	\$0	\$0	-\$173,662
2012	2	\$0	\$0	\$378,635	\$210,846	\$0	\$0	-\$167,789
2013	3	\$0	\$0	\$384,120	\$203,716	\$0	\$0	-\$180,404
2014	4	\$0	\$0	\$353,460	\$196,827	\$0	\$0	-\$156,633
2015	5	\$0	\$0	\$341,507	\$190,171	\$0	\$0	-\$151,336
2016	6	\$0	\$0	\$329,959	\$183,740	\$0	\$0	-\$146,218
2017	7	\$0	\$0	\$470,084	\$177,527	\$0	\$0	-\$292,557
2018	8	\$0	\$0	\$448,041	\$171,523	\$0	\$0	-\$276,518
2019	9	\$0	\$0	\$297,604	\$165,723	\$0	\$0	-\$131,881
2020	10	\$7,497,177	\$0	\$37,080	\$160,119	\$0	\$0	-\$7,374,138
2021	11	\$7,243,649	\$0	\$27,075	\$154,704	\$0	\$0	-\$7,116,019
2022	12	\$0	\$0	\$268,421	\$149,473	\$0	\$0	-\$118,949
2023	13	\$0	\$0	\$259,344	\$144,418	\$0	\$0	-\$114,926
2024	14	\$0	\$0	\$250,574	\$139,534	\$0	\$0	-\$111,040
2025	15	\$0	\$0	\$242,101	\$134,816	\$0	\$0	-\$107,285
2026	16	\$0	\$0	\$503,821	\$130,257	\$0	\$0	-\$373,564
2027	17	\$0	\$0	\$226,004	\$125,852	\$0	\$0	-\$100,152
2028	18	\$0	\$0	\$218,361	\$121,596	\$0	\$0	-\$96,765
2029	19	\$0	\$0	\$364,368	\$117,484	\$0	\$0	-\$246,883
2030	20	\$0	\$0	\$203,842	\$113,511	\$9,673,099	\$91,944,562	-\$82,361,793
Total for Project Life	2011-2030	\$14,740,826	\$272,906,915	\$5,996,288	\$3,210,064	\$9,673,099	\$91,944,562	\$ 173,108,403
Net Cost Differentials	2011-2030	\$258,166,089		-\$2,786,223		\$82,271,462		(d) (e) (g)

NOTES:

- (a) Assumes construction in 2020-2021 for Base Case and 2008-2010 for Alt. Initial capital costs were brought back to 2004 to determine present value.
- (b) Annual costs consist of roadway and bridge maintenance. For the Base Condition, major maintenance costs are added to routine maintenance costs in scheduled years (Minnesota only).
- (c) Assumes base year for remaining capital value as 2030. Remaining value in constant dollars was brought back from 2030 to 2004 to determine present value.
- (d) Present value of costs during the life of the project in terms of 2004 dollars.
- (e) Net cost is the difference between the Base Case and the Alternative.
- (f) Remaining capital value was considered a reduction of cost in this analysis and was subtracted from construction and maintenance costs to obtain a net cost.
- (g) Cost differentials are the difference between the Alternative and the Base Case. The Base Case is subtracted from the cost of the Alternative. These costs are reported on Table B/C.

**TABLE C2: CALCULATION OF CAPITAL COST AND REMAINING CAPITAL VALUE - BASE CASE
Highway Alternative**

Base Case	Cost Category	Initial Capital Costs in Constant Dollars			
	Preliminary Engineering	\$ -			
	Right of Way	\$ -			
	Major Structures	\$ 26,000,000			
	Roadway	\$ -			
	Other	\$ -			
	Other	\$ -			
	Total	\$ 26,000,000			
	Cost Category	Initial Capital Costs in Constant Dollars	Factor ^(a)	Remaining Capital Value in Constant Dollars ^(c)	
	Preliminary Engineering	\$ -	0.00	\$ -	
Right of Way	\$ -	0.00	\$ -		
Major Structures	\$ 26,000,000	0.91	\$ 23,660,000		
Roadway	\$ -	0.00	\$ -		
Other	\$ -	0.00	\$ -		
Other	\$ -	0.00	\$ -		
Total Remaining Capital Value in Constant Dollars				\$ 23,660,000	

First Year of Construction: 2020 (b)
Duration of Construction (years): 2 (b)

Year of Remaining Capital Value: 2030 (c)

Year	CAPITAL COST TOTALS		REMAINING CAPITAL VALUE (RCV) TOTALS	
	Base Case ^(a) Capital Cost in Constant Dollars	Present Value of Capital Cost (dollars) ^(d)	Base Case RCV in Constant Dollars	Present Value of RCV (dollars) ^(d)
2008	-	\$0	\$0	\$0
2009	-	\$0	\$0	\$0
2010	-	\$0	\$0	\$0
2011	1	\$0	\$0	\$0
2012	2	\$0	\$0	\$0
2013	3	\$0	\$0	\$0
2014	4	\$0	\$0	\$0
2015	5	\$0	\$0	\$0
2016	6	\$0	\$0	\$0
2017	7	\$0	\$0	\$0
2018	8	\$0	\$0	\$0
2019	9	\$0	\$0	\$0
2020	10	\$13,000,000	\$0	\$0
2021	11	\$13,000,000	\$0	\$0
2022	12	\$0	\$0	\$0
2023	13	\$0	\$0	\$0
2024	14	\$0	\$0	\$0
2025	15	\$0	\$0	\$0
2026	16	\$0	\$0	\$0
2027	17	\$0	\$0	\$0
2028	18	\$0	\$0	\$0
2029	19	\$0	\$0	\$0
2030	20	\$0	\$0	\$0
Total for Project Life (2011 - 2030) (e)		\$14,740,826	\$23,660,000	\$9,673,099 (d)

NOTES:

- (a) Factor for Base Case major structure remaining capital value calculation is based on an analysis period of 10 years (2021 - 2030) and an estimated life expectancy of 50 years. The factor was derived based on the "Recommended standard values for use in economic analysis", Mn/DOT Office of Investment Management, November 2003.
- (b) Assumes construction in 2020 and 2021 for Base Case. Initial capital costs were brought back to 2004 to determine present value.
- (c) Assumes base year for remaining capital value as 2030. Remaining value in constant dollars was brought back from 2030 to 2004 to determine present value.
- (d) Present value of costs in terms of 2004 dollars.

TABLE C3: CALCULATION OF CAPITAL COST AND REMAINING CAPITAL VALUE - ALTERNATIVE Highway Alternative

Alternative	Cost Category ^(a)	Initial Capital Costs in Constant Dollars			
	Preliminary Engineering	\$ -			
	Right of Way ^(b)	\$ 45,000,000			
	Major Structures	\$ 42,510,000			
	Roadway	\$ 236,489,979			
	Other	\$ -			
	Other	\$ -			
	Total	\$ 323,999,979			
	Cost Category ^(a)	Initial Capital Costs in Constant Dollars	Factor ^(d)	Remaining Capital Value in Constant Dollars ^(e)	
	Preliminary Engineering	\$ -	0.00	\$ -	
Right of Way ^(b)	\$ 45,000,000	0.97	\$ 43,650,000		
Major Structures	\$ 42,510,000	0.87	\$ 36,983,700		
Roadway	\$ 236,489,979	0.61	\$ 144,258,887		
Other	\$ -	0.00	\$ -		
Other	\$ -	0.00	\$ -		
Total Remaining Capital Value in Constant Dollars			\$ 224,892,587		

First Year of Construction: 2008 (c)
Duration of Construction (years): 3 (c)

Year of Remaining Capital Value: 2030 (e)

Year	CAPITAL COST TOTALS		REMAINING CAPITAL VALUE (RCV) TOTALS	
	Alternative ^(a) Capital Cost in Constant Dollars	Present Value of Capital Cost (dollars) ^(f)	Alternative RCV in Constant Dollars	Present Value of RCV (dollars) ^(f)
2008	-	\$107,999,993	\$94,115,754	\$0
2009	-	\$107,999,993	\$90,933,096	\$0
2010	-	\$107,999,993	\$87,858,064	\$0
2011	1	\$0	\$0	\$0
2012	2	\$0	\$0	\$0
2013	3	\$0	\$0	\$0
2014	4	\$0	\$0	\$0
2015	5	\$0	\$0	\$0
2016	6	\$0	\$0	\$0
2017	7	\$0	\$0	\$0
2018	8	\$0	\$0	\$0
2019	9	\$0	\$0	\$0
2020	10	\$0	\$0	\$0
2021	11	\$0	\$0	\$0
2022	12	\$0	\$0	\$0
2023	13	\$0	\$0	\$0
2024	14	\$0	\$0	\$0
2025	15	\$0	\$0	\$0
2026	16	\$0	\$0	\$0
2027	17	\$0	\$0	\$0
2028	18	\$0	\$0	\$0
2029	19	\$0	\$0	\$0
2030	20	\$0	\$224,892,587	\$91,944,562
Total for Project Life (2011 - 2030) (e)		\$272,906,915		\$91,944,562 (f)

NOTES:

- (a) Mitigation costs were not included.
- (b) Right of way costs shown reflect per acre costs plus costs for additional severances that could occur.
- (c) Assumes construction in 2008, 2009, and 2010 for Alt. Initial capital costs were brought back to 2004 to determine present value.
- (d) Factors based on the "Recommended standard values for use in economic analysis", Mn/DOT Office of Investment Management, November 2003.
- (e) Assumes base year for remaining capital value as 2030. Remaining value in constant dollars was brought back from 2030 to 2004 to determine present value.
- (f) Present value of costs in terms of 2004 dollars.

TABLE C4: ANNUAL ROADWAY MAINTENANCE COSTS - BUILD VS. NO BUILD^(e)
Highway Alternative

Base Case	Roadway Facility	Mainline Roadway Length (lane-mi) ^(a)	Annual Maintenance Cost Per Mile (\$)	Total (\$) ^(b)
	Freeway	0	\$ 3,000.00	\$ -
Multi-lane Divided	11.2	\$ 2,000.00	\$ 22,400.00	
Undivided	14.6	\$ 1,800.00	\$ 26,190.00	
Annual Maintenance Costs:				\$ 48,590.00

Alt.	New Roadway Facility	Mainline Roadway Length (lane-mi) ^(a)	Annual Maintenance Cost Per Mile (\$)	Total (\$)
	Freeway	34.9	\$ 3,000.00	\$ 104,640.00
Multi-lane Divided	8.37	\$ 2,000.00	\$ 16,740.00	
Undivided	3.48	\$ 1,800.00	\$ 6,264.00	
Annual Maintenance Costs:				\$ 127,644.00

450000
150000

Year	BASE CASE (c) MAINTENANCE COST		ALT. MAINTENANCE COST	
	In Constant Dollars	Present Value of Cost (dollars) ^(d)	In Constant Dollars	Present Value of Cost (dollars) ^(d)
2011	\$498,590	\$391,887	\$277,644	\$218,226
2012	\$498,590	\$378,635	\$277,644	\$210,846
2013	\$523,516	\$384,120	\$277,644	\$203,716
2014	\$498,590	\$353,460	\$277,644	\$196,827
2015	\$498,590	\$341,507	\$277,644	\$190,171
2016	\$498,590	\$329,959	\$277,644	\$183,740
2017	\$735,190	\$470,084	\$277,644	\$177,527
2018	\$725,242	\$448,041	\$277,644	\$171,523
2019	\$498,590	\$297,604	\$277,644	\$165,723
2020	\$64,296	\$37,080	\$277,644	\$160,119
2021	\$48,590	\$27,075	\$277,644	\$154,704
2022	\$498,590	\$268,421	\$277,644	\$149,473
2023	\$498,590	\$259,344	\$277,644	\$144,418
2024	\$498,590	\$250,574	\$277,644	\$139,534
2025	\$498,590	\$242,101	\$277,644	\$134,816
2026	\$1,073,901	\$503,821	\$277,644	\$130,257
2027	\$498,590	\$226,004	\$277,644	\$125,852
2028	\$498,590	\$218,361	\$277,644	\$121,596
2029	\$861,090	\$364,368	\$277,644	\$117,484
2030	\$498,590	\$203,842	\$277,644	\$113,511
Total for Project Life (2011 - 2030) (e)		\$5,996,288		\$3,210,064

NOTES:

- (a) Calculations for state trunk highway facilities within the project area only.
- (b) Cost does not include major maintenance activities for Wisconsin roadways (e.g. mill and overlay, etc.). This information was not available from the Wisconsin Department of Transportation.
- (c) Annual costs consist of roadway and bridge maintenance. For the Base Condition, major maintenance costs are added to routine maintenance costs in scheduled years (Minnesota only).
- (d) Present value of additional maintenance costs during the life of the project in terms of 2004 dollars.
- (e) The B/C analysis was derived from these results and is for the twenty year period between years 2011 - 2030.

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TABLE D1: GENERAL DATA AND PARAMETERS
Highway Alternative

PROJECT NUMBER: 4686
 PROJECT NAME: Highway Alternative

PROJECT DATA			
Type of Facilities			
Maintain existing facilities with necessary changes	Base Case	Alt.	
	X		
Construction of a new roadway		X	
Project Location			
	Highway Alternative		
Hours of Congested Operation (Existing Peak Period(s))			
	3	hours	
Hours of Congested Operation (Future Peak Period(s))			
	0	hours	

NETWORK ASSUMPTIONS						
Percent Autos						
Base Case						
96%						
Alt.						
96%						
Percent Trucks						
Base Case						
4%						
Alt.						
4%						
Average Vehicle Occupancy Ratios						
Base Case						
Alt.						
(b)	Non-Peak			1.49	1.48	
(b)	Peak			1.36	1.34	
Traffic - Daily VMT and VHT						
Base Case						
Alt. (g)						
(c)	Year	0	Base Year - Vehicle Miles Traveled	2010	92,888,000	92,808,000
(c)	Year	20	Future Year - Vehicle Miles Traveled	2030	104,515,700	104,425,800
(c)	Year	0	Base Year - Vehicle Hours Traveled	2010	2,599,900	2,593,425
(c)	Year	20	Future Year - Vehicle Hours Traveled	2030	3,615,125	3,585,250

ANALYSIS TIMEFRAME			
Years of Construction			
Base Case			
Alt.			
	First Year of Construction	2020	2008
	Duration of Construction	2	3
(a)	Length of B/C Analysis		
		20	years
	Benefit-cost First Year of Benefit:	2011	
	Benefit-cost Final Year of Analysis/Year of Remaining Capital Value:	2030	
(a)	Length of Period Modeled		
		21	years
	Model Base Year:	2010	
	Model Future Year:	2030	

GLOBAL ASSUMPTIONS AND FACTORS			
General Economic Parameters			
(d)	Year of Analysis		2004
(d)	Number of Days in a Year (Assumed)		260
(e)	Assumed Discount Rate		3.5%
Costs per Hour			
(e)	Automobile	Value	Units
		\$ 10.04	\$/hr
	Truck	\$ 18.61	\$/hr
(e)	Automobile	\$ 0.28	\$/mile
	Truck	\$ 1.45	\$/mile
(f)	Composite Cost per Hour		
		\$ 14.88	\$/hr
(f)	Composite Cost per Mile		
		\$ 0.33	\$/mile

NOTES:

- (a) The analysis used regional forecast model data for years 2010 and 2030. The B/C analysis was derived from these results and is for the twenty year period between years 2011 - 2030.
- (b) Vehicle occupancy ratios are derived from the regional forecast model.
- (c) All daily VMT and VHT data was derived using a transportation forecast model of this region.
- (d) Assumed a 260-day year to reflect the weekday benefits only. The roadway is used for recreational purposes, which means there are additional benefits that are not shown in this analysis.
- (e) Rates from "Recommended standard values for use in economic analysis in FY2004", Mn/DOT Office of Investment Management, November 2003.
- (f) Hours of congested operation was used to, along with the vehicle occupancy ratios and the percent split of autos and trucks, derive composite costs per hour and per mile for the 2010 and 2030 scenarios.

TABLE D2: COMPARISON OF ESTIMATED DAILY VHT VALUES ⁽³⁾
Highway Alternative

Year	Estimated VHT ⁽⁴⁾		
	Base Case VHT from Existing Trips (hrs) ^{(2)(b)}	Alternative ⁽³⁾⁽⁶⁾	
		VHT from Existing Trips (hrs)	Benefit (hrs) ^{(1)(f)}
1st year modeled 2010	2,599,900	2,593,425	6,475
1st year of B/C 2011	2,643,108	2,635,761	7,348
2012	2,687,035	2,678,788	8,247
2013	2,731,691	2,722,517	9,175
2014	2,777,090	2,766,960	10,130
2015	2,823,243	2,812,128	11,115
2016	2,870,164	2,858,034	12,129
2017	2,917,864	2,904,689	13,174
2018	2,966,356	2,952,106	14,250
2019	3,015,655	3,000,297	15,358
2020	3,102,321	3,049,275	53,046
2021	3,151,959	3,099,052	52,907
2022	3,168,521	3,149,642	18,880
2023	3,221,180	3,201,057	20,123
2024	3,274,714	3,253,312	21,402
2025	3,329,137	3,306,420	22,717
2026	3,384,465	3,360,395	24,070
2027	3,440,712	3,415,251	25,461
2028	3,497,894	3,471,002	26,892
2029	3,556,026	3,527,664	28,363
Last year of B/C, Last year modeled 2030	3,615,125	3,585,250	29,875

See following page for notes.

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NOTES FOR TABLE D2: COMPARISON OF ESTIMATED DAILY VHT VALUES

(1) The benefits shown reflect relative savings in vehicle hours that would be realized with the construction of Alternative compared to the Base Case.

(2) "Base Case" is defined as the current facilities as described in the accompanying memorandum.

(3) "Alternative" reflects the build Alternative described in the accompanying memorandum.

(4) Daily VHT data was derived using a transportation forecast model for the entire model area.

(5) Base Case VHT results are based on existing trips and the projected growth of these trips between year 2010 and 2030.

(6) Alternative VHT results are based on existing trips and the additional trips that would be generated due to the construction of new facilities.

(7) Benefits shown equal VHT results from the Base Case minus the VHT results from Alternative.

TABLE D3: COMPARISON OF ESTIMATED DAILY VMT VALUES ⁽³⁾
Highway Alternative

Year	Estimated VMT ⁽⁴⁾		
	Base Case VMT from Existing Trips (mi) ^{(2)(b)}	Alternative ⁽³⁾⁽⁶⁾	
		VMT from Existing Trips (mi)	Benefit (mi) ^{(1)(f)}
1st year modeled 2010	92,888,000	92,808,000	80,000
1st year of B/C 2011	93,437,392	93,356,924	80,468
2012	93,990,033	93,909,095	80,939
2013	94,545,944	94,464,531	81,412
2014	95,105,142	95,023,253	81,889
2015	95,667,647	95,585,279	82,368
2016	96,233,479	96,150,630	82,850
2017	96,802,659	96,719,324	83,334
2018	97,375,204	97,291,382	83,822
2019	97,951,136	97,866,824	84,312
2020	98,648,778	98,445,668	203,110
2021	99,240,671	99,027,937	212,734
2022	99,699,451	99,613,650	85,801
2023	100,289,129	100,202,826	86,303
2024	100,882,296	100,795,488	86,808
2025	101,478,971	101,391,655	87,316
2026	102,079,174	101,991,348	87,827
2027	102,682,928	102,594,588	88,340
2028	103,290,253	103,201,396	88,857
2029	103,901,170	103,811,793	89,377
Last year of B/C, Last year modeled 2030	104,515,700	104,425,800	89,900

See following page for notes.

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NOTES FOR TABLE D3: COMPARISON OF ESTIMATED DAILY VMT VALUES

- (1) The benefits shown reflect relative savings in vehicle miles that would be realized with the construction of Alternative compared to the Base Case.
- (2) "Base Case" is defined as the current facilities as described in the accompanying memorandum.
- (3) "Alternative" reflects the build Alternative described in the accompanying memorandum.
- (4) Daily VMT data was derived using a transportation forecast model for the entire model area.
- (5) Base Case VMT results are based on existing trips and the projected growth of these trips between year 2010 and 2030.
- (6) Alternative VMT results are based on existing trips and the additional trips that would be generated due to the construction of new facilities.
- (7) Benefits shown equal VMT results from the Base Case minus the VMT results from Alternative.

TABLE D4: SAFETY DATA AND PARAMETERS
Highway Alternative

HIGHWAY CRASH DATA

Annual VMT for Freeway Facilities		Daily		Annual	
		Base Case ^(a)	Alt. ^(a)	Base Case ^(b)	Alt. ^(b)
Base Year	2010 (c)	37,909,000	38,861,000	9,856,340,000	10,103,860,000
Future Year	2030 (c)	42,541,600	42,608,800	11,060,816,000	11,078,288,000
Annual VMT for Non-Freeway Facilities					
Base Year	2010 (c)	54,979,000	53,947,000	14,294,540,000	14,026,220,000
Future Year	2030 (c)	61,974,100	61,817,000	16,113,266,000	16,072,420,000

Crash Type	Crash Rate Distribution (per 100 million vehicle miles)		Crash Values (\$ per crash) ^(e)
	Freeway ^(d)	Non-Freeway ^(d)	
Fatal	0.177	0.513	\$ 3,400,000.00
Injury A	0.319	1.229	\$ 270,000.00
Injury B	1.980	6.628	\$ 58,000.00
Injury C	3.312	9.425	\$ 29,000.00
PDO	15.836	40.809	\$ 4,200.00

CRASH CALCULATIONS

Crash Type		2010 ^(c)				2030 ^(c)			
		Base Case		Alternative		Base Case		Alternative	
		Annual Forecast Number of Crashes	Estimated Cost						
Freeway	Fatal	17.4	\$ 59,222,481.26	17.9	\$ 60,709,721.82	19.5	\$ 66,459,656.25	19.6	\$ 66,564,637.94
	Injury A	31.4	\$ 8,485,778.80	32.2	\$ 8,698,880.22	35.3	\$ 9,522,767.88	35.3	\$ 9,537,810.33
	Injury B	195.2	\$ 11,321,566.29	200.1	\$ 11,605,882.18	219.1	\$ 12,705,097.58	219.4	\$ 12,725,166.94
	Injury C	326.4	\$ 9,465,751.83	334.6	\$ 9,703,463.08	366.3	\$ 10,622,496.72	366.9	\$ 10,639,276.34
	PDO	1560.8	\$ 6,555,519.72	1600.0	\$ 6,720,146.98	1751.6	\$ 7,356,625.02	1754.3	\$ 7,368,245.77
Freeway Sub-total:			\$ 95,051,097.91		\$ 97,438,094.27		\$ 106,666,643.46		\$ 106,835,137.32
Non-Freeway	Fatal	73.3	\$ 249,378,335.14	72.0	\$ 244,697,303.44	82.7	\$ 281,107,293.33	82.5	\$ 280,394,706.04
	Injury A	175.7	\$ 47,435,767.22	172.4	\$ 46,545,359.76	198.0	\$ 53,471,125.00	197.5	\$ 53,335,579.44
	Injury B	947.4	\$ 54,950,092.73	929.6	\$ 53,918,635.34	1068.0	\$ 61,941,514.79	1065.2	\$ 61,784,497.40
	Injury C	1347.3	\$ 39,070,970.94	1322.0	\$ 38,337,577.42	1518.7	\$ 44,042,057.15	1514.8	\$ 43,930,413.62
	PDO	5833.5	\$ 24,500,546.13	5724.0	\$ 24,040,651.20	6575.7	\$ 27,617,804.91	6559.0	\$ 27,547,795.71
Non-freeway sub-total:			\$ 415,335,712.16		\$ 407,539,527.16		\$ 468,179,795.18		\$ 466,992,992.21
Total (Freeway and Non-freeway)			\$ 510,386,810.07		\$ 504,977,621.44		\$ 574,846,438.63		\$ 573,828,129.53

NOTES:

- (a) All daily VMT data was derived using a transportation forecast model of this region.
- (b) Assumed a 260-day year to reflect the weekday benefits only. The roadway is used for recreational purposes, which means there are additional benefits that are not shown in this analysis.
- (c) The analysis used regional forecast model data for years 2010 and 2030. The B/C analysis is derived from these results and is for the twenty year period from 2011 to 2030.
- (d) Crash statistics for different facility types were gathered from Mn/DOT for 1999-2001. This information was used to find a crash rate per 100 million vehicle miles, which helped to estimate crash data for 2010 and 2030. Statewide statistics for rural freeways were used for Freeway Facilities. A weighted average of statewide data for rural 4-lane expressways, rural 2-lane roadways with ADTs 5,000 - 8,000, and urban 2-lane roadways with ADTs 1,500 - 5,000 was used for Non-Freeway Facilities.
- (e) Costs are consistent with "Recommended standard values for use in economic analysis", Mn/DOT Office of Investment Management, November 2003.

TABLE D5: ESTIMATED DAILY VMT VALUES - FREEWAY FACILITIES ONLY(3)(7)
Highway Alternative

	Estimated VMT - Freeway ⁽⁴⁾		
	Base Case	Alternative ⁽³⁾⁽⁶⁾	
	VMT from Existing Trips (mi) ⁽²⁾⁽⁵⁾	VMT from Existing Trips (mi)	
1st year modeled	2010	37,909,000	38,861,000
1st year of B/C	2011	38,128,165	39,040,308
	2012	38,348,597	39,220,444
	2013	38,570,303	39,401,411
	2014	38,793,291	39,583,213
	2015	39,017,568	39,765,853
	2016	39,243,142	39,949,337
	2017	39,470,020	40,133,667
	2018	39,698,210	40,318,847
	2019	39,927,719	40,504,882
	2020	40,158,555	40,691,775
	2021	40,390,725	40,879,531
	2022	40,624,238	41,068,153
	2023	40,859,100	41,257,645
	2024	41,095,321	41,448,012
	2025	41,332,907	41,639,257
	2026	41,571,866	41,831,384
	2027	41,812,207	42,024,398
	2028	42,053,938	42,218,303
	2029	42,297,066	42,413,102
Last year of B/C, Last year modeled	2030	42,541,600	42,608,800

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NOTES FOR TABLE D5: ESTIMATED DAILY VMT VALUES - FREEWAY FACILITIES ONLY

- (1) "Base Case" is defined as the current facilities as described in the accompanying memorandum.
- (2) "Alternative" reflects the build Alternative described in the accompanying memorandum.
- (3) Daily VMT data was derived using a transportation forecast model for the entire model area.
- (4) Base Case VMT results are based on existing trips and the projected growth of these trips between year 2010 and 2030.
- (5) Alternative VMT results are based on existing trips and the additional trips that would be generated due to the construction of new facilities.
- (6) Data shown reflects VMT estimates for freeway facilities only.

TABLE D6: ESTIMATED DAILY VMT VALUES - NON - FREEWAY FACILITIES ONLY(3)(7)
Highway Alternative

	Estimated VMT - Non Freeway ⁽⁴⁾		
	Year	Base Case	Alternative ⁽³⁾⁽⁶⁾
		VMT from Existing Trips (mi) ⁽²⁾⁽⁵⁾	VMT from Existing Trips (mi)
1st year modeled	2010	54,979,000	53,947,000
1st year of B/C	2011	55,309,216	54,315,569
	2012	55,641,416	54,686,655
	2013	55,975,611	55,060,277
	2014	56,311,814	55,436,452
	2015	56,650,035	55,815,196
	2016	56,990,288	56,196,528
	2017	57,332,585	56,580,466
	2018	57,676,938	56,967,026
	2019	58,023,358	57,356,228
	2020	58,371,860	57,748,088
	2021	58,722,455	58,142,626
	2022	59,075,155	58,539,859
	2023	59,429,974	58,939,806
	2024	59,786,924	59,342,486
	2025	60,146,018	59,747,917
	2026	60,507,269	60,156,118
	2027	60,870,689	60,567,107
	2028	61,236,293	60,980,905
	2029	61,604,092	61,397,529
Last year of B/C, Last year modeled	2030	61,974,100	61,817,000

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NOTES FOR TABLE D6: ESTIMATED DAILY VMT VALUES - NON-FREEWAY FACILITIES ONLY

- (1) "Base Case" is defined as the current facilities as described in the accompanying memorandum.
- (2) "Alternative" reflects the build Alternative described in the accompanying memorandum.
- (3) Daily VMT data was derived using a transportation forecast model for the entire model area.
- (4) Base Case VMT results are based on existing trips and the projected growth of these trips between year 2010 and 2030.
- (5) Alternative VMT results are based on existing trips and the additional trips that would be generated due to the construction of new facilities.
- (6) Data shown reflects VMT estimates for non-freeway facilities only.