

Department of Transportation's National Infrastructure Investments under the Consolidated
Appropriations Act, 2014

TIGER VI Discretionary Grant Program

Project Name: **Interstate 530 Rehabilitation**
Highway 65B to Highway 65 (Pine Bluff Bypass)

Project Location: **Pine Bluff, Jefferson County, Arkansas**
United States Congressional District 4

Location Type: **Urban**

Total Funds Requested:	<u>\$36,800,000</u>
Total State Funds:	<u>\$9,200,000</u>
Total Project Cost:	<u>\$46,000,000</u>



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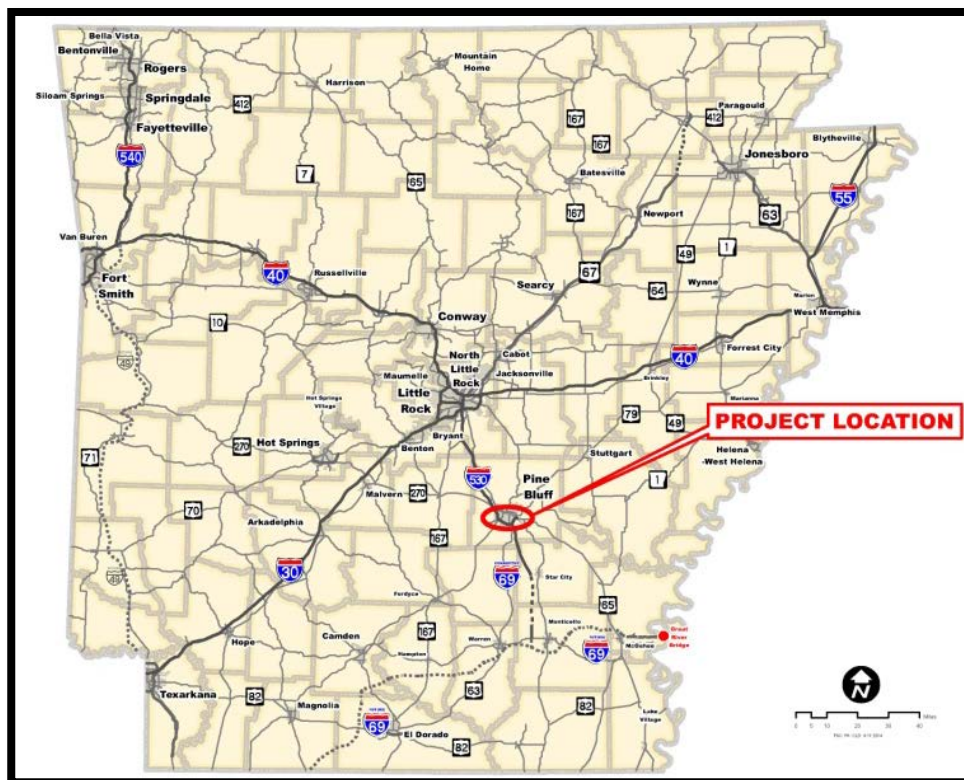
Project

Project Description

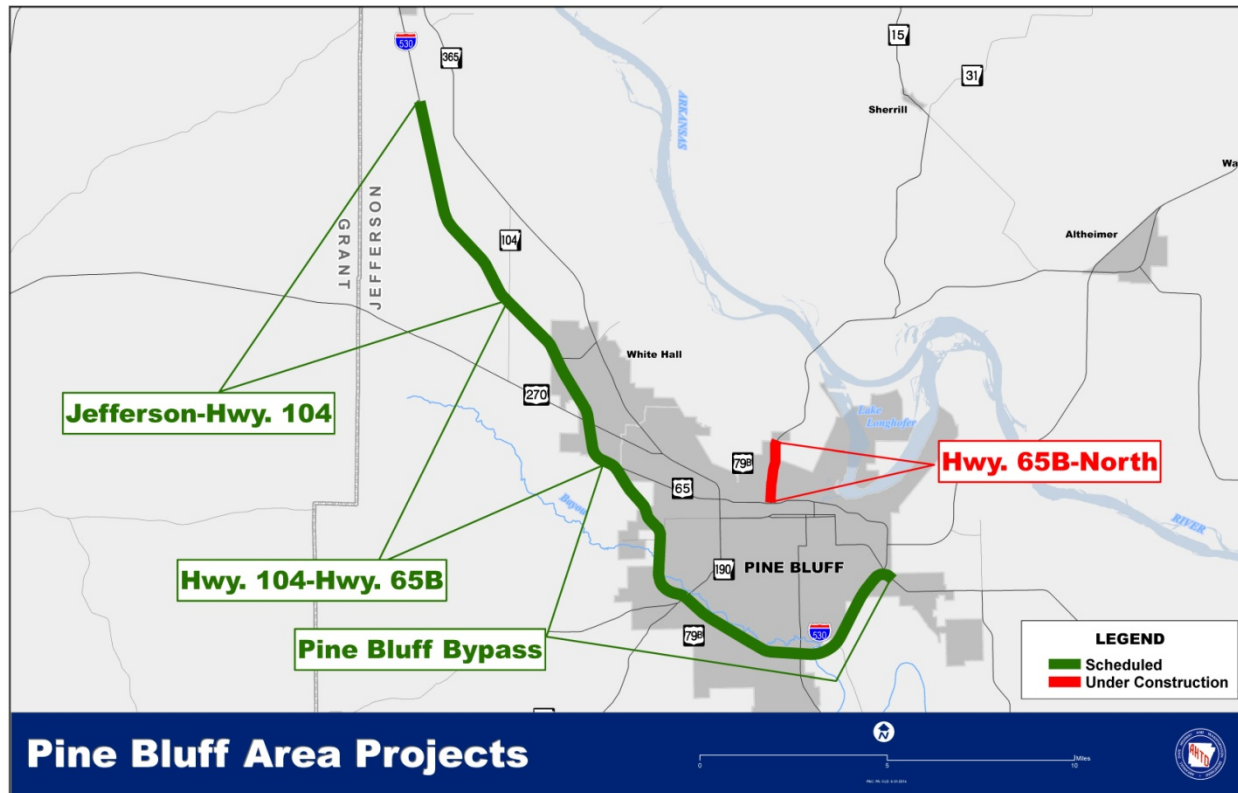
The Arkansas State Highway and Transportation Department (AHTD) is requesting funding to rehabilitate the Pine Bluff Bypass of Interstate 530, located in Jefferson County, Arkansas. This urban area project is necessary due to deterioration of the pavement by alkali-silica reaction (ASR). This application requests \$36.8 million. The Arkansas State Highway and Transportation Department is committed to provide matching funds to cover the costs of the Bypass rehabilitation project.

Overview

Since the adoption of the Federal-Aid Highway Act of 1976, the federal government has been committed to the preservation of the taxpayers' investment in the Interstate System in the United States. Presidents and Congresses have seen the need to resurface, restore, and rehabilitate the nation's Interstates rather than wait until it was necessary to replace them. One of those Interstates in need of rehabilitation is Interstate 530 in Arkansas. Work has already begun on several sections of INTERSTATE 530, but funds are not currently available for the necessary rehabilitation of the Pine Bluff Bypass, and the route is deteriorating too quickly to wait until full funding is available. Delays could adversely affect business and quality of life for residents of the region as well as interstate commerce. As a link to Congressional High Priority Corridor 18/ Future Interstate 69, the Bypass must be improved to a standard comparable to the new Interstate corridor with which it will connect. As President Ronald Regan stated, "The state of our transportation system affects our commerce, our economy, and our future."



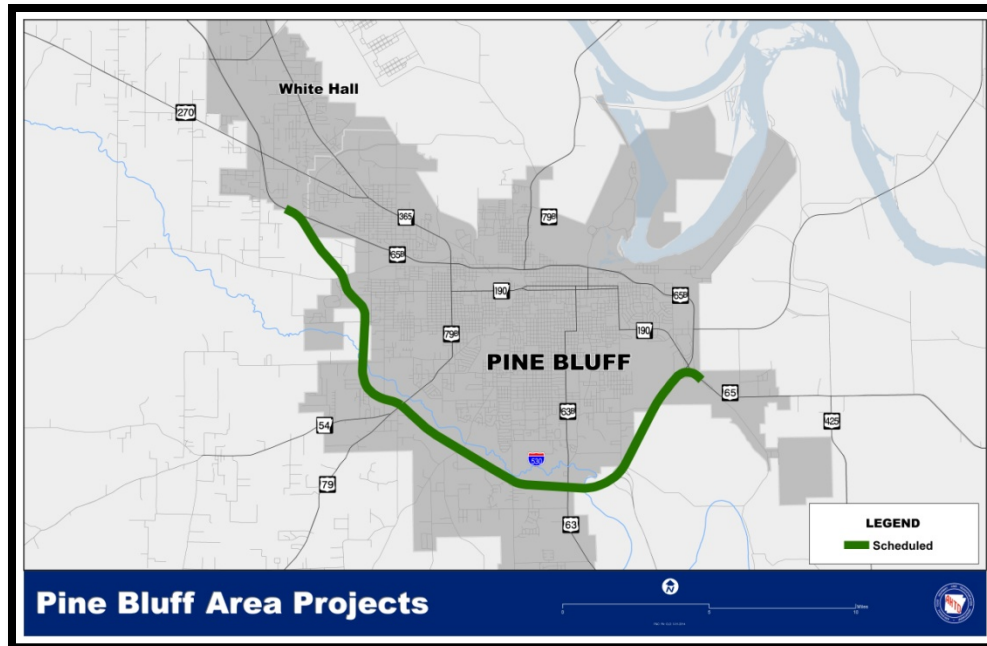
Project Location and Links



Interstate 530 spans approximately 47 miles from Little Rock, at the junction of Interstates 30 and 440, to Pine Bluff. Constructed as Highway 65 between the mid-1960s and mid-1970s this route was officially designated as Interstate 530 in 1999. South of Pine Bluff, Interstate 530 becomes U.S. Highway 65, a four-lane route through the Delta region to Mississippi and Louisiana.

Interstate 530 is the primary route between Pine Bluff and Little Rock- Arkansas' capital city and economic center. It is the only interstate in southeast Arkansas, making it critical to intrastate and interstate commerce in this region. Interstate 530 links include U.S. Highways 63, 65, 79, 270, and 425. Interstate links include 30, 40, and 440 in Arkansas, 20 in Louisiana, and future Interstate 69 and the Great River Bridge crossing the Mississippi River. This route also links ground transportation to the Arkansas and Mississippi Rivers navigation systems, railroads, and the Bill and Hillary Clinton National Airport in Little Rock.

The Bypass was completed in 1999. Prior to the addition of this bypass, Highway 65 was routed through the city of Pine Bluff. This route included eight traffic signals, which created delays and traffic problems for both citizens and persons travelling through the city. A total of six fatal automobile accidents were recorded in the five years prior to the opening of the Bypass. The Bypass currently serves up to 29,000 vehicles per day.



Communities Served

According to the U.S. Census Bureau, Pine Bluff has a population of approximately 49,083, with an additional 27,688 in the surrounding areas in Jefferson County. Population estimate for 2012 is approximately 47,035. This is a loss of approximately 4.2 percent between April 1, 2010 and July 1, 2012. According to the 2010 Census data, 79 percent of the population of Pine Bluff is classified as minority, and 29.9 percent are at or below poverty level. The population decline has been attributed to diminished opportunities in the area.

Eighty-three percent of the population of Pine Bluff are high school graduates, and some of these have training or education beyond high school. Eighteen percent have obtained a bachelor's degree or higher. Pine Bluff has one four-year university - the University of Arkansas at Pine Bluff with an enrollment of more than 2,600 - and one two-year college - Southeast Arkansas College with an enrollment of more than 1,500.

According to the Bureau of Labor Statistics data for the month of February 2014, the unemployment rate is approximately 10.2 percent, or more than four percent above the national average of 6.7 percent. The main source of commerce in the area is agriculture, particularly cotton, soybeans, cattle, rice, poultry, timber, and catfish. Principal industries in the area consists of cotton processing, cottonseed oil production, paper and wood products, poultry processing, manufacture of wire products, electrical transformers and metal fabrication. Major



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employers in the area include Jefferson Regional Medical Center, Simmons First National Corporation, Tyson Foods, Evergreen Packaging, and Union Pacific Railroad.

Jefferson Regional Medical Center (JRMC) is the largest, and only, full service hospital in the area. It serves the citizens of Pine Bluff, Jefferson County, and southeast Arkansas. JRMC has numerous clinics and affiliated centers to meet the needs of southeast Arkansas citizens. It serves the lowest percentage of commercially insured patients and provides more charity care in the emergency department than any other hospital in the state.



Interstate 530 is designated as one of ten Arkansas Scenic Byways for 15 miles from State Highway 256 northwest of White Hall to U.S. Highway 65 in southern Pine Bluff. The route passes over Bayou Bartholomew and the Mississippi Alluvial Plain. Bayou Bartholomew is the longest bayou in the United States, meandering approximately 359 miles, beginning near Pine Bluff and continuing into Louisiana, and is a unique example of a lowland wetland.

As host to more than 60 bass tournaments each year, Pine Bluff/Jefferson County Regional Park



has earned Pine Bluff the nickname "Bass Capital of the World." Fishing tournaments, two national airshows, the Arkansas Railroad Museum, and the Delta Rivers Nature Center, bring approximately 450,000 visitors and \$112.8 million annually to the Pine Bluff area, of which more than \$21.3 million is travel generated payroll.

Following completion of the Bypass, the Arkansas State Highway and Transportation Department received the American Road and

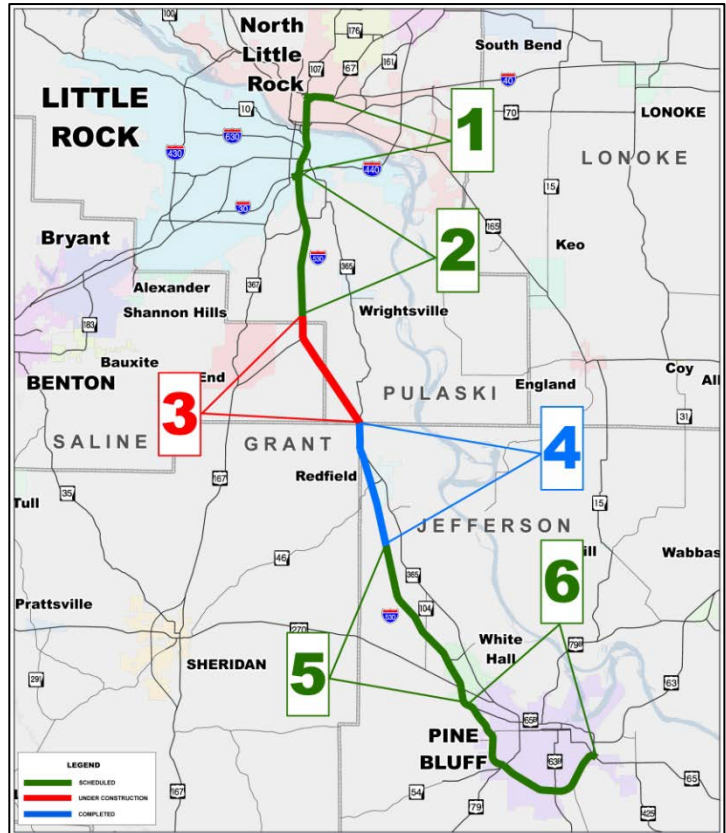
Transportation Builders Association's "Globe Award" in 2001. This award recognizes excellence in environmental protection and mitigation in the planning, design, and construction of transportation and infrastructure projects in the United States. This project not only provided the much-needed southern bypass, but also relieved local flooding problems by increasing floodplain storage, restoring 175 acres of wetlands, preserving 200 areas of bottomland hardwood forest, while saving \$12 million dollars of taxpayer funds in the process.

Numerous businesses are accessed via the Bypass. Most notably are the only Walmart Supercenter in the area; the Pines Mall, which houses Dillard's, Sears, JC Penny; hotels; and a variety of locally owned and national chain restaurants. Reduced accessibility to these businesses due to poor road conditions would cause undue hardships for consumers and reduced revenues for businesses.

Interstate and Highway Projects in Region

The corridor from Interstate 40 to Pine Bluff is shown in the map to the right. Over \$500 million has been committed to improve this corridor. Rehabilitation from the Grant County Line to the Jefferson Interchange has been completed at a cost of \$44 million. Rehabilitation from Bingham Road to the Grant County Line is under construction at a cost of \$14 million. The remaining portions of this corridor are scheduled for rehabilitation or widening at a cost of \$445 million.

To complete improvements to this corridor, an additional \$46 million is necessary to rehabilitate the Pine Bluff Bypass, between Highway 65B and Highway 65.



Regional Projects Supporting Improvements to Pine Bluff Bypass

Key	Route	Termini	Length (Miles)	Cost (Millions)			
				Completed	Under Construction	Scheduled	Remaining
1	I-30	I-40 to I-530	5.6			325	
2	I-530	I-30 to Bingham Road	8.5			68	
3	I-530	Bingham Road to Grant County Line	7.5		14		
4	I-530	Grant County Line to Jefferson Interchange	10.0	44			
5	I-530	Jefferson Interchange to Beginning of Pine Bluff Bypass	11.1			52	
6	I-530	Pine Bluff Bypass	10.1				46
Totals			52.8	44	14	445	46

Problems

Since the opening of the Bypass in 1999, the concrete pavement has deteriorated significantly and in approximately half the time expected. The pavement failure is abnormally high in comparison to other concrete pavements constructed during the same time period due to alkali-silica reaction (ASR). Over the past three years, the Arkansas State Highway and Transportation Department has expended approximately \$650,000 of an extremely limited maintenance budget to keep the Bypass repaired. Unfortunately, many of these repairs have merely served to keep the road open, and not in a condition to be considered “good repair.” In addition, these expenditures have greatly reduced funds available for the repair of other roads in the District.

ASR is a reaction which occurs over time in concrete between the highly alkaline cement paste and reactive non-crystalline (amorphous) silica, which is found in many common aggregates. This reaction causes the expansion of the altered aggregate by the formation of a swelling gel of calcium silicate hydrate (C-S-H). This gel increases in volume with water and exerts an expansive pressure inside the material, causing flaking and loss of strength of the concrete, finally leading to its failure. ASR can cause serious expansion and cracking in concrete, resulting in critical structural problems that can force the demolition of a particular structure.

The Federal Highway Administration, Office of Pavements Technology sponsored a study in an attempt to find a way to mitigate ASR damage. Core samples were taken from the area between Highway 190 and Highway 79 in the north bound lanes of the Bypass. Researchers did not attempt the more severely damaged area between Highway 79 and Highway 63, as it was determined that this area was too degraded to be in anyway helped by the mitigation products available. Completed in July 2011, the study shows the primary reasons for concrete deterioration is due to ASR and aggregate processing.

The Federal Highway Administration study concludes:

Damage Rating Indices ranging from 254 to 489 were obtained for the cores Ark1 to Ark5 [core samples from the Bypass], thus suggesting low to moderate degree of deterioration/damage due to ASR. Signs of alkali-silica reaction can be found in chert particles of the coarser fraction of the sand in the concrete [Cherts are subject to problems when used as concrete aggregates. Deeply weathered chert develops surface pop-outs when used in concrete that undergoes freezing and thawing because of the high porosity of weathered chert]. Typical petrographic features of ASR corresponds to cracking with ASR gel and reaction rims in the chert particles, as well as cracking in the cement paste with reaction products associated to the reactive chert particles. Tight/closed cracks were observed in several coarse aggregate particles, consisting of granitic gneiss. This cracking is thought to be associated to the aggregate processing operations and not to ASR. (<http://www.fhwa.dot.gov/pavement/concrete/asr/petrographic/arkansas.pdf>, pp. 17.)

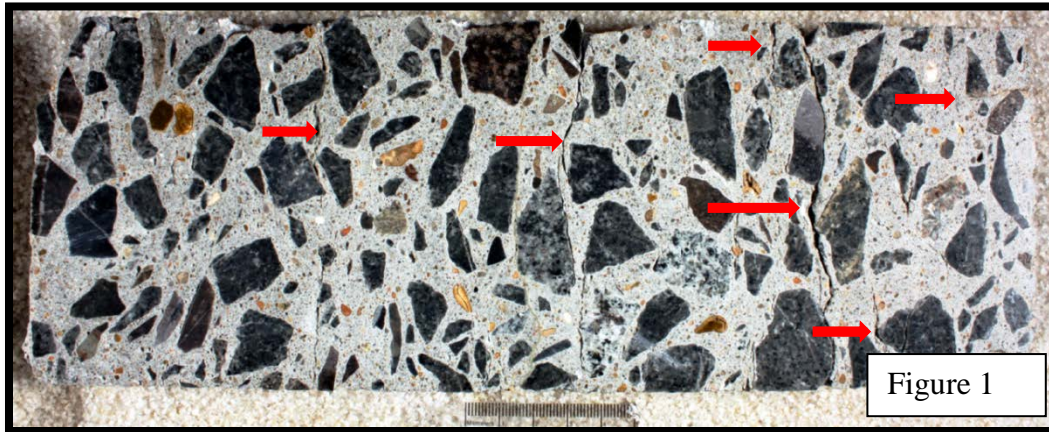
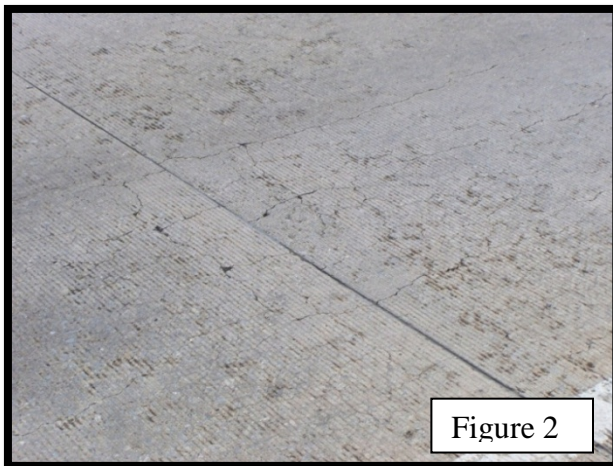


Figure 1 shows significant cracking in the cement paste (crack width from 0.2 mm to 2 mm) with or without reaction products. One surface crack penetrates about 20 mm into the concrete. Several significant cracks (ranging from 0.10 to 0.20 mm in width) are observed roughly parallel to the surface and at various depths: 10-20, 30-40, 60, 80-85, 135 and ~200 mm. Cracks often run at the interface between the cement paste and the coarse aggregate particles.

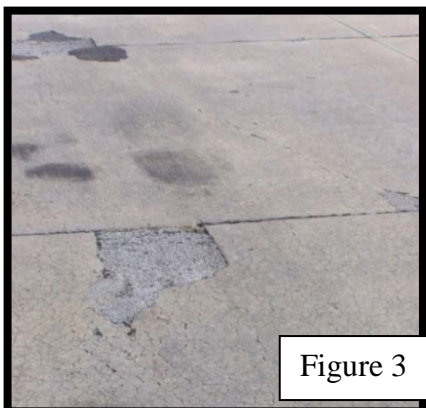
In the years since the publication of the above study, the mild to moderately damaged pavement has continued to deteriorate due to ASR. Mitigation efforts have been ineffective, due to the depth of the damage. Moisture reaches too deeply into the concrete for silane treatments (a water repellent treatment often used to mitigate ASR) to have any effect. Areas of severe degradation have drained the maintenance budget of the District. However, these expenditures have been necessary to keep the Interstate open and provide, at least a moderately smooth ride for travelers.



degradation have drained the maintenance budget of the District. However, these expenditures have been necessary to keep the Interstate open and provide, at least a moderately smooth ride for travelers.

Temporary Repairs

Figures 2 and 3 are recent photographs of the pavement on the Bypass. Figure 4 shows a failed attempt using partial-depth repair to patch the roadway. Degradation of the pavement beneath the patches causes failure of the patch. In addition to partial-depth repair,



other methods have been utilized. The only method that seems to produce good results is a full-depth repair. A full-depth repair, as shown in figure 5, is extremely expensive, time consuming and has a substantial adverse impact on the traffic.



Grant Funds and Sources/ Uses of Project Funds

Additional Funding

In addition to TIGER VI grant funds, the Arkansas State Highway and Transportation Department is committed to provide matching funds to cover the costs of the Bypass rehabilitation project. Additional state and federal funding is not available in our current STIP.

Uses

Funds will be used for rehabilitation of the Interstate 530 Pine Bluff Bypass in Arkansas. Rehabilitation work is only needed on roadways. All structures appear to be in excellent condition, and are expected to have at least normal lifecycle.

Selection Criteria

State of Good Repair

As illustrated above, rehabilitation of the Bypass is critical at this time. Deterioration has taken place at a much more rapid pace than is usual under similar conditions. Repairs of the Bypass are draining the maintenance budget of the District, leaving few resources to make repairs on other roads in that District.

Surface patching has served only to keep roadways mostly open and in usable condition. They do not offer a smooth ride for travelers, and are often riddled with construction zones due to crews making repairs. Areas receiving costly full-depth repairs further complicate travel through the area due to the extended lengths of time required to complete this work.

Economic Competitiveness – Local Impact

According to studies by the Federal Highway Administration, a region's industrial and employment base is closely tied to the quality of the transportation system. The Pine Bluff area is in particular need of economic growth. An unemployment rate of 10.2 percent and the 4.2 percent reduction in population mentioned above, are due to lack of employment and business opportunities. Every attempt must be made to increase economic growth in this area. Further decreases in population and incomes will force more businesses to close, increasing the unemployment rate.

Good, dependable transportation infrastructure allows businesses to receive supplies for production facilities, and to transport finished goods to market in an efficient manner. An efficient transportation system allows companies to lower transportation costs, which lowers production costs and enhances productivity and profits. This is in particular to manufacturing businesses. Lower transportation costs mean they will be able to lower their costs relative to

their competitors, thereby allowing these manufacturers to expand. These qualities are also attractive to businesses looking for new locations, thus creating incentives for local economic growth.

Further economic impact can be realized in employees of expanded businesses, or new businesses brought into the area, subsequently spend and invest their earnings within the local, state, and national economies, thereby generating more jobs across many industries and geographic areas. All of these jobs serve to strengthen and expand the middle class.

All of these factors can cause employment and earnings to increase in counties that receive a new interstate highway. But, it is also clear that not all industries will expand equally. As implied by the discussion above, manufacturing businesses, tourism-related businesses, and industries serving local residents such as retail stores, the health care industry, and the like should expand the most.

Economic Competitiveness – Regional and National Impact

As previously stated, Interstate 530, including the Bypass, is an integral part of a much larger system of highways and Interstates that serves to transport the nation's goods from manufacturers, to distributors and, ultimately, consumers in an efficient and cost effective manner. As a major feeder to Interstate 30, Interstate 40, and the future Interstate 69/Congressional High Priority Corridor 18 route, allowing any further neglect would only serve to hinder interstate transportation of goods through the area, thereby increasing costs to manufacturers, distributors, and consumers. For this reason, this is a much needed Interstate rehabilitation project.

Quality of Life

The citizens of Pine Bluff and surrounding areas, as well as thousands of travelers passing through on their way south to the Gulf Coast, or Central Arkansas and beyond to the north, enjoyed the convenience of the Bypass for several years before deterioration began. However, pavement conditions of this route have begun to make travel unpleasant. Attractions in the area such as the northern end of Bayou Bartholomew, bass fishing tournaments, The Arkansas Railroad Museum, and The Delta Rivers Nature Center will begin to suffer if potential visitors conclude that they do not want to wrestle with the poor driving conditions to reach their destination.

As the only hospital in the area, and because of a large number of physicians' offices, it is crucial that residents from areas southeast of Pine Bluff are able to reach Jefferson County Regional Medical Center in a timely manner. While the work necessary to rehab the pavement on the Bypass will shut down sections of lanes for periods, at least there will be an end in sight. Currently, travelers still have to deal with lane closures so crews can temporarily patch the road, but because these patches are temporary, there is no end in sight.

Results of Benefit-Cost Analysis

The Benefit Cost Analysis (BCA) (<http://www.arkansashighways.com/TIGER/T6/t6.aspx>) was performed in accordance with the ARRA guidance provided in the Federal Register. These benefits and costs were quantified in accordance with the Notice of Funding Availability, 79 Fed. Reg. 11,854 (2014)

The purpose of the BCA is to systematically compare the benefits and costs of reconstructing approximately 11 miles of Interstate 530 in Pine Bluff (Jefferson County). The BCA compared the cost of replacing the freeway as soon as possible (Build in 2016 Alternative) to the cost of deferring major construction until the year the reconstruction job is scheduled, (Build in 2022 Alternative). For the Build in 2016 Alternative, the analysis considers a 20-year project life (2016 through 2018 construction years), with a 2018 opening year and a 20-year project life through 2038. After pavement reconstruction is complete in the Alternative to build in 2022 through 2024, it is assumed that all user costs and benefits would equalize as designs and scheduled maintenance would produce the outcome of nearly identical pavements. Maintenance of Traffic costs would be different for each alternative and are accounted for in the construction and maintenance costs.

The analysis considered typical roadway construction and maintenance costs in Arkansas. Table 1 summarizes the findings of the BCA analysis of three percent discount rate and shows the finding of the BCA with seven percent discount rate. Road User Benefits that were considered include the value of travel time savings provided by the improved facility, vehicle operating cost benefits, and the value to society of enhancing the safety within the improved highway network.

Table 1: Benefit Cost Analysis Results (3 Percent & 7 Percent Discounted)

Year	Activity	Construction and Maintenance Costs			Travel Time Benefit			Vehicle Operation Cost Benefit			Safety Benefit		
		Non-Disc.	3% Discount	7% Discount	Non-Disc.	3% Discount	7% Discount	Non-Disc.	3% Discount	7% Discount	Non-Disc.	3% Discount	7% Discount
2014		\$217,000	\$217,000	\$217,000	\$2,560,641	\$2,716,584	\$2,931,678	\$2,418,771	\$2,566,074	\$2,769,251	\$12,197,585	\$12,940,417	\$13,965,015
2015		\$217,000	\$217,000	\$217,000	\$2,608,504	\$2,686,759	\$2,791,099	\$2,537,901	\$2,614,038	\$2,715,554	\$12,425,577	\$12,798,344	\$13,295,367
2016	(Construction)	\$8,184,000	\$8,184,000	\$8,184,000	\$2,560,641	\$2,560,641	\$2,560,641	\$2,669,296	\$2,669,296	\$2,669,296	\$12,688,236	\$12,688,236	\$12,688,236
2017		-\$37,817,520	-\$36,716,039	-\$34,314,055	\$2,686,759	\$2,608,504	\$2,510,989	\$2,803,616	\$2,721,957	\$2,620,202	\$13,326,716	\$12,938,559	\$12,454,875
2018		-\$44,738,221	-\$42,170,064	-\$36,832,967	\$2,825,860	\$2,663,644	\$2,468,215	\$2,938,610	\$2,769,921	\$2,566,695	\$13,968,395	\$13,166,552	\$12,200,537
2019		\$716,538	\$655,734	\$535,274	\$2,968,059	\$2,716,194	\$2,422,820	\$3,079,180	\$2,817,885	\$2,513,528	\$14,636,580	\$13,394,544	\$11,947,809
2020		\$6,892,807	\$6,124,169	\$4,672,100	\$3,110,970	\$2,764,056	\$2,373,344	\$3,234,376	\$2,873,701	\$2,467,490	\$15,374,291	\$13,659,858	\$11,728,973
2021		\$775,008	\$668,529	\$476,652	\$3,259,785	\$2,811,919	\$2,324,181	\$3,377,908	\$2,913,813	\$2,408,402	\$16,056,558	\$13,850,528	\$11,448,104
2022		\$44,286,166	\$37,088,967	\$24,713,944	\$3,424,084	\$2,867,616	\$2,281,612	\$3,536,517	\$2,961,777	\$2,356,531	\$16,810,490	\$14,078,521	\$11,201,539
2023		\$85,535,566	\$69,548,242	\$43,311,150	\$3,576,035	\$2,907,644	\$2,226,975	\$3,701,602	\$3,009,741	\$2,305,172	\$17,595,206	\$14,306,513	\$10,957,410
2024		\$95,799,834	\$75,625,273	\$44,014,598	\$3,743,947	\$2,955,506	\$2,179,011	\$3,868,790	\$3,054,059	\$2,251,671	\$18,389,918	\$14,517,171	\$10,703,100
2025		\$0	\$0	\$0									
2026		\$0	\$0	\$0									
2027		\$0	\$0	\$0									
2028		\$0	\$0	\$0									
2029		-\$13,773,488	-\$9,379,075	-\$3,891,983									
2030		\$0	\$0	\$0									
2031		\$0	\$0	\$0									
2032		\$0	\$0	\$0									
2033		\$0	\$0	\$0									
2034		\$8,715,063	\$5,119,181	\$1,514,581									
2035		\$0	\$0	\$0									
2036		\$0	\$0	\$0									
2037		\$0	\$0	\$0									
2038		\$0	\$0	\$0									
TOTAL		\$154,575,752	\$114,748,917	\$52,383,294	\$28,156,139	\$24,855,724	\$21,347,789	\$29,209,895	\$25,792,152	\$22,158,987	\$138,846,390	\$122,600,482	\$105,330,583
			\$173,248,359						\$148,837,359				
			\$114,748,917						\$52,383,294				
			1.51						2.84				

After reconstruction is complete in 2024, I-530 would be maintained in good condition so that Travel Time, Vehicle Operating Costs, and Safety Benefits would be identical.

Interstate 530 is a key component in the economic vitality of Southeastern Arkansas, connecting the City of Pine Bluff with Central Arkansas and the rest of the State. Providing an improved transportation network in the region makes an impact in terms of improving the per capita income in areas of the country that are below the national average, which is a 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

Attachment 1 shows construction, maintenance and road user costs during construction. The cost estimate for the improvement of Interstate 530 is an estimated \$50 million. These costs reflect basic construction costs that would be incurred if the project were built using traditional construction methods and schedules. An inflation rate of three was applied to calculate future benefits and an inflation rate of four percent was used to calculate future construction and maintenance costs.

The continuously increasing cost of pavement maintenance on Interstate 530 will cause road user costs during construction to escalate in future years. Two alternatives were evaluated to reconstruct the 11.0 miles of pavement on Interstate 530. One alternative would reconstruct Interstate 530 beginning in Year 1016. The other alternative would wait until Year 2022. These alternatives are different in the future maintenance needs and the road user costs during construction. Without pavement reconstruction, vehicles, particularly trucks, would face increasingly worse pavement conditions as maintenance activities address only the worst areas of pavement deterioration and the remainder of the road continues to worsen. It is assumed that the worst concrete slabs would need to be replaced and a four inch asphalt concrete overlay would be needed in the near future, then an additional two inch asphalt concrete overlay would be needed before the Year 2022 to remain a minimally acceptably ride ability on Interstate 530 up until full depth reconstruction.

The BCA value of time analysis quantifies the road user impacts that the Interstate 530 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. Because of the deteriorating pavement conditions, it was assumed that both passenger cars and trucks would experience the same driving environment, which would ultimately require a ten mile per hour reduction in speed limit to navigate poor pavement conditions. The Value of Time for commercial vehicles was calculated as 100% of the total compensation. A vehicle occupancy rate of 1.0 person per commercial vehicle was used. Detailed worksheets showing factors considered for the Value of Time are included in Attachment 2.

Maintenance of traffic costs during construction were a key component for determining the ultimate road user cost to the driving public. As traffic increases, the ability for the existing pavement to provide sufficient capacity for traffic volumes can be hampered when there is a need to perform pavement maintenance, particularly if a random incident blocks a lane. For this analysis, traffic management costs during construction were built into the construction costs.

The impacts of the vehicle operating costs account for the actual cost to operate the vehicle, aside from the travel time costs. The detailed worksheets for this calculation are shown in Attachment 3.

References

- User and Non-User Benefit Analysis for Highways, September, AASHTO
- Manual on User Benefit Analysis for Highway and Bus Transit Improvements, 1977, 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 77, Number 20): Notice of Fund Availability for the Department of Transportation's National Infrastructure Investments Under the Full-Year Continuing Appropriations, 2012; and Request for Comments
- TIGER Benefit-Cost Analysis (BCA) Resource Guide (<http://www.dot.gov/tiger>)
- Work Zone Road User Costs Concepts and Applications, December 2011, AASHTO

ATTACHMENT 1

Construction, Maintenance and Road Usr Costs for Interstate 530 Reconstruction								
Build 2022				Build 2016			DIFFERENCE	INFLATED \$2014
	Activity	Const	User Delay	Activity	Const.	User Delay	(2014)	(Future Year)
2014		\$217,000	\$420,000		\$217,000	\$420,000	\$0	\$0
2015		\$217,000	\$420,000		\$217,000	\$420,000	\$0	\$0
2016	Maint	\$8,184,000	\$3,000,000	Const	\$10,000,000	\$8,000,000	-\$6,816,000	-\$6,816,000
2017	Rehab	\$217,000	\$420,000		\$15,000,000	\$22,000,000	-\$36,363,000	-\$37,817,520
2018	maint	\$217,000	\$420,000		\$20,000,000	\$22,000,000	-\$41,363,000	-\$44,738,221
2019	Maint	\$217,000	\$420,000		\$0	\$0	\$637,000	\$716,538
2020	Rehab	\$4,092,000	\$1,800,000		\$0	\$0	\$5,892,000	\$6,892,807
2021	Maint	\$217,000	\$420,000		\$0	\$0	\$637,000	\$775,008
2022	Construct	\$10,000,000	\$25,000,000		\$0	\$0	\$35,000,000	\$44,286,166
2023		\$15,000,000	\$50,000,000		\$0	\$0	\$65,000,000	\$85,535,566
2024		\$20,000,000	\$50,000,000		\$0	\$0	\$70,000,000	\$95,799,834
2025		\$0			\$0	\$0	\$0	\$0
2026		\$0			\$0	\$0	\$0	\$0
2027		\$0			\$0	\$0	\$0	\$0
2028		\$0			\$0	\$0	\$0	\$0
2029		\$0		Rehab	\$3,872,000	\$4,400,000	-\$8,272,000	-\$13,773,488
2030		\$0			\$0	\$0	\$0	\$0
2031		\$0			\$0	\$0	\$0	\$0
2032		\$0			\$0	\$0	\$0	\$0
2033		\$0			\$0	\$0	\$0	\$0
2034	Rehab	\$3,872,000	\$430,000		\$0	\$0	\$4,302,000	\$8,715,063
2035		\$0			\$0	\$0	\$0	\$0
2036		\$0			\$0	\$0	\$0	\$0
2037		\$0			\$0	\$0	\$0	\$0
3038		\$0			\$0	\$0	\$0	\$0
		\$62,450,000	\$132,750,000		\$49,306,000	\$57,240,000	\$88,654,000	\$139,575,752
Construction is assumed to require 300 work days								
Periodic Maintenance includes 30 days to overlay 2 lanes or 60 days to overlay four lanes								

ATTACHMENT 2

Value of Time						
Year	TOTAL VMT		Benefit per Auto VMT	Benefit per Truck VMT	TOTAL COST (2014)	TOTAL COST (Future Year)
	Auto	Truck				
2014	159,695,895.0	23,862,605.0	\$0.007	\$0.062	\$2,560,641	\$2,560,641
2015	162,680,865.0	24,308,635.0	\$0.007	\$0.062	\$2,608,504	\$2,686,759
2016	166,119,714.0	24,822,486.0	\$0.007	\$0.062	\$2,663,644	\$2,825,860
2017	169,397,047.5	25,312,202.5	\$0.007	\$0.062	\$2,716,194	\$2,968,059
2018	172,382,017.5	25,758,232.5	\$0.007	\$0.062	\$2,764,056	\$3,110,970
2019	175,366,987.5	26,204,262.5	\$0.007	\$0.062	\$2,811,919	\$3,259,785
2020	178,840,593.0	26,723,307.0	\$0.007	\$0.062	\$2,867,616	\$3,424,084
2021	181,336,927.5	27,096,322.5	\$0.007	\$0.062	\$2,907,644	\$3,576,035
2022	184,321,897.5	27,542,352.5	\$0.007	\$0.062	\$2,955,506	\$3,743,947
2023	187,306,867.5	27,988,382.5	\$0.007	\$0.062	\$3,003,369	\$3,918,715
2024	190,064,898.0	28,400,502.0	\$0.007	\$0.062	\$3,047,592	\$4,095,709
2025	192,530,565.0	28,768,935.0	\$0.007	\$0.062	\$3,087,128	\$4,273,307
2026	195,515,535.0	29,214,965.0	\$0.007	\$0.062	\$3,134,990	\$4,469,747
2027	198,500,505.0	29,660,995.0	\$0.007	\$0.062	\$3,182,853	\$4,674,127
2028	202,037,490.0	30,189,510.0	\$0.007	\$0.062	\$3,239,567	\$4,900,135

ATTACHMENT 3

Worksheet: Operating and Ownership Cost			
		Site Information	
Analyst	KKR	Facility	DIFFERENCE
Agency/Company	AHTD	Segment	Combined
Project	TIGER 6	Analysis Time Period	2016
Date Performed	4/22/2014	Analysis Year	2016
		Segment Length (mi.)	11
Inputs			
	Finance Rate:		3.0%
Autos		Trucks	
Speed (mph):		Speed (mph):	
without improvement	55	without improvement	55
with improvement	65	with improvement	62
Fuel Cost Per Gallon	\$3.42	Fuel Cost Per Gallon	\$3.86
Fuel Consumption per Mile (Table 5-5):		Fuel Consumption per Mile (Table 5-5):	
without improvement	0.041	without improvement	0.166
with improvement	0.039	with improvement	0.158
Other Operating Costs per Mile (Table 5-4)	\$0.040	Other Operating Costs per Mile	\$0.050
(tires, maintenance, etc.)		(tires, maintenance, etc.)	
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	\$0.1402	without improvement	\$0.6408
with improvement	\$0.1334	with improvement	\$0.6099
(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	\$0.1802	without improvement	\$0.6908
with improvement	\$0.1734	with improvement	\$0.6599
(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	\$0.0125
		with improvement	\$0.0110
		(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	\$0.8805
with improvement	\$0.2113	with improvement	\$0.8496
(vehicle + insurance)		(vehicle + insurance + inventory)	
Oper. and Ownership Cost per VMT		Oper. and Ownership Cost per VMT	
without improvement	\$0.3916	without improvement	\$1.5712
with improvement	\$0.3847	with improvement	\$1.5095
(operating + ownership)		(operating + ownership)	
Oper. and Ownership Savings / VMT	\$0.0068	Oper. and Ownership Savings / VMT	\$0.0618
(without - with)		(without - with)	

ATTACHMENT 4

SAFETY BENEFIT				
Year	Total VMT	Benefit per VMT	TOTAL BENEFIT (2016)	TOTAL BENEFIT (Future Year)
2014	183,558,500	\$0.133	\$12,197,585	\$11,497,393
2015	186,989,500	\$0.133	\$12,425,577	\$12,063,667
2016	190,942,200	\$0.133	\$12,688,236	\$12,688,236
2017	194,709,250	\$0.133	\$12,938,559	\$13,326,716
2018	198,140,250	\$0.133	\$13,166,552	\$13,968,395
2019	201,571,250	\$0.133	\$13,394,544	\$14,636,580
2020	205,563,900	\$0.133	\$13,659,858	\$15,374,291
2021	208,433,250	\$0.133	\$13,850,528	\$16,056,558
2022	211,864,250	\$0.133	\$14,078,521	\$16,810,490
2023	215,295,250	\$0.133	\$14,306,513	\$17,595,206
2024	218,465,400	\$0.133	\$0	\$0
2025	221,299,500	\$0.133	\$0	\$0
2026	224,730,500	\$0.133	\$0	\$0
2027	228,161,500	\$0.133	\$0	\$0
2028	232,227,000	\$0.000	\$0	\$0
2029	235,023,500	\$0.000	\$0	\$0
2030	237,596,750	\$0.000	\$0	\$0
2031	241,027,750	\$0.000	\$0	\$0
2032	244,268,400	\$0.000	\$0	\$0
2033	247,032,000	\$0.000	\$0	\$0
2034	250,463,000	\$0.000	\$0	\$0
2035	253,036,250	\$0.000	\$0	\$0
2036	257,169,900	\$0.000	\$0	\$0

Project Readiness

Task	Completion Date
Awarded to Contract	June-16
Mobilization of Project	July-16
Project Substantially Complete	July-18
Open to Traffic	July-18