

West Columbia Roadway State of Good Repair

HGAC ID - #772

Benefit-Cost Analysis

August 2024

The 2024 USDOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grant Programs forms the basis for the methodologies employed to estimate quantified and, subsequently, monetized benefits for the West Columbia Roadway State of Good Repair project.¹ The BCA evaluation process examines the fundamental question of whether the anticipated societal benefits of the project justify the associated costs, acknowledging the inherent difficulty in quantifying some benefits and costs. This analysis examines how the No-Build and Build Scenarios enhance societal benefits over the planning horizon.

This BCA analysis quantifies the net difference between the No-Build and Build Scenarios for the West Columbia Roadway State of Good Repair (“Project”). The project limits are shown in Figure 1.



Figure 1. Project Limits

1 United States Department of Transportation (2024). Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Retrieved January 2024 from <https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0>

BCA Result Summary

Benefits and costs in real dollars and discounted real dollars are shown in the table below. The benefit-cost ratio is 0.6 in 2022 real dollars and 0.5 when discounted at 3.1%.

Table 1. BCA Summary

Scenario	\$2022 Real Dollars	\$2022 Real Dollars 3.1% Discount
Benefits	\$4,245,000	\$3,168,000
Costs	\$7,944,000	\$6,847,000
BCA	0.50	0.50

BCA Methodology and Foundations to BCA

The baseline (No-Build) and Build methodology and calculations for each benefit are contained within this technical memorandum, supported by the BCA Excel Workbook. The calculation is based on the following methodologies and general assumptions.

Real Dollars & Discount Rate

All monetized values in the analysis are standardized to 2022 (real dollars). Costs from previous years were adjusted using a 2.79% annual inflation factor, derived from Table A-7 of the 2024 USDOT BCA Guide, to **reflect real dollars in 2022**. The final present-value estimates in this **Benefit-Cost Analysis (BCA) utilized a 3.1% discount rate** recommended by OMB Circular A-94 for both benefits and costs. Real dollars, also known as inflation-free or constant dollars, allow for consistent comparisons over time by negating the effects of inflation.

Summarized Costs

The costs for the Project in the year of expenditure amount to \$9,150,000 (nominal dollars). Applying an annual inflation factor of 2.79%, the costs were discounted from the expenditure year to reflect real dollars in 2022. Consequently, the total project cost in 2022 real dollars is \$7,944,000. These costs are discounted at 3.1% from the expenditure year to 2022, resulting in total discounted costs of \$6,848,000.

Table 2. Project Costs

Cost	Nominal \$ Year of Expenditure No Discount	Real \$ \$2022 No Discount	3.1% Discount \$2022
Planning	\$103,000	\$98,000	\$92,000
Design/Environmental	\$825,000	\$735,000	\$651,000
Construction	\$8,222,000	\$7,111,000	\$6,105,000
Project Costs	\$9,150,000	\$7,944,000	\$6,848,000

Planning Horizon

The planning horizon spans from 2022 to 2047, initiating from the project's planning phase. The Project is expected to begin operations in 2027, with a projected 20-year operating period. Consequently, benefits are quantified over the 20-year period from 2027 to 2047.

No-Build Scenario

The No-Build scenario assumes minimal planned improvements to the roadway. It considers factors such as future changes in traffic volumes and routine maintenance that would occur irrespective of the proposed project.

Build Scenario

The scope includes the design and construction of a total of 2.4 miles of two-lane residential streets. The following streets include segments identified for reconstruction: Austin Street, Blue Bird Court, Carver Street, CR (Old Bell Plant Road), Crawford Lane, Dyson Road, East Meadow Lane, East Texaco Avenue, Ellis Lane, Ellis Street, Irwin Road, Kirby Drive, Larkin Street, Mockingbird Lane, North 11th Street, North 15th Street, North Broad Street, North Ringold Street, Papendorf Lane, Prewitt Lane, Red Bird Court, Reverend Swinney Street, South Gray Avenue, Snow Drive, Starfield Lane, West Meadow Lane, Washington Street, and Woodbine Drive. Construction activities include constructing new roadway pavement, installing pavement markings, replacing roadside signs, and restoring roadside grass-lined ditch banks to the extent disturbed by construction activities. Additional work includes limited stormwater drainage features, driveways, sidewalks, curbs, ramps, streetlighting, and landscaping to improve multimodal access to nearby residences, schools, and retail establishments. These improvements are designed to enhance multimodal access, linking nearby residences to the neighborhood trip generators, thereby ensuring a comprehensive upgrade to the local infrastructure supporting vehicular and pedestrian traffic.

Major Key Data Points

To measure the economic value of outcomes to be achieved by a project, several key data points are used throughout the analysis.

Annual Average Daily Traffic

Current and future vehicle daily volumes are obtained from the Texas Department of Transportation (TxDOT) Statewide Planning Map.²

Table 3. Average Daily Traffic Volume

Segment	2022	2047	CAGR
Various (Weighted Average)	124	234	2.47%

² TxDOT – Statewide Planning Map. Accessed on March 2024, from https://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html

Daily Vehicle Miles Traveled

Vehicle miles traveled are calculated by multiplying the daily AADT by the length of the project corridor.

Table 4. Average Daily Vehicle Miles Traveled (**Without** Modal Diversion)

Segment	Corridor Length Miles	2022	2047
Various (Weighted Average)	4.28	544	1,026

Project Specific Monetized Benefits

The 2024 USDOT BCA guidance provides guidance on an array of benefits that can be monetized using parameters provided by the USDOT. Proceeding with the **Build** scenario will yield the following monetizable societal benefits; however, there are also associated disbenefits with the project, as explained below:

Benefit 1: State of Good Repair

Maintenance and user costs associated with the condition of a roadway’s surface are significant factors in the decision to continue with the current pavement or to replace it. The capital expenditure required for a reconstruction project may make economic sense if it saves money over the planning horizon. Demonstrating a roadway’s current surface condition, or state of good repair (SOGR), and projecting the costs and benefits for alternative maintenance strategies will provide the information needed to make this decision.

Table 5. State of Good Repair Monetized Benefits

State of Good Repair Calculation	No Build	Build
On-Going Maintenance Cost	\$1,212,000	\$1,038,000
Rehab Cost	\$4,467,000	\$0
Residual Life of Rehab	(\$1,292,000)	\$0
User Costs (Value of Travel Time)	\$871,000	\$232,000
Vehicle Wear and Tear	\$64,000	\$51,000
<i>Total in Real \$</i>	\$5,323,000	\$1,320,000
Total Monetized Benefit Real \$ (No Build – Build)	\$4,003,000	
Total Monetized Benefit Discounted @ 3.1% (No Build – Build)	\$2,986,000	

Benefit 2: Safety Improvements

The analysis uses the average number of crashes by type over the last 5 years (2019-2023) from TxDOT Crash Record Information System (CRIS) database. The appropriate reduction factor was given by TxDOT based on the 2022 TxDOT Highway Safety Improvement Program (HSIP) work codes, and the damages avoided are quantified using USDOT parameters by injury type.³ A crash can only be assigned to one work code. If multiple work codes are applicable to one crash, the work code with the highest crash reduction rate will be assigned to that crash. For the Project, crashes and corresponding injuries were assigned to codes listed in tables below.

³ Texas Department of Transportation (2022). Highway Safety Improvement Manual. Retrieved August 2022 from <https://www.txdot.gov/inside-txdot/forms-publications/publications/highway-safety.html>

Table 6. Roadway Related Crashes - Injury Data (5-Year Average)

Injury	First Harmful Event - Auto
	2018-2022
Non-Injury	7
Possible Injury	0
Non-Incap. Injury	0
Serious Injury	0
Fatality	0
Unknown Injury	0

Table 7. Roadway Countermeasure #1 - 303, 401 Resurfacing, Install Pavement Markings

Injury	Roadway Countermeasure #1 - 303, 401 Resurfacing, Install Pavement Markings Reduction Factor: 50% Service Life: 10 Years	
	Average (No-Build)	Average (Build)
Non-Injury	0.8	0.4
Possible Injury	0.0	0.0
Non-Incap. Injury	0.0	0.0
Serious Injury	0.0	0.0
Fatality	0.0	0.0
Unknown Injury	0.2	0.1

Table 8. Roadway Countermeasure #2 - 101, 401 Install Warning/Guide Signs, Install Pavement Markings

Injury	Roadway Countermeasure #2 - 101, 401 Install Warning/Guide Signs, Install Pavement Markings Reduction Factor: 24% Service Life: 6 Years	
	Average (No-Build)	Average (Build)
Non-Injury	0.6	0.5
Possible Injury	0.0	0.0
Non-Incap. Injury	0.0	0.0
Serious Injury	0.0	0.0
Fatality	0.0	0.0
Unknown Injury	0.0	0.0

Table 9. Safety - Auto Monetized Benefits

Safety - Auto Monetized Benefits	No Build	Build
Countermeasure #1 - 303, 401 Resurfacing, Install Pavement Markings	\$475,200	\$237,600
Countermeasure #2 - 101, 401 Install Warning/Guide Signs, Install Pavement Markings	\$18,000	\$13,680
<i>Total in Real \$</i>	\$493,200	\$251,280
Total Monetized Benefit Real \$ (No Build – Build)	\$242,000	
Total Monetized Benefit Discounted @ 3.1% (No Build – Build)	\$182,000	

Summary of Benefits and Costs

The table below summarizes the Project benefits detailed above.

Table 10. Project Benefits Summary

Benefit #	Benefit Name	Current Status/Baseline and Problem to be Addressed	Change to Baseline or Alternatives	Types of Impacts	\$2022 Monetized Value	\$2022 Real Dollars 3.1% Discount Rate
1	State of Good Repair	Ongoing expensive maintenance of roadway pavement	Low maintenance required of new facility through the planning horizon	Maintenance cost savings	\$4,003,000	\$2,986,000
2	Safety Benefits	Outdated design, disproportionally higher crash rates	Safety improvement resulting in reduction in traffic crashes	Reduced crashes resulting in reduced fatalities and injuries	\$242,000	\$182,000
Totals					\$4,245,000	\$3,168,000