**Broadway Reconstruction from IH‐45 to SH255 Project**

HGAC ID - #796

Benefit-Cost Analysis

August 2024

A blue and gold emblem with a train

Description automatically generated

The 2024 USDOT Benefit-Cost Analysis (BCA) Guidance for Discretionary Grant Programs forms the basis for the methodologies employed to estimate and, subsequently, monetized benefits for the Broadway Reconstruction project.[[1]](#footnote-2) 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 Broadway Reconstruction from IH-45 to SH 255 Project (“Project”). The project limits are detailed in Table 1.

**Table 1.** Project Limits

|  |  |  |
| --- | --- | --- |
| Street | Terminus A | Terminus B |
| Broadway Street | Interstate 45 (IH-45) | SH 255 |

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# BCA Result Summary

Benefits and costs in real dollars and discounted real dollars are shown in the table below. The benefit-cost ratio is 5.36 in 2022 real dollars and 3.88 when discounted at 3.1%.

**Table 2.** BCA Summary

|  |  |  |
| --- | --- | --- |
| Scenario | $2022 Real Dollars | $2022 Real Dollars  3.1% Discount |
| Benefits | $251,172,700 | $159,289,100 |
| Costs | $46,899,800 | $41,064,300 |
| BCA | 5.36 | 3.88 |

# 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**.1 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 $52,884,200 (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 $46,899,800. These costs are discounted at 3.1% from the expenditure year to 2022, resulting in total discounted costs of $41,064,300

**Table 3.** Project Costs

|  |  |  |  |
| --- | --- | --- | --- |
| Cost | Nominal $  Year of Expenditure  No Discount | Real $  $2022  No Discount | 3.1% Discount  $2022 |
| Planning | $50,000 | $50,000 | $50,000 |
| Design/Environmental | $4,625,500 | $4,259,100 | $3,886,300 |
| Construction | $48,208,700 | $42,590,700 | $37,128,000 |
| **Project Costs** | $52,884,200 | $46,899,800 | $41,064,300 |

## 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 2028, with a projected 20-year operating period. Consequently, benefits are quantified over the 20-year period from 2028 to 2047.

## No-Build Scenario

The No-Build scenario assumes minimal planned improvements to the project corridor's 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 Build scenario entails total roadway reconstruction to include shared paths, intersection & accessibility improvements, railroad safety improvements, upgraded Hawk signals for safer school crossings, drainage improvements, traffic signal & street lighting upgrades, access management & roadway reconfiguration with wider median to accommodate future Metro LRT

**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]](#footnote-3)**

**Table 4.** Average Daily Traffic Volume

|  |  |  |  |
| --- | --- | --- | --- |
| Segment | 2028 | 2047 | CAGR |
| Broadway Street (IH-45 to SH 225) | 13,440 | 20,791 | 2.32% |

#### Daily Vehicle Miles Traveled

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

**Table 5.** Average Daily Vehicle Miles Traveled (**Without** Modal Diversion)

|  |  |  |  |
| --- | --- | --- | --- |
| Segment | Corridor Length  Miles | 2028 | 2047 |
| Broadway Street (IH-45 to SH 225) | 1.81 | 24,326 | 37,632 |

#### Daily Vehicle Miles Traveled with Modal Diversion

The benefits of active transportation improvements of the Project are mostly derived from the new projected walking and cycling trips diverted from automobile usage. New daily induced trips are gathered from the Activity-Connectivity Explorer (ACE) Advance viewer interactive web app on H-GAC website. The induced daily trips are multiplied by the pedestrian facility length (0.86 mi) and the bike facility length (2.38 mi) to estimate the VMT reduction derived from modal diversion.

**Table 6.** Daily VMT Reduced by Modal Diversion

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mode | Daily Induced Demand  2028 | Daily Induced Demand  2047 | Daily VMT Reduced  2028 | Daily VMT Reduced  2047 |
| Pedestrian | 75 | 115 | 64 | 99 |
| Bike | 180 | 278 | 428 | 662 |
| Total | 254 | 393 | 492 | 761 |
| Transit | 80 | 86 | 453 | 488 |

**Table 7.** Average Daily Vehicle Miles Traveled (**With** Modal Diversion)

|  |  |  |  |
| --- | --- | --- | --- |
| Segment | Corridor Length  Miles | 2028 | 2047 |
| Broadway Street (IH-45 to SH 225) | 1.81 | 23,834 | 36,871 |

# 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: Remaining Useful Life of Asset

The asset is expected to have a 50-year useful life. After 20 years of operation, 60% of its useful life will remain at the end of the planning horizon.

**Table 8.** Useful Life Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Useful Life Calculation | No Build | Build |
| Construction Cost | N/A | $25,554,000 |
| (x) Remaining Life at End of Planning Horizon | N/A | 60% |
| *Total in Real $* | *N/A* | *$25,554,447* |
| **Total Monetized Benefit Real $** | **$25,554,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$11,912,000** | |

#### Benefit 2: 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 9.** State of Good Repair Monetized Benefits

|  |  |  |
| --- | --- | --- |
| State of Good Repair Calculation | No Build | Build |
| On-Going Maintenance Cost | $1,138,000 | $172,000 |
| Rehab Cost | $12,192,000 | $0 |
| Residual Life of Rehab | ($3,479,000) | $0 |
| User Costs (Value of Travel Time) | $12,556,000 | $7,384,000 |
| Vehicle Wear and Tear | $2,903,000 | $351,000 |
| *Total in Real $* | *$25,310,000* | *$7,907,000* |
| **Total Monetized Benefit Real $** | **$17,402,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$10,008,000** | |

#### Benefit 3: Safety Improvements

The analysis uses the average number of crashes by type over the last 5 years (2018-2022) 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]](#footnote-4) 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.

**Table 10.** Roadway Related Crashes - Injury Data (5-Year Average)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Injury | First Harmful Event - Auto | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** |
| Non-Injury | 228 | 191 | 194 | 189 | 216 | 203.6 |
| Possible Injury | 29 | 30 | 45 | 37 | 37 | 35.6 |
| Non-Incap. Injury | 6 | 8 | 3 | 10 | 11 | 7.6 |
| Serious Injury | 1 | 3 | 3 | 1 | 5 | 2.6 |
| Fatality | 0 | 0 | 0 | 0 | 1 | 0.2 |
| Unknown Injury | 31 | 30 | 38 | 37 | 28 | 32.8 |

**Table 11.** Roadway Countermeasure #1 - 209, 304 Safety Treat Fixed Objects, Safety Lighting

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Injury | Roadway Countermeasure #1 - 209, 304 Safety Treat Fixed Objects, Safety Lighting  Reduction Factor: 72%  Service Life: 20 Years | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** | **Average**  **(Build)** |
| Non-Injury | 43 | 36 | 31 | 37 | 38 | 37.0 | 10.4 |
| Possible Injury | 7 | 10 | 7 | 3 | 11 | 7.6 | 2.1 |
| Non-Incap. Injury | 4 | 5 | 0 | 2 | 2 | 2.6 | 0.7 |
| Serious Injury | 1 | 1 | 0 | 0 | 2 | 0.8 | 0.2 |
| Fatality | 0 | 0 | 0 | 0 | 1 | 0.2 | 0.1 |
| Unknown Injury | 14 | 11 | 19 | 12 | 6 | 12.4 | 3.5 |

**Table 12.** Roadway Countermeasure #2 - 108,305 Improve Traffic Signals, Safety Lighting at Intersection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Injury | Roadway Countermeasure #2 - 108,305 Improve Traffic Signals, Safety Lighting at Intersection  Reduction Factor: 33%  Service Life: 15 Years | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** | **Average**  **(Build)** |
| Non-Injury | 46 | 46 | 23 | 38 | 33 | 37.2 | 24.9 |
| Possible Injury | 4 | 5 | 8 | 10 | 5 | 6.4 | 4.3 |
| Non-Incap. Injury | 1 | 0 | 0 | 3 | 4 | 1.6 | 1.1 |
| Serious Injury | 0 | 0 | 1 | 0 | 2 | 0.6 | 0.4 |
| Fatality | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| Unknown Injury | 5 | 6 | 0 | 5 | 7 | 4.6 | 3.1 |

**Table 13.** Roadway Countermeasure #3 - 303, 401 Resurfacing, Install Pavement Markings

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Injury | Roadway Countermeasure #3 - 303, 401 Resurfacing, Install Pavement Markings  Reduction Factor: 50%  Service Life: 10 Years | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** | **Average**  **(Build)** |
| Non-Injury | 139 | 109 | 140 | 114 | 145 | 129.4 | 64.7 |
| Possible Injury | 18 | 15 | 30 | 24 | 21 | 21.6 | 10.8 |
| Non-Incap. Injury | 1 | 3 | 3 | 5 | 5 | 3.4 | 1.7 |
| Serious Injury | 0 | 2 | 2 | 1 | 1 | 1.2 | 0.6 |
| Fatality | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| Unknown Injury | 12 | 13 | 19 | 20 | 15 | 15.8 | 7.9 |

**Table 14.** Pedestrian Related Crashes - Injury Data (5-Year Average)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Injury | First Harmful Event – Pedestrian | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** |
| Non-Injury | 5 | 0 | 8 | 7 | 1 | 4.2 |
| Possible Injury | 0 | 0 | 2 | 2 | 1 | 1.0 |
| Non-Incap. Injury | 0 | 0 | 0 | 1 | 0 | 0.2 |
| Serious Injury | 0 | 0 | 1 | 0 | 0 | 0.2 |
| Fatality | 0 | 0 | 1 | 0 | 0 | 0.2 |
| Unknown Injury | 1 | 0 | 0 | 0 | 0 | 0.2 |

**Table 15.** Pedestrian Countermeasure #1 - 304, 407 Safety Lighting, Install Sidewalks

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Injury | Pedestrian Countermeasure #1 - 304, 407 Safety Lighting, Install Sidewalks  Reduction Factor: 46%  Service Life: 15 Years | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** | **Average**  **(Build)** |
| Non-Injury | 5 | 0 | 8 | 7 | 1 | 4.2 | 2.3 |
| Possible Injury | 0 | 0 | 2 | 2 | 1 | 1.0 | 0.5 |
| Non-Incap. Injury | 0 | 0 | 0 | 1 | 0 | 0.2 | 0.1 |
| Serious Injury | 0 | 0 | 1 | 0 | 0 | 0.2 | 0.1 |
| Fatality | 0 | 0 | 1 | 0 | 0 | 0.2 | 0.1 |
| Unknown Injury | 1 | 0 | 0 | 0 | 0 | 0.2 | 0.1 |

**Table 16.** Bicycle Related Crashes - Injury Data (5-Year Average)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Injury | First Harmful Event – Bicycle | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** |
| Non-Injury | 0 | 0 | 2 | 1 | 13 | *3.2* |
| Possible Injury | 0 | 0 | 0 | 1 | 1 | *0.4* |
| Non-Incap. Injury | 0 | 0 | 1 | 0 | 1 | *0.4* |
| Serious Injury | 0 | 0 | 0 | 0 | 0 | *0.0* |
| Fatality | 0 | 0 | 0 | 0 | 0 | *0.0* |
| Unknown Injury | 0 | 0 | 0 | 0 | 1 | *0.2* |

**Table 17.** Bicycle Countermeasure #1 - Buffered bicycle lane on 4-lane roads

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Injury | Bicycle Countermeasure #1 - Buffered bicycle lane on 4-lane roads  Reduction Factor: 63%  Service Life: 20 Years | | | | | | |
| **2019** | **2020** | **2021** | **2022** | **2023** | **Average**  **(No-Build)** | **Average**  **(Build)** |
| Non-Injury | 0 | 0 | 2 | 1 | 13 | *3.2* | *1.2* |
| Possible Injury | 0 | 0 | 0 | 1 | 1 | *0.4* | *0.1* |
| Non-Incap. Injury | 0 | 0 | 1 | 0 | 1 | *0.4* | *0.1* |
| Serious Injury | 0 | 0 | 0 | 0 | 0 | *0.0* | *0.0* |
| Fatality | 0 | 0 | 0 | 0 | 0 | *0.0* | *0.0* |
| Unknown Injury | 0 | 0 | 0 | 0 | 1 | *0.2* | *0.1* |

**Table 18.** Safety Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Motorist Safety Calculation | No Build | Build |
| Countermeasure #1: 209, 303 Safety Treat Fixed Objects, Safety Lighting | $155,812,000 | $43,627,000 |
| Countermeasure #2: 108,305 Improve Traffic Signals, Safety Lighting at Intersection | $44,833,000 | $30,038,000 |
| Countermeasure #3: 303, 401 Resurfacing, Install Pavement Markings | $87,186,000 | $43,593,000 |
| *Total in Real $* | *$287,830,200* | *$117,258,000* |
| **Total Monetized Benefit Real $** | **$170,572,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$112,773,000** | |

**Table 19.** Safety – Pedestrian Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Safety – Pedestrian Monetized Benefits | No Build | Build |
| Countermeasure #1: 304, 407 Safety Lighting, Install Sidewalks | $44,409,000 | $23,981,000 |
| *Total in Real $* | *$44,409,000* | *$23,981,000* |
| **Total Monetized Benefit Real $** | **$20,428,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$13,856,000** | |

**Table 20.** Safety – Bicycle Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Safety – Bicycle Monetized Benefits | No Build | Build |
| Countermeasure #1: Buffered bicycle lane on 4-lane roads | $3,954,000 | $1,463,000 |
| *Total in Real $* | *$3,954,000* | *$1,463,000* |
| **Total Monetized Benefit Real $** | **$2,491,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$1,576,000** | |

**Table 21.** Safety – All Modes

|  |  |  |
| --- | --- | --- |
| Safety – Total Benefits | No Build | Build |
| Auto | $287,830,200 | $117,258,000 |
| Pedestrian | $44,409,300 | $23,981,000 |
| Bicycle | $3,954,400 | $1,463,000 |
| *Total in Real $* | *$336,193,900* | *$142,702,000* |
| **Total Monetized Benefit Real $** | **$193,491,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$128,205,000** | |

#### Benefit 4: Emissions

The Project will install new sidewalks that can accommodate both pedestrians and bicyclists, these amenities will result in modal shift with a reduction in overall VMT.

H-GAC models NOx using the following emissions factor:

* Nitrogen Oxides (NOX): 0.19 grams (g) per VMT

United Environmental Protection Agency (EPA) uses the following emissions factor for CO2:[[4]](#footnote-5)

* Carbon Dioxide (CO2): 0.0089 metric tons per gallon of gasoline used.

NOx and CO2 have measurable societal economic impacts on the economy. The 2023 USDOT BCA Guide provides recommended monetized values of damage costs for NOx and CO2 emissions per metric ton by year between 2022 and 2050. These values are used to calculate the Project’s benefit derived from the reduction of harmful air pollutants.

**Table 22.** Emission Benefits

|  |  |  |
| --- | --- | --- |
| Emission Calculation | No Build | Build |
| Nitrogen Oxides (NOX) | $1,472,000 | $1,663,000 |
| Carbon Dioxide (CO2) | $18,892,000 | $21,541,000 |
| *Total in Real $* | $20,364,146 | $23,204,278 |
| **Total Monetized Benefit Real $** | **$2,840,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$1,810,000** | |

#### Benefit 5: Facility Improvements

Improvements to pedestrian, cycling, transit facilities, and transit vehicles often provide amenities that can improve the quality and comfort of journeys made by active transportation (e.g., cyclists and pedestrians) and public transportation users. The improvements will not only benefit the existing users, but also encourage more people to walk, bike, and use public transit. The methodology used to estimate new active or public transportation demand is explained in the Major Key Data Points section on page 3. The 2023 USDOT BCA Guidance provides recommended monetized values for facility improvement benefits based on research on system users’ preferences.

|  |
| --- |
| Sidewalk Expansion Benefit = $0.11 \* Added Width (foot) \* (½ New Walking Trips) \* Trip Length |
| Trip Length = Proposed Length of Expanded Sidewalk or 0.86 Miles (whichever is smaller) |

|  |
| --- |
| Cycling Facility Improvement Benefit = Value per Cycling Mile \* (½ New Cycling Trips) \* Trip Length |
| Trip Length = Proposed Cycling Facility Length or 2.38 Miles (whichever is smaller) |

**Table 23.** Facility Improvements Benefits

|  |  |  |
| --- | --- | --- |
| Facility Improvements Calculation | No Build | Build |
| Pedestrian Facility | N/A | $1,348,770 |
| Bike Facility | N/A | $2,339,648 |
| *Total in Real $* | *N/A* | *$3,688,418* |
| **Total Monetized Benefit Real $** | **$3,689,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$2,280,000** | |

#### Benefit 6: Mortality Reduction

To monetize the reduction in mortality risks associated with increased walking, the 2023 USDOT BCA Guide recommends $7.20 ($2021) per induced walking trip. This is based on the following factors: an assumed average walking speed of 3.2 miles per hour, an assumed average age of the relevant age range (20-74 years) of 45, a corresponding baseline mortality risk of 267.1 per 100,000, an annual risk reduction of 8.6 percent per daily mile walked, and an average walking trip distance of 0.86 miles. This monetized value can only be applied to trips induced from non-active transportation modes within the relevant age range. A general assumption of 68% of overall induced trips falling into the walking age range (20-74 years), assuming a distribution matching the national average, is applied in the absence of more localized data on the proportion of the expected users falling into the age range.

|  |
| --- |
| Mortality Reduction Benefits = Number of New Walking Trips Induced from Non-Active Transportation Modes \* 68% \* $7.20 |

The 2023 USDOT BCA Guide recommends $6.42 ($2021) per induced cycling trip to monetize reduced mortality risks associated with increased cycling. It is based on an assumed average cycling speed of 9.8 miles per hour, an assumed average age of the relevant age range (20-64 years) of 42, a corresponding baseline mortality risk of 217.9 per 100,000, an annual risk reduction of 4.3 percent per daily mile cycled, and an average cycling trip distance of 2.38 miles. This monetization value can only be applied to trips induced from non-active transportation modes within the relevant age ranges. A general assumption of 59% of overall induced trips falling into the cycling age range (20-64 years), assuming a distribution matching the national average, is applied in the absence of more localized data on the proportion of the expected users falling into the age range.

|  |
| --- |
| Mortality Reduction Benefits = Number of New Cycling Trips Induced from Non-Active Transportation Modes \* 59% \* $6.42 |

**Table 24.** Mortality Reduction Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Mortality Reduction Calculation | No Build | Build |
| Pedestrian Facility | N/A | $2,523,372 |
| Bike Facility | N/A | $4,705,911 |
| *Total in Real $* | *N/A* | *$7,229,283* |
| **Total Monetized Benefit Real $** | **$7,229,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$4,469,000** | |

#### Benefit 7: Other Externalities

The 2023 USDOT BCA Guide provides recommended monetized values for external highway use costs. The recommended costs per vehicle mile traveled including all kinds of vehicles in urban locations are $0.144 for congestion and $0.0048 for noise.

|  |
| --- |
| Other Externalities Reduction = VMT \* ($0.144+$0.0048) |
| VMT = Vehicle Miles Traveled Reduced because of Modal Diversion |

**Table 25.** Other Externalities Monetized Benefits

|  |  |  |
| --- | --- | --- |
| Other Externalities Calculation | No Build | Build |
| Congestion Externality | $4,320,000 | $5,256,000 |
| Noise Externality | $143,000 | $174,000 |
| *Total in Real $* | *$4,463,450* | *$5,429,924* |
| **Total Monetized Benefit Real $** | **$966,000** | |
| **Total Monetized Benefit Discounted @ 3.1%** | **$604,000** | |

# Summary of Benefits and Costs

The table below summarizes the Project benefits detailed above.

**Table 26***.* 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** | Remaining Useful Life of Asset | The current asset has 0% remaining useful life | Replace infrastructure within public right-of-way | Extend useful life | $25,554,000 | $11,912,000 |
| **2** | State of Good Repair | Ongoing expensive maintenance of roadway pavement | Low maintenance required of new facility through the planning horizon | Maintenance cost savings | $17,402,000 | $10,008,000 |
| **3** | Safety Benefits | Outdated design, disproportionally higher crash rates | Safety improvement resulting in reduction in traffic crashes | Reduced crashes resulting in reduced fatalities and injuries | $193,491,000 | $128,205,000 |
| **4** | Emissions Reduction | The current facilities are not conductive for active transportation | Improvements to the existing facilities will induce demand for walking and biking | Reduced emission derived from modal shift from driving personal vehicles to walking and biking | $2,840,100 | $1,809,900 |
| **5** | Facility Improvements | The current facilities are not conductive for active transportation or using transit | Improvements to the current facilities will improve the quality or comfort of journeys | Improved comfort for active transportation and public transportation users | $3,689,000 | $2,280,000 |
| **6** | Mortality Reduction Benefits | Roadway is not conducive for active transportation. | New and improved active transportation facilities will encourage more walking, cycling and transit | Reduced mortality risks associated with increased walking and cycling | $7,229,000 | $4,469,000 |
| **7** | Externalities Reduction | Roadway is not conducive for active transportation. | New and improved facilities will encourage more walking, cycling and transit | Reduced various externalities | $966,500 | $604,200 |
| **Totals** | | | | | **$251,172,700** | **$159,289,100** |

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> [↑](#footnote-ref-2)
2. TxDOT – Statewide Planning Map. Accessed on March 2024, from https://www.txdot.gov/apps/statewide\_mapping/StatewidePlanningMap.html [↑](#footnote-ref-3)
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> [↑](#footnote-ref-4)
4. Environmental Protection Agency. (n.d.). EPA. Retrieved April 2024, from <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references> [↑](#footnote-ref-5)