Railroad Safety Grants for the Safe Transportation of Energy Products by Rail

26th Street SW to Edgewood Road Track Improvement

Submitted by Iowa Department of Transportation

Appendix E

Benefit Cost for
26th Street SW to Edgewood Road Track Improvement

26th Street SW to Edgewood Road Track Improvements

Quantitative Benefit Cost Calculation

The total quantitative benefit after removing the initial cost is –(1,094,832), which equates to a Benefit/Cost of (1.62), per Table 4.

Spreadsheets with calculations are included as a separate attachment.

This project has many qualitative benefits that are not easily quantified. These benefits are detailed in the narrative

CRANDIC

26th St SW to Edgewood Road

Project area stops short of 26th St. SW

Edgewood Road is a separated crossing with traffic over RR

Street	MP	DOT#	AADT	#trains	MaxSpd	Day Traffic [1]	Night Traffic [2]	Affected Drivers	Travel Time Saved (hours)	Total Value of Travel Time
No affected crossings						0	0	0	0.0	$ -
						0	0	0	0.0	$ -
						0	0	0	0.0	$ -
						0	0	0	0.0	$ -
NPV								**0**	**0.0**	**$ -**

Year	Assumed inflation (1.2%)	No-Build Maintenance cost	Build maintenance cost	Saved Maintenance costs
2016	1.012	$ 50,600.00	$ -	$ 50,600.00
2017	1.024144	$ 51,207.20	$ 15,000.00	$ 36,207.20
2018	1.036433728	$ 51,821.69	$ 17,692.87	$ 34,128.81
2019	1.048870933	$ 52,443.55	$ 20,385.75	$ 32,057.80
2020	1.061457384	$ 53,072.87	$ 23,078.62	$ 29,994.25
2021	1.074194873	$ 53,709.74	$ 25,771.49	$ 27,938.25
2022	1.087085211	$ 54,354.26	$ 28,464.37	$ 25,889.89
2023	1.100130234	$ 55,006.51	$ 31,157.24	$ 23,849.27
2024	1.113331796	$ 55,666.59	$ 33,850.11	$ 21,816.48
2025	1.126691778	$ 56,334.59	$ 36,542.99	$ 19,791.60
2026	1.140212079	$ 57,010.60	$ 39,235.86	$ 17,774.74
2027	1.153894624	$ 57,694.73	$ 41,928.73	$ 15,766.00
2028	1.16774136	$ 58,387.07	$ 44,621.61	$ 13,765.46
2029	1.181754256	$ 59,087.71	$ 47,314.48	$ 11,773.23
2030	1.195935307	$ 59,796.77	$ 50,007.35	$ 9,789.41
2031	1.210286531	$ 60,514.33	$ 52,700.23	$ 7,814.10
2032	1.224809969	$ 61,240.50	$ 55,393.10	$ 5,847.40
2033	1.239507689	$ 61,975.38	$ 58,085.97	$ 3,889.41
2034	1.254381781	$ 62,719.09	$ 60,778.84	$ 1,940.24
2035	1.269434362	$ 63,471.72	$ 63,471.72	$ -
				$ 390,633.57

Table 3A - Emissions Factors

[a]**EMISSION FACTORS** (g/gal)			
PM_{10}	**HC**	**NO_x**	**CO**
3.744	5.408	102.96	26.624

[a]Equals Table 1, Tier 2 factor times Table 3, Large Line Haul factor

Table 3B - Emissions Factors

	Travel Time (hours)	Fuel Usage Rate (gal/hr)	Number of Locomotives	Total Annual Fuel (gallons)
No-Build	0.0525	90.4	1	1731
Build	0.0525	35.9	1	687
		Annual Fuel Savings (gallons)		**1044**

# locomotives	1
Locomotive tier	0
trains/day	10
CurrentMaxSpd (mph)	10
Current speed notch	8
NewMaxSpd (mph)	10
New speed notch	4
track length (miles)	0.525
movement type	Switch

Calendar Year	Project Year	Initial Costs	Operations & Maintenance Costs	Emissions Reduction PM_{10}	Value of Emissions Reduction NO_x	Undiscounted Net Benefits	Discounted at 7%
2016	1	$ 1,773,875	$ -			$ (1,773,875)	$ (1,657,827)
2017	2		$ (36,207)	$1,277	$35,129	$ 72,614	$ 63,424
2018	3		$ (34,129)	$1,277	$35,129	$ 70,535	$ 57,578
2019	4		$ (32,058)	$1,277	$35,129	$ 68,464	$ 52,231
2020	5		$ (29,994)	$1,277	$35,129	$ 66,401	$ 47,343
2021	6		$ (27,938)	$1,277	$35,129	$ 64,345	$ 42,876
2022	7		$ (25,890)	$1,277	$35,129	$ 62,296	$ 38,795
2023	8		$ (23,849)	$1,277	$35,129	$ 60,256	$ 35,069
2024	9		$ (21,816)	$1,277	$35,129	$ 58,223	$ 31,669
2025	10		$ (19,792)	$1,277	$35,129	$ 56,198	$ 28,568
2026	11		$ (17,775)	$1,277	$35,129	$ 54,181	$ 25,741
2027	12		$ (15,766)	$1,277	$35,129	$ 52,172	$ 23,165
2028	13		$ (13,765)	$1,277	$35,129	$ 50,172	$ 20,820
2029	14		$ (11,773)	$1,277	$35,129	$ 48,180	$ 18,685
2030	15		$ (9,789)	$1,277	$35,129	$ 46,196	$ 16,743
2031	16		$ (7,814)	$1,277	$35,129	$ 44,220	$ 14,979
2032	17		$ (5,847)	$1,277	$35,129	$ 42,254	$ 13,376
2033	18		$ (3,889)	$1,277	$35,129	$ 40,296	$ 11,922
2034	19		$ (1,940)	$1,277	$35,129	$ 38,347	$ 10,603
2035	20		$ -	$1,277	$35,129	$ 36,406	$ 9,408
NPV							**$ (1,094,832)**
	Undiscounted totals by category		$ (340,034)	$ 24,271	$ 667,450	$ 1,031,755	

Initial Costs	**$ 1,773,875**
Benefits discounted 7%	**$ 562,995**
Benefit Cost Ratio	**-1.62**

Day trains		6
Night trains		4
CurrentMaxSpd		10
NewMaxSpd		10
Train length (miles)		1.136363636
Day%Traffic		70%
Night%traffic		30%
DayHours		12
NightHours		12
DaysPerYear		365
All Purpose Local Travel Rate (2012)	$	12.80

[1] Day Traffic Affected ((((3600/CurrentMaxSpd)*train length)-((3600/NewMaxSpd)*train length)/60)/(DayHours*60))*(AADT*Day%Traffic)*DayTrains*DaysPerYear

[2] Night Traffic Affected ((((3600/CurrentMaxSpd)*train length)-((3600/NewMaxSpd)*train length)/60)/(NightHours*60))*(AADT*Night%Traffic)*NightTrains*DaysPerYear

[3]Travel Rate Exponent calculation based on Impact of Income Growth on VTTS as per ***The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*** ; page 14
https://www.transportation.gov/sites/dot.gov/files/docs/USDOT%20VOT%20Guidance%202014.pdf

* Day Hours are 6am to 6pm - Night Hours are 6pm to 6am

** Day and night traffic percentages calculated from Iowa specific statewide municipal noninterstate traffic permanent automatic traffic recorders (2004 to 2014)

***negative maintenance cost are the annual savings attributed to maintenance when compared to the no-build alternative