

COMPETITIVE HIGHWAY BRIDGE PROGRAM KINGFISHER COUNTY BRIDGE BUNDLE

BCA NARRATIVE

NBI #15106

NBI #15187

NBI #16159

NBI #16167



OKLAHOMA
Transportation

BCA Narrative

PROJECT OVERVIEW

A Benefit-Cost Analysis (BCA) was conducted in support of the Competitive Highway Bridge Program (CHBP) application for the Oklahoma Department of Transportation (ODOT).

Project Description

The Oklahoma Department of Transportation (ODOT) is seeking funding through the Competitive Highway Bridge Program to reconstruct four bridges for the Kingfisher County Bridge Bundle project. These bridges need reconstruction and were strategically chosen for their economic importance and benefit to rural communities.

The bridges are on US-81 and the Kingfisher County's E. 715 Rd. The two bridges on US-81 run parallel to each other carrying north and southbound traffic along the highway. US-81 begins in North Texas and runs through North Dakota to the Canadian border, making it an important cross-country connector. The bridges are gradeseparated crossings over a Union Pacific Railroad (UPRR) line. Should the bridge experience a catastrophic structural failure, railroad and vehicle traffic would be at a standstill, causing delays and economic losses.

The two county road bridges on E. 715 Rd serve the rural residents just outside Dover, Oklahoma. The bridges are adjacent to each other and cross over Turkey Creek and Turkey Creek overflow. They are the only crossings over the creek. For rural residents west of the bridges, a structural failure would force them to drive five extra miles around to cross the creek and then several miles back down if they were trying to make a grocery trip or go to any common destination in town.

The reconstruction of the bridges is intended to bring them back into high quality condition so they can continue to serve the rural residents of Oklahoma, freight, and travelers for years to come. Additionally, the project will enhance efficiency and safety on US-81 and E. 715 Rd.

The total project cost for the Kingfisher County Bridge Bundle is about \$30.9 million. **ODOT is seeking approximately \$24.7 million in funding and will cover all remaining project costs.**

Project Improvements

Improving safety in a bridge replacement involves several critical elements. Here are detailed comments on how the proposed plans enhance safety by addressing these components:

UPDATING BRIDGE RAILS

The proposed replacement bridges are designed to meet higher safety standards, incorporating more robust materials that provide better resistance to impacts and weatherrelated wear and tear. Improved railings are designed to better contain vehicles, preventing them from falling off the bridge in case of accidents, thereby reducing the risk to both vehicular traffic and pedestrians.

IMPROVING CLEARANCE OVER THE UPRR RAIL LINES

Increasing the clearance between the bridge and the rail lines minimizes the risk of collisions with tall railway vehicles or equipment that might otherwise strike the bridge, creating smoother and safer rail operations. Ensuring sufficient clearance meets regulatory requirements and standards, thereby fostering safer railway and bridge interactions.

EXPANDED HORIZONTAL CLEARANCE

The proposed replacement bridges are designed with increased horizontal clearance, creating valuable space that can support the addition of a future rail line. This wider span beneath the bridge not only allows for the passage of freight traffic but also enhances regional connectivity by enabling more diverse travel options. By proactively incorporating this expanded clearance, the design helps future-proof the infrastructure—offering greater flexibility and cost-efficiency for adapting to evolving transportation demands.

ADDING FENCING ON TOP OF PARAPETS OVER THE UPRR

Fencing helps prevent debris from falling onto the railway tracks, which could otherwise cause damage to trains or disrupt train operations. This is vital for maintaining an uninterrupted and safe railway service. Fencing acts as a barrier to prevent pedestrians from inadvertently or intentionally throwing objects onto the tracks, further enhancing overall safety for railway operations.

IMPROVING CLEAR DISTANCE FROM TRACKS TO PROPOSED PIER COLUMNS

By increasing the distance between the railway tracks and pier columns, the likelihood of a train striking the columns in the event of a derailment is significantly reduced. This spatial enhancement mitigates the potential for severe structural damage. More clear space around the tracks allows for easier access and maneuverability for emergency responders in case of an accident, ensuring faster and more effective incident response.

These measures collectively create a safer environment for both bridge users and railway operations. The importance of each improvement not only aligns with regulatory requirements but also demonstrates a strong commitment to exceptional community safety.

Project Need**IMPROVE THE SAFETY, EFFICIENCY, AND RELIABILITY OF THE MOVEMENT OF PEOPLE AND FREIGHT OVER THE RURAL BRIDGES**

This project aims to replace four aging bridges, enhancing the safety and efficiency of travel across these vital pathways in rural Oklahoma. Modernizing these structures will significantly reduce delays for all vehicles, particularly trucks transporting freight. The improvements will facilitate more reliable transportation and contribute to the overall flow of commerce in the region, making travel over these bridges more reliable.

BCA PARAMETERS AND ASSUMPTIONS

As noted, the BCA utilized the Federal Highway Administration (FHWA) Bridge Investment Program (BIP) BCA tool, as the primary cost and benefits are tied to a bridge structure.

The BCA guidance provides methodological guidance and specific values for monetizing benefits, such as hourly values of travel time, crash costs, and emissions costs for various pollutants. Values in the BIP BCA tool automatically default to the BCA guidance values, and an extended discussion of those parameters can be found in the BCA guidance document.

- All costs and benefits in the BCA are expressed in 2023 constant dollars discounted to the year 2023 (year zero for discounting).
- All monetary values included in this analysis are discounted using a 3.1 percent real discount rate.
- Construction and related construction expenditures are assumed to begin in 2026 and end in 2027. The BCA assumes completion at the end of 2027.
- Operation is expected to commence in 2028. The analysis utilizes a thirty-year period of operation, as prescribed for new facilities.
- The average useful life for the bridge and other new facility improvements is assumed to be 75 years. Accordingly, a residual value is included in the analysis at the end of the thirty-year period.

PROJECT COSTS

The total future eligible project cost for the ODOT Project is estimated at \$30,971,224. To align with USDOT's 2024 BCA guidance, all costs and benefits are expressed in 2023 dollars. Capital costs have been adjusted to 2023 dollars using the Bridge Investment Program BCA tool from the year of expenditure, in line with the sample calculations provided in the USDOT BCA spreadsheet template, after being entered as Year of Expenditure costs. Estimated project costs and funding sources are shown in Table 1.

Table 1. Total Future Eligible Project Costs (Undiscounted and Rounded)

MILESTONE	NON-FEDERAL FUNDS	OTHER FEDERAL SOURCES	CHBP	TOTAL
Construction	\$4,728,431 20%	\$0	\$18,913,725 80%	\$23,642,156
Construction Management, Inspection, and Oversight	\$283,706 20%	\$0	\$1,134,823 80%	\$1,418,529
Contingency	\$1,182,108 20%	\$0	\$4,728,431 80%	\$5,910,539
Total	\$6,194,245	\$0	\$24,776,979	\$30,971,224

Table 2. Exact Project Capital Costs (Discounted and Unrounded)

YEAR	UNDISCOUNTED COSTS	DISCOUNTED COSTS
2025	\$1,399,244	\$1,277,474
2026	\$12,388,490	\$10,964,370
2027	\$18,582,734	\$15,952,042
Total	\$32,370,468	\$28,193,196

The total unrounded Capital Costs for the Project, including costs previously incurred, are \$32,370,468 is undiscounted, and the total discounted Capital Costs are \$28,193,196.

Due to the proximity of the US-81 and county road bridges, cost estimates have been combined for the county bridges and another for the US-81 bridges. The tables below outline the breakdown of the two cost estimates.

Table 2. Off-System County Road Bridges (NBI #15106 and 15187) Funding Sources

MILESTONE	NON-FEDERAL FUNDS		OTHER FEDERAL SOURCES		CHBP	TOTAL
	<i>Previously Incurred</i>					
Engineering (2025-2026)	\$250,000	\$0	\$0	\$0	\$0	\$250,000
ROW (2027)	\$25,000	\$0	\$0	\$0	\$0	\$25,000
Utilities (2015-2017)	\$25,000	\$0	\$0	\$0	\$0	\$25,000
Construction (2026-2028)	\$0	\$600,000 20%	\$0	\$2,400,000 80%	\$3,000,000	\$3,000,000
E&C	\$0	\$36,000 20%	\$0	\$144,000 80%	\$180,000	\$180,000
Contingency	\$0	\$150,000 20%	\$0	\$600,000 80%	\$750,000	\$750,000
Total	\$300,000	\$786,000	\$0	\$3,144,000	\$4,230,000	

Table 3. On-System US-81 Bridges (NBI #16159 and 16167) Funding Sources

MILESTONE	NON-FEDERAL FUNDS		OTHER FEDERAL SOURCES		CHBP	TOTAL
	<i>Previously Incurred</i>	Future	<i>Previously Incurred</i>	Future	Future	
Engineering (2024-2026)	\$0	\$0	\$1,036,449	\$0	\$0	\$1,036,449
Railroad Engineering	\$0	\$0	\$10,000	\$0	\$0	\$10,000
ROW (2025-2026)	\$43,000	\$0	\$0	\$0	\$0	\$43,000
Utilities (2025-2026)	\$1,959	\$0	\$7,836	\$0	\$0	\$9,795
Construction (2026-2028)	\$0	\$4,128,431 20%	\$0	\$0	\$16,513,725 80%	\$20,642,156
E&C	\$0	\$247,706 20%	\$0	\$0	\$990,823 80%	\$1,238,529

MILESTONE	NON-FEDERAL FUNDS		OTHER FEDERAL SOURCES		CHBP	TOTAL
	<i>Previously Incurred</i>	Future	<i>Previously Incurred</i>	Future	Future	
Contingency	\$0	\$1,032,108 20%	\$0	\$0	\$4,128,431 80%	\$5,160,539
Total	\$44,959	\$5,408,245	\$1,054,285	\$0	\$21,632,979	\$28,140,468

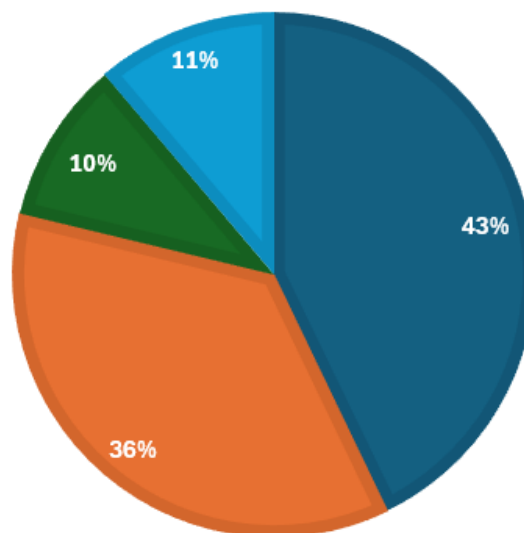
The local match provided for the county bridges will be sourced through County Improvements for Roads and Bridges (CIRB) Funds. Local and State funding sources have traditionally been used for maintenance activities, and funding for the future maintenance of the Kingfisher County Bridge Bundle improvements would be no different. ODOT is committed to building and maintaining the bridge improvements on behalf of their constituents and in support of future development.

PROJECT BENEFITS

The BIP BCA tool was used as a base to calculate the benefits in this BCA. The project benefits monetized in this BCA include:

- Travel Time
- Vehicle Operation Costs
- Maintenance
- Residual Value

■ Travel Time ■ Vehicle Operation Costs ■ Maintenance ■ Residual Value



Distribution of Project Benefits by Type (Present Value over 30 years)

These benefit streams are described below, including methodology and major assumptions. Calculation details may be further followed in the accompanying Excel spreadsheet. Each benefit type in the sections below is keyed to the worksheets in the Excel model.

The benefits are those found from the bridge replacement, utilizing the BIP tool.

Travel Time

Travel time savings result from avoided detouring due to a bridge closure or load posting. Based on the NBI forecasting, two bridges will close in 2052, and the other two bridges are forecasted to close in 2037 and 2047, respectively.

When the bridges close, other roads will be utilized for the detour. Also, depending on how the bridge fails, it could block railroad operations below the US-81 bridge, affecting freight operations.

The discounted travel time savings benefits total \$36,299,692.

Vehicle Operating Costs

VOCs (vehicle operating costs) arise from reduced vehicle miles traveled (VMT) associated with avoided detouring. Like the travel time savings for this project, the VOCs are mainly driven from the NBI bridge closure forecasts.

The discounted VOC benefits total \$32,639,290.

Maintenance

According to ODOT, the No Build scenario would require a yearly maintenance cost of \$86,000, while the Build scenario assumes \$20,000 yearly maintenance.

The discounted maintenance savings total \$8,205,372.

Residual Value

The residual value of the project comes from the value of the new infrastructure built, primarily the construction of four bridges. The BCA assumes a 75-year useful life for all the new project elements being constructed or installed as part of this project

The total residual value of the project totals \$6,474,451.

BCA RESULTS

The table on the next page provides the discounted BCA results. The analysis utilizes a 3.6 percent discount rate for all costs and benefits. The incremental Benefit Cost Ratio (BCR) for the project is 3.6, with a Net Present Value (NPV) of \$60,369,270. The total discounted cost of the Project (Build capital cost) is approximately \$23,249,535 (2023 dollars) using a 3.1 percent discount rate.

Table 4. Summary BCA Results, Discounted to 2023 Dollars

CATEGORY	TOTAL	PERCENT
Travel Time	\$36,299,692	43%
Vehicle Operating Costs	\$32,639,290	39%
Maintenance	\$8,205,372	10%
Residual Value	\$6,474,451	8%
Total Benefits	\$83,618,806	100%
Total Discounted Costs		\$23,249,535
Benefit-Cost Ratio (BCR)		3.6
Net Present Value (NPV)		\$60,369,270