

FY 2011 Continuing Appropriations Act

TIGER Discretionary Grant Program

Highway 150 Resurfacing Project

Appendices

A – Benefit Cost Analysis

B – Federal Wage Rate Certifications



Submitted by
Arkansas State Highway and Transportation Department
October 31, 2011

Benefit-Cost Analysis

The Benefit Cost Analysis (BCA) was performed in accordance with the ARRA guidance provided in the Federal Register. These benefits and costs were quantified in accordance with the Federal Register Volume 75, Number 104, Docket No. DOT-OST-2010-0076 and Circulars A-4 and A-94 (See <http://www.whitehouse.gov/omb/circulars/>).

The purpose of the BCA is to systemically compare the benefits and costs of resurfacing Highway 150 between Interstate 55 and Highway 137 in Mississippi County, Arkansas. The BCA compared the cost of the proposed project to the cost of not doing anything outside of routine maintenance. The analysis considers a 20-year project life (2013 through 2033) for purposes of the BCA.

The analysis considered standard features of roadway construction and maintenance costs in Arkansas. Table 1 summarizes the findings of the BCA analysis. Road User Benefits that were considered include the value of travel time savings provided by the improved facility and the value to society of enhancing the safety within the improved highway network.

Many benefits of this project do not easily lend themselves to simple quantification. The economic benefits of improving the connection between the steel mills and the agricultural resources in the region to the Interstate System cannot be easily quantified. Making economically distressed Areas competitive is stated as a primary goal of the TIGER Discretionary Grant program.

The BCA was calculated using the following key factors for evaluation:

- Construction Costs
- Operation and Maintenance Costs
- Forecasted Traffic
- Travel Speeds and Congestion
- Historic Crash Data
- Vehicles Miles Traveled
- Traffic Distribution by Vehicle Type
- Value of Time

The Construction Cost Estimate to improve Highway 150 between Interstate 55 and Highway 137 is \$2.2 million. This cost reflects traditional construction methods and schedules. A 3% inflation rate was applied to calculate future costs and benefits. Additionally, a 3% discount rate was used to bring future benefits and costs to present value.

Maintenance costs are also reported in this section. The two scenarios considered for the Benefit-Cost Analysis are the overlay of Highway 150 versus no improvements to Highway 150 outside of routine maintenance. These costs have been taken into account and brought to present value. These schedule construction and maintenance activities are reported in Attachment 1.

Table 1: Benefit Cost Analysis Results

Year	Activity	Construction and Maintenance Costs		Value of Time Saved Benefit		Vehicle Operation Cost Benefit		Safety Benefits	
		Non-Disc.	Discounted	Non-Disc.	Discounted	Non-Disc.	Discounted	Non-Disc.	Discounted
2013	(Construction)	\$2,195,550	\$2,195,550		\$0		\$0		\$0
2014		\$0	\$0	\$112,673	\$109,391	\$12,567	\$12,200	\$74,481	\$72,312
2015		\$0	\$0	\$117,480	\$110,736	\$13,174	\$12,418	\$78,095	\$73,612
2016		\$0	\$0	\$122,827	\$112,404	\$13,736	\$12,571	\$81,438	\$74,527
2017		\$0	\$0	\$128,417	\$114,097	\$14,362	\$12,760	\$85,156	\$75,660
2018		\$0	\$0	\$134,630	\$116,133	\$15,015	\$12,952	\$89,044	\$76,810
2019		\$0	\$0	\$140,373	\$117,560	\$15,742	\$13,183	\$93,364	\$78,191
2020		\$0	\$0	\$146,762	\$119,331	\$16,413	\$13,346	\$97,360	\$79,163
2021		\$0	\$0	\$153,442	\$121,129	\$17,160	\$13,547	\$101,805	\$80,366
2022		\$0	\$0	\$160,866	\$123,290	\$17,941	\$13,751	\$106,453	\$81,587
2023		\$0	\$0	\$167,728	\$124,805	\$18,809	\$13,996	\$111,618	\$83,054
2024		\$0	\$0	\$175,362	\$126,685	\$19,612	\$14,168	\$116,395	\$84,086
2025		\$0	\$0	\$183,344	\$128,594	\$20,504	\$14,381	\$121,709	\$85,364
2026		\$0	\$0	\$192,214	\$130,889	\$21,438	\$14,598	\$127,266	\$86,662
2027		\$0	\$0	\$200,414	\$132,497	\$22,475	\$14,859	\$133,441	\$88,220
2028		\$0	\$0	\$209,536	\$134,493	\$23,434	\$15,041	\$139,152	\$89,317
2029		\$0	\$0	\$219,073	\$136,519	\$24,500	\$15,268	\$145,505	\$90,674
2030		\$0	\$0	\$229,672	\$138,955	\$25,615	\$15,498	\$152,149	\$92,052
2031		\$0	\$0	\$239,470	\$140,663	\$26,855	\$15,774	\$159,531	\$93,708
2032		\$0	\$0	\$250,370	\$142,782	\$28,000	\$15,968	\$166,359	\$94,872
2033		\$0	\$0	\$261,766	\$144,933	\$29,275	\$16,209	\$173,954	\$96,314
TOTAL			\$2,195,550		\$2,525,889		\$282,488		\$1,676,552
			\$4,484,929	Discounted Benefit					
			\$2,195,550	Discounted Costs					
			2.04	Overall B/C					

The BCA Value of Time analysis quantifies the road user impacts that the Highway 150 improvements would have in terms of travel time savings by first determining the amount of travel time saved and then assigning a dollar value for this time. The value of time for the passenger vehicles was calculated as 50% of the standard wage rate in the area for work. For commercial vehicles, the value of time was calculated as 70% of the total compensation. Vehicle occupancy rates of 1.5 persons per passenger vehicle and 1.05 persons per commercial vehicle were used. Detailed worksheets showing factors considered for the Value of Time are included in Attachment 2.

The BCA Ownership and Operating Cost analysis quantifies the monetary costs of owning and operating a vehicle (aside from travel time costs). Included in this analysis are such factors as vehicle depreciation, fuel costs, maintenance, and insurance. Also included for trucks is an inventory cost that represents the value of the cargo that is being transported. Detailed worksheets that demonstrate the ownership and operating cost calculations are also included in Attachment 3.

The Value of Safety Improvements considers the benefits to society as a result of fewer crashes on an improved Highway 150. The Highway Safety Manual, 1st Edition was used to estimate reductions in crashes. Detailed safety improvement calculations are shown in Attachment 4.

When examined as a single segment of improvements made within this corridor, the improvements along Highway 150 exhibit a net positive economic impact of 2.04.

REFERENCES

- User Benefit Analysis for Highways, August 2003, AASHTO
- Manual on User Benefit Analysis for Highway and Bus Transit Improvements, 1977, AASHTO
- Highway Safety Manual, First Edition, 2010, AASHTO
- Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, Office of Management and Budget
- BCA.NET-Highway Project Benefit-Cost Analysis System User's Manual, Federal Highway Administration
- Memorandum: Department Guidance for the Valuation of Travel Time in Economic Analysis; Guidance for Conducting Economic Evaluations, April 9, 1997, US Department of Transportation
- Memorandum to Secretarial Officers Modal Administrators; Re: Treatment of the Economic Value of a Statistical Life in Departmental Analyses – 2009 Annual Revision; March 18, 2009
- Circular A-4: To the Heads of Executive Agencies and Establishments; Subject: Regulatory Analysis, September 17, 2003, Office of Management and Budget
- Federal Register (Volume 76, Number 156): Notice of Fund Availability for the Department of Transportation's National Infrastructure Investments Under the Full-Year Continuing Appropriations, 2011; and Request for Comments

ATTACHMENT 1

Construction and Maintenance Costs for Highway 150				
	Build	No-Build	DIFFERENCE (2013)	DIFFERENCE (Future Year)
2013	\$2,200,000	\$4,450	\$2,195,550	\$2,195,550
2014	\$4,450	\$4,450	\$0	\$0
2015	\$4,450	\$4,450	\$0	\$0
2016	\$4,450	\$4,450	\$0	\$0
2017	\$4,450	\$4,450	\$0	\$0
2018	\$4,450	\$4,450	\$0	\$0
2019	\$4,450	\$4,450	\$0	\$0
2020	\$4,450	\$4,450	\$0	\$0
2021	\$4,450	\$4,450	\$0	\$0
2022	\$4,450	\$4,450	\$0	\$0
2023	\$4,450	\$4,450	\$0	\$0
2024	\$4,450	\$4,450	\$0	\$0
2025	\$4,450	\$4,450	\$0	\$0
2026	\$4,450	\$4,450	\$0	\$0
2027	\$4,450	\$4,450	\$0	\$0
2028	\$4,450	\$4,450	\$0	\$0
2029	\$4,450	\$4,450	\$0	\$0
2030	\$4,450	\$4,450	\$0	\$0
2031	\$4,450	\$4,450	\$0	\$0
2032	\$4,450	\$4,450	\$0	\$0
2033	\$4,450	\$4,450	\$0	\$0
Note: User Cost during construction are assumed to be negligible				

ATTACHMENT 2

Value of Time - Existing Route - No Build versus Build				
General Information		Site Information		
Analyst	KKR	DRAFT	Facility	Hwy 150-Section 1
Agency/Company	AHTD		Segment	Mississippi County
Project	TIGER III		Analysis Time Period	Peak Hour
Date Performed	8/30/2011		Analysis Year	2013
			Segment Length (mi.)	8.9
Inputs				
Autos		Trucks		
Percentage of hourly wage (Table 5-1)	50%	Percentage of compensation (Table 5-1)	100%	
Average hourly wage (Table 5-2)	\$25.69	Average hourly compensation (Table 5-2)	\$28.00	
Average vehicle occupancy	1.5	Average vehicle occupancy	1.05	
Speed without Improvement (mph)	50	Speed without Improvement (mph)	50	
Speed with Improvement (mph)	55	Speed with Improvement (mph)	55	
Calculations				
Autos		Trucks		
Value of time per hour (wage X percentage X occupancy)	\$19.27	Value of time per hour (wage X percentage X occupancy)	\$29.40	
For speed change:		For speed change:		
Time without improvement (min.)	10.680	Time without improvement (min.)	10.680	
Time with improvement (min.)	9.709	Time with improvement (min.)	9.709	
(1 / speed) X length X 60		(1 / speed) X length X 60		
Travel time saved per vehicle (min.):	0.971	Travel time saved per vehicle (min.):	0.971	
or		or		
For delay change:		For delay change:		
Travel time saved per vehicle (min.):	0.000	Travel time saved per vehicle (min.):	0.000	
(delay without - delay with)		(delay without - delay with)		
Value of time saved per vehicle (VOT per hour * time saved / 60)	\$0.3118	Value of time saved per vehicle (VOT per hour * time saved / 60)	\$0.4758	
Value of time saved per VMT (VOT per vehicle / length)	\$0.0350	Value of time saved per VMT (VOT per vehicle / length)	\$0.0535	

ATTACHMENT 2

Calculation of Annual VMT										
	West Portion	East Portion								
Length (miles)	3.39	5.55	"West Portion" refers to Highway 150 west of Highway 312							
Truck Percent	25%	25%	"East Portion" refers to Highway 150 east of Highway 312							
Growth Rate Calculation		TIGER III								
	West Side	East Side								
2012 ADT	1700	300								
2032 ADT	2300	400								
Rate	1.52%	1.45%								
	ADT by year		Days in	Annual VMT (Full Project)		West Portion VMT		East Portion VMT		
	West Side	East Side	Year	Auto	Truck	Auto	Truck	28.00305	Truck	
2013	1700	300	365	2033415	677805	1577621	525874	455794	151931	
2014	1726	304	366	2069699	689900	1606035	535345	463664	154555	
2015	1752	309	365	2095134	698378	1626038	542013	469097	156366	
2016	1779	313	365	2126693	708898	1650800	550267	475893	158631	
2017	1806	318	365	2158728	719576	1675940	558647	482788	160929	
2018	1833	322	366	2197249	732416	1706124	568708	491124	163708	
2019	1861	327	365	2224252	741417	1727374	575791	496878	165626	
2020	1890	332	365	2257757	752586	1753680	584560	504077	168026	
2021	1918	337	365	2291767	763922	1780387	593462	511380	170460	
2022	1948	341	366	2332662	777554	1812452	604151	520210	173403	
2023	1977	346	365	2361331	787110	1835026	611675	526305	175435	
2024	2007	351	365	2396902	798967	1862971	620990	533930	177977	
2025	2038	357	365	2433008	811003	1891342	630447	541666	180555	
2026	2069	362	366	2476425	825475	1925406	641802	551019	183673	
2027	2101	367	365	2506862	835621	1949387	649796	557475	185825	
2028	2133	372	365	2544625	848208	1979074	659691	565552	188517	
2029	2165	378	365	2582958	860986	2009213	669738	573746	191249	
2030	2198	383	366	2629052	876351	2045399	681800	583653	194551	
2031	2232	389	365	2661365	887122	2070874	690291	590491	196830	
2032	2265	394	365	2701457	900486	2102411	700804	599046	199682	
2033	2300	400	365	2742154	914051	2134429	711476	607725	202575	

ATTACHMENT 3

Worksheet 5-2: Operating and Ownership Cost			
		Site Information	
Analyst	AJW/VHP	Facility	Highway 150-Section 1
Agency/Company	AHTD	Segment	Mississippi County
Project	TIGER III	Analysis Time Period	
Date Performed	10/26/2011	Analysis Year	2013
		Segment Length (mi.)	8.9
Inputs			
Finance Rate:		3.0%	
Autos		Trucks	
Speed (mph):		Speed (mph):	
without improvement	50	without improvement	50
with improvement	55	with improvement	55
Fuel Cost Per Gallon	\$3.00	Fuel Cost Per Gallon	\$3.00
Fuel Consumption per Mile (Table 5-5):		Fuel Consumption per Mile (Table 5-5):	
without improvement	0.041	without improvement	0.166
with improvement	0.041	with improvement	0.163
Other Operating Costs per Mile (Table 5-4) (tires, maintenance, etc.)	\$0.040	Other Operating Costs per Mile (tires, maintenance, etc.)	\$0.050
Vehicle Life (years)	10	Vehicle Life (years)	8
Vehicle Cost	\$20,000	Vehicle Cost	\$60,000
Salvage Value at End of Life	\$2,000	Salvage Value at End of Life	\$5,000
Miles per Year	15,000	Miles per Year	50,000
		Cargo Value	\$200,000
Insurance per Year (Table 5-3)	\$1,000	Insurance per Year	\$1,500
Calculations			
Autos		Trucks	
Fuel Cost per VMT (Equation 5-3):		Fuel Cost per VMT (Equation 5-3):	
without improvement	\$0.1230	without improvement	\$0.4980
with improvement	\$0.1230	with improvement	\$0.4890
(cost per gallon X gallons per mile)		(cost per gallon X gallons per mile)	
Total Operating Cost per VMT:		Total Operating Cost per VMT:	
without improvement	\$0.1630	without improvement	\$0.5480
with improvement	\$0.1630	with improvement	\$0.5390
(fuel cost per VMT + other oper. cost)		(fuel cost per VMT + other oper. cost)	
Amortized Vehicle Cost Per Year:	\$2,170	Amortized Vehicle Cost Per Year:	\$7,985
(Equation 5-6)		(Equation 5-6)	
		Inventory Cost per Hour	\$0.6849
		(Equation 5-10)	
		Inventory Cost per Mile:	
		without improvement	\$0.0137
		with improvement	\$0.0125
		(cost per hour / miles per hour)	
Amortized Vehicle Cost per VMT	\$0.1447	Vehicle Cost per VMT	\$0.1597
Insurance Cost per VMT	\$0.0667	Insurance Cost per VMT	\$0.0300
Ownership Cost per VMT		Ownership Cost per VMT	
without improvement	\$0.2113	without improvement	\$0.7377
with improvement	\$0.2113	with improvement	\$0.7287
(vehicle + insurance)		(vehicle + insurance + inventory)	
Oper. and Ownership Cost per VMT		Oper. and Ownership Cost per VMT	
without improvement	\$0.3743	without improvement	\$1.2857
with improvement	\$0.3743	with improvement	\$1.2677
(operating + ownership)		(operating + ownership)	
Oper. and Ownership Savings / VMT	\$0.0000	Oper. and Ownership Savings / VMT	\$0.0180
(without - with)		(without - with)	

ATTACHMENT 4

Safety Benefits		
Prior Crash Rates (Crashes per MVM)		
	West Portion	East Portion
All	2.90	2.01
Fatal	0.00	0.00
Non Fatal	2.90	2.01
Crash Costs		
Fatal	\$6,200,000	
Non Fatal	\$85,408	
Crash Reduction Factors (Highway Safety Manual, 1st Ed., Table 13-3)		
	West Portion	East Portion
	(ADT = 2000)	(ADT = 350)
Old Shoulder CMF	1.5	1.1 (0 Foot)
New Shoulder CMF	1.3	1.07 (2 Foot)
Reduction Ratio	0.867	0.973
Modified Crash Rates (Crashes per VMT)		
	West Portion	East Portion
Fatal	0.00	0.00
Non-Fatal	2.51	1.96
Cost per VMT		
	West Portion	East Portion
Without Project	\$0.2477	\$0.1717
With Project	\$0.2147	\$0.1670
DIFFERENCE	\$0.0330	\$0.0047
"West Portion" refers to Highway 150 west of Highway 312		
"East Portion" refers to Highway 150 east of Highway 312		

ATTACHMENT 4

Estimation of Accident Costs		
\$6,200,000	Value of a Statistical Life (VSL)	
	http://ostpxweb.dot.gov/policy/reports/vsl_guidance_072911.pdf	
Disutility Factors by Injury Severity Level		
Severity	Fraction of VSL	
MAIS 1	0.003	
MAIS 2	0.047	
MAIS 3	0.105	
MAIS 4	0.266	
MAIS 5	0.593	
MAIS 6	1	
KABCO-AIS Conversion Table		
	Unknown if	
	Injured	Fatal
AIS 0	0.43676	0
AIS 1	0.41739	0
AIS 2	0.08872	0
AIS 3	0.04817	0
AIS 4	0.00617	0
AIS 5	0.00279	0
Fatality (6)	0	1
Cost of Accident		
Non-Fatal	\$85,408	
Fatal	\$6,200,000	

Appendix B - Wage Rate Certification Statement

<p style="text-align: center;">WAGE RATE CERTIFICATION FOR THE CONTINUING APPROPRIATIONS ACT OF 2011</p>

Pursuant to the Fiscal Year 2011 Continuing Appropriations Act (Pub. Law 112-010 (April 15, 2011), I, Scott E. Bennett, Director of Highways and Transportation for the State of Arkansas, hereby certify that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the federal government pursuant to the Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code, the Davis-Bacon Act.

I understand that the Arkansas State Highway and Transportation Department may not receive ARRA infrastructure investment funding unless this certification is made and posted.



Scott E. Bennett
Director of Highways and Transportation

10-26-2011

Date