



Calendar Year 2014 Report on

# Life-Cycle Cost Analyses

January 2015



**Prepared by**

The Minnesota Department of Transportation  
395 John Ireland Boulevard  
Saint Paul, Minnesota 55155-1899

Phone: 651-296-3000

Toll-Free: 1-800-657-3774

TTY, Voice or ASCII: 1-800-627-3529

**To request this document in an alternative format**

Please call 651-366-4718 or 1-800-657-3774 (Greater Minnesota). You may also send an email to [ADArequest.dot@state.mn.us](mailto:ADArequest.dot@state.mn.us).

The cost of preparing this report is under \$5,000.

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# Legislative Request

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This report is required by Minn. Stat. 174.185, which requires a life-cycle cost analysis for every project in the reconditioning, resurfacing and road repair funding categories constructed after July 1, 2011. The LCCA is a comparison of life-cycle costs among competing paving materials using equal design lives and equal comparison periods. Documentation required by the statute includes:

- Lowest life-cycle cost
- Alternatives considered
- Chosen strategy
- Documented justification, if the chosen strategy isn't the low cost

## **174.185 PAVEMENT LIFE-CYCLE COST ANALYSIS.**

### **Subd. 1. Definitions.**

For the purposes of this section, the following definitions apply.

- (a) "Life-cycle cost" is the sum of the cost of the initial pavement project and all anticipated costs for maintenance, repair, and resurfacing over the life of the pavement. Anticipated costs must be based on Minnesota's actual or reasonably projected maintenance, repair, and resurfacing schedules, and costs determined by the Department of Transportation district personnel based upon recently awarded local projects and experience with local material costs.
- (b) "Life-cycle cost analysis" is a comparison of life-cycle costs among competing paving materials using equal design lives and equal comparison periods.

### **Subd. 2. Required analysis.**

For each project in the reconditioning, resurfacing, and road repair funding categories, the commissioner shall perform a life-cycle cost analysis and shall document the lowest life-cycle costs and all alternatives considered. The commissioner shall document the chosen pavement strategy and, if the lowest life cycle is not selected, document the justification for the chosen strategy. A life-cycle cost analysis is required for projects to be constructed after July 1, 2011. For projects to be constructed prior to July 1, 2011, when feasible, the department will use its best efforts to perform life-cycle cost analyses.

### **Subd. 3. Report.**

The commissioner shall report annually to the chairs and ranking minority members of the senate and house of representatives committees with jurisdiction over transportation finance beginning on January 1, 2012, the results of the analyses required in subdivision 2.

# Life-Cycle Cost Analysis Report

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## Implementation

Minn. Stat. 174.185 requires a life-cycle cost analysis for every project in the reconditioning, resurfacing and road repair funding categories constructed after July 1, 2011.

MnDOT first implemented a LCCA process for roadway rehabilitation projects in 1999. That LCCA process was modified in 2010 to meet the specific requirements of the legislation approved in 2008 and presented in [Technical Memorandum 10-04-MAT-01](#).

This memorandum requires that a LCCA consistent with Federal Highway Administration guidelines be performed on all projects in the reconditioning, resurfacing and road repair funding categories. The memorandum limits the LCCA requirement to projects greater than two miles in length or more than 30,000 square yards. The memorandum also limits the requirement for a LCCA to projects that include placing more than two-inch thickness of pavement material. Thin overlays (two inches or less) are considered short-term preventive maintenance and do not have a viable concrete alternative with an equal design life.

The memorandum requires the LCCA includes at least one Portland cement concrete and one hot-mix asphalt alternate with equal design lives. To best determine the most cost effective design, the memorandum also allows the LCCA to include additional alternatives with other design lives.

Technical Memorandum 10-04-MAT-01 was superseded by the updated MnDOT Pavement Design Manual when it was signed on Oct. 31, 2014; however, LCCAs for projects constructed this year were already completed and this report will retain the LCCA procedure in the memorandum as the standard.

## Results

In 2014, 34 construction projects were in the reconditioning, resurfacing and road repair funding categories and required a LCCA according to Technical Memorandum 10-04-MAT-01. A LCCA was not submitted for one of these projects. It was a non-programmed project that was developed on an accelerated timeline to repair a road's unexpectedly poor pavement condition.

The results of the 33 LCCAs are as follows:

- Hot-mix asphalt was the low-cost option for 28 construction projects
- Portland cement concrete was the low-cost option for five construction projects
- Twenty-five projects selected the low-cost option for construction
- Four projects used the alternate bidding process to select the pavement option to construct.
- Four projects selected an option other than the low-cost option for construction. Documented justification for selecting other than the low-cost option was provided for three of these projects. The remaining project (SP 8103-113) selected the pavement option as part of an agreement for the turn-back of a road to the county.

A table of LCCA results and copies of the LCCAs submitted by MnDOT districts are attached.

## Discussion

Hot-mix asphalt is most often the low-cost option in the submitted LCCAs. Portland cement concrete options usually have a greater initial cost than hot-mix asphalt, but become competitive by having lower maintenance costs over the life of the pavement. However, the relatively short design lives of these rehabilitation-type projects do not allow Portland cement concrete options to exploit this relative advantage. Portland cement concrete options with longer design lives than hot-mix asphalt alternates are more competitive than the Portland cement concrete options with the equal design lives required by the statute.

Recently, procedures were developed to implement two new Portland cement concrete pavement design programs. These new programs resulted in substantially thinner pavement designs, which reduce the initial cost of constructing Portland cement concrete pavements and increase competitiveness. In addition, a research project was started to develop a new procedure to design Portland cement concrete pavements that are built on top of existing Portland cement concrete pavements.

To create competition and to get the most cost-effective pavement, MnDOT continues to use the alternate bidding process on projects that are likely to have competitive hot-mix asphalt and Portland cement concrete options. A LCCA is still performed but the option constructed is selected through the alternate bidding process

The alternate bidding process is similar to using a LCCA to determine the low-cost option. However, instead of using an estimate for the initial cost of an option, alternate bidding uses actual bid prices. The process is as follows:

1. MnDOT lets a project with two options, a hot-mix asphalt option and a Portland cement concrete option.
2. MnDOT calculates a maintenance factor. This is the difference between the maintenance costs of the two options.

3. Each contractor bids on either of the two options.
4. MnDOT adjusts the bids by adding the maintenance factor to the bids of the option with the greater maintenance costs.
5. MnDOT selects the bid with the lowest adjusted bid.

## **Conclusion**

MnDOT implemented the requirements of Minn. Stat. 174.185 through Technical Memorandum 10-04-MAT-01 and provided the required results in this report. MnDOT will continue to ensure that all future projects meet the requirements of the legislation.

In addition, MnDOT is innovating new methods to design and select the most cost-effective pavement structure. Innovations include new pavement design procedures and refining the alternate bidding process to allow bidders of both pavement materials to bid on a project.

## Appendix A: Summary of LCCA Results

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SP #	Existing Pavement	Exception to selecting low-cost option	Design Life	Option Description	Present Worth/Rdwy Mile	Option Material (1)	Selected (2)	Alternate Bid (3)
0207-100	PCC	No						Yes
			14	Major CPR	\$546,341.00	PCC		
			14	HMA Overlay	\$546,740.00	HMA		
			20	Rubblize w/HMA	\$557,451.00	HMA	X	
			35	PCC Overlay	\$476,215.00	PCC	X	
0805-112	HMA	No						No
			13	HMA Overlay	\$562,844.00	HMA	X	
			20	PCC Overlay	\$665,105.00	PCC		
			20	FDR w/HMA	\$640,021.00	HMA		
			35	PCC Overlay	\$602,004.00	PCC		
1002-102	HMA	No						No
			15	HMA Overlay	\$520,208.00	HMA	X	
			20	PCC Overlay	\$1,050,604.00	PCC		
			20	FDR w/HMA	\$903,283.00	HMA		
1102-62	HMA	No						No
			20	New HMA	\$1,374,656.00	HMA	X	
			20	New PCC	\$2,102,453.00	PCC		
			35	New PCC	\$1,696,507.00	PCC		
1117-23	HMA	No						No
			15	PCC Overlay	\$497,268.00	PCC		
			15	HMA Overlay	\$360,706.00	HMA	X	
1407-25	PCC	No						No
			18	HMA Overlay	\$400,715.00	HMA	X	
			20	PCC Overlay	\$444,910.00	PCC		
			20	HMA Overlay	\$422,926.00	HMA		
1602-49	HMA	No						No
			20	New HMA	\$455,685.00	HMA		
			20	New PCC	\$554,125.00	PCC		
			20	HMA Overlay	\$390,482.00	HMA	X	
			35	New PCC	\$438,144.00	PCC		
1704-27	HMA	Yes						No
			20	FDR w/PCC	\$455,755.00	PCC		
			20	FDR w/ HMA Overlay	\$424,520.00	HMA	X	
			35	FDR w/PCC	\$391,936.00	PCC		
2001-36	PCC	No						No
			15	HMA Overlay	\$351,231.00	HMA	X	
			20	PCC Overlay	\$748,410.00	PCC		
			20	HMA Overlay	\$362,732.00	HMA		
2103-35	HMA	No						No
			20	PCC Overlay	\$591,984.00	PCC		
			20	HMA Overlay	\$471,932.00	HMA	X	
			20	CIR w/HMA Overlay	\$495,926.00	HMA		

SP #	Existing Pavement	Exception to selecting low-cost option	Design Life	Option Description	Present Worth/Rdwy Mile	Option Material (1)	Selected (2)	Alternate Bid (3)
2212-29	HMA	No	15	HMA Overlay	\$564,964.00	HMA	X	Yes
			20	PCC Overlay	\$727,389.00	PCC	X	
			20	FDR w/ PCC	\$732,263.00	PCC		
			20	FDR w/ HMA	\$520,715.00	HMA		
2280-132	PCC	No	20	New HMA	\$1,243,437.00	HMA		No
			20	PCC Overlay	\$799,542.00	PCC		
			35	PCC Overlay	\$778,527.00	PCC	X	
			35	PCC Overlay	\$779,597.00	PCC		
2514-120	HMA	No	15	HMA Overlay	\$424,219.00	HMA	X	No
			20	New PCC	\$922,832.00	PCC		
			20	New HMA	\$860,349.00	HMA		
3003-46	PCC	No	15	HMA Overlay	\$595,560.00	HMA		No
			15	PCC Overlay	\$614,272.00	PCC		
			15	HMA Overlay	\$567,694.00	HMA	X	
3403-66	PCC	No	15	HMA Overlay	\$607,142.00	HMA	X	Yes
			20	PCC Overlay	\$684,733.00	PCC		
			20	HMA Overlay	\$614,765.00	HMA		
			35	PCC Overlay	\$562,258.00	PCC	X	
3501-14	HMA	No	20	PCC Overlay	\$821,370.00	PCC		No
			20	HMA Overlay	\$345,223.00	HMA	X	
			35	New	\$669,207.00	PCC		
			35	New	\$680,161.00	PCC		
3604-73	HMA	No	15	HMA Overlay	\$389,829.00	HMA	X	No
			20	PCC Overlay	\$737,640.00	PCC		
			20	New HMA	\$863,679.00	PCC		
			20	FDR	\$555,334.00	PCC		
4402-19	HMA	No	16	HMA Overlay	\$448,730.00	HMA		Yes
			16	HMA Overlay	\$415,404.00	HMA		
			20	CIR w/HMA	\$410,657.00	HMA	X	
			20	PCC Overlay	\$436,347.00	PCC	X	
			35	PCC Overlay	\$448,863.00	PCC		

SP #	Existing Pavement	Exception to selecting low-cost option	Design Life	Option Description	Present Worth/Rdwy Mile	Option Material (1)	Selected (2)	Alternate Bid (3)
4604-32	PCC	No	12	HMA Overlay	\$571,283.00	HMA	X	No
			20	HMA Overlay	\$660,680.00	HMA		
			20	PCC Overlay	\$746,089.00	PCC		
			35	PCC Overlay	\$623,609.00	PCC		
4704-47	HMA	No	20	FDR w/HMA	\$730,017.00	HMA	X	Yes
			20	PCC Overlay	\$609,892.00	PCC		
			35	PCC Overlay	\$702,902.00	PCC	X	
			35	PCC Overlay	\$668,893.00	PCC	X	
4711-19	HMA	Yes	20	PCC Overlay	\$539,860.00	PCC	X	No
			20	CIR w/ HMA Overlay	\$405,983.00	HMA		
4712-18	PCC	No	15	HMA Overlay	\$490,294.00	HMA	X	No
			20	HMA Overlay	\$509,774.00	HMA		
			20	PCC Overlay	\$636,828.00	PCC		
			35	PCC Overlay	\$529,213.00	PCC		
5006-19	HMA	No	15	HMA Overlay	\$325,291.00	HMA	X	No
			20	HMA Overlay	\$481,208.00	HMA		
			20	PCC Overlay	\$337,238.00	PCC		
5209-66	PCC	No	12	HMA Overlay	\$645,237.00	HMA	X	No
			15	HMA Overlay	\$570,448.00	HMA		
			15	PCC Overlay	\$690,692.00	PCC		
			20	PCC Overlay	\$711,502.00	PCC		
			35	PCC Overlay	\$708,995.00	PCC		
5380-121	PCC	Yes	12	HMA Overlay	\$627,315.00	HMA		No
			13	HMA Overlay	\$646,051.00	HMA		
			14	HMA Overlay	\$683,814.00	HMA		
			20	Rubblize w/ HMA	\$655,648.00	HMA		
			20	PCC Overlay	\$948,200.00	PCC		
			35	PCC Overlay	\$834,833.00	PCC	X	
5407-31	PCC	No	20	Crack & Seat w/HMA	\$445,176.00	HMA	X	No
			20	PCC Overlay	\$930,631.00	PCC		
			35	PCC Overlay	\$673,387.00	PCC		
			35	New PCC	\$663,651.00	PCC		

SP #	Existing Pavement	Exception to selecting low-cost option	Design Life	Option Description	Present Worth/Rdwy Mile	Option Material (1)	Selected (2)	Alternate Bid (3)
5409-30	PCC	No	20	HMA Overlay	\$383,660.00	HMA	X	No
			20	PCC Overlay	\$678,358.00	PCC		
			35	PCC Overlay	\$527,793.00	PCC		
5509-79	PCC	No	15	HMA Overlay	\$387,772.00	HMA	X	No
			20	HMA Overlay	\$425,240.00	HMA		
			20	PCC Overlay	\$572,328.00	PCC		
6304-13	HMA	No	16	HMA Overlay	\$289,429.00	HMA	X	No
			20	PCC Overlay	\$635,983.00	PCC		
			20	HMA Overlay	\$333,193.00	HMA		
6410-06	HMA	No	15	HMA Overlay	\$463,565.00	HMA	X	No
			20	PCC Overlay	\$532,509.00	PCC		
			20	FDR w/HMA	\$517,920.00	HMA		
7380-247	HMA	No	None (non-programmed project)			HMA		No
8103-113	HMA	Yes (Selected as part of agreement for county turn-back).	15	HMA Overlay	\$486,392.00	HMA	X	No
			16	HMA Overlay	\$506,364.00	HMA		
			20	PCC Overlay	\$495,093.00	PCC		
			20	FDR w/HMA	\$478,056.00	HMA		
8402-17	HMA	No	20	CIR w/HMA	\$342,626.00	HMA	X	No
			20	PCC Overlay	\$594,238.00	PCC		
			20	HMA Overlay	\$305,474.00	HMA		
8680-167	HMA	No	15	HMA Overlay	\$601,383.00	HMA	X	No
			15	PCC Overlay	\$544,348.00	PCC		
			15	HMA Overlay	\$453,252.00	HMA		
			16	HMA Overlay	\$478,330.00	HMA		

(1) **Option material** - The pavement material that each option utilizes.

(2) **Selected** - This is marked (X) if the pavement option was selected to be constructed.  
If the project uses alternate bidding, more than one option will be marked and  
and the constructed option will be the low-cost option as determine by alternate bidding.

(3) **Alternate Bidding** - 'Yes' if the project used alternate bidding to select which option to construct.

**Definitions:**

CIR = Cold-in-Place Recycling (Recycle a layer of existing HMA with Cold-Mix Asphalt)  
CPR = Concrete Pavement Repair  
Crack & Seat = Crack and compact the existing PCC pavement to delay reflective cracking in a HMA overlay.  
FDR = Full-Depth Reclamation (recycle existing HMA and Base as new base)  
HMA = Hot-Mix Asphalt  
PCC = Portland Cement Concrete  
Rubblyze = Break the existing PCC into pieces to act at new base for HMA pavement.

## Appendix B: LCCAs

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District	2	Project Number	1102-62
Performed By	KO	Date	3/6/2014
Analysis Period	35	Funding Category	
Discount rate	2.2	Low Cost Option	
		Chosen Option	

Option 1		
Description	7" bituminous	
Design Life	20	
Year	Description	Cost/Mile
0	Initial Cost	\$ 1,084,759.99
1		
2		
3		
4		
5		
6		
7		
8	Light Crack Treatment	\$ 7,000.00
9		
10		
11		
12	Chip Seal	\$ 38,000.00
13		
14		
15		
16		
17		
18		
19		
20	Mill & Overlay (1st Overlay)	\$ 192,896.00
21		
22		
23	Crack Treatment	\$ 14,000.00
24		
25		
26		
27	Chip Seal	\$ 38,000.00
28		
29		
30		
31		
32		
33		
34		
35	End of Analysis Period - 0% Remaning Service Life	

Total Present Worth	\$ 1,374,655.99
Eq. Annual Cost	\$ 56,728.78
% of Low Cost	100%

Total	\$ 7,115,219.40
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District	2	Project Number	1102-62
Performed By	KO	Date	3/6/2014
Analysis Period	35	Funding Category	
Discount rate	2.2	Low Cost Option	
		Chosen Option	

Option 2		
Description	8.5" concrete	
Design Life	35	
Year	Description	Cost/Mile
0	Initial Cost	\$ 1,527,547.68
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17	Reseal Joints & Partial Depth Repair	\$ 54,540.29
18		
19		
20		
21		
22		
23		
24		
25		
26		
27	Minor CPR & Some Full Depth Repairs	\$ 184,546.56
28		
29		
30		
31		
32		
33		
34		
35	End of Analysis Period - 38% Remaning Service Life	\$ (70,127.69)

Total Present Worth	\$ 1,696,506.84
Eq. Annual Cost	\$ 70,010.80
% of Low Cost	123%

Total	\$ 8,781,119.39
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District	2	Project Number
Performed By	KO	Date
Analysis Period	35	Funding Category
Discount rate	2.2	Low Cost Option
		Chosen Option

Option 3		
Description	7.5" concrete	
Design Life	20	
Year	Description	Cost/Mile
0	Initial Cost	\$ 1,491,754.87
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13	Reseal Joints & Partial Depth Repair	\$ 83,060.74
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25	Major CPR	\$ 527,637.00
26		
27		
28		
29		
30		
31		
32		
33		
34		
35	End of Analysis Period - 0% Remaning Service Life	

Total Present Worth	\$ 2,102,452.60
Eq. Annual Cost	\$ 86,763.21
% of Low Cost	153%

Total	\$ 10,882,294.66
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District	3
Performed By	CD
Analysis Period	35
Discount Rate	2.84

Project Number	1117-23
Date	2/20/2013
Funding Category	RS
Low Cost Option #	1
Chosen Option #	

[illegible]

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

Life Cycle Cost Analysis - Rehabilitation

S.P. `1407-27

T.H. 75

Date #####

Interest Rate: 2.70

Inflation Rate: 0.00

Discount Rate 2.70

Soils Engineer: graig

Major Fixes are greater than \$10,000.00

Option 1					Option 2				Option 3					
1.5" mill and 3" overlay					5" unbonded				4" mill and fill					
design life 18 years.					design life 20 years.				design life 20 years.					
Year	Description of Work	Future Value	Present Value	Annualized	Description of Work	Future Value	Present Value	Annualized	Description of Work	Future Value	Present Value	Annualized		
0	1.5" mill and 3" overlay	210000	210000	9350	5" unbonded	350000	350000	15583	4" mill and fill	275000	275000	12244		
1			0	0			0	0			0	0		
2			0	0			0	0			0	0		
3			0	0			0	0			0	0		
4			0	0			0	0			0	0		
5			0	0			0	0	seal joints	5000	4376	195		
6			0	0			0	0			0	0		
7	chip seal	25000	20747	924			0	0			0	0		
8			0	0			0	0			0	0		
9			0	0			0	0	chip seal	27000	21244	946		
10			0	0			0	0			0	0		
11	patch	10000	7460	332			0	0			0	0		
12			0	0			0	0			0	0		
13			0	0			0	0			0	0		
14			0	0			0	0			0	0		
15	patch	10000	6706	299	minor cpr	100000	67057	2986	patch	6000	4023	179		
16			0	0			0	0			0	0		
17			0	0			0	0			0	0		
18	5" mill and overlay	250000	154765	6891			0	0			0	0		
19			0	0			0	0			0	0		
20			0	0			0	0	mill 1.5" and fill 3"	210000	123257	5488		
21			0	0			0	0			0	0		
22	crack seal	10000	5565	248			0	0			0	0		
23			0	0			0	0			0	0		
24			0	0			0	0			0	0		
25	chip seal	25000	12843	572	overlay 3"	200000	102747	4575			0	0		
26			0	0			0	0	crack seal	5000	2501	111		
27			0	0			0	0			0	0		
28			0	0			0	0			0	0		
29	patch	5000	2309	103			0	0			0	0		
30			0	0	patch	5000	2248	100	patch	5000	2248	100		
31			0	0			0	0			0	0		
32			0	0			0	0			0	0		
33	patch		0	0			0	0			0	0		
34			0	0			0	0			0	0		
35	20/25	-50000	-19679	-876	mill 1.5" overlay 3" 1/15x210000	-196000	-77142	-3435	2/17 x 210000	-24705	-9723	-433		
Totals		\$495,000	\$400,715			\$459,000	\$444,910			\$508,295	\$422,926			
		Annualized	\$17,841.31				Annualized	\$19,809.05				Annualized	\$18,830.24	
		Annual Cost	100%				Annual Cost	111%				Annual Cost	106%	

District	1
Performed By	CJM
Analysis Period	35
Discount Rate	2.2
ESALs (20 yr bit)	1,463,000

Project Number	1602-49
Date	10/1/2013
Funding Category	RC
Low Cost Option #	1
Chosen Option #	1

District	1
Performed By	CJM
Analysis Period	20
Discount Rate	2.2
ESALs (20 yr bit)	1,463,000

<b>OPTION #1</b> ( <i>Bituminous Mill and Overlay</i> )					
<b>DESCRIPTION</b>					
3.0" Mill & 3.0" Overlay					
20				<b>DESIGN LIFE</b>	<b>TYPE</b>
				20 year	BIT
Year	#	Life	Description	Cost/Mile	
	AO		3.0" Mill & 3.0" Overlay	\$	143,462
1				\$	-
2				\$	-
3	AA		Crack Treatment	\$	7,000
4				\$	-
5				\$	-
6				\$	-
7	AB		Surface Treatment (Chip Seal)	\$	19,000
8				\$	-
9				\$	-
10				\$	-
11				\$	-
12				\$	-
13				\$	-
14				\$	-
15	AL		2.0" Mill & 3.5" Overlay	\$	162,867
16				\$	-
17				\$	-
18	AA		Crack Treatment	\$	7,000
19				\$	-
20				\$	-
21				\$	-
22	AB		Surface Treatment (Chip Seal)	\$	19,000
23				\$	-
24				\$	-
25				\$	-
26				\$	-
27				\$	-
28				\$	-
29	AL		2.0" Mill & 3.5" Overlay	\$	162,867
30				\$	-
31				\$	-
32	AA		Crack Treatment	\$	7,000
33				\$	-
34				\$	-
35	AL		Remaining Service Life Value**	\$	-
			Total Present Worth	\$	390,482
			Eq. Annual Cost*		\$16,114
			% of Low Cost		100%

[illegible][illegible]

OPTION #4					
DESCRIPTION					
6" Bituminous over 6" of Class V					
			DESIGN LIFE	TYPE	
			20	BIT	
Year	#	Life	Description	Cost/Mile	
			Reconstruct HMA	\$306,237	
1				\$ -	
2				\$ -	
3	AA		Crack Treatment	\$ 7,000	
4				\$ -	
5				\$ -	
6				\$ -	
7	AB		Surface Treatment (Chip Seal)	\$ 19,000	
8				\$ -	
9				\$ -	
10				\$ -	
11				\$ -	
12				\$ -	
13				\$ -	
14	AH		1.5" Mill & 1.5" Overlay	\$ 78,208	
15				\$ -	
16				\$ -	
17	AA		Crack Treatment	\$ 7,000	
18				\$ -	
19				\$ -	
20				\$ -	
21	AB		Surface Treatment (Chip Seal)	\$ 19,000	
22				\$ -	
23				\$ -	
24				\$ -	
25				\$ -	
26				\$ -	
27	AJ		2.0" Mill & 2.0" Overlay	\$ 98,316	
28				\$ -	
29				\$ -	
30	AA		Crack Treatment	\$ 7,000	
31				\$ -	
32				\$ -	
33				\$ -	
34	AB		Surface Treatment (Chip Seal)	\$ 19,000	
35	AJ	4	Remaining Service Life Value**	\$ (32,772)	
			Total Present Worth	\$	455,685
			Eg. Annual Cost*		\$18,805
			% of Low Cost		117%

\* Equivalent Annual Cost is included for information only.

\* Equivalent Annual Cost is included for informatic



## Cost Analysis/ T.H. 14 From I-35 to Dodge Center

### Givens:

Length =	14.217 miles		
Width of Road =	24 feet(Conc.)	24 feet(Bit.)	5/15/14-TRM
1" Bituminous =	113 lbs/SY		
Interest Rate =	2.2 %		
Inflation Rate =	0 %		

### 2" MILL & 3.5" Bituminous Overlay(15 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
2" MILL BITUMINOUS		SY	0.80	\$160,140.29	Initial Cost	0	\$185,139	1.000	\$185,139	\$7,640
PATCH		Ton	100.00	\$56,868.00	Rout & seal	2	\$5,000	0.957	\$4,787	\$198
TACK COAT		GAL	\$1.00	\$40,035.07	Chipseal	4	\$25,000	0.917	\$22,916	\$946
3.5" SPWEB440B	Wear	TON	60.00	\$2,375,080.65	Mill & 3" Overlay	17	\$154,114	0.691	\$106,458	\$4,393
					Rout & seal	19	\$5,000	0.661	\$3,307	\$136
					Chipseal	21	\$25,000	0.633	\$15,830	\$653
					Mill & 3" Overlay	33	\$154,114	0.488	\$75,156	\$3,102
					Remaining Life Value	35	(\$133,565)	0.467	-\$62,361	-\$2,573
					<b>Total Present Worth:</b>				<b>\$351,231</b>	\$14,494
					<b>Equivalent Annual Cost:</b>				<b>\$14,494</b>	\$14,494

### 7" Unbonded Overlay(20 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
6" MILL BITUMINOUS		SY	3.00	\$600,526.08	Initial Cost	0	\$372,793	1.000	\$372,793	\$15,384
PASSRC		Ton	58.54	\$830,598.65	Reseal Joints	13	\$140,976	0.754	\$106,239	\$4,384
Place Concr. Pvmnt. 7"		SY	3.60	\$720,631.30	Major CPR	25	\$464,125	0.580	\$269,378	\$11,117
Structural Concrete		CY	68.34	\$2,279,997.35	Remaining Life Value	35	\$0	0.467	\$0	\$0
Reinforcement Bars	Epoxy	lb	0.80	\$70,743.79						
Dowel Bars	Epoxy	each	6.64	\$797,498.63						
					<b>Total Present Worth:</b>				<b>\$748,410</b>	\$30,885
					<b>Equivalent Annual Cost:</b>				<b>\$30,885</b>	\$30,885

### MILL 3" & 5.5" Bituminous Overlay(20 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost	Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
3" MILL BITUMINOUS		SY	1.20	\$240,210.43	Initial Cost	0	\$239,910	1.000	\$239,910	\$9,901
PATCH		Ton	100.00	\$56,868.00	Rout & seal	3	\$5,000	0.937	\$4,684	\$193
TACK COAT		GAL	\$1.00	\$60,052.61	Chipseal	5	\$25,000	0.897	\$22,423	\$925
4.5" SPWEB440B	Wear	TON	60.00	\$3,053,675.12	Mill & 3" Overlay	22	\$154,114	0.620	\$95,482	\$3,940
					Rout & seal	24	\$5,000	0.593	\$2,966	\$122
					Chipseal	26	\$25,000	0.568	\$14,198	\$586
					Remaining Life Value	35	(\$36,262)	0.467	-\$16,931	-\$699
					<b>Total Present Worth:</b>				<b>\$362,732</b>	\$14,969
					<b>Equivalent Annual Cost:</b>				<b>\$14,969</b>	\$14,969

1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium and heavy overlays and Reclaimed pavements.
2. Each successive overlay has 1 year less life than previous one on a section.
3. Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, unbonded-20 years.
4. Aggregate and shoulder quantities were not included in each option.
5. Calculations are based on 35 year life cycle.
6. Costs are based upon recent district project costs.



Life Cycle Cost Analysis - Rehabilitation

S.P. 2103-35

T.H. 29

Date #####

Interest Rate: 2.20

Inflation Rate: 0.00

Discount Rate 2.20

Soils Engineer: Graig Gilbertson

Major Fixes are greater than \$10,000.00

	Option 1				Option 2				Option 3			
	3" mill and fill				concrete; 5' whitetop				CIR			
	20 year. Last 3" mill made 23 years.				20				20			
Year	Description of Work	Future Value	Present Value	Annualized	Description of Work	Future Value	Present Value	Annualized	Description of Work	Future Value	Present Value	Annualized
0	3" mill and fill	225000	225000	9285	concrete; 5' whitetop	350000	350000	14444	CIR	300000	300000	12380
1			0	0			0	0		0	0	0
2			0	0			0	0		0	0	0
3			0	0			0	0			0	0
4	seal joints	5000	4583	189			0	0	seal	5000	4583	189
5			0	0			0	0			0	0
6			0	0			0	0		0	0	0
7	chip seal	27000	23185	957			0	0	chip seal	27000	23185	957
8			0	0			0	0			0	0
9			0	0			0	0		0	0	0
10			0	0			0	0			0	0
11			0	0			0	0			0	0
12	minor patch	6000	4621	191			0	0	patch	5000	3851	159
13			0	0			0	0			0	0
14			0	0			0	0			0	0
15			0	0			0	0			0	0
16			0	0			0	0		0	0	0
17			0	0	cpr	150000	103616	4276			0	0
18			0	0			0	0	patch	5000	3380	139
19			0	0			0	0			0	0
20	reclaim	300000	194135	8011			0	0			0	0
21			0	0			0	0			0	0
22			0	0			0	0			0	0
23			0	0			0	0			0	0
24	seal joints	5000	2966	122			0	0			0	0
25			0	0			0	0	mill and inlay	250000	145100	5988
26			0	0			0	0			0	0
27	chip seal	27000	15003	619			0	0		0	0	0
28			0	0	overlay 4.5"	250000	135930	5610			0	0
29			0	0			0	0	seal	5000	2660	110
30			0	0			0	0			0	0
31			0	0			0	0			0	0
32			0	0			0	0			0	0
33	patch	5000	2438	101	patch	5000	2438	101	chip seal	27000	13167	543
34			0	0			0	0			0	0
35			0	0			0	0			0	0
Totals		\$600,000	\$471,932			\$755,000	\$591,984			\$624,000	\$495,926	
			Annualized	\$19,475.49			Annualized	\$24,429.77			Annualized	\$20,465.67
			Annual Cost	100%			Annual Cost	125%			Annual Cost	105%



Project Number	2212-29
Date	#####
Funding Category	RD
Low Cost Option #	
Chosen Option #	1

District	7
Performed By	A. Noble
Analysis Period	35
Discount Rate	2.7

[illegible]



\* Equivalent Annual Cost is included for information only.  
\*\*Remaining Service Life Value is reported as a negative value.

\* Equivalent Annual Cost is included for information only.

Cost Analysis/T.H. 61 From Ready Mix Entr. to Potter St. & From Old W. Main to T.H. 19

Givens:

Length =	14.272 miles		
Width of Road =	24 feet	24 feet	5/20/14-TRM
1" Bituminous =	113 lbs/SY		
Interest Rate =	2.2 %		
Inflation Rate =	0 %		

8" Concrete Doweled-Select Granular(20 Year Fix)					Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
12" Select Granular Mod.		CY	\$11.86	\$794,421.38	Initial Cost	0	\$10,508,243	1.000	\$736,284	\$30,385
8" Class 6		CY	\$19.44	\$868,102.96	Reseal Joints	13	\$55,000	0.754	\$41,448	\$1,710
4" Perf PE Drain		LF	\$3.00	\$452,136.96	Major CPR	25	\$250,000	0.580	\$145,100	\$5,988
Subgrade Excavation		CY	\$8.92	\$995,817.70	Remaining Life Value	35	\$0	0.467	\$0	\$0
Conc Pavement 8"		SY	\$25.70	\$5,164,408.83	Total Present Worth:				\$922,832	\$38,083
Dowel Bars	Epoxy	each	\$6.64	\$800,583.84	Equivalent Annual Cost:				\$38,083	
Remove Pavement		SY	\$7.13	\$1,432,771.79						
Total Cost:				\$10,508,243						
Cost/Mile:				\$736,284						

Bituminous Aggregate Base Modified(20 Year Fix)					Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
20" Select Granular Mod.		CY	\$11.86	\$1,324,035.64	Initial Cost	0	\$9,983,407	1.000	\$699,510	\$28,867
Subgrade Excavation		CY	\$8.92	\$1,294,563.01	Rout & Seal	4	\$5,000	0.917	\$4,583	\$189
4" Perf PE Drain		LF	\$3.00	\$452,136.96	Chipseal	6	\$25,000	0.878	\$21,940	\$905
Tack Coats		GAL	\$1.00	\$60,284.93	Mill & 3" Overlay	20	\$180,706	0.647	\$116,938	\$4,826
4" SPWEB440F	Wear	TON	\$70.00	\$3,179,025.20	Rout & Seal	22	\$5,000	0.620	\$3,098	\$128
2" SPNWB430F	NW	TON	\$70.00	\$1,589,512.60	Chipseal	24	\$25,000	0.593	\$14,829	\$612
6" Class 5		CY	\$19.44	\$651,077.22	Remaining Life Value	35	(\$1,177)	0.467	-\$549	-\$23
Remove Pavement		SY	\$7.13	\$1,432,771.79	Total Present Worth:				\$860,349	\$35,505
Total Cost:				\$9,983,407	Equivalent Annual Cost:				\$35,505	
Cost/Mile:				\$699,510						

MILL 1.5" & 3" min. Bituminous Overlay(15 Year Fix)					Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
1.5" MILL BITUMINOUS		SY	\$0.80	\$160,759.81	Initial Cost	0	\$180,706	1.000	\$180,706	\$7,457
PATCH		Ton	\$100.00	\$96,000.00	Rout & seal	2	\$5,000	0.957	\$4,787	\$198
TACK COAT		GAL	\$1.00	\$40,189.95	Chipseal	4	\$25,000	0.917	\$22,916	\$946
3" SPWEB440E	Wear	TON	\$67.00	\$2,282,085.95	Mill & 3" Overlay	15	\$180,706	0.722	\$130,379	\$5,380
Total Cost:				\$2,579,036	Rout & seal	17	\$5,000	0.691	\$3,454	\$143
Cost/Mile:				\$180,706	Chipseal	19	\$25,000	0.661	\$16,534	\$682
					Mill & 3" Overlay	29	\$180,706	0.532	\$96,138	\$3,967
					Rout & seal	31	\$5,000	0.509	\$2,547	\$105
					Chipseal	33	\$25,000	0.488	\$12,192	\$503
					Remaining Life Value	35	(\$97,310)	0.467	-\$45,434	-\$1,875
					Total Present Worth:				\$424,219	\$17,507
					Equivalent Annual Cost:				\$17,507	\$17,507

1. Concrete Regrade design-20 years,bituminous regrade design-20 years, bituminous overlay-15 years.
2. Shoulder quantities were not included in each option.
3. Calculations are based on 50 year life cycle.
4. Costs are based upon recent district project costs.









## Mn/DOT DISTRICT 2

## REHABILITATION WORKSHEET

(General Pre-Scoping / Planning Estimate)

## TH 11 State Project 3604-73

Funding category		RD	Alternate #1	Alternate #2	Alternate #3	Alternate #4
Description ---->			1.5" MILL & 3"OVERLAY	5" whitetopping	6" New bit	Reclaim
		YR				
First Cost \$ / Mile			\$240,069	\$520,361	\$757,564	\$450,368
Rehab Life in Yrs			35	35	35	35
Interest %			2.50%	2.50%	2.50%	2.50%
			15yr	20yr	20yr	20yr
		1	\$0	\$0	\$0	\$0
		2	\$0	\$0	\$0	\$0
		3 F	\$5,000	\$0	\$0	\$0
		4	\$0	\$0	\$0	\$0
		5	\$0	\$0	\$0	\$0
		6	\$0	\$0 F	\$5,000	\$0
		7 G	\$25,000	\$0	\$0	\$0
		8	\$0	\$0	\$0 F	\$5,000
		9	\$0	\$0	\$0	\$0
		10	\$0	\$0 G	\$25,000	\$0
		11	\$0	\$0	\$0	\$0
		12	\$0	\$0	\$0 G	\$25,000
		13	\$0 I	\$97,945	\$0	\$0
		14	\$0	\$0	\$0	\$0
		15 D	\$109,140	\$0	\$0	\$0
		16	\$0	\$0	\$0	\$0
		17	\$0	\$0	\$0	\$0
		18 F	\$5,000	\$0	\$0	\$0
		19	\$0	\$0	\$0	\$0
		20	\$0	\$0 D	\$109,140 D	\$109,140
		21	\$0	\$0	\$0	\$0
		22 G	\$25,000	\$0	\$0	\$0
		23	\$0	\$0 F	\$5,000 F	\$5,000
		24	\$0	\$0	\$0	\$0
		25	\$0 J	\$271,098	\$0	\$0
		26	\$0	\$0	\$0	\$0
		27	\$0	\$0 G	\$25,000 G	\$25,000
		28	\$0	\$0	\$0	\$0
		29	\$0	\$0	\$0	\$0
		30 N	\$158,300	\$0	\$0	\$0
		31	\$0	\$0	\$0	\$0
		32	\$0	\$0	\$0	\$0
		33	\$0	\$0	\$0	\$0
		34	\$0	\$0	\$0	\$0
		35	(\$105,533)	\$0	\$0	\$0
		36	\$0	\$0	\$0	\$0
		37	\$0	\$0	\$0	\$0
		38	\$0	\$0	\$0	\$0
		39	\$0	\$0	\$0	\$0
		40	\$0	\$0	\$0	\$0
		41	\$0	\$0	\$0	\$0
		42	\$0	\$0	\$0	\$0
		43	\$0	\$0	\$0	\$0
		44	\$0	\$0	\$0	\$0
		45	\$0	\$0	\$0	\$0
		46	\$0	\$0	\$0	\$0
		47	\$0	\$0	\$0	\$0
		48	\$0	\$0	\$0	\$0
		49	\$0	\$0	\$0	\$0
Total Cost (Present Worth)			\$389,829	\$737,640	\$863,679	\$555,334
Annual Cost (Present Worth)			\$16,843	\$31,870	\$37,316	\$23,994
% Above Low Option			100%	189%	222%	142%

Data Furnished By:

Completed By:

KO

District	4
Performed By	TA check
Analysis Period	35
Discount Rate	2.2

Project Number	4402-19
Date	3/17/2014
Funding Category	RS
Low Cost Option #	5
Chosen Option #	

T.H. 200

District	4
Performed By	TA check
Analysis Period	35
Discount Rate	2.2

Project Number	4402-19
Date	3/17/2014
Funding Category	RS
Low Cost Option #	5
Chosen Option #	

OPTION #1					OPTION #2					OPTION #3					OPTION #4					OPTION #5				
DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION				
4" Mill & 4" HMA OL					4" Mill & 4.5" White/Topping					3" Mill, Chip Seal, & 3" HMA OL					4" Mill & 4.5" PCC (BCOA-ME)					3" Mill, 3" CR, & 3" HMA OL				
DESIGN LIFE					DESIGN LIFE					DESIGN LIFE					DESIGN LIFE					DESIGN LIFE				
16 yrs					35 yrs					16 yrs					20 yrs					20 yrs				
Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile
0				\$ 233,947	0				\$ 269,844	0				\$ 200,620	0				\$ 269,844	0				\$ 251,752
1				\$ -	1				\$ -	1				\$ -	1				\$ -	1				\$ -
2				\$ -	2				\$ -	2				\$ -	2				\$ -	2				\$ -
3	AA		Crack Treatment	\$ 7,000	3				\$ -	3	AA		Crack Treatment	\$ 7,000	3				\$ -	3				\$ -
4				\$ -	4				\$ -	4				\$ -	4				\$ -	4				\$ -
5				\$ -	5				\$ -	5				\$ -	5				\$ -	5				\$ -
6				\$ -	6				\$ -	6				\$ -	6				\$ -	6				\$ -
7	AB		Surface Treatment	\$ 19,000	7				\$ -	7	AB		Surface Treatment	\$ 19,000	7				\$ -	7				\$ -
8				\$ -	8				\$ -	8				\$ -	8				\$ -	8	BJ		Light Crack Treatment	\$ 3,500
9				\$ -	9				\$ -	9				\$ -	9				\$ -	9				\$ -
10				\$ -	10				\$ -	10				\$ -	10				\$ -	10				\$ -
11				\$ -	11				\$ -	11				\$ -	11				\$ -	11				\$ -
12				\$ -	12				\$ -	12				\$ -	12				\$ -	12	AB		Surface Treatment	\$ 19,000
13				\$ -	13				\$ -	13				\$ -	13				\$ -	13				\$ -
14				\$ -	14				\$ -	14				\$ -	14				\$ -	14				\$ -
15				\$ -	15				\$ -	15				\$ -	15				\$ -	15				\$ -
16	BB		2" Mill & 3.5" HMA Overlay	\$ 195,528	16			Minor CPR (6"x6")	\$ 123,331	16	BN		2" Mill & 3.5" OL option#3	\$ 195,528	16				\$ -	16				\$ -
17				\$ -	17	AP			\$ -	17				\$ -	17				\$ -	17				\$ -
18				\$ -	18				\$ -	18				\$ -	18				\$ -	18				\$ -
19	AA		Crack Treatment	\$ 7,000	19				\$ -	19	AA		Crack Treatment	\$ 7,000	19				\$ -	19				\$ -
20				\$ -	20				\$ -	20				\$ -	20	BD	35	Reconstruct with 6" PCC	\$ 437,799	20	BB	15	2" Mill & 3.5" HMA Overlay	\$ 195,528
21				\$ -	21				\$ -	21				\$ -	21				\$ -	21				\$ -
22				\$ -	22				\$ -	22				\$ -	22				\$ -	22				\$ -
23	AB		Surface Treatment	\$ 19,000	23				\$ -	23	AB		Surface Treatment	\$ 19,000	23				\$ -	23	AA		Crack Treatment	\$ 7,000
24				\$ -	24				\$ -	24				\$ -	24				\$ -	24				\$ -
25				\$ -	25				\$ -	25				\$ -	25				\$ -	25				\$ -
26				\$ -	26				\$ -	26				\$ -	26				\$ -	26				\$ -
27				\$ -	27	BL		Minor CPR (6"x6") 35 yr DL	\$ 249,464	27				\$ -	27				\$ -	27	AB		Surface Treatment	\$ 19,000
28				\$ -	28				\$ -	28				\$ -	28				\$ -	28				\$ -
29				\$ -	29				\$ -	29				\$ -	29				\$ -	29				\$ -
30				\$ -	30				\$ -	30				\$ -	30				\$ -	30				\$ -
31	BB		2" Mill & 3.5" HMA Overlay	\$ 195,528	31				\$ -	31	BN		2" Mill & 3.5" OL option#3	\$ 195,528	31				\$ -	31				\$ -
32				\$ -	32				\$ -	32				\$ -	32				\$ -	32				\$ -
33				\$ -	33				\$ -	33				\$ -	33				\$ -	33				\$ -
34	AA		Crack Treatment	\$ 7,000	34				\$ -	34	AA		Crack Treatment	\$ 7,000	34				\$ -	34				\$ -
35			Remaining Service Life Value**	\$ (139,663)	35			Remaining Service Life Value**	\$ (95,947.53)	35			Remaining Service Life Value**	\$ (139,663)	35			Remaining Service Life Value**	\$ (250,170.68)	35			Remaining Service Life Value**	\$ -
36				\$ -	36				\$ -	36				\$ -	36				\$ -	36				\$ -
37				\$ -	37				\$ -	37				\$ -	37				\$ -	37				\$ -
38				\$ -	38				\$ -	38				\$ -	38				\$ -	38				\$ -
39				\$ -	39				\$ -	39				\$ -	39				\$ -	39				\$ -
40				\$ -	40				\$ -	40				\$ -	40				\$ -	40				\$ -
41				\$ -	41				\$ -	41				\$ -	41				\$ -	41				\$ -
42				\$ -	42				\$ -	42				\$ -	42				\$ -	42				\$ -
43				\$ -	43				\$ -	43				\$ -	43				\$ -	43				\$ -
44				\$ -	44				\$ -	44				\$ -	44				\$ -	44				\$ -
45				\$ -	45				\$ -	45				\$ -	45				\$ -	45				\$ -
46				\$ -	46				\$ -	46				\$ -	46				\$ -	46				\$ -
47				\$ -	47				\$ -	47				\$ -	47				\$ -	47				\$ -
48				\$ -	48				\$ -	48				\$ -	48				\$ -	48				\$ -
49				\$ -	49				\$ -	49				\$ -	49				\$ -	49				\$ -
50				\$ -	50				\$ -	50				\$ -	50				\$ -	50				\$ -
Total Present Worth				\$ 448,730	Total Present Worth				\$ 448,863	Total Present Worth				\$ 415,404	Total Present Worth				\$ 436,347	Total Present Worth				\$ 410,657
Eq. Annual Cost*				\$18,518	Eq. Annual Cost*				\$19,524	Eq. Annual Cost*				\$17,143	Eq. Annual Cost*				\$18,027	Eq. Annual Cost*				\$16,947
% of Low Cost				109%	% of Low Cost				109%	% of Low Cost				101%	% of Low Cost				106%	% of Low Cost				100%

\* Equivalent Annual Cost is included for information only.

\*\* Remaining Service Life Value is reported as a negative value.

\* Equivalent Annual Cost is included for information only.

			District	7				Project Number	4604-32									District	7
			Performed By	Kyle Vogt				Date	5/28/2013									Performed By	Kyle Vogt
			Analysis Period	35				Funding Category										Analysis Period	35
			Discount Rate	2.5				Low Cost Option #										Discount Rate	2.5
								Chosen Option #	1										
			OPTION #1					OPTION #2					OPTION #3					OPTION #4	
			DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION	
			3.5" Bit. Overlay with Aggregate Shoulders					6" Bit. Overlay with Aggregate Shoulders					5" Unbonded Concrete Overlay (No Dowels)					6" Unbonded Concrete Overlay (Dowels)	
			DESIGN LIFE		TYPE			DESIGN LIFE		TYPE			DESIGN LIFE		TYPE			DESIGN LIFE	
			12		Bit.			20		Bit.			20		Conc.			35	
Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#
0		12	3" Mill & 3.5" Bit. Overlay		\$ 282,053	0		20	3" Mill & 6" Bit. Overlay		\$ 508,984	0		20	5" Unbonded Conc. (No Dowels)		\$ 369,776	0	
1					\$ -	1					\$ -	1					\$ -	1	
2					\$ -	2					\$ -	2					\$ -	2	
3	AA		Crack Treatment		\$ 3,000	3	AA		Crack Treatment		\$ 3,000	3					\$ -	3	
4					\$ -	4					\$ -	4					\$ -	4	
5					\$ -	5					\$ -	5					\$ -	5	
6					\$ -	6					\$ -	6					\$ -	6	
7	AB		Surface Treatment		\$ 20,000	7	AB		Surface Treatment		\$ 20,000	7					\$ -	7	
8					\$ -	8					\$ -	8					\$ -	8	
9					\$ -	9					\$ -	9					\$ -	9	
10					\$ -	10					\$ -	10					\$ -	10	
11					\$ -	11					\$ -	11					\$ -	11	
12	AJ	11	2" Mill & 3.5" Overlay		\$ 171,147	12					\$ -	12					\$ -	12	
13					\$ -	13					\$ -	13	BB		20 yr. - Reseal Jts. & Part. Depth Rpr (No Dowels)		\$ 194,289	13	
14					\$ -	14					\$ -	14					\$ -	14	
15	AA		Crack Treatment		\$ 3,000	15					\$ -	15					\$ -	15	
16					\$ -	16					\$ -	16					\$ -	16	
17					\$ -	17					\$ -	17					\$ -	17	BC
18					\$ -	18					\$ -	18					\$ -	18	
19	AB		Surface Treatment		\$ 20,000	19					\$ -	19					\$ -	19	
20					\$ -	20	AJ	13	2" Mill & 3.5" Overlay		\$ 171,147	20					\$ -	20	
21					\$ -	21					\$ -	21					\$ -	21	
22					\$ -	22					\$ -	22					\$ -	22	
23	AJ	10	2" Mill & 3.5" Overlay		\$ 171,147	23	AA		Crack Treatment		\$ 3,000	23					\$ -	23	
24					\$ -	24					\$ -	24					\$ -	24	
25					\$ -	25					\$ -	25	BE		20 yr. - Major CPR (No Dowels)		\$ 436,367	25	
26	AA		Crack Treatment		\$ 3,000	26					\$ -	26					\$ -	26	
27					\$ -	27	AB		Surface Treatment		\$ 20,000	27					\$ -	27	BF
28					\$ -	28					\$ -	28					\$ -	28	
29					\$ -	29					\$ -	29					\$ -	29	
30	AB		Surface Treatment		\$ 20,000	30					\$ -	30					\$ -	30	
31					\$ -	31					\$ -	31					\$ -	31	
32					\$ -	32					\$ -	32					\$ -	32	
33	AJ	9	2" Mill & 3.5" Overlay		\$ 171,147	33	AJ	12	2" Mill & 3.5" Overlay		\$ 171,147	33					\$ -	33	
34					\$ -	34					\$ -	34					\$ -	34	
35			Remaining Service Life (7/9)		\$ (133,115)	35			Remaining Service Life (10/12)		\$ (142,623)	35			No Remaining Service Life		\$ -	35	
															</				

District	8
Performed By	AA/TA
Analysis Period	35
Discount Rate	2.2

Project Number	4704-47
Date	3/26/2014
Funding Category	RD
Low Cost Option #	
Chosen Option #	2

District	8
Performed By	AA/TA
Analysis Period	35
Discount Rate	2.2

OPTION #1					OPTION #2					OPTION #3					OPTION #4				
DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION				
5" Mill, 10" FDR, 5" HMA (20 Yr Design)					4.5" Bit. Mill, 4.5" PCC (Wide) (ME BCOA 20 Yr Design)					6" Bit. Mill, 6" PCC (Wide), 4" HMA Shld (ME PCC 35 Yr Design)					6" Bit. Mill, 6" PCC (Wide), 4" PCC Shld (ME PCC 35 Yr Design)				
DESIGN LIFE			TYPE		DESIGN LIFE			TYPE		DESIGN LIFE			TYPE		DESIGN LIFE			TYPE	
20			BIT		20			PCC		35			PCC		35			PCC	
Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile
0	BB	20	Bit. Mill, FDR, 5" HMA (20 Yr Design)	\$ 542,270	0	BG	20	Concrete (Wide) (20 Yr Design)	\$ 412,090	0	BK	35	PCC (Wide Design) HMA Shld	\$ 572,667	0	BP		PCC (Wide Design) PCC Shld	\$ 576,396
1				\$ -	1				\$ -	1				\$ -	1				\$ -
2				\$ -	2				\$ -	2				\$ -	2				\$ -
3				\$ -	3				\$ -	3				\$ -	3				\$ -
4				\$ -	4				\$ -	4				\$ -	4				\$ -
5				\$ -	5				\$ -	5				\$ -	5				\$ -
6				\$ -	6				\$ -	6				\$ -	6				\$ -
7				\$ -	7				\$ -	7				\$ -	7				\$ -
8	BX		Light Crack Treatment	\$ 3,500	8				\$ -	8				\$ -	8				\$ -
9				\$ -	9				\$ -	9				\$ -	9				\$ -
10				\$ -	10				\$ -	10				\$ -	10				\$ -
11				\$ -	11				\$ -	11				\$ -	11				\$ -
12	BE		Chipseal	\$ 19,000	12				\$ -	12				\$ -	12				\$ -
13				\$ -	13				\$ -	13				\$ -	13				\$ -
14				\$ -	14				\$ -	14				\$ -	14				\$ -
15				\$ -	15				\$ -	15				\$ -	15				\$ -
16				\$ -	16				\$ -	16				\$ -	16				\$ -
17				\$ -	17				\$ -	17	BL		1st CPR Concrete (35 Yr Design)	\$ 39,769	17	BQ		1st CPR Concrete (35 Yr Design)	\$ 39,769
18				\$ -	18				\$ -	18				\$ -	18				\$ -
19				\$ -	19				\$ -	19				\$ -	19				\$ -
20	BC		Bit. 2" Mill & 3.5" Overlay plus 1.5" overlay on Shoulders	\$ 240,098	20	BY	35	5.5" Reconstruction	\$ 520,094	20				\$ -	20				\$ -
21				\$ -	21				\$ -	21				\$ -	21				\$ -
22				\$ -	22				\$ -	22				\$ -	22				\$ -
23	BD		Crack Treatment	\$ 7,000	23				\$ -	23				\$ -	23				\$ -
24				\$ -	24				\$ -	24				\$ -	24				\$ -
25				\$ -	25				\$ -	25				\$ -	25				\$ -
26				\$ -	26				\$ -	26				\$ -	26				\$ -
27	BE		Chipseal	\$ 19,000	27				\$ -	27	BM		2nd CPR Concrete (35 Yr Design)	\$ 273,231	27	BR		2nd CPR Concrete (35 Yr Design)	\$ 172,892
28				\$ -	28				\$ -	28				\$ -	28				\$ -
29				\$ -	29				\$ -	29				\$ -	29				\$ -
30				\$ -	30				\$ -	30				\$ -	30				\$ -
31				\$ -	31				\$ -	31				\$ -	31				\$ -
32				\$ -	32				\$ -	32				\$ -	32				\$ -
33				\$ -	33				\$ -	33				\$ -	33				\$ -
34				\$ -	34				\$ -	34				\$ -	34				\$ -
35			Remaining Service Life Value**	\$ -	35			Remaining Service Life Value**	\$ (297,197)	35			Remaining Service Life Value**	\$ (105,088.77)	35			Remaining Service Life Value**	\$ (66,497)
Total Present Worth				\$ 730,017	Total Present Worth				\$ 609,892	Total Present Worth				\$ 702,902	Total Present Worth				\$ 668,893
Eq. Annual Cost*				\$30,126	Eq. Annual Cost*				\$25,169	Eq. Annual Cost*				\$29,007	Eq. Annual Cost*				\$27,604
% of Low Cost				120%	% of Low Cost				100%	% of Low Cost				115%	% of Low Cost				110%

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

Due to severe transverse reflective cracks, this option will not be considered.

\* Equivalent Annual Cost is included for information only.

District	8
Performed By	A. A.
Analysis Period	35
Discount Rate	2.2

Project Number	4711-19
Date	9/4/2013
Funding Category	4
Low Cost Option #	1
Chosen Option #	

[illegible]

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.

District	8
Performed By	AAA
Analysis Period	35
Discount Rate	2.5

Project Number	
Date	9/9/2013
Funding Category	RD
Low Cost Option #	1
Chosen Option #	

OPTION #1					OPTION #2					OPTION #3					OPTION #4				
DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION				
3.0" Bituminous Overlay + 5/8" UTBWC					7.0" Bituminous Overlay					5" Unbonded Concrete Overlay					6" Unbonded Concrete Overlay				
			DESIGN LIFE		TYPE				DESIGN LIFE		TYPE				DESIGN LIFE		TYPE		
			15		BIT				20		BIT				20		PCC	35	
Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile		
0	AG	15	3.0" Overlay + 5/8" UTBWC		\$ 293,348	0	BA	20	7.0" Overlay		\$ 374,587	0	BC	20	5" Unbonded Overlay		\$ 380,922		
1		14			\$ -	1		19			\$ -	1					\$ -		
2		13			\$ -	2		18			\$ -	2					\$ -		
3		12			\$ -	3		17			\$ -	3					\$ -		
4		11			\$ -	4		16			\$ -	4					\$ -		
5		10			\$ -	5		15			\$ -	5					\$ -		
6		9			\$ -	6		14			\$ -	6					\$ -		
7	AB	8	Chip Seal		\$ 20,000	7		13			\$ -	7					\$ -		
8		7			\$ -	8	AA	12	Crack Treatment		\$ 3,000	8					\$ -		
9		6			\$ -	9		11			\$ -	9					\$ -		
10		5			\$ -	10		10			\$ -	10					\$ -		
11		4			\$ -	11		9			\$ -	11					\$ -		
12		3			\$ -	12	AB	8	Chip Seal		\$ 20,000	12					\$ -		
13		2			\$ -	13		7			\$ -	13	BE		1st CPR		\$ 82,053		
14		1			\$ -	14		6			\$ -	14					\$ -		
15	BB	14	2" Mill & 3.5" Overlay		\$ 173,506	15		5			\$ -	15					\$ -		
16		13			\$ -	16		4			\$ -	16					\$ -		
17		12			\$ -	17		3			\$ -	17					\$ -		
18	AA	11	Crack Treatment		\$ 3,000	18		2			\$ -	18					\$ -		
19		10			\$ -	19		1			\$ -	19					\$ -		
20		9			\$ -	20	BB	15	2" Mill & 3.5" Overlay		\$ 173,506	20					\$ -		
21		8			\$ -	21		14			\$ -	21					\$ -		
22	AB	7	Chip Seal		\$ 20,000	22		13			\$ -	22					\$ -		
23		6			\$ -	23	AA	12	Crack Treatment		\$ 3,000	23					\$ -		
24		5			\$ -	24		11			\$ -	24					\$ -		
25		4			\$ -	25		10			\$ -	25	BF		2nd CPR		\$ 364,083		
26		3			\$ -	26		9			\$ -	26					\$ -		
27		2			\$ -	27	AB	8	Chip Seal		\$ 20,000	27					\$ -		
28		1			\$ -	28		7			\$ -	28					\$ -		
29	BB	13	2" Mill & 3.5" Overlay		\$ 173,506	29		6			\$ -	29					\$ -		
30		12			\$ -	30		5			\$ -	30					\$ -		
31		11			\$ -	31		4			\$ -	31					\$ -		
32	AA	10	Crack Treatment		\$ 3,000	32		3			\$ -	32					\$ -		
33		9			\$ -	33		2			\$ -	33					\$ -		
34		8			\$ -	34		1			\$ -	34					\$ -		
35		7	Remaining Service Life Value**		\$ (93,426.30)	35		0	Remaining Service Life Value**		\$ -	35			Remaining Service Life Value**		\$ -		
			Total Present Worth		\$ 490,294				Total Present Worth		\$ 509,774				Total Present Worth		\$ 636,828		
			Eq. Annual Cost*		\$21,183				Eq. Annual Cost*		\$22,025				Eq. Annual Cost*		\$27,515		
			% of Low Cost		100%				% of Low Cost		104%				% of Low Cost		130%		

			Total Present Worth		\$ 529,213
			Eq. Annual Cost*		\$22,865
			% of Low Cost		108%

\* Equivalent Annual Cost is included for information only.  
 \*\*Remaining Service Life Value is reported as a negative value.

\*The 5-inch Unbonded Concrete Overlay is not an option since the standard design thickness of a UBOL is 6 inches.

## Cost Analysis/ TH 63 From Stewartville to T.H. 16

### Givens:

Length = 9.434 miles  
 Width of Road = 24 feet(Conc.) 24 feet(Bit.) 6/19/13-TRM  
 1" Bituminous = 113 lbs/SY  
 Interest Rate = 2.5 %  
 Inflation Rate = 0 %

### MILL 2" & 3.5" min. Bituminous Overlay(15 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost
2" MILL BITUMINOUS		SY	0.80	\$106,264.58
PATCH		Ton	125.00	\$47,170.00
TACK COAT		GAL	\$1.00	\$26,566.14
3.5" SPWEB340B	Wear	TON	55.00	<u>\$1,444,700.12</u>
<b>Total Cost:</b>				<b>\$1,624,701</b>
<b>Cost/Mile:</b>				<b>\$172,218</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$172,218	1.000	\$172,218	\$7,441
Rout & seal	2	\$5,000	0.952	\$4,759	\$206
Chipseal	4	\$25,000	0.906	\$22,649	\$979
Mill & 3" Overlay	17	\$146,525	0.657	\$96,296	\$4,161
Rout & seal	19	\$5,000	0.626	\$3,128	\$135
Chipseal	21	\$25,000	0.595	\$14,885	\$643
Mill & 3" Overlay	33	\$146,525	0.443	\$64,867	\$2,803
Remaining Life Value	35	(\$126,988)	0.421	-\$53,509	-\$2,312
<b>Total Present Worth:</b>				<b>\$325,291</b>	\$14,054
<b>Equivalent Annual Cost:</b>				<b>\$14,054</b>	\$14,054

### 7" Whitetopping(20 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost
4" MILL BITUMINOUS		SY	1.75	\$232,453.76
Place Concrete Pave. 7"		SY	4.20	\$557,889.02
Structural Concrete		CY	68.34	\$1,512,941.90
Dowel Bars	Epoxy	each	6.64	\$529,197.59
Reinforcement Bars	Epoxy	lb	1.00	<u>\$58,679.48</u>
<b>Total Cost:</b>				<b>\$2,891,162</b>
<b>Cost/Mile:</b>				<b>\$306,462</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$306,462	1.000	\$306,462	\$13,241
Reseal	13	\$55,000	0.725	\$39,898	\$1,724
Major CPR	25	\$250,000	0.539	\$134,848	\$5,826
Remaining Life Value	35	\$0	0.421	\$0	\$0
<b>Total Present Worth:</b>				<b>\$481,208</b>	\$20,791
<b>Equivalent Annual Cost:</b>				<b>\$20,791</b>	\$20,791

### MILL 3" & 4.5" min. Bituminous Overlay(20 Year Fix)

Item	Course	Unit	Price/Unit	Total Cost
3" MILL BITUMINOUS		SY	1.25	\$166,038.40
PATCH		Ton	125.00	\$47,170.00
TACK COAT		GAL	\$1.00	\$39,849.22
4.5" SPWEB340B	Wear	TON	55.00	<u>\$1,857,471.58</u>
<b>Total Cost:</b>				<b>\$2,110,529</b>
<b>Cost/Mile:</b>				<b>\$223,715</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$223,715	1.000	\$223,715	\$9,666
Rout & seal	2	\$5,000	0.952	\$4,759	\$206
Chipseal	4	\$25,000	0.906	\$22,649	\$979
Mill & 3" Overlay	22	\$146,525	0.581	\$85,111	\$3,677
Rout & seal	25	\$5,000	0.539	\$2,697	\$117
Chipseal	27	\$25,000	0.513	\$12,835	\$555
Remaining Life Value	35	(\$34,477)	0.421	-\$14,528	-\$628
<b>Total Present Worth:</b>				<b>\$337,238</b>	\$14,571
<b>Equivalent Annual Cost:</b>				<b>\$14,571</b>	\$14,571

1. Preventive Maintenance adds 1 year of life to thin overlays and 2 years to medium and heavy overlays and Reclaimed pavements.
2. Each successive overlay has 1 year less life than previous one on a section.
3. Medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, CIR-20 years, whitetopping-20 years.
4. Aggregate and shoulder quantities were not included in each option.
5. Calculations are based on 35 year life cycle.
6. Costs are based upon recent district project costs.





			District	7				Project Number	5380-121 (EB)									District	7									Project Number	5380-121 (EB)	
			Performed By	Kyle Vogt				Date	2/22/2013										Performed By	Kyle Vogt								Date	2/22/2013	
			Analysis Period	35				Funding Category											Analysis Period	35								Funding Category	3	
			Discount Rate	2.5				Low Cost Option #											Discount Rate	2.5								Low Cost Option #		
								Chosen Option #																				Chosen Option #		
			OPTION #1					OPTION #2					OPTION #3						OPTION #4								OPTION #5			
			DESCRIPTION					DESCRIPTION					DESCRIPTION						DESCRIPTION								DESCRIPTION			
			3.0" Bit. Overlay includes Shoulders					3.5" Bit. Overlay includes Shoulders					4" Bit. Overlay includes Shoulders						6" Unbonded Concrete Overlay (Dowels)							4.5" Bit. over Rubblized Concrete over CRCP				
			DESIGN LIFE		TYPE			DESIGN LIFE		TYPE			DESIGN LIFE		TYPE				DESIGN LIFE		TYPE					DESIGN LIFE		TYPE		
			12		Bit.			13		Bit.			14		Bit.				35		Conc.					20		Bit.		
Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	Year	#	Life	Description		Cost/Mile	
0		12	3" Bit. Overlay		\$ 331,887	0		13	3.5" Bit. Overlay		\$ 386,030	0		14	4" Bit. Overlay		\$ 440,173	0		35	6" Unbonded Conc. (Dowels)		\$ 706,387	0		20	4.5" Bit. over Rubblized PCC		\$ 501,650	
1					\$ -	1					\$ -	1					\$ -	1					\$ -	1					\$ -	
2					\$ -	2					\$ -	2					\$ -	2					\$ -	2					\$ -	
3	AA		Crack Treatment		\$ 3,000	3	AA		Crack Treatment		\$ 3,000	3	AA		Crack Treatment		\$ 3,000	3					\$ -	3					\$ -	
4					\$ -	4					\$ -	4					\$ -	4					\$ -	4					\$ -	
5					\$ -	5					\$ -	5					\$ -	5					\$ -	5					\$ -	
6					\$ -	6					\$ -	6					\$ -	6					\$ -	6					\$ -	
7	AB		Surface Treatment		\$ 20,000	7	AB		Surface Treatment		\$ 20,000	7	AB		Surface Treatment		\$ 20,000	7					\$ -	7					\$ -	
8					\$ -	8					\$ -	8					\$ -	8					\$ -	8	AA		Crack Treatment		\$ 3,000	
9					\$ -	9					\$ -	9					\$ -	9					\$ -	9					\$ -	
10					\$ -	10					\$ -	10					\$ -	10					\$ -	10					\$ -	
11					\$ -	11					\$ -	11					\$ -	11					\$ -	11					\$ -	
12	BI	12	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	12					\$ -	12					\$ -	12					\$ -	12	AB		Surface Treatment		\$ 20,000	
13					\$ -	13	BI	12	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	13					\$ -	13					\$ -	13					\$ -	
14					\$ -	14					\$ -	14	BI	13	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	14					\$ -	14					\$ -	
15	AA		Crack Treatment		\$ 3,000	15					\$ -	15					\$ -	15					\$ -	15					\$ -	
16					\$ -	16	AA		Crack Treatment		\$ 3,000	16					\$ -	16					\$ -	16					\$ -	
17					\$ -	17					\$ -	17	AA		Crack Treatment		\$ 3,000	17	BB		Rseal Jts. & Part. Depth Rpr (Dov		\$ 68,839	17					\$ -	
18					\$ -	18					\$ -	18					\$ -	18					\$ -	18					\$ -	
19	AB		Surface Treatment		\$ 20,000	19					\$ -	19					\$ -	19					\$ -	19					\$ -	
20					\$ -	20					\$ -	20					\$ -	20					\$ -	20	BM	15	2.5" Mill, 4" Overlay & 1.5" Shld		\$ 204,330	
21					\$ -	21					\$ -	21	AB		Surface Treatment		\$ 20,000	21					\$ -	21					\$ -	
22					\$ -	22					\$ -	22					\$ -	22					\$ -	22					\$ -	
23					\$ -	23					\$ -	23					\$ -	23					\$ -	23	AA		Crack Treatment		\$ 3,000	
24	BI	11	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	24					\$ -	24					\$ -	24					\$ -	24					\$ -	
25					\$ -	25	BI	11	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	25					\$ -	25					\$ -	25					\$ -	
26					\$ -	26					\$ -	26					\$ -	26					\$ -	26					\$ -	
27	AA		Crack Treatment		\$ 3,000	27					\$ -	27	BI	12	2" Mill, 3.5" Overlay & 1.5" Shld		\$ 193,140	27	BC	13	Mnr CPR & Full Depth Rpr (Dowe		\$ 236,826	27	AB		Surface Treatment		\$ 20,000	
28					\$ -	28	AA		Crack Treatment		\$ 3,000	28					\$ -	28					\$ -	28					\$ -	
29					\$ -	29					\$ -	29					\$ -	29					\$ -	29					\$ -	
30					\$ -	30					\$ -	30	AA		Crack Treatment		\$ 3,000	30					\$ -	30					\$ -	
31	AB		Surface Treatment		\$ 20,000	31					\$ -	31					\$ -	31					\$ -	31					\$ -	
32					\$ -	32					\$ -	32					\$ -	32					\$ -	32					\$ -	
33					\$ -	33					\$ -	33					\$ -	33					\$ -	33					\$ -	
34					\$ -	34					\$ -	34					\$ -	34					\$ -	34					\$ -	
35			No Remaining Service Life		\$ -	35			Remaining Service Life (1/11)		\$ (17,558)	35			Remaining Service Life (4/12)		\$ (64,380)	35			Remaining Service Life (5/13)		\$ (91,087.00)	35			No remaining service life		\$ -	
												</																		

District	2
Performed By	K.Olson
Analysis Period	35
Discount Rate	2.5

Project Number	5407-31
Date	5/13/2013
Funding Category	4
Low Cost Option #	
Chosen Option #	

District	2
Performed By	K.Olson
Analysis Period	35
Discount Rate	2.5

[illegible]

## Life Cycle Cost Analysis

District	2
Performed By	ko
Analysis Period	35

Project Number	5409-30
Date	5/15/2014
Discount Rate	2.2

Funding Category	RS
Low Cost Option	1
Chosen Option	1

Option 1			Option 2			Option 3		
Description	3" mill and OL		Description	5" UBOL		Description	6" UBOL	
Design Life	20		Design Life	20		Design Life	35	
Year	Description	Cost/Mile	Year	Description	Cost/Mile	Year	Description	Cost/Mile
0	Initial Cost	\$ 215,615.37	0	Initial Cost	\$ 429,586.78	0	Initial Cost	\$ 457,678.79
1		\$ -	1		\$ -	1		\$ -
2		\$ -	2		\$ -	2		\$ -
3		\$ -	3		\$ -	3		\$ -
4		\$ -	4		\$ -	4		\$ -
5		\$ -	5		\$ -	5		\$ -
6		\$ -	6		\$ -	6		\$ -
7		\$ -	7		\$ -	7		\$ -
8	Light Crack Treatment	\$ 3,500.00	8	Light Crack Treatment	\$ 159.35	8		\$ -
9		\$ -	9		\$ -	9		\$ -
10		\$ -	10		\$ -	10		\$ -
11		\$ -	11		\$ -	11		\$ -
12	Chip Seal	\$ 19,000.00	12	Chip Seal	\$ 865.02	12		\$ -
13		\$ -	13	Reseal Joints & Partial Depth Repair	\$ 104,968.30	13		\$ -
14		\$ -	14		\$ -	14		\$ -
15		\$ -	15		\$ -	15		\$ -
16		\$ -	16		\$ -	16		\$ -
17		\$ -	17	Reseal Joints & Partial Depth Repair	\$ 1,291.75	17	Reseal Joints & Partial Depth Repair	\$ 36,691.35
18		\$ -	18		\$ -	18		\$ -
19		\$ -	19		\$ -	19		\$ -
20	Mill & Overlay (1st Overlay)	\$ 209,652.38	20	Mill & Overlay (1st Overlay)	\$ 6,073.74	20		\$ -
21		\$ -	21		\$ -	21		\$ -
22		\$ -	22		\$ -	22		\$ -
23	Crack Treatment	\$ 7,000.00	23	Crack Treatment	\$ 318.69	23		\$ -
24		\$ -	24		\$ -	24		\$ -
25		\$ -	25	Major CPR	\$ 278,764.38	25		\$ -
26		\$ -	26		\$ -	26		\$ -
27	Chip Seal	\$ 19,000.00	27	Minor CPR & Some Full Depth Repairs, Chip Seal	\$ 5,031.81	27	Minor CPR & Some Full Depth Repairs	\$ 118,354.60
28		\$ -	28		\$ -	28		\$ -
29		\$ -	29		\$ -	29		\$ -
30		\$ -	30		\$ -	30		\$ -
31		\$ -	31		\$ -	31		\$ -
32		\$ -	32		\$ -	32		\$ -
33		\$ -	33		\$ -	33		\$ -
34		\$ -	34		\$ -	34		\$ -
35	Remaining Service Life	\$ -	35	Remaining Service Life	\$ (1,583.38)	35	Remaining Service Life	\$ (44,974.75)

Total Present Worth	\$ 383,660.32
Eq. Annual Cost	\$ 15,832.75
% of Low Cost	100%

Total Project Cost	\$ 2,865,175.28
--------------------	-----------------

Total Present Worth	\$ 678,358.19
Eq. Annual Cost	\$ 27,994.23
% of Low Cost	177%

Total Project Cost	\$ 5,065,978.96
--------------------	-----------------

Total Present Worth	\$ 527,793.13
Eq. Annual Cost	\$ 21,780.77
% of Low Cost	138%

Total Project Cost	\$ 3,941,559.08
--------------------	-----------------

This spreadsheet does a weighted cost/mile of all segments within each option.

## Cost Analysis/ TH 63 NB & SB From 0.1 Mi. N. T.H. 30 to 28th St. SE(Rochester)

### Givens:

Length = 12.68 miles  
 Width of Road = 24 feet(Conc.) 24 feet(Bit.) 4/22/14-TRM  
 1" Bituminous = 115 lbs/SY  
 Interest Rate = 2.2 %  
 Inflation Rate = 0 %

### MILL & 3" min. Bituminous Overlay(15 Years)

Item	Course	Unit	Price/Unit	Total Cost
1.5" MILL BITUMINOUS		SY	0.80	\$142,827.52
PATCH		Ton	100.00	\$50,720.00
TACK COAT		GAL	\$1.00	\$35,706.88
3" SPWEB440E	Wear	TON	62.00	\$1,909,425.41
<b>Total Cost:</b>				<b>\$2,138,680</b>
<b>Cost/Mile:</b>				<b>\$168,666</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$168,666	1.000	\$168,666	\$6,960
Rout & seal	2	\$5,000	0.957	\$4,787	\$198
Chipseal	4	\$25,000	0.917	\$22,916	\$946
Mill & 3" Overlay	15	\$168,666	0.722	\$121,693	\$5,022
Rout & seal	17	\$5,000	0.691	\$3,454	\$143
Chipseal	19	\$25,000	0.661	\$16,534	\$682
Mill & 3" Overlay	30	\$168,666	0.521	\$87,801	\$3,623
Rout & seal	32	\$5,000	0.498	\$2,492	\$103
Chipseal	34	\$25,000	0.477	\$11,929	\$492
Remaining Life Value	35	(\$112,444)	0.467	-\$52,499	-\$2,167
<b>Total Present Worth:</b>				<b>\$387,772</b>	\$16,002
<b>Equivalent Annual Cost:</b>				<b>\$16,002</b>	\$16,002

### 7" Unbonded Overlay(20 Years)

Item	Course	Unit	Price/Unit	Total Cost
3.5" MILL BITUMINOUS		SY	1.50	\$267,801.60
PASSRC		Ton	58.54	\$740,802.63
Place Conc. Pave. 7		SY	4.20	\$749,844.48
Structural Concrete		CY	68.34	\$2,358,867.91
Reinforcement Bars	Epoxy	lb	0.80	\$63,095.68
Dowel Bars	Epoxy	each	6.64	\$711,281.05
<b>Total Cost:</b>				<b>\$4,891,693</b>
<b>Cost/Mile:</b>				<b>\$385,780</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$385,780	1.000	\$385,780	\$15,920
Reseal	13	\$55,000	0.754	\$41,448	\$1,710
Major CPR	25	\$250,000	0.580	\$145,100	\$5,988
Remaining Life Value	35	\$0	0.467	\$0	\$0
<b>Total Present Worth:</b>				<b>\$572,328</b>	\$23,619
<b>Equivalent Annual Cost:</b>				<b>\$23,619</b>	\$23,619

### MILL & 5" min. Bituminous Overlay(20 Years)

Item	Course	Unit	Price/Unit	Total Cost
1.5" MILL BITUMINOUS		SY	0.80	\$142,827.52
PATCH		Ton	100.00	\$50,720.00
TACK COAT		GAL	\$1.00	\$53,560.32
5" SPWEB440E	Wear	TON	62.00	\$3,182,375.68
<b>Total Cost:</b>				<b>\$3,429,484</b>
<b>Cost/Mile:</b>				<b>\$270,464</b>

Strategy	Year	Cost/Mile	P/F	Present Worth	Annual Cost
Initial Cost	0	\$270,464	1.000	\$270,464	\$11,161
Rout & seal	2	\$5,000	0.957	\$4,787	\$198
Chipseal	4	\$25,000	0.917	\$22,916	\$946
Mill & 3" Overlay	20	\$168,666	0.647	\$109,146	\$4,504
Rout & seal	22	\$5,000	0.620	\$3,098	\$128
Chipseal	24	\$25,000	0.593	\$14,829	\$612
Remaining Life Value	35	\$0	0.467	\$0	\$0
<b>Total Present Worth:</b>				<b>\$425,240</b>	\$17,549
<b>Equivalent Annual Cost:</b>				<b>\$17,549</b>	\$17,549

- Thin overlay -10 years life, medium overlay-15 years, heavy bit. overlay-20 years, reclamation overlay-20 years, whitetopping-20 years, unbonded-20 years.
- Aggregate and shoulder quantities were not included in each option.
- Calculations are based on 35 year life cycle.
- Costs are based upon recent district project costs.

## Mn/DOT DISTRICT 2

## REHABILITATION WORKSHEET

(General Pre-Scoping / Planning Estimate)

SP.6304-12

TH 92

Funding category		RS	Alternate #1	Alternate #2	Alternate #3	Alternate #4
Description ---->			2.5" MILL & 3"OVERLAY	2.5" MILL 5" whitetopping	2.5" MILL & 5"OVERLAY	
		YR				
First Cost \$ / Mile			\$153,873	\$418,704	\$247,251	\$1,000,000
Rehab Life in Yrs			35	35	35	35
Interest %			2.50%	2.50%	2.50%	2.70%
			20 years	20 years	20 years	
		1	\$0	\$0	\$0	\$0
		2	\$0	\$0	\$0	\$0
		3	\$5,000	\$0	\$0	\$0
		4	\$0	\$0	\$0	\$0
		5	\$0	\$0	\$5,000	\$0
		6	\$0	\$0	\$0	\$0
		7	\$23,000	\$0	\$0	\$0
		8	\$0	\$0	\$0	\$0
		9	\$0	\$0	\$23,000	\$0
		10	\$0	\$0	\$0	\$0
		11	\$0	\$0	\$0	\$0
		12	\$0	\$0	\$0	\$0
		13	\$0	\$97,945	\$0	\$0
		14	\$0	\$0	\$0	\$0
		15	\$0	\$0	\$0	\$0
		16	\$105,214	\$0	\$0	\$0
		17	\$0	\$0	\$0	\$0
		18	\$0	\$0	\$0	\$0
		19	\$0	\$0	\$0	\$0
		20	\$5,000	\$0	\$80,000	\$0
		21	\$0	\$0	\$0	\$0
		22	\$0	\$0	\$0	\$0
		23	\$0	\$0	\$0	\$0
		24	\$23,000	\$0	\$5,000	\$0
		25	\$0	\$271,098	\$0	\$0
		26	\$0	\$0	\$0	\$0
		27	\$0	\$0	\$0	\$0
		28	\$0	\$0	\$23,000	\$0
		29	\$0	\$0	\$0	\$0
		30	\$0	\$0	\$0	\$0
		31	\$137,060	\$0	\$0	\$0
		32	\$0	\$0	\$0	\$0
		33	\$0	\$0	\$0	\$0
		34	\$5,000	\$0	\$0	\$0
		35	(\$97,270)	\$0		
		36	\$0	\$0	\$0	\$0
		37	\$0	\$0	\$0	\$0
		38	\$0	\$0	\$0	\$0
		39	\$0	\$0	\$0	\$0
		40	\$0	\$0	\$0	\$0
		41	\$0	\$0	\$0	\$0
		42	\$0	\$0	\$0	\$0
		43	\$0	\$0	\$0	\$0
		44	\$0	\$0	\$0	\$0
		45	\$0	\$0	\$0	\$0
		46	\$0	\$0	\$0	\$0
		47	\$0	\$0	\$0	\$0
		48	\$0	\$0	\$0	\$0
		49	\$0	\$0	\$0	\$0
Total Cost (Present Worth)			\$289,429	\$635,983	\$333,193	\$1,000,000
Annual Cost (Present Worth)			\$12,505	\$27,478	\$14,396	\$44,524
% Above Low Option			100%	220%	115%	356%

Data Furnished By:

TA for conc. Rehab costs

Completed By:

KO

Date:

7/2/2012



[illegible]



## Appendix 4

		District		4			Project Number		8402-17						
		Performed By		Knopf			Date		4/30/2013						
		Analysis Period		35			Funding Category		R5 2 ▾						
		Discount Rate		2.5			Low Cost Option #		1						
							Chosen Option #								
					</										

District	3 - Baxter
Performed By	SZ
Analysis Period	35
Discount Rate	1.7
Inflation Rate	1.0094

Project Number	8680-167
Date	4/24/2014
Funding Category	RS
Low Cost Option #	1
Chosen Option #	1

OPTION #1					OPTION #2					OPTION #3					OPTION #4				
DESCRIPTION					DESCRIPTION					DESCRIPTION					DESCRIPTION				
2.0" Mill & OL ML, 1.5" OL ML & SHLD					6.0" Concrete Whitetopping					3" Mill & 3" Overlay, ML & SHLD					4" Mill & Fill ML, 2" Mill & Fill Shld				
DESIGN LIFE					DESIGN LIFE					DESIGN LIFE					DESIGN LIFE				
15 Years					15 Years					15 Years					16 Years				
Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile	Year	#	Life	Description	Cost/Mile
0	BH		2" Mill & OL ML, 1.5" OL ML & S	\$ 203,130	0	AX		6.0" Concrete Whitetopping	\$ 310,610	0	BE		3" Mill & OL, ML & SHLD	\$ 219,630	0	BG		4" Mill & Fill ML, 2" Mill & Fill Shld	\$ 251,692
1				\$ -	1				\$ -	1				\$ -	1				\$ -
2				\$ -	2				\$ -	2				\$ -	2				\$ -
3				\$ -	3				\$ -	3				\$ -	3				\$ -
4	AA		Crack Treatment	\$ 7,000	4				\$ -	4	AA		Crack Treatment	\$ 7,000	4				\$ -
5				\$ -	5				\$ -	5				\$ -	5	AA		Crack Treatment	\$ 7,000
6				\$ -	6				\$ -	6				\$ -	6				\$ -
7				\$ -	7				\$ -	7				\$ -	7				\$ -
8				\$ -	8				\$ -	8	BI		Micro Surface	\$ 45,000	8				\$ -
9	BI		Micro Surface	\$ 45,000	9				\$ -	9				\$ -	9				\$ -
10				\$ -	10				\$ -	10				\$ -	10	BI		Micro Surface	\$ 45,000
11				\$ -	11				\$ -	11				\$ -	11				\$ -
12				\$ -	12	AN		Reseal Joints & Partial Depth Re	\$ 30,000	12	BC		3.0" Mill & Fill - ML Only	\$ 142,138	12				\$ -
13				\$ -	13				\$ -	13				\$ -	13				\$ -
14				\$ -	14				\$ -	14				\$ -	14				\$ -
15	BC		3.0" Mill & Fill - ML Only	\$ 142,138	15				\$ -	15				\$ -	15				\$ -
16				\$ -	16				\$ -	16	AA		Crack Treatment	\$ 7,000	16	BC		3.0" Mill & Fill - ML Only	\$ 142,138
17				\$ -	17				\$ -	17				\$ -	17				\$ -
18				\$ -	18				\$ -	18				\$ -	18				\$ -
19	AA		Crack Treatment	\$ 7,000	19				\$ -	19				\$ -	19				\$ -
20				\$ -	20	AR		Major CPR (6'X6')	\$ 150,000	20	BI		Micro Surface	\$ 45,000	20	AA		Crack Treatment	\$ 7,000
21				\$ -	21				\$ -	21				\$ -	21				\$ -
22				\$ -	22				\$ -	22				\$ -	22				\$ -
23				\$ -	23				\$ -	23	BD		1.5" ML Mill & Fill, 1.5" OL ML &	\$ 175,991	23				\$ -
24	BI		Micro Surface	\$ 45,000	24				\$ -	24				\$ -	24	BI		Micro Surface	\$ 45,000
25				\$ -	25				\$ -	25				\$ -	25				\$ -
26				\$ -	26				\$ -	26	AA		Crack Treatment	\$ 7,000	26				\$ -
27				\$ -	27				\$ -	27				\$ -	27				\$ -
28				\$ -	28				\$ -	28				\$ -	28				\$ -
29	BD		1.5" ML Mill & Fill, 1.5" OL ML &	\$ 175,991	29				\$ -	29				\$ -	29				\$ -
30				\$ -	30	BF		Rem and Rep Conc Surf	\$ 437,477	30	BI		Micro Surface	\$ 45,000	30				\$ -
31				\$ -	31				\$ -	31				\$ -	31	BD		1.5" ML Mill & Fill, 1.5" OL ML &	\$ 175,991
32				\$ -	32				\$ -	32				\$ -	32				\$ -
33	AA		Crack Treatment	\$ 7,000	33				\$ -	33	BE		3" Mill & OL, ML & SHLD	\$ 219,630	33				\$ -
34				\$ -	34				\$ -	34				\$ -	34	AA		Crack Treatment	\$ 7,000
35			Remaining Service Life Value**	\$ (94,764)	35			Remaining Service Life Value**	\$ (291,651)	35			Remaining Service Life Value**	\$ (170,823.33)	35			Remaining Service Life Value**	\$ (125,707.86)
Total Present Worth				\$ 453,252	Total Present Worth				\$ 544,348	Total Present Worth				\$ 601,383	Total Present Worth				\$ 478,330
Eq. Annual Cost*				\$17,289	Eq. Annual Cost*				\$20,764	Eq. Annual Cost*				\$22,940	Eq. Annual Cost*				\$18,246
% of Low Cost				100%	% of Low Cost				120%	% of Low Cost				133%	% of Low Cost				106%

\* Equivalent Annual Cost is included for information only.

\*\*Remaining Service Life Value is reported as a negative value.


\* Equivalent Annual Cost is included for information only.

## Appendix C: LCCA Exceptions

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# Office Memorandum

**TO:** Steve Lund  
MnDOT Pavement Program Manager

**FROM:** Lowell Flaten   
District 8 Materials Engineer

**DATE:** November 24, 2014

**SUBJECT:** REQUEST FOR AN EXCEPTION TO SELECTING THE LOW COST ALTERNATE

<b>SP #</b>	4711-19
<b>Highway #</b>	TH 24 from Litchfield to the junction with TH15
<b>Project Limits</b>	RP 0+00.000 to RP 15+0.609
<b>Project Description</b>	Mill 2 inches of existing bituminous pavement and construct a 4 inch bonded concrete overlay.

## LCCA Results

Alternative	Design Life	Total Present Cost / Mile	Requested Selection	% of Low Cost
2" Mill and 4" Whitetopping	20	\$539,860	Yes	133
2" Mill, 5" CIR, 4"HMA	20	405,983	No	100

## Reason for Request

Project costs were based on the district cost estimating practices used in the Project Scoping Process. This project was selected for Destination Innovation funding, to study the suitability of thin, bonded-concrete overlays as an alternative to medium-thickness bituminous overlays. The low cost option was the bituminous fix at \$16,754/mile equivalent annual cost. The life cycle cost analysis is located in EDMS ([DOC#1380487](#)).

  
District Engineer

12-1-14  
Date

## INTERSTATE INVESTMENT PROPOSAL...October 2013

### Background Information

1. Based on 2011 data, the most recent data available from the Federal Highway Administration (FHWA), Minnesota's rural interstate pavement condition ranks 43<sup>rd</sup> (1=Best, 50=Worst) in terms of the percent of miles in Poor condition (3.56%). This ranking is lower than all of our surrounding states. Just to be ranked in the middle of the 50 states, we would have to reduce our percent Poor to 0.66%.
2. The recently enacted MAP-21 legislation will require each state to meet minimum, as yet to be determined, condition levels on the interstate system. While we still do not know what level that will be, having a national ranking of 43<sup>rd</sup> does not provide much room for funding flexibility. If the FHWA sets the condition close or better than our current level we will be forced to spend federal funds on our interstate pavements to improve their condition.
3. The pavement management system was used to identify the sections of interstate, at least ½ mile long, that are expected to be in Poor condition after the 2014-2017 STIP. Of the 67 miles of interstate expected to be in Poor condition at the end of 2017, 52 miles (78%) are on I-90 in D-7. Long life fixes on nearly all of the D-7 segments could be done for \$50M.
4. Remaining Service Life (RSL) is defined as the number of years until the pavement section will reach the point where rehabilitation is needed. At the end of the 2014-2017 STIP, the average RSL of the interstate system in D-7 is expected to be 7.5 years, more than 5 years less than the next closest district (D-1) at 12.4 years.
5. Statewide, extensive work has been done on the interstate system over the last few years. In particular, unbonded concrete overlays have been or are being done on I-35 near Owatonna, Lakeville, Hugo, North Branch, and Duluth, I-694 in Oakdale, I-94 in D-3, and I-90 in D-6. Few, if any of these have been done on I-90 in D-7.

### Proposal

Invest \$50M to reduce the amount of Poor pavement on I-90 by constructing long-life fixes that will provide maximum MAP-21 funding flexibility in the future.

### Benefits provided by this investment

- Will provide maximum future funding flexibility under MAP-21
- The Average RSL of D-7's interstate will increase from 7.5 to 11.2 years
- Eliminates nearly all sections of poor pavement from one end of the state to the other along I-90.

## **DECISION SUPPORT TOOL**

**Decision Statement:** Invest \$50M to reduce the percentage of mileage in poor condition on I-90, providing maximum funding flexibility, under MAP-21, and improve Minnesota's national interstate ranking.

**Date:** October 2, 2013

**Document prepared by:** Office of Materials and Road Research

**Final Decision Makers:** Senior Leadership Team

### ***Persons/positions consulted:***

- Jon Chiglo, Amr Jabr (Engineering Services Division)
- Greg Ous, Chad Fowlds (District 7 Management Team)
- Tim Quinn (Metro District)
- Mike Barnes (Operations Division)
- Matt Zeller (Concrete Paving Industry)

### ***Area/person directly affected by decision and impacts:***

- District 7 staff
- Travelling public
- Contractors

### ***Area/person indirectly affected by decision and impacts:***

- All other Districts
- Office of Technical Support
- Construction Office

### ***Givens:***

- Investment will be on Interstate Pavements in Poor Condition Only
- Maximize service life, get in, get out, stay out (long life fixes)
- New projects, not in currently in the STIP
- Maintain two healthy paving industries
- Accelerated delivery techniques
- Innovative quality methods

### ***Assumptions:***

- District 7 buy-in
- Contracting industry can deliver
- MnDOT can deliver this on time

- Coordination with projects in current STIP

**Objective: What are we trying to achieve?**

Reduce the % of poor Interstate pavements so we meet the MAP-21 requirements for the maximum number of years. This will allow MnDOT flexibility, under MAP-21, to use funding in future years on a variety of project types, not simply pavement preservation.

**Business Impacts:**

- Construction of these projects will give MnDOT more flexibility in the followings years to spend funds on a variety of projects
- Short-term large increase in program delivery effort for D-7

**Risks:**

- We need to get buy-in and agreement from the district on these projects to make sure they are not included in their STIP and are good candidates.
- We also need to determine if they could deliver them in the timeframe the \$50M need to be spent.
- Negative reaction from other Districts, Industry, and other specialty groups, etc.
- Coordination with other projects on I-90
- Can the construction industry deliver a quality product on time?

**Action/Assistance Needed:**

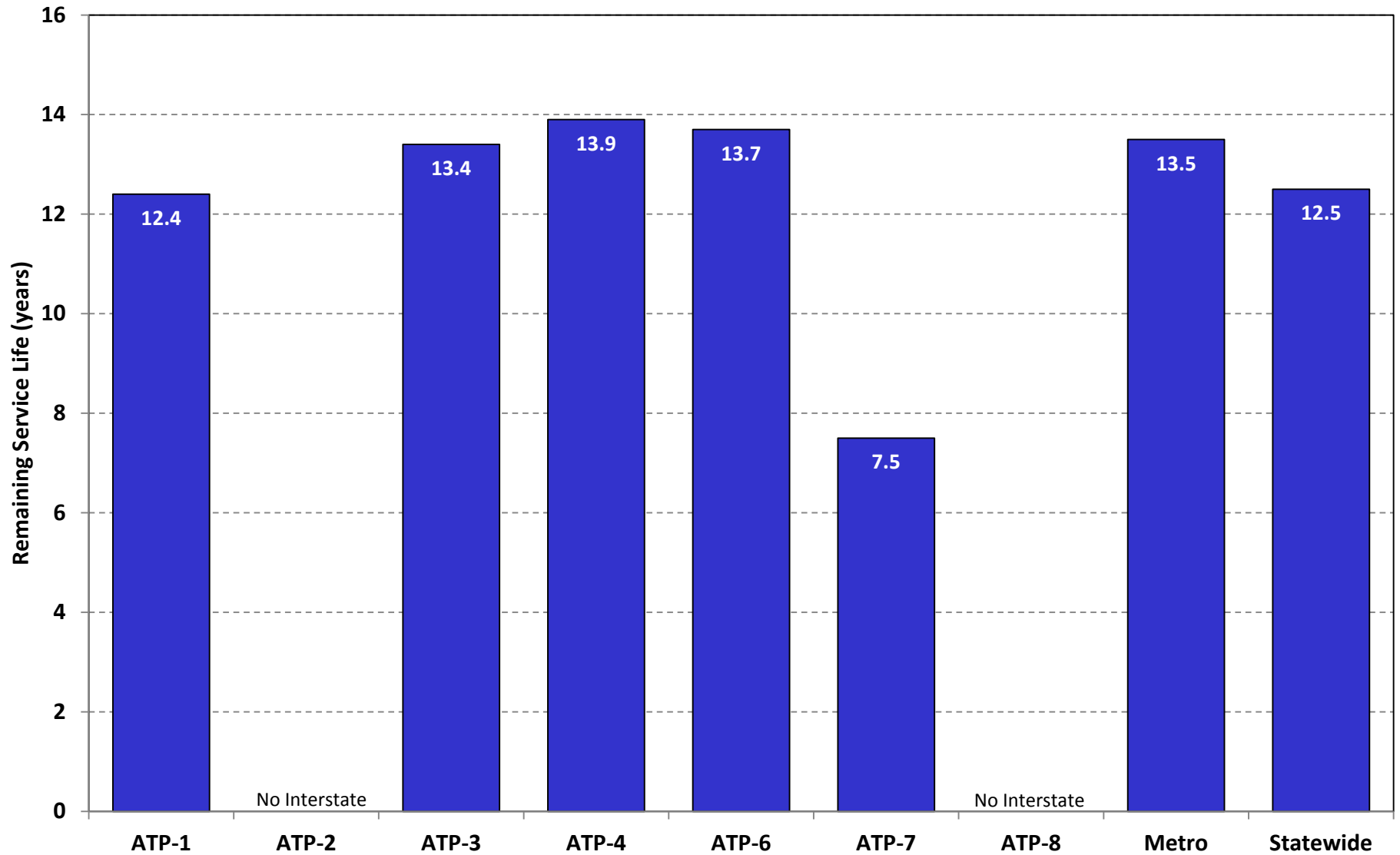
- Additional MnDOT resources will be needed to deliver these projects.

**Other Information:**

<b>Pavement Conditions on the National Highway System in the Midwest</b> <b>Percent of Miles in Poor Condition (2011 data)</b> (Poor = IRI >= 170 inches/mile)							
State	Interstates			Other NHS			NHS
	Rural	Urban	All	Rural	Urban	All	All
Iowa	1	35	14	35	36	29	26
Minnesota	43	41	38	46	15	35	35
North Dakota	1	1	1	6	5	4	4
South Dakota	14	31	11	11	24	7	8
Wisconsin	33	33	32	40	43	40	41

# Interstate Remaining Service Life, in years

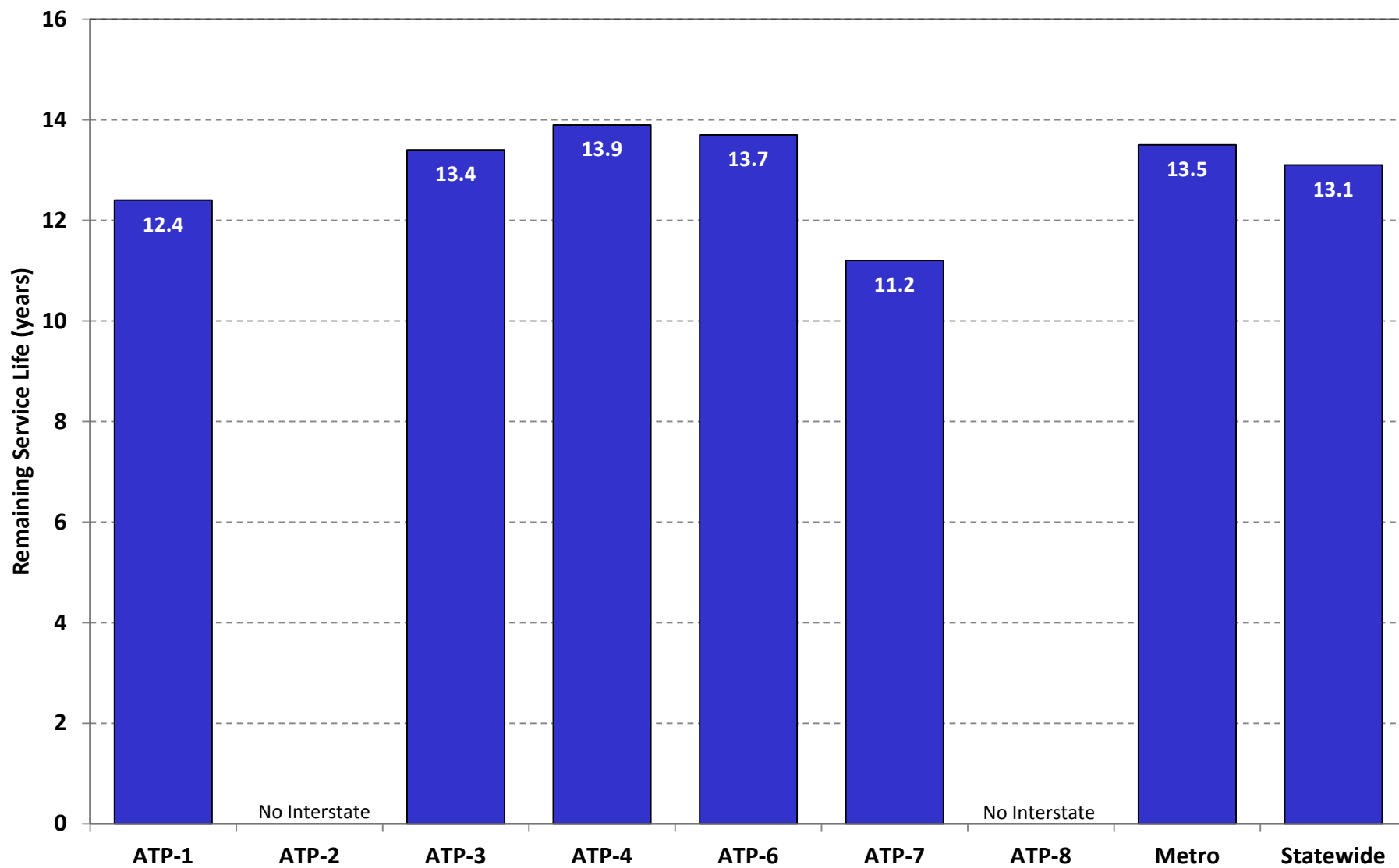
(After 2014-2017 STIP)





# Interstate Remaining Service Life, in years

(After 2014-2017 STIP, with Extra \$50M on I-90 in D-7)





## Minnesota Department of Transportation

District 7

2151 Bassett Drive

Mankato, MN 56001-6888

Office Tel: 507-304-6100

Fax: 507-304-6119

# Memo

**TO:** Curt Turgeon, Pavement Engineer  
Office of Materials & Road Research

**FROM:** R. Kent Purrier, Senior Engineer  
District 7 Design

**DATE:** Sept. 30, 2013

**SUBJECT:** Alternate Bid Exception Request for SP 1704-27 (TH 62)

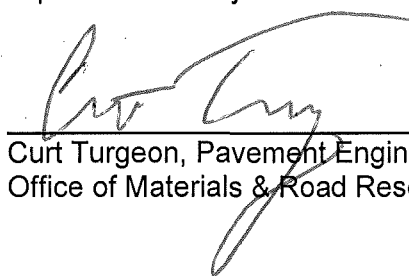
The above project was designed for alternate bid. The current concrete option in the Materials Design Recommendation calls for milling some asphalt, reclaiming the remaining asphalt and paving concrete. Feedback received from CPAM (Concrete Paving Association of Minnesota) indicates that this option is not competitive; therefore the District will be removing the current concrete option from the plans.

The District has considered a 5" whitetopping design involving a 1" grade raise as another potential concrete alternate. After reviewing cores of the existing pavement, it appears that the bituminous that would remain after milling does not have enough integrity to withstand construction traffic to place a whitetopping surface. In many cases there would not be the minimum 4" of bituminous remaining after milling. After looking at all of the data, the District will not pursue a whitetopping concrete alternate for this project.

Email documentation of the CPAM feedback and whitetopping consideration is attached.

Given the above, the District would like to pursue an exception from the alternate bidding process for this project and prepare a bituminous option only. Please indicate whether this approach is acceptable. Thank you.

I concur:

  
Curt Turgeon, Pavement Engineer  
Office of Materials & Road Research

10/9/2013

**CC:** Greg Ous  
Chad Fowlds  
Lisa Bigham  
John Hager  
Tim Andersen

An Equal Opportunity Employer



**From:** Fowlds, Chad (DOT)  
**Sent:** Thursday, September 26, 2013 11:03 AM  
**To:** Turgeon, Curtis (DOT)  
**Cc:** Hager, John (DOT); Andersen, Tim (DOT); Ous, Greg (DOT); Bloomgren, Keith (DOT); Purrier, Richard (DOT); Benzkofer, Brett (DOT)  
**Subject:** Re: TH 62, SP 1704-27

**Follow Up Flag:** Follow up  
**Flag Status:** Completed

All,

I viewed the photos of the cores yesterday with John and it is very apparent to me that the bituminous that is remaining after milling does not have enough integrity to withstand construction traffic to place a whitetopping surface. In many cases there isn't 4" of bituminous remaining after milling.

After looking at all of the data, the District will not pursue a whitetopping concrete alternate for this project.

Given feedback from CPAM that the concrete alternate over the reclaimed pavement is not competitive, we will be removing the concrete alternate from the plans and seeking an exemption from using alternate bid.

Kent - please draft a letter for Curt's concurrence on an exemption for alternate bid. If you need help with language, etc let me know.

Thanks.

Chad

Sent from my iPhone

On Sep 24, 2013, at 3:11 PM, "Turgeon, Curtis (DOT)" <[curt.turgeon@state.mn.us](mailto:curt.turgeon@state.mn.us)> wrote:

Chad

At this time the District is proceeding with an alternate big plan for the above reference SP. Tim Andersen shared the MDR and LCCA with Matt Zeller of CPAM for preliminary comments. . Matt does not think concrete will be competitive with the current typical sections. (4.5" bit on FDR vs. 6.5" concrete on FDR) Mr. Zeller wondered if a whitetopping approach might be more competitive

The current concrete option in the MDR calls for milling some asphalt, reclaiming the remaining asphalt and paving concrete. The concrete thickness is based upon the process for designing a new concrete pavement.

There are two restrictive issues on this project that precludes the use of a concrete whitetopping design. The current whitetopping standard requires a minimum of 4.0" of remaining asphalt after milling. The in place pavement is just over 8" thick, GPR data (over 9" thick based on cores). The second restriction is the zero grade raise. With this in mind, the only way to build a whitetopping would be to mill 4.0" and inlay 4.0" of concrete.

If a grade raise was possible, a 5.0" whitetopping could handle around 35 years of traffic. This would be similar to the TH 30 whitetopping in your District. TH 30 was built slightly thicker than the original design.

So there are two potential outcomes:

1. If the District can abide a 1.0" grade raise, we could continue discussing the possibility of a 5.0" whitetopping design and associated LCCA considerations.
2. If the District cannot abide a grade raise, the current concrete typical is 2.0" thicker than the asphalt typical AND a 4.0" whitetopping is not feasible for this traffic volume. Therefore, based on Mr Zeller's input, this should not proceed as an alternate bid project, just build asphalt.

Curt

Curt Turgeon  
State Pavement Engineer  
1400 Gervais Avenue  
Maplewood, Mn 55109