



**Downtown Westminster
Smart City
Mobility Initiative**

TIGER IX DISCRETIONARY GRANT PROJECT
FISCAL YEAR 2017

**ATTACHMENT F -
COST-BENEFIT ANALYSIS**



Benefit-Cost Analysis

Downtown Westminster Smart City Mobility Initiative

Date: October 13, 2017

Summary

This cost-benefit analysis weighs the estimated costs and estimated benefits that would accrue for the proposed Downtown Westminster Smart City Mobility Initiative from the start of a 2016 base year through a 20-year post-construction period. Below is a summary of the undiscounted findings of the cost-benefit analysis (values in 2016 constant dollars):

- The proposed project will **cost an estimated \$8,046,000** to construct and, on average, an estimated \$13,000 per year to maintain (undiscounted and rounded).
- After construction, the proposed project would encourage an estimated **reduction of between 24.6 million and 35.7 million vehicle-miles traveled (VMT)**, helping to **save the tax payers an estimated \$2.9 million to \$4.1 million in roadway maintenance costs** over the life of the project.
- This estimated reduction in VMT could help prevent between 11,000 and 16,000 fewer metric tons of greenhouse gases and criteria pollutants from entering the atmosphere between 2016 and 2040, the equivalent of **\$0.7 million to \$1.0 million in avoided environmental damage or mitigation costs**.
- The proposed project would encourage more walking and bicycling trips, resulting, on average over the 20-year post-construction period, in 280 to 380 more people per year meeting the Centers for Disease Control's recommended amount of weekly physical activity, helping residents save **\$8.3 million to 11.2 million in healthcare expenses** over the life of the project.
- Through construction of the overcrossing, the proposed project will help **address an estimated 4.7 collisions per year and save residents \$2.7 million in collision costs** between 2016 and 2040.
- With a safer, more efficient street network for all modes of travel, Westminster residents will **save an estimated \$1.0 million to \$1.5 million in traffic congestion costs, \$6.4 million in travel time savings, and \$14.7 million to \$20.4 million in household transportation costs** over the life of the project.

At a 7 percent real discount rate, the net present value of the proposed overcrossing in Westminster is between \$10.8 million and \$14.0 million, the estimated internal rate of return is between 17.2 percent and 19.7 percent, and the **benefit-cost ratio is between 2.7:1 and 3.2:1**.¹

¹ For a full list of links, sources, and notes, please see the attached Excel workbook.

Project Background

Method

The approach used in this cost-benefit analysis expands on the methods suggested by the National Cooperative Highway Research Program (NCHRP) Report 552: *Guidelines for Analysis of Investments in Bicycle Facilities* by incorporating detailed local demographic information and using new data and research that has become available since *Guidelines for Analysis* was published in 2006. One notable alternation is the consideration of benefits from both bicycling and walking activity by using different impact areas for each mode. By comparison, *Guidelines for Analysis* only provides guidance for measuring bicycling benefits and does not quantify pedestrian benefits for sidewalks or multi-use paths. Another alteration is the estimate of utilitarian (non-commute) and school trips in addition to work commute trips. This addition helps capture the full range of bicycling and walking trips in the project area. The cost-benefit analysis also considers local travel patterns, trip distances, and impacts on public health to create a complete, detailed picture of benefits generated by the proposed facilities. A major advantage of this expanded approach is the ability to quantify benefits at a line-item level for each distinct type of benefit associated with the recommended project.

Study Area and Project Description

The Downtown Westminster Smart City Mobility Initiative is located in the City of Westminster, Colorado. The proposed project includes the widening of Sheridan Boulevard (SH 95) to allow full utilization of the roadway U.S. 36 overpass and the construction of an at-grade 'smart' underpass that will connect Downtown Westminster to the existing Regional Transportation District (RTD) Sheridan Station.

The smart underpass will incorporate sensors and technological controls to provide a platform for future smart city solutions. It will utilize the Internet of Things (IoT) technologies to incorporate smarty city solutions such as intelligent lighting, autonomous transit vehicles, connected bus shelters, and interactive touchscreen displays.

Baseline & Alternative

The baseline scenarios for the cost-benefit analysis assumes a no-build (or do-nothing) scenario that considers future travel patterns if there were no new capital transportation projects built in the study area and the population were to grow at the same proportion as the estimated countywide projections.²

In addition to the baseline scenario, three other scenarios were considered: lane widening, underpass + bikeway, and combined. The lane widening and underpass + bikeway scenarios represent a breakdown of the combined scenario into two project components with independent utility.

Project Matrix

| Scenarios | Current Status/Baseline and Problem to be Addressed | Change to Baseline or Alternatives | Type of Impacts |
|---------------------|---|--|---|
| Lane Widening | 3-lanes on Sheridan Boulevard in the southbound direction creating a bottleneck for motor vehicles. | Widen Sheridan Boulevard (SH 95) from 2 to 3 lanes in southbound to allow the maximum efficiency of the U.S. 36 overpass and exit ramps. | Improve value of travel time savings. |
| Underpass + Bikeway | Disconnected U.S. 36 bikeway and dangerous at-grade crossing / | Construct grade-separated 'smart' multi-modal underpass to connect future transit riders, bicyclists, and pedestrians at Sheridan Station to the Downtown Westminster development. | Reduced motor vehicle trips, collisions, emissions, household transportation costs, congestion costs, and healthcare costs. |

² Population projections provided by the Denver Regional Council of Governments.

Demand Forecasting

Base year employment, population, school enrollment, and commute mode share estimates are derived from 2011-2014 five-year estimates from the American Community Survey. The baseline commute walk mode share for the project study area is 0.30 percent and the baseline bicycle commute mode share is 0.38 percent. To estimate the increase in walk and bicycle commute mode share, counts on the U.S. 36 Bikeway from the Denver Regional Council of Governments (DRCOG) near the project study area (32 existing pedestrians and an average of 59 existing bicyclists at U.S. 36 and Sheridan Boulevard) were compared to counts at an existing segment of the U.S. 36 Bikeway that is representative of the proposed facility (195 existing pedestrians and 106 bicyclists). The assumed 509 percent increase in pedestrians and 80 percent increase in bicyclists was applied to the existing commute mode share for a mid-estimate of 1.82 percent walk commute mode share and 0.65 percent bicycle commute mode share. Because these are high-level estimates, the cost-benefit incorporates a sensitivity analysis of -25 percent for a low estimate and +25 percent for a high estimate.

Inflation Adjustment

This cost-benefit mode assumes a common base year of 2016, with the effects of inflation netted out. Inflation adjustments are based on OMB Circular A-94 and OMB Circular A-4, and the Gross Domestic Product Deflator is used as a general method for converting nominal dollars into real dollars.

Discounting

After accounting for effects of inflation to express costs and benefits in real dollars, a second adjustment was made to account for the time value of money. These discounted values reflect the principle that benefits and costs that occur sooner in time are more highly value than those that occur in the more distant future, and that there is thus a cost associated with diverting the resources needed for an investment from other productive uses. This analysis uses a real discount rate of 7 percent per year to discount streams of benefits and costs to their present value.

Analysis Period & Useful Life

The useful life for the proposed lane widening is 65 years from the end of construction and is 75 years for the underpass + bikeway. The combined scenario assumes the more conservative useful life of 65 years. The analysis period for the cost-benefit analysis is 2016 to 2040. Benefit estimates only accrue in the post-construction period of 2021 (first year after construction) to the end of the project's useful life in 2040. Because the analysis period is longer than the estimated useful life of the project, a residual value is claimed for this project in the last year of the analysis.

Costs

The proposed lane widening component is estimated to cost \$3,423,767 over a three-year design and construction period (2018-2020), with an estimated annual maintenance cost of \$5,346. The proposed underpass and bikeways are estimated to cost \$4,622,233 over a three-year design and construction period (2018-2020), with an estimated annual maintenance cost of \$7,217. Combined, the proposed project is estimated to cost \$8,046,000 over a three-year design and construction period (2018-2020), with an estimated annual maintenance cost of \$12,563. See **Table 1** for a full break down of capital and maintenance costs for each alternative.

Table 1: Estimated Annual Project Capital and Maintenance Costs (Low, Mid, and High)

| Project Year | Year | No Build | Lane Widening | Underpass + Bikeway | Combined |
|--------------|------|----------|---------------|---------------------|-------------|
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$101,275 | \$136,725 | \$238,000 |
| Year -1 | 2019 | \$0 | \$365,100 | \$492,900 | \$858,000 |
| Year 0 | 2020 | \$0 | \$2,957,392 | \$3,992,608 | \$6,950,000 |
| Year 1 | 2021 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 2 | 2022 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 3 | 2023 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 4 | 2024 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 5 | 2025 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 6 | 2026 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 7 | 2027 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 8 | 2028 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 9 | 2029 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 10 | 2030 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 11 | 2031 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 12 | 2032 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 13 | 2033 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 14 | 2034 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 15 | 2035 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 16 | 2036 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 17 | 2037 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 18 | 2038 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 19 | 2039 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| Year 20 | 2040 | \$500 | \$5,346 | \$7,217 | \$12,563 |
| AVERAGE | | \$0 | \$141,000 | \$191,000 | \$332,000 |
| TOTAL | | \$10,000 | \$3,530,687 | \$4,766,573 | \$8,297,260 |

Benefits

Estimated safety, state of good repair, economic competitiveness, environmental sustainability, and quality of life are based on estimated reductions in vehicle-miles traveled resulting from people shifting away from existing private motor vehicle trips to new, future bicycle, pedestrian, and transit trips. To estimate this reduction, this analysis uses the following set of multipliers.

First, it is assumed that for every one commute trip by bicycle, there is 1.6 utilitarian bicycle trips. And for every one commute trip by foot, there are 4.3 utilitarian walk trips. Social and recreational trips were not included in this analysis.

*Table 2: Trip Purpose Multipliers**

| | Bike | Walk |
|------------------------------|-------|-------|
| Utilitarian Trip Multiplier* | 1.611 | 4.323 |

*Estimated by comparing local commute mode share data from the American Community Survey (2011-2015) to the National Household Travel Survey (2009).

Second, it is assumed that not all private motor vehicle trips are fully replaced by bicycle and walk trips. The table below shows the motor vehicle trip replacement factors by trip purpose.

*Table 3: Motor Vehicle Trip Replacement Factors**

| | Bike | Walk |
|---------------------------|-------|-------|
| Commuter Trips | 0.109 | 0.110 |
| College Trips | 0.766 | 0.841 |
| K-12 Trips | 0.377 | 0.494 |
| Utilitarian Trips | 0.528 | 0.549 |
| Social/Recreational Trips | 0.155 | 0.155 |

*Estimated by comparing local commute mode share data from the American Community Survey (2011-2015) to the National Household Travel Survey (2009).

After the trip replacement is estimated, an assumption on trip distance was made. Those distance per mile trip estimates are shown in the table below.

Table 4: Trip Distance (miles)

| | Bike | Walk |
|---------------------------------|-------|-------|
| Commute Trips ⁱⁱ | 3.540 | 0.670 |
| College Trips ⁱⁱⁱ | 2.090 | 0.480 |
| K-12 School Trips ^{iv} | 0.770 | 0.360 |
| Utilitarian Trips ^v | 1.890 | 0.670 |

The end result of the conversions are estimates of a change in mode share, as shown in **Table 5**, **Table 6**, and **Table 7**.

Table 5: Estimated Mode Shift (Low)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction |
| Year -4 | 2016 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 |
| Year -3 | 2017 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 |
| Year -2 | 2018 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 |
| Year -1 | 2019 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 |
| Year 0 | 2020 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 |
| Year 1 | 2021 | 621,347 | 795,165 | 621,347 | 795,165 | 636,262 | 814,680 | 636,262 | 814,680 |
| Year 2 | 2022 | 619,383 | 797,232 | 619,383 | 797,232 | 649,479 | 836,610 | 649,479 | 836,610 |
| Year 3 | 2023 | 617,179 | 799,139 | 617,179 | 799,139 | 662,721 | 858,728 | 662,721 | 858,728 |
| Year 4 | 2024 | 614,733 | 800,884 | 614,733 | 800,884 | 675,989 | 881,032 | 675,989 | 881,032 |
| Year 5 | 2025 | 612,048 | 802,469 | 612,048 | 802,469 | 689,282 | 903,523 | 689,282 | 903,523 |
| Year 6 | 2026 | 609,121 | 803,892 | 609,121 | 803,892 | 702,600 | 926,202 | 702,600 | 926,202 |
| Year 7 | 2027 | 605,954 | 805,154 | 605,954 | 805,154 | 715,945 | 949,067 | 715,945 | 949,067 |
| Year 8 | 2028 | 602,547 | 806,256 | 602,547 | 806,256 | 729,314 | 972,120 | 729,314 | 972,120 |
| Year 9 | 2029 | 598,898 | 807,196 | 598,898 | 807,196 | 742,709 | 995,359 | 742,709 | 995,359 |
| Year 10 | 2030 | 595,010 | 807,975 | 595,010 | 807,975 | 756,130 | 1,018,786 | 756,130 | 1,018,786 |
| Year 11 | 2031 | 590,880 | 808,594 | 590,880 | 808,594 | 769,576 | 1,042,399 | 769,576 | 1,042,399 |
| Year 12 | 2032 | 586,510 | 809,051 | 586,510 | 809,051 | 783,047 | 1,066,200 | 783,047 | 1,066,200 |
| Year 13 | 2033 | 581,900 | 809,348 | 581,900 | 809,348 | 796,545 | 1,090,187 | 796,545 | 1,090,187 |
| Year 14 | 2034 | 577,049 | 809,483 | 577,049 | 809,483 | 810,067 | 1,114,362 | 810,067 | 1,114,362 |
| Year 15 | 2035 | 571,957 | 809,457 | 571,957 | 809,457 | 823,615 | 1,138,723 | 823,615 | 1,138,723 |
| Year 16 | 2036 | 566,625 | 809,271 | 566,625 | 809,271 | 837,188 | 1,163,272 | 837,188 | 1,163,272 |
| Year 17 | 2037 | 561,052 | 808,923 | 561,052 | 808,923 | 850,787 | 1,188,008 | 850,787 | 1,188,008 |
| Year 18 | 2038 | 555,238 | 808,414 | 555,238 | 808,414 | 864,412 | 1,212,930 | 864,412 | 1,212,930 |
| Year 19 | 2039 | 549,184 | 807,745 | 549,184 | 807,745 | 878,062 | 1,238,040 | 878,062 | 1,238,040 |
| Year 20 | 2040 | 542,889 | 806,914 | 542,889 | 806,914 | 891,737 | 1,263,337 | 891,737 | 1,263,337 |
| AVERAGE | | 593,175 | 799,985 | 593,175 | 799,985 | 732,614 | 982,425 | 732,614 | 982,425 |
| TOTAL | | 14,829,385 | 19,999,617 | 14,829,385 | 19,999,617 | 18,315,347 | 24,560,617 | 18,315,347 | 24,560,617 |

Table 6: Estimated Mode Shift (Mid)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction |
| Year -4 | 2016 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 |
| Year -3 | 2017 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 |
| Year -2 | 2018 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 |
| Year -1 | 2019 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 |
| Year 0 | 2020 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 |
| Year 1 | 2021 | 621,347 | 795,165 | 621,347 | 795,165 | 652,839 | 838,435 | 652,839 | 838,435 |
| Year 2 | 2022 | 619,383 | 797,232 | 619,383 | 797,232 | 682,928 | 884,544 | 682,928 | 884,544 |
| Year 3 | 2023 | 617,179 | 799,139 | 617,179 | 799,139 | 713,338 | 931,264 | 713,338 | 931,264 |
| Year 4 | 2024 | 614,733 | 800,884 | 614,733 | 800,884 | 744,070 | 978,595 | 744,070 | 978,595 |
| Year 5 | 2025 | 612,048 | 802,469 | 612,048 | 802,469 | 775,123 | 1,026,536 | 775,123 | 1,026,536 |
| Year 6 | 2026 | 609,121 | 803,892 | 609,121 | 803,892 | 806,497 | 1,075,088 | 806,497 | 1,075,088 |
| Year 7 | 2027 | 605,954 | 805,154 | 605,954 | 805,154 | 838,192 | 1,124,250 | 838,192 | 1,124,250 |
| Year 8 | 2028 | 602,547 | 806,256 | 602,547 | 806,256 | 870,209 | 1,174,023 | 870,209 | 1,174,023 |
| Year 9 | 2029 | 598,898 | 807,196 | 598,898 | 807,196 | 902,547 | 1,224,407 | 902,547 | 1,224,407 |
| Year 10 | 2030 | 595,010 | 807,975 | 595,010 | 807,975 | 935,206 | 1,275,402 | 935,206 | 1,275,402 |
| Year 11 | 2031 | 590,880 | 808,594 | 590,880 | 808,594 | 968,186 | 1,327,007 | 968,186 | 1,327,007 |
| Year 12 | 2032 | 586,510 | 809,051 | 586,510 | 809,051 | 1,001,488 | 1,379,223 | 1,001,488 | 1,379,223 |
| Year 13 | 2033 | 581,900 | 809,348 | 581,900 | 809,348 | 1,035,110 | 1,432,050 | 1,035,110 | 1,432,050 |
| Year 14 | 2034 | 577,049 | 809,483 | 577,049 | 809,483 | 1,069,054 | 1,485,487 | 1,069,054 | 1,485,487 |
| Year 15 | 2035 | 571,957 | 809,457 | 571,957 | 809,457 | 1,103,320 | 1,539,535 | 1,103,320 | 1,539,535 |
| Year 16 | 2036 | 566,625 | 809,271 | 566,625 | 809,271 | 1,137,906 | 1,594,193 | 1,137,906 | 1,594,193 |
| Year 17 | 2037 | 561,052 | 808,923 | 561,052 | 808,923 | 1,172,814 | 1,649,463 | 1,172,814 | 1,649,463 |
| Year 18 | 2038 | 555,238 | 808,414 | 555,238 | 808,414 | 1,208,043 | 1,705,342 | 1,208,043 | 1,705,342 |
| Year 19 | 2039 | 549,184 | 807,745 | 549,184 | 807,745 | 1,243,593 | 1,761,833 | 1,243,593 | 1,761,833 |
| Year 20 | 2040 | 542,889 | 806,914 | 542,889 | 806,914 | 1,279,464 | 1,818,934 | 1,279,464 | 1,818,934 |
| AVERAGE | | 593,175 | 799,985 | 593,175 | 799,985 | 887,592 | 1,204,507 | 887,592 | 1,204,507 |
| TOTAL | | 14,829,385 | 19,999,617 | 14,829,385 | 19,999,617 | 22,189,808 | 30,112,666 | 22,189,808 | 30,112,666 |

Table 7: Estimated Mode Shift (High)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
| | | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction | Annual Bike/Ped Trips | Annual VMT Reduction |
| Year -4 | 2016 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 | 596,882 | 761,885 |
| Year -3 | 2017 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 | 603,429 | 769,648 |
| Year -2 | 2018 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 | 609,976 | 777,411 |
| Year -1 | 2019 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 | 616,523 | 785,174 |
| Year 0 | 2020 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 | 623,071 | 792,937 |
| Year 1 | 2021 | 621,347 | 795,165 | 621,347 | 795,165 | 621,347 | 795,165 | 669,415 | 862,190 |
| Year 2 | 2022 | 619,383 | 797,232 | 619,383 | 797,232 | 619,383 | 797,232 | 716,377 | 932,478 |
| Year 3 | 2023 | 617,179 | 799,139 | 617,179 | 799,139 | 617,179 | 799,139 | 763,956 | 1,003,801 |
| Year 4 | 2024 | 614,733 | 800,884 | 614,733 | 800,884 | 614,733 | 800,884 | 812,151 | 1,076,157 |
| Year 5 | 2025 | 612,048 | 802,469 | 612,048 | 802,469 | 612,048 | 802,469 | 860,964 | 1,149,548 |
| Year 6 | 2026 | 609,121 | 803,892 | 609,121 | 803,892 | 609,121 | 803,892 | 910,394 | 1,223,974 |
| Year 7 | 2027 | 605,954 | 805,154 | 605,954 | 805,154 | 605,954 | 805,154 | 960,440 | 1,299,433 |
| Year 8 | 2028 | 602,547 | 806,256 | 602,547 | 806,256 | 602,547 | 806,256 | 1,011,104 | 1,375,927 |
| Year 9 | 2029 | 598,898 | 807,196 | 598,898 | 807,196 | 598,898 | 807,196 | 1,062,384 | 1,453,456 |
| Year 10 | 2030 | 595,010 | 807,975 | 595,010 | 807,975 | 595,010 | 807,975 | 1,114,282 | 1,532,018 |
| Year 11 | 2031 | 590,880 | 808,594 | 590,880 | 808,594 | 590,880 | 808,594 | 1,166,796 | 1,611,615 |
| Year 12 | 2032 | 586,510 | 809,051 | 586,510 | 809,051 | 586,510 | 809,051 | 1,219,928 | 1,692,246 |
| Year 13 | 2033 | 581,900 | 809,348 | 581,900 | 809,348 | 581,900 | 809,348 | 1,273,676 | 1,773,912 |
| Year 14 | 2034 | 577,049 | 809,483 | 577,049 | 809,483 | 577,049 | 809,483 | 1,328,042 | 1,856,612 |
| Year 15 | 2035 | 571,957 | 809,457 | 571,957 | 809,457 | 571,957 | 809,457 | 1,383,024 | 1,940,346 |
| Year 16 | 2036 | 566,625 | 809,271 | 566,625 | 809,271 | 566,625 | 809,271 | 1,438,624 | 2,025,115 |
| Year 17 | 2037 | 561,052 | 808,923 | 561,052 | 808,923 | 561,052 | 808,923 | 1,494,840 | 2,110,918 |
| Year 18 | 2038 | 555,238 | 808,414 | 555,238 | 808,414 | 555,238 | 808,414 | 1,551,674 | 2,197,755 |
| Year 19 | 2039 | 549,184 | 807,745 | 549,184 | 807,745 | 549,184 | 807,745 | 1,609,124 | 2,285,626 |
| Year 20 | 2040 | 542,889 | 806,914 | 542,889 | 806,914 | 542,889 | 806,914 | 1,667,191 | 2,374,532 |
| AVERAGE | | 593,175 | 799,985 | 593,175 | 799,985 | 593,175 | 799,985 | 1,042,571 | 1,426,589 |
| TOTAL | | 14,829,385 | 19,999,617 | 14,829,385 | 19,999,617 | 14,829,385 | 19,999,617 | 26,064,268 | 35,664,715 |

Safety

This analysis looked at historic collision data between January 1, 2007 and December 31, 2016. Over that time period, there were 47 reported collisions resulting in an injury, or an average of 4.7 collisions per year. Because no injury severity data was available, it was assumed that each injury was a minor injury. Estimated undiscounted annual safety benefits are shown in **Table 8**.

Table 8: Estimated Undiscounted Annual Safety Benefits (Low, Mid, and High)

| Project Year | Year | No Build | Lane Widening | Underpass + Bikeway | Combined |
|--------------|---------|----------|---------------|---------------------|-------------|
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 2 | 2022 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 3 | 2023 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 4 | 2024 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 5 | 2025 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 6 | 2026 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 7 | 2027 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 8 | 2028 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 9 | 2029 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 10 | 2030 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 11 | 2031 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 12 | 2032 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 13 | 2033 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 14 | 2034 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 15 | 2035 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 16 | 2036 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 17 | 2037 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 18 | 2038 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 19 | 2039 | \$0 | \$0 | \$137,000 | \$137,000 |
| Year 20 | 2040 | \$0 | \$0 | \$137,000 | \$137,000 |
| | AVERAGE | \$0 | \$0 | \$110,000 | \$110,000 |
| | TOTAL | \$0 | \$0 | \$2,740,000 | \$2,740,000 |

State of Good Repair

For every one mile of vehicle-miles traveled (VMT) reduced, it is assumed to generate a value of \$0.14 in roadway maintenance cost savings.

Table 9: State of Good Repair Multiplier

| | Value/ VMT |
|--|------------|
| Roadway Maintenance Cost Savings ^{vi} | \$0.14 |

These per VMT values applied to the estimated VMT reduction are shown in **Table 10**, **Table 11**, and **Table 12**.

Table 10: Estimated Undiscounted Annual State of Good Repair Benefits (Low)

| Project Year | Year | No Build | Lane Widening | Underpass + Bikeway | Combined |
|--------------|---------|-----------|---------------|---------------------|-----------|
| Year -4 | 2016 | 0 | 0 | 0 | 0 |
| Year -3 | 2017 | 0 | 0 | 0 | 0 |
| Year -2 | 2018 | 0 | 0 | 0 | 0 |
| Year -1 | 2019 | 0 | 0 | 0 | 0 |
| Year 0 | 2020 | 0 | 0 | 0 | 0 |
| Year 1 | 2021 | 115,041 | 115,041 | 116,923 | 116,923 |
| Year 2 | 2022 | 115,340 | 115,340 | 119,138 | 119,138 |
| Year 3 | 2023 | 115,616 | 115,616 | 121,364 | 121,364 |
| Year 4 | 2024 | 115,869 | 115,869 | 123,599 | 123,599 |
| Year 5 | 2025 | 116,098 | 116,098 | 125,845 | 125,845 |
| Year 6 | 2026 | 116,304 | 116,304 | 128,101 | 128,101 |
| Year 7 | 2027 | 116,486 | 116,486 | 130,367 | 130,367 |
| Year 8 | 2028 | 116,646 | 116,646 | 132,643 | 132,643 |
| Year 9 | 2029 | 116,782 | 116,782 | 134,930 | 134,930 |
| Year 10 | 2030 | 116,895 | 116,895 | 137,227 | 137,227 |
| Year 11 | 2031 | 116,984 | 116,984 | 139,535 | 139,535 |
| Year 12 | 2032 | 117,050 | 117,050 | 141,852 | 141,852 |
| Year 13 | 2033 | 117,093 | 117,093 | 144,180 | 144,180 |
| Year 14 | 2034 | 117,113 | 117,113 | 146,518 | 146,518 |
| Year 15 | 2035 | 117,109 | 117,109 | 148,867 | 148,867 |
| Year 16 | 2036 | 117,082 | 117,082 | 151,226 | 151,226 |
| Year 17 | 2037 | 117,032 | 117,032 | 153,595 | 153,595 |
| Year 18 | 2038 | 116,958 | 116,958 | 155,974 | 155,974 |
| Year 19 | 2039 | 116,861 | 116,861 | 158,363 | 158,363 |
| Year 20 | 2040 | 116,741 | 116,741 | 160,763 | 160,763 |
| | AVERAGE | 93,244 | 93,244 | 110,840 | 110,840 |
| | TOTAL | 2,331,100 | 2,331,100 | 2,771,011 | 2,771,011 |

Table 11: Estimated Undiscounted Annual State of Good Repair Benefits (Mid)

| Project Year | Year | No Build | Lane Widening | Underpass + Bikeway | Combined |
|--------------|---------|-------------|---------------|---------------------|-------------|
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$115,041 | \$115,041 | \$119,215 | \$119,215 |
| Year 2 | 2022 | \$115,340 | \$115,340 | \$123,762 | \$123,762 |
| Year 3 | 2023 | \$115,616 | \$115,616 | \$128,360 | \$128,360 |
| Year 4 | 2024 | \$115,869 | \$115,869 | \$133,009 | \$133,009 |
| Year 5 | 2025 | \$116,098 | \$116,098 | \$137,709 | \$137,709 |
| Year 6 | 2026 | \$116,304 | \$116,304 | \$142,461 | \$142,461 |
| Year 7 | 2027 | \$116,486 | \$116,486 | \$147,263 | \$147,263 |
| Year 8 | 2028 | \$116,646 | \$116,646 | \$152,117 | \$152,117 |
| Year 9 | 2029 | \$116,782 | \$116,782 | \$157,022 | \$157,022 |
| Year 10 | 2030 | \$116,895 | \$116,895 | \$161,978 | \$161,978 |
| Year 11 | 2031 | \$116,984 | \$116,984 | \$166,985 | \$166,985 |
| Year 12 | 2032 | \$117,050 | \$117,050 | \$172,044 | \$172,044 |
| Year 13 | 2033 | \$117,093 | \$117,093 | \$177,153 | \$177,153 |
| Year 14 | 2034 | \$117,113 | \$117,113 | \$182,314 | \$182,314 |
| Year 15 | 2035 | \$117,109 | \$117,109 | \$187,525 | \$187,525 |
| Year 16 | 2036 | \$117,082 | \$117,082 | \$192,788 | \$192,788 |
| Year 17 | 2037 | \$117,032 | \$117,032 | \$198,102 | \$198,102 |
| Year 18 | 2038 | \$116,958 | \$116,958 | \$203,467 | \$203,467 |
| Year 19 | 2039 | \$116,861 | \$116,861 | \$208,884 | \$208,884 |
| Year 20 | 2040 | \$116,741 | \$116,741 | \$214,351 | \$214,351 |
| | AVERAGE | \$93,244 | \$93,244 | \$132,260 | \$132,260 |
| | TOTAL | \$2,331,100 | \$2,331,100 | \$3,306,510 | \$3,306,510 |

Table 12: Estimated Undiscounted Annual State of Good Repair Benefits (High)

| Project Year | Year | No Build | Lane Widening | Underpass + Bikeway | Combined |
|--------------|---------|-------------|---------------|---------------------|-------------|
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$115,041 | \$115,041 | \$121,506 | \$121,506 |
| Year 2 | 2022 | \$115,340 | \$115,340 | \$128,385 | \$128,385 |
| Year 3 | 2023 | \$115,616 | \$115,616 | \$135,356 | \$135,356 |
| Year 4 | 2024 | \$115,869 | \$115,869 | \$142,419 | \$142,419 |
| Year 5 | 2025 | \$116,098 | \$116,098 | \$149,574 | \$149,574 |
| Year 6 | 2026 | \$116,304 | \$116,304 | \$156,821 | \$156,821 |
| Year 7 | 2027 | \$116,486 | \$116,486 | \$164,160 | \$164,160 |
| Year 8 | 2028 | \$116,646 | \$116,646 | \$171,591 | \$171,591 |
| Year 9 | 2029 | \$116,782 | \$116,782 | \$179,114 | \$179,114 |
| Year 10 | 2030 | \$116,895 | \$116,895 | \$186,729 | \$186,729 |
| Year 11 | 2031 | \$116,984 | \$116,984 | \$194,436 | \$194,436 |
| Year 12 | 2032 | \$117,050 | \$117,050 | \$202,235 | \$202,235 |
| Year 13 | 2033 | \$117,093 | \$117,093 | \$210,126 | \$210,126 |
| Year 14 | 2034 | \$117,113 | \$117,113 | \$218,109 | \$218,109 |
| Year 15 | 2035 | \$117,109 | \$117,109 | \$226,184 | \$226,184 |
| Year 16 | 2036 | \$117,082 | \$117,082 | \$234,351 | \$234,351 |
| Year 17 | 2037 | \$117,032 | \$117,032 | \$242,610 | \$242,610 |
| Year 18 | 2038 | \$116,958 | \$116,958 | \$250,961 | \$250,961 |
| Year 19 | 2039 | \$116,861 | \$116,861 | \$259,404 | \$259,404 |
| Year 20 | 2040 | \$116,741 | \$116,741 | \$267,939 | \$267,939 |
| | AVERAGE | \$93,244 | \$93,244 | \$153,680 | \$153,680 |
| | TOTAL | \$2,331,100 | \$2,331,100 | \$3,842,008 | \$3,842,008 |

Quality of Life

The value of time savings estimates are based on the U.S. DOT's *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations (Revision 2, 2016 Update)*. In the analysis, travel time is conceived as a negative demand, that is a consumer's willingness to pay to have less of it. To evaluate the aggregate impact of the proposed project, the analysis assumes that the value of each minute saved time is constant, regardless of the total time required for the trip. In addition, the analysis distinguishes between trip purposes, as shown in **Table 13**. Although it may be possible to monetize estimates for reliability, because U.S. DOT does not yet have guidance on the subject, it was excluded from the analysis. This analysis assumes that all travelers' value of travel time savings is independent and additive, as shown in **Table 13, Table 14, and Table 15**.

Table 13: Quality of Life Multipliers

| | Value |
|---|-------------|
| Value of Travel Time Savings (Private, Personal Trip) | \$4.33 |
| Value of Travel Time Savings (Private, Business Trip) | \$8.09 |
| Value of Travel Time Savings (Commercial, Truck Driver) | \$8.66 |
| Property Value Increase (Assumed 4% increase due to proximity to new pathway) | \$2,133,508 |
| Physically Inactive Adults in Colorado ^{vii} | 0.17 |
| Healthcare Cost Savings ^{viii} | \$1,488 |

Table 14: Estimated Undiscounted Annual Quality of Life Benefits (Low)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$312,949 | \$0 | \$381,661 | \$320,286 | \$0 | \$381,661 | \$305,593 | \$2,133,508 | \$386,461 | \$312,949 | \$2,133,508 | \$386,461 |
| Year 2 | 2022 | \$313,485 | \$0 | \$380,033 | \$320,842 | \$0 | \$380,033 | \$306,122 | \$0 | \$389,719 | \$313,485 | \$0 | \$389,719 |
| Year 3 | 2023 | \$314,028 | \$0 | \$378,244 | \$321,394 | \$0 | \$378,244 | \$306,652 | \$0 | \$392,901 | \$314,028 | \$0 | \$392,901 |
| Year 4 | 2024 | \$314,577 | \$0 | \$376,293 | \$321,949 | \$0 | \$376,293 | \$307,186 | \$0 | \$396,008 | \$314,577 | \$0 | \$396,008 |
| Year 5 | 2025 | \$315,115 | \$0 | \$374,181 | \$322,506 | \$0 | \$374,181 | \$307,712 | \$0 | \$399,039 | \$315,115 | \$0 | \$399,039 |
| Year 6 | 2026 | \$315,653 | \$0 | \$371,908 | \$323,062 | \$0 | \$371,908 | \$308,243 | \$0 | \$401,995 | \$315,653 | \$0 | \$401,995 |
| Year 7 | 2027 | \$316,202 | \$0 | \$369,474 | \$323,616 | \$0 | \$369,474 | \$308,769 | \$0 | \$404,875 | \$316,202 | \$0 | \$404,875 |
| Year 8 | 2028 | \$316,743 | \$0 | \$366,878 | \$324,174 | \$0 | \$366,878 | \$309,304 | \$0 | \$407,679 | \$316,743 | \$0 | \$407,679 |
| Year 9 | 2029 | \$317,281 | \$0 | \$364,121 | \$324,726 | \$0 | \$364,121 | \$309,835 | \$0 | \$410,407 | \$317,281 | \$0 | \$410,407 |
| Year 10 | 2030 | \$317,830 | \$0 | \$361,203 | \$325,279 | \$0 | \$361,203 | \$310,357 | \$0 | \$413,060 | \$317,830 | \$0 | \$413,060 |
| Year 11 | 2031 | \$318,368 | \$0 | \$358,123 | \$325,834 | \$0 | \$358,123 | \$310,897 | \$0 | \$415,638 | \$318,368 | \$0 | \$415,638 |
| Year 12 | 2032 | \$318,916 | \$0 | \$354,882 | \$326,398 | \$0 | \$354,882 | \$311,426 | \$0 | \$418,139 | \$318,916 | \$0 | \$418,139 |
| Year 13 | 2033 | \$319,459 | \$0 | \$351,480 | \$326,953 | \$0 | \$351,480 | \$311,950 | \$0 | \$420,565 | \$319,459 | \$0 | \$420,565 |
| Year 14 | 2034 | \$319,998 | \$0 | \$347,917 | \$327,498 | \$0 | \$347,917 | \$312,481 | \$0 | \$422,916 | \$319,998 | \$0 | \$422,916 |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year 15 | 2035 | \$320,547 | \$0 | \$344,192 | \$328,065 | \$0 | \$344,192 | \$313,014 | \$0 | \$425,190 | \$320,547 | \$0 | \$425,190 |
| Year 16 | 2036 | \$321,082 | \$0 | \$340,306 | \$328,618 | \$0 | \$340,306 | \$313,544 | \$0 | \$427,389 | \$321,082 | \$0 | \$427,389 |
| Year 17 | 2037 | \$321,627 | \$0 | \$336,259 | \$329,173 | \$0 | \$336,259 | \$314,075 | \$0 | \$429,513 | \$321,627 | \$0 | \$429,513 |
| Year 18 | 2038 | \$322,171 | \$0 | \$332,050 | \$329,725 | \$0 | \$332,050 | \$314,605 | \$0 | \$431,560 | \$322,171 | \$0 | \$431,560 |
| Year 19 | 2039 | \$322,717 | \$0 | \$327,680 | \$330,289 | \$0 | \$327,680 | \$315,134 | \$0 | \$433,533 | \$322,717 | \$0 | \$433,533 |
| Year 20 | 2040 | \$323,255 | \$0 | \$323,149 | \$330,843 | \$0 | \$323,149 | \$315,665 | \$0 | \$435,429 | \$323,255 | \$0 | \$435,429 |
| AVERAGE | | \$254,480 | \$0 | \$285,601 | \$260,449 | \$0 | \$285,601 | \$248,503 | \$85,340 | \$330,481 | \$254,480 | \$85,340 | \$330,481 |
| TOTAL | | \$6,362,003 | \$0 | \$7,140,033 | \$6,511,230 | \$0 | \$7,140,033 | \$6,212,564 | \$2,133,508 | \$8,262,016 | \$6,362,003 | \$2,133,508 | \$8,262,016 |

Table 15: Estimated Undiscounted Annual Quality of Life Benefits (Mid)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$312,949 | \$0 | \$381,661 | \$320,286 | \$0 | \$381,661 | \$305,593 | \$2,133,508 | \$392,666 | \$312,949 | \$2,133,508 | \$392,666 |
| Year 2 | 2022 | \$313,485 | \$0 | \$380,033 | \$320,842 | \$0 | \$380,033 | \$306,122 | \$0 | \$402,240 | \$313,485 | \$0 | \$402,240 |
| Year 3 | 2023 | \$314,028 | \$0 | \$378,244 | \$321,394 | \$0 | \$378,244 | \$306,652 | \$0 | \$411,849 | \$314,028 | \$0 | \$411,849 |
| Year 4 | 2024 | \$314,577 | \$0 | \$376,293 | \$321,949 | \$0 | \$376,293 | \$307,186 | \$0 | \$421,493 | \$314,577 | \$0 | \$421,493 |
| Year 5 | 2025 | \$315,115 | \$0 | \$374,181 | \$322,506 | \$0 | \$374,181 | \$307,712 | \$0 | \$431,173 | \$315,115 | \$0 | \$431,173 |
| Year 6 | 2026 | \$315,653 | \$0 | \$371,908 | \$323,062 | \$0 | \$371,908 | \$308,243 | \$0 | \$440,887 | \$315,653 | \$0 | \$440,887 |
| Year 7 | 2027 | \$316,202 | \$0 | \$369,474 | \$323,616 | \$0 | \$369,474 | \$308,769 | \$0 | \$450,637 | \$316,202 | \$0 | \$450,637 |
| Year 8 | 2028 | \$316,743 | \$0 | \$366,878 | \$324,174 | \$0 | \$366,878 | \$309,304 | \$0 | \$460,421 | \$316,743 | \$0 | \$460,421 |
| Year 9 | 2029 | \$317,281 | \$0 | \$364,121 | \$324,726 | \$0 | \$364,121 | \$309,835 | \$0 | \$470,241 | \$317,281 | \$0 | \$470,241 |
| Year 10 | 2030 | \$317,830 | \$0 | \$361,203 | \$325,279 | \$0 | \$361,203 | \$310,357 | \$0 | \$480,095 | \$317,830 | \$0 | \$480,095 |
| Year 11 | 2031 | \$318,368 | \$0 | \$358,123 | \$325,834 | \$0 | \$358,123 | \$310,897 | \$0 | \$489,985 | \$318,368 | \$0 | \$489,985 |
| Year 12 | 2032 | \$318,916 | \$0 | \$354,882 | \$326,398 | \$0 | \$354,882 | \$311,426 | \$0 | \$499,910 | \$318,916 | \$0 | \$499,910 |
| Year 13 | 2033 | \$319,459 | \$0 | \$351,480 | \$326,953 | \$0 | \$351,480 | \$311,950 | \$0 | \$509,870 | \$319,459 | \$0 | \$509,870 |
| Year 14 | 2034 | \$319,998 | \$0 | \$347,917 | \$327,498 | \$0 | \$347,917 | \$312,481 | \$0 | \$519,865 | \$319,998 | \$0 | \$519,865 |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year 15 | 2035 | \$320,547 | \$0 | \$344,192 | \$328,065 | \$0 | \$344,192 | \$313,014 | \$0 | \$529,895 | \$320,547 | \$0 | \$529,895 |
| Year 16 | 2036 | \$321,082 | \$0 | \$340,306 | \$328,618 | \$0 | \$340,306 | \$313,544 | \$0 | \$539,960 | \$321,082 | \$0 | \$539,960 |
| Year 17 | 2037 | \$321,627 | \$0 | \$336,259 | \$329,173 | \$0 | \$336,259 | \$314,075 | \$0 | \$550,061 | \$321,627 | \$0 | \$550,061 |
| Year 18 | 2038 | \$322,171 | \$0 | \$332,050 | \$329,725 | \$0 | \$332,050 | \$314,605 | \$0 | \$560,196 | \$322,171 | \$0 | \$560,196 |
| Year 19 | 2039 | \$322,717 | \$0 | \$327,680 | \$330,289 | \$0 | \$327,680 | \$315,134 | \$0 | \$570,366 | \$322,717 | \$0 | \$570,366 |
| Year 20 | 2040 | \$323,255 | \$0 | \$323,149 | \$330,843 | \$0 | \$323,149 | \$315,665 | \$0 | \$580,572 | \$323,255 | \$0 | \$580,572 |
| AVERAGE | | \$254,480 | \$0 | \$285,601 | \$260,449 | \$0 | \$285,601 | \$248,503 | \$85,340 | \$388,495 | \$254,480 | \$85,340 | \$388,495 |
| TOTAL | | \$6,362,003 | \$0 | \$7,140,033 | \$6,511,230 | \$0 | \$7,140,033 | \$6,212,564 | \$2,133,508 | \$9,712,384 | \$6,362,003 | \$2,133,508 | \$9,712,384 |

Table 16: Estimated Undiscounted Annual Quality of Life Benefits (High)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$312,949 | \$0 | \$381,661 | \$320,286 | \$0 | \$381,661 | \$305,593 | \$2,133,508 | \$398,871 | \$312,949 | \$2,133,508 | \$398,871 |
| Year 2 | 2022 | \$313,485 | \$0 | \$380,033 | \$320,842 | \$0 | \$380,033 | \$306,122 | \$0 | \$414,761 | \$313,485 | \$0 | \$414,761 |
| Year 3 | 2023 | \$314,028 | \$0 | \$378,244 | \$321,394 | \$0 | \$378,244 | \$306,652 | \$0 | \$430,797 | \$314,028 | \$0 | \$430,797 |
| Year 4 | 2024 | \$314,577 | \$0 | \$376,293 | \$321,949 | \$0 | \$376,293 | \$307,186 | \$0 | \$446,979 | \$314,577 | \$0 | \$446,979 |
| Year 5 | 2025 | \$315,115 | \$0 | \$374,181 | \$322,506 | \$0 | \$374,181 | \$307,712 | \$0 | \$463,306 | \$315,115 | \$0 | \$463,306 |
| Year 6 | 2026 | \$315,653 | \$0 | \$371,908 | \$323,062 | \$0 | \$371,908 | \$308,243 | \$0 | \$479,780 | \$315,653 | \$0 | \$479,780 |
| Year 7 | 2027 | \$316,202 | \$0 | \$369,474 | \$323,616 | \$0 | \$369,474 | \$308,769 | \$0 | \$496,399 | \$316,202 | \$0 | \$496,399 |
| Year 8 | 2028 | \$316,743 | \$0 | \$366,878 | \$324,174 | \$0 | \$366,878 | \$309,304 | \$0 | \$513,163 | \$316,743 | \$0 | \$513,163 |
| Year 9 | 2029 | \$317,281 | \$0 | \$364,121 | \$324,726 | \$0 | \$364,121 | \$309,835 | \$0 | \$530,074 | \$317,281 | \$0 | \$530,074 |
| Year 10 | 2030 | \$317,830 | \$0 | \$361,203 | \$325,279 | \$0 | \$361,203 | \$310,357 | \$0 | \$547,131 | \$317,830 | \$0 | \$547,131 |
| Year 11 | 2031 | \$318,368 | \$0 | \$358,123 | \$325,834 | \$0 | \$358,123 | \$310,897 | \$0 | \$564,333 | \$318,368 | \$0 | \$564,333 |
| Year 12 | 2032 | \$318,916 | \$0 | \$354,882 | \$326,398 | \$0 | \$354,882 | \$311,426 | \$0 | \$581,681 | \$318,916 | \$0 | \$581,681 |
| Year 13 | 2033 | \$319,459 | \$0 | \$351,480 | \$326,953 | \$0 | \$351,480 | \$311,950 | \$0 | \$599,175 | \$319,459 | \$0 | \$599,175 |
| Year 14 | 2034 | \$319,998 | \$0 | \$347,917 | \$327,498 | \$0 | \$347,917 | \$312,481 | \$0 | \$616,815 | \$319,998 | \$0 | \$616,815 |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|------------------------------|----------------|-------------------------|
| | | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings | Value of Travel Time Savings | Property Value | Healthcare Cost Savings |
| Year 15 | 2035 | \$320,547 | \$0 | \$344,192 | \$328,065 | \$0 | \$344,192 | \$313,014 | \$0 | \$634,600 | \$320,547 | \$0 | \$634,600 |
| Year 16 | 2036 | \$321,082 | \$0 | \$340,306 | \$328,618 | \$0 | \$340,306 | \$313,544 | \$0 | \$652,532 | \$321,082 | \$0 | \$652,532 |
| Year 17 | 2037 | \$321,627 | \$0 | \$336,259 | \$329,173 | \$0 | \$336,259 | \$314,075 | \$0 | \$670,609 | \$321,627 | \$0 | \$670,609 |
| Year 18 | 2038 | \$322,171 | \$0 | \$332,050 | \$329,725 | \$0 | \$332,050 | \$314,605 | \$0 | \$688,832 | \$322,171 | \$0 | \$688,832 |
| Year 19 | 2039 | \$322,717 | \$0 | \$327,680 | \$330,289 | \$0 | \$327,680 | \$315,134 | \$0 | \$707,200 | \$322,717 | \$0 | \$707,200 |
| Year 20 | 2040 | \$323,255 | \$0 | \$323,149 | \$330,843 | \$0 | \$323,149 | \$315,665 | \$0 | \$725,715 | \$323,255 | \$0 | \$725,715 |
| AVERAGE | | \$254,480 | \$0 | \$285,601 | \$260,449 | \$0 | \$285,601 | \$248,503 | \$85,340 | \$446,510 | \$254,480 | \$85,340 | \$446,510 |
| TOTAL | | \$6,362,003 | \$0 | \$7,140,033 | \$6,511,230 | \$0 | \$7,140,033 | \$6,212,564 | \$2,133,508 | \$11,162,753 | \$6,362,003 | \$2,133,508 | \$11,162,753 |

Environmental Sustainability

For every one mile in VMT reduced it is assumed to have a proportional decrease in various greenhouse gas and criteria pollutants, as listed below. The cost to mitigate or clean-up those values are also listed below.

Table 17: Environmental Sustainability Multipliers

| | Value (metric tons/VMT) | Value (\$USD/VMT) |
|---|-------------------------|-------------------|
| Particulate Matter (PM) ^{ix} | 0.0000001 | \$0.02 |
| Nitrous Oxides (NOx) ^x | 0.0000009 | \$0.01 |
| Sulfur Oxides (SOx) ^{xi} | 0.0000000 | \$0.00 |
| Volatile Organic Compounds (VOC) ^{xii} | 0.0000012 | \$0.00 |
| Carbon Dioxide ^{xiii} | 0.0004205 | \$0.01 |

These per VMT values applied to the estimated VMT reduction are shown in **Table 18**, **Table 19**, and **Table 20**.

Table 18: Estimated Undiscounted Annual Environmental Sustainability Benefits (Low)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|
| | | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants |
| Year -4 | 2016 | 0 | \$0 | 322 | 0 | 322 | \$0 | 2,016 | \$0 |
| Year -3 | 2017 | 0 | \$0 | 325 | 0 | 325 | \$0 | 2,017 | \$0 |
| Year -2 | 2018 | 0 | \$0 | 329 | 0 | 329 | \$0 | 2,018 | \$0 |
| Year -1 | 2019 | 0 | \$0 | 332 | 0 | 332 | \$0 | 2,019 | \$0 |
| Year 0 | 2020 | 0 | \$0 | 335 | 0 | 335 | \$0 | 2,020 | \$0 |
| Year 1 | 2021 | 336 | \$23,730 | 336 | 23,730 | 344 | \$23,730 | 2,021 | \$35,451 |
| Year 2 | 2022 | 337 | \$23,792 | 337 | 23,792 | 354 | \$23,792 | 2,022 | \$36,405 |
| Year 3 | 2023 | 338 | \$23,849 | 338 | 23,849 | 363 | \$23,849 | 2,023 | \$37,368 |
| Year 4 | 2024 | 338 | \$23,901 | 338 | 23,901 | 372 | \$23,901 | 2,024 | \$38,338 |
| Year 5 | 2025 | 339 | \$23,948 | 339 | 23,948 | 382 | \$23,948 | 2,025 | \$39,317 |
| Year 6 | 2026 | 340 | \$23,990 | 340 | 23,990 | 391 | \$23,990 | 2,026 | \$40,304 |
| Year 7 | 2027 | 340 | \$24,028 | 340 | 24,028 | 401 | \$24,028 | 2,027 | \$41,299 |
| Year 8 | 2028 | 341 | \$24,061 | 341 | 24,061 | 411 | \$24,061 | 2,028 | \$42,302 |
| Year 9 | 2029 | 341 | \$24,089 | 341 | 24,089 | 421 | \$24,089 | 2,029 | \$43,313 |
| Year 10 | 2030 | 341 | \$24,112 | 341 | 24,112 | 431 | \$24,112 | 2,030 | \$44,333 |
| Year 11 | 2031 | 342 | \$24,131 | 342 | 24,131 | 441 | \$24,131 | 2,031 | \$45,360 |
| Year 12 | 2032 | 342 | \$24,144 | 342 | 24,144 | 451 | \$24,144 | 2,032 | \$46,396 |
| Year 13 | 2033 | 342 | \$24,153 | 342 | 24,153 | 461 | \$24,153 | 2,033 | \$47,440 |
| Year 14 | 2034 | 342 | \$24,157 | 342 | 24,157 | 471 | \$24,157 | 2,034 | \$48,492 |
| Year 15 | 2035 | 342 | \$24,157 | 342 | 24,157 | 481 | \$24,157 | 2,035 | \$49,552 |
| Year 16 | 2036 | 342 | \$24,151 | 342 | 24,151 | 492 | \$24,151 | 2,036 | \$50,620 |
| Year 17 | 2037 | 342 | \$24,141 | 342 | 24,141 | 502 | \$24,141 | 2,037 | \$51,697 |
| Year 18 | 2038 | 342 | \$24,125 | 342 | 24,125 | 513 | \$24,125 | 2,038 | \$52,781 |
| Year 19 | 2039 | 341 | \$24,105 | 341 | 24,105 | 523 | \$24,105 | 2,039 | \$53,874 |
| Year 20 | 2040 | 341 | \$24,081 | 341 | 24,081 | 534 | \$24,081 | 2,040 | \$54,974 |
| AVERAGE | | 272 | \$19,234 | 338 | 19,234 | 415 | 19,234 | 2,028 | 35,985 |
| TOTAL | | 6,810 | \$480,846 | 8,453 | 480,846 | 10,380 | 480,846 | 50,700 | 899,616 |

Table 19: Estimated Undiscounted Annual Environmental Sustainability Benefits (Mid)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|
| | | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants |
| Year -4 | 2016 | 322 | \$0 | 322 | \$0 | 322 | \$0 | 322 | \$0 |
| Year -3 | 2017 | 325 | \$0 | 325 | \$0 | 325 | \$0 | 325 | \$0 |
| Year -2 | 2018 | 329 | \$0 | 329 | \$0 | 329 | \$0 | 329 | \$0 |
| Year -1 | 2019 | 332 | \$0 | 332 | \$0 | 332 | \$0 | 332 | \$0 |
| Year 0 | 2020 | 335 | \$0 | 335 | \$0 | 335 | \$0 | 335 | \$0 |
| Year 1 | 2021 | 336 | \$23,730 | 336 | \$23,730 | 354 | \$25,021 | 336 | \$23,730 |
| Year 2 | 2022 | 337 | \$23,792 | 337 | \$23,792 | 374 | \$26,397 | 337 | \$23,792 |
| Year 3 | 2023 | 338 | \$23,849 | 338 | \$23,849 | 394 | \$27,792 | 338 | \$23,849 |
| Year 4 | 2024 | 338 | \$23,901 | 338 | \$23,901 | 414 | \$29,204 | 338 | \$23,901 |
| Year 5 | 2025 | 339 | \$23,948 | 339 | \$23,948 | 434 | \$30,635 | 339 | \$23,948 |
| Year 6 | 2026 | 340 | \$23,990 | 340 | \$23,990 | 454 | \$32,084 | 340 | \$23,990 |
| Year 7 | 2027 | 340 | \$24,028 | 340 | \$24,028 | 475 | \$33,551 | 340 | \$24,028 |
| Year 8 | 2028 | 341 | \$24,061 | 341 | \$24,061 | 496 | \$35,036 | 341 | \$24,061 |
| Year 9 | 2029 | 341 | \$24,089 | 341 | \$24,089 | 517 | \$36,540 | 341 | \$24,089 |
| Year 10 | 2030 | 341 | \$24,112 | 341 | \$24,112 | 539 | \$38,062 | 341 | \$24,112 |
| Year 11 | 2031 | 342 | \$24,131 | 342 | \$24,131 | 561 | \$39,602 | 342 | \$24,131 |
| Year 12 | 2032 | 342 | \$24,144 | 342 | \$24,144 | 583 | \$41,160 | 342 | \$24,144 |
| Year 13 | 2033 | 342 | \$24,153 | 342 | \$24,153 | 605 | \$42,737 | 342 | \$24,153 |
| Year 14 | 2034 | 342 | \$24,157 | 342 | \$24,157 | 628 | \$44,331 | 342 | \$24,157 |
| Year 15 | 2035 | 342 | \$24,157 | 342 | \$24,157 | 651 | \$45,944 | 342 | \$24,157 |
| Year 16 | 2036 | 342 | \$24,151 | 342 | \$24,151 | 674 | \$47,575 | 342 | \$24,151 |
| Year 17 | 2037 | 342 | \$24,141 | 342 | \$24,141 | 697 | \$49,225 | 342 | \$24,141 |
| Year 18 | 2038 | 342 | \$24,125 | 342 | \$24,125 | 721 | \$50,892 | 342 | \$24,125 |
| Year 19 | 2039 | 341 | \$24,105 | 341 | \$24,105 | 745 | \$52,578 | 341 | \$24,105 |
| Year 20 | 2040 | 341 | \$24,081 | 341 | \$24,081 | 769 | \$54,282 | 341 | \$24,081 |
| AVERAGE | | 338 | 19,234 | 338 | 19,234 | 509 | 31,306 | 338 | 19,234 |
| TOTAL | | 8,453 | 480,846 | 8,453 | 480,846 | 12,727 | 782,649 | 8,453 | 480,846 |

Table 20: Estimated Undiscounted Annual Environmental Sustainability Benefits (High)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|--|-----------------------------------|
| | | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants | Avoided GHG + Criteria Pollutants (MT) | Avoided GHG + Criteria Pollutants |
| Year -4 | 2016 | 322 | \$0 | 322 | \$0 | 322 | \$0 | 322 | \$0 |
| Year -3 | 2017 | 325 | \$0 | 325 | \$0 | 325 | \$0 | 325 | \$0 |
| Year -2 | 2018 | 329 | \$0 | 329 | \$0 | 329 | \$0 | 329 | \$0 |
| Year -1 | 2019 | 332 | \$0 | 332 | \$0 | 332 | \$0 | 332 | \$0 |
| Year 0 | 2020 | 335 | \$0 | 335 | \$0 | 335 | \$0 | 335 | \$0 |
| Year 1 | 2021 | 336 | \$23,730 | 336 | \$23,730 | 354 | \$25,021 | 336 | \$23,730 |
| Year 2 | 2022 | 337 | \$23,792 | 337 | \$23,792 | 374 | \$26,397 | 337 | \$23,792 |
| Year 3 | 2023 | 338 | \$23,849 | 338 | \$23,849 | 394 | \$27,792 | 338 | \$23,849 |
| Year 4 | 2024 | 338 | \$23,901 | 338 | \$23,901 | 414 | \$29,204 | 338 | \$23,901 |
| Year 5 | 2025 | 339 | \$23,948 | 339 | \$23,948 | 434 | \$30,635 | 339 | \$23,948 |
| Year 6 | 2026 | 340 | \$23,990 | 340 | \$23,990 | 454 | \$32,084 | 340 | \$23,990 |
| Year 7 | 2027 | 340 | \$24,028 | 340 | \$24,028 | 475 | \$33,551 | 340 | \$24,028 |
| Year 8 | 2028 | 341 | \$24,061 | 341 | \$24,061 | 496 | \$35,036 | 341 | \$24,061 |
| Year 9 | 2029 | 341 | \$24,089 | 341 | \$24,089 | 517 | \$36,540 | 341 | \$24,089 |
| Year 10 | 2030 | 341 | \$24,112 | 341 | \$24,112 | 539 | \$38,062 | 341 | \$24,112 |
| Year 11 | 2031 | 342 | \$24,131 | 342 | \$24,131 | 561 | \$39,602 | 342 | \$24,131 |
| Year 12 | 2032 | 342 | \$24,144 | 342 | \$24,144 | 583 | \$41,160 | 342 | \$24,144 |
| Year 13 | 2033 | 342 | \$24,153 | 342 | \$24,153 | 605 | \$42,737 | 342 | \$24,153 |
| Year 14 | 2034 | 342 | \$24,157 | 342 | \$24,157 | 628 | \$44,331 | 342 | \$24,157 |
| Year 15 | 2035 | 342 | \$24,157 | 342 | \$24,157 | 651 | \$45,944 | 342 | \$24,157 |
| Year 16 | 2036 | 342 | \$24,151 | 342 | \$24,151 | 674 | \$47,575 | 342 | \$24,151 |
| Year 17 | 2037 | 342 | \$24,141 | 342 | \$24,141 | 697 | \$49,225 | 342 | \$24,141 |
| Year 18 | 2038 | 342 | \$24,125 | 342 | \$24,125 | 721 | \$50,892 | 342 | \$24,125 |
| Year 19 | 2039 | 341 | \$24,105 | 341 | \$24,105 | 745 | \$52,578 | 341 | \$24,105 |
| Year 20 | 2040 | 341 | \$24,081 | 341 | \$24,081 | 769 | \$54,282 | 341 | \$24,081 |
| AVERAGE | | 338 | 19,234 | 338 | 19,234 | 509 | 31,306 | 338 | 19,234 |
| TOTAL | | 8,453 | 480,846 | 8,453 | 480,846 | 12,727 | 782,649 | 8,453 | 480,846 |

Economic Competitiveness

For every one mile in VMT reduced it is assumed to generate \$0.77 in household transportation cost savings.

Table 21: Economic Competitiveness Multipliers

| | Value |
|--|--------|
| Household Transportation Cost Savings ^{xiv} | \$0.77 |
| Congestion Cost Savings ^{xv} | \$0.06 |

Table 22: Estimated Undiscounted Annual Economic Competitiveness Benefits (Low)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
| | | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$611,529 | \$45,456 | \$611,529 | \$45,456 | \$621,534 | \$46,200 | \$621,534 | \$46,200 |
| Year 2 | 2022 | \$613,119 | \$45,575 | \$613,119 | \$45,575 | \$633,308 | \$47,075 | \$633,308 | \$47,075 |
| Year 3 | 2023 | \$614,585 | \$45,684 | \$614,585 | \$45,684 | \$645,136 | \$47,955 | \$645,136 | \$47,955 |
| Year 4 | 2024 | \$615,927 | \$45,783 | \$615,927 | \$45,783 | \$657,019 | \$48,838 | \$657,019 | \$48,838 |
| Year 5 | 2025 | \$617,146 | \$45,874 | \$617,146 | \$45,874 | \$668,957 | \$49,725 | \$668,957 | \$49,725 |
| Year 6 | 2026 | \$618,240 | \$45,955 | \$618,240 | \$45,955 | \$680,949 | \$50,617 | \$680,949 | \$50,617 |
| Year 7 | 2027 | \$619,211 | \$46,028 | \$619,211 | \$46,028 | \$692,996 | \$51,512 | \$692,996 | \$51,512 |
| Year 8 | 2028 | \$620,058 | \$46,090 | \$620,058 | \$46,090 | \$705,097 | \$52,412 | \$705,097 | \$52,412 |
| Year 9 | 2029 | \$620,781 | \$46,144 | \$620,781 | \$46,144 | \$717,254 | \$53,315 | \$717,254 | \$53,315 |
| Year 10 | 2030 | \$621,381 | \$46,189 | \$621,381 | \$46,189 | \$729,464 | \$54,223 | \$729,464 | \$54,223 |
| Year 11 | 2031 | \$621,856 | \$46,224 | \$621,856 | \$46,224 | \$741,730 | \$55,135 | \$741,730 | \$55,135 |
| Year 12 | 2032 | \$622,208 | \$46,250 | \$622,208 | \$46,250 | \$754,049 | \$56,050 | \$754,049 | \$56,050 |
| Year 13 | 2033 | \$622,436 | \$46,267 | \$622,436 | \$46,267 | \$766,424 | \$56,970 | \$766,424 | \$56,970 |
| Year 14 | 2034 | \$622,540 | \$46,275 | \$622,540 | \$46,275 | \$778,853 | \$57,894 | \$778,853 | \$57,894 |
| Year 15 | 2035 | \$622,520 | \$46,274 | \$622,520 | \$46,274 | \$791,337 | \$58,822 | \$791,337 | \$58,822 |
| Year 16 | 2036 | \$622,377 | \$46,263 | \$622,377 | \$46,263 | \$803,875 | \$59,754 | \$803,875 | \$59,754 |
| Year 17 | 2037 | \$622,109 | \$46,243 | \$622,109 | \$46,243 | \$816,468 | \$60,690 | \$816,468 | \$60,690 |
| Year 18 | 2038 | \$621,718 | \$46,214 | \$621,718 | \$46,214 | \$829,116 | \$61,630 | \$829,116 | \$61,630 |
| Year 19 | 2039 | \$621,203 | \$46,176 | \$621,203 | \$46,176 | \$841,818 | \$62,574 | \$841,818 | \$62,574 |
| Year 20 | 2040 | \$620,564 | \$46,128 | \$620,564 | \$46,128 | \$854,575 | \$63,523 | \$854,575 | \$63,523 |
| AVERAGE | | \$495,660 | \$36,844 | \$495,660 | \$36,844 | \$589,198 | \$43,797 | \$589,198 | \$43,797 |
| TOTAL | | \$12,391,508 | \$921,092 | \$12,391,508 | \$921,092 | \$14,729,960 | \$1,094,915 | \$14,729,960 | \$1,094,915 |

Table 23: Estimated Undiscounted Annual Economic Competitiveness Benefits (Mid)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
| | | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$611,529 | \$45,456 | \$611,529 | \$45,456 | \$633,714 | \$47,106 | \$633,714 | \$47,106 |
| Year 2 | 2022 | \$613,119 | \$45,575 | \$613,119 | \$45,575 | \$657,884 | \$48,902 | \$657,884 | \$48,902 |
| Year 3 | 2023 | \$614,585 | \$45,684 | \$614,585 | \$45,684 | \$682,326 | \$50,719 | \$682,326 | \$50,719 |
| Year 4 | 2024 | \$615,927 | \$45,783 | \$615,927 | \$45,783 | \$707,040 | \$52,556 | \$707,040 | \$52,556 |
| Year 5 | 2025 | \$617,146 | \$45,874 | \$617,146 | \$45,874 | \$732,026 | \$54,413 | \$732,026 | \$54,413 |
| Year 6 | 2026 | \$618,240 | \$45,955 | \$618,240 | \$45,955 | \$757,284 | \$56,291 | \$757,284 | \$56,291 |
| Year 7 | 2027 | \$619,211 | \$46,028 | \$619,211 | \$46,028 | \$782,813 | \$58,189 | \$782,813 | \$58,189 |
| Year 8 | 2028 | \$620,058 | \$46,090 | \$620,058 | \$46,090 | \$808,615 | \$60,106 | \$808,615 | \$60,106 |
| Year 9 | 2029 | \$620,781 | \$46,144 | \$620,781 | \$46,144 | \$834,688 | \$62,044 | \$834,688 | \$62,044 |
| Year 10 | 2030 | \$621,381 | \$46,189 | \$621,381 | \$46,189 | \$861,033 | \$64,003 | \$861,033 | \$64,003 |
| Year 11 | 2031 | \$621,856 | \$46,224 | \$621,856 | \$46,224 | \$887,650 | \$65,981 | \$887,650 | \$65,981 |
| Year 12 | 2032 | \$622,208 | \$46,250 | \$622,208 | \$46,250 | \$914,538 | \$67,980 | \$914,538 | \$67,980 |
| Year 13 | 2033 | \$622,436 | \$46,267 | \$622,436 | \$46,267 | \$941,699 | \$69,999 | \$941,699 | \$69,999 |
| Year 14 | 2034 | \$622,540 | \$46,275 | \$622,540 | \$46,275 | \$969,131 | \$72,038 | \$969,131 | \$72,038 |
| Year 15 | 2035 | \$622,520 | \$46,274 | \$622,520 | \$46,274 | \$996,835 | \$74,097 | \$996,835 | \$74,097 |
| Year 16 | 2036 | \$622,377 | \$46,263 | \$622,377 | \$46,263 | \$1,024,811 | \$76,177 | \$1,024,811 | \$76,177 |
| Year 17 | 2037 | \$622,109 | \$46,243 | \$622,109 | \$46,243 | \$1,053,059 | \$78,277 | \$1,053,059 | \$78,277 |
| Year 18 | 2038 | \$621,718 | \$46,214 | \$621,718 | \$46,214 | \$1,081,578 | \$80,396 | \$1,081,578 | \$80,396 |
| Year 19 | 2039 | \$621,203 | \$46,176 | \$621,203 | \$46,176 | \$1,110,370 | \$82,537 | \$1,110,370 | \$82,537 |
| Year 20 | 2040 | \$620,564 | \$46,128 | \$620,564 | \$46,128 | \$1,139,433 | \$84,697 | \$1,139,433 | \$84,697 |
| AVERAGE | | \$495,660 | \$36,844 | \$495,660 | \$36,844 | \$703,061 | \$52,260 | \$703,061 | \$52,260 |
| TOTAL | | \$12,391,508 | \$921,092 | \$12,391,508 | \$921,092 | \$17,576,528 | \$1,306,508 | \$17,576,528 | \$1,306,508 |

Table 24: Estimated Undiscounted Annual Economic Competitiveness Benefits (High)

| Project Year | Year | No Build | | Lane Widening | | Underpass + Bikeway | | Combined | |
|--------------|------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|---------------------------------------|---------------------------------|
| | | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings | Household Transportation Cost Savings | Traffic Congestion Cost Savings |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year 1 | 2021 | \$611,529 | \$45,456 | \$611,529 | \$45,456 | \$645,893 | \$48,011 | \$645,893 | \$48,011 |
| Year 2 | 2022 | \$613,119 | \$45,575 | \$613,119 | \$45,575 | \$682,460 | \$50,729 | \$682,460 | \$50,729 |
| Year 3 | 2023 | \$614,585 | \$45,684 | \$614,585 | \$45,684 | \$719,516 | \$53,483 | \$719,516 | \$53,483 |
| Year 4 | 2024 | \$615,927 | \$45,783 | \$615,927 | \$45,783 | \$757,061 | \$56,274 | \$757,061 | \$56,274 |
| Year 5 | 2025 | \$617,146 | \$45,874 | \$617,146 | \$45,874 | \$795,095 | \$59,101 | \$795,095 | \$59,101 |
| Year 6 | 2026 | \$618,240 | \$45,955 | \$618,240 | \$45,955 | \$833,619 | \$61,965 | \$833,619 | \$61,965 |
| Year 7 | 2027 | \$619,211 | \$46,028 | \$619,211 | \$46,028 | \$872,631 | \$64,865 | \$872,631 | \$64,865 |
| Year 8 | 2028 | \$620,058 | \$46,090 | \$620,058 | \$46,090 | \$912,132 | \$67,801 | \$912,132 | \$67,801 |
| Year 9 | 2029 | \$620,781 | \$46,144 | \$620,781 | \$46,144 | \$952,122 | \$70,774 | \$952,122 | \$70,774 |
| Year 10 | 2030 | \$621,381 | \$46,189 | \$621,381 | \$46,189 | \$992,602 | \$73,783 | \$992,602 | \$73,783 |
| Year 11 | 2031 | \$621,856 | \$46,224 | \$621,856 | \$46,224 | \$1,033,570 | \$76,828 | \$1,033,570 | \$76,828 |
| Year 12 | 2032 | \$622,208 | \$46,250 | \$622,208 | \$46,250 | \$1,075,027 | \$79,910 | \$1,075,027 | \$79,910 |
| Year 13 | 2033 | \$622,436 | \$46,267 | \$622,436 | \$46,267 | \$1,116,974 | \$83,027 | \$1,116,974 | \$83,027 |
| Year 14 | 2034 | \$622,540 | \$46,275 | \$622,540 | \$46,275 | \$1,159,409 | \$86,182 | \$1,159,409 | \$86,182 |
| Year 15 | 2035 | \$622,520 | \$46,274 | \$622,520 | \$46,274 | \$1,202,334 | \$89,373 | \$1,202,334 | \$89,373 |
| Year 16 | 2036 | \$622,377 | \$46,263 | \$622,377 | \$46,263 | \$1,245,747 | \$92,600 | \$1,245,747 | \$92,600 |
| Year 17 | 2037 | \$622,109 | \$46,243 | \$622,109 | \$46,243 | \$1,289,650 | \$95,863 | \$1,289,650 | \$95,863 |
| Year 18 | 2038 | \$621,718 | \$46,214 | \$621,718 | \$46,214 | \$1,334,041 | \$99,163 | \$1,334,041 | \$99,163 |
| Year 19 | 2039 | \$621,203 | \$46,176 | \$621,203 | \$46,176 | \$1,378,922 | \$102,499 | \$1,378,922 | \$102,499 |
| Year 20 | 2040 | \$620,564 | \$46,128 | \$620,564 | \$46,128 | \$1,424,291 | \$105,871 | \$1,424,291 | \$105,871 |
| AVERAGE | | \$495,660 | \$36,844 | \$495,660 | \$36,844 | \$816,924 | \$60,724 | \$816,924 | \$60,724 |
| TOTAL | | \$12,391,508 | \$921,092 | \$12,391,508 | \$921,092 | \$20,423,096 | \$1,518,101 | \$20,423,096 | \$1,518,101 |

Comparison

At a 7 percent real discount rate, the proposed project is expected to generate a positive benefit-cost ratio between 2.7:1 and 3.2:1, as shown in **Table 25**, **Table 26**, and **Table 27**. In addition, the proposed project is expected to support 103 job-years from construction spending.

Table 25: Estimated Annual Cost and Benefit at 7% Real Discount Rate (Low)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|-------------|-------|-----------------------------------|---------------|-------------|-----------------------------------|---------------------|-------------|-----------------------------------|-------------|-------------|-----------------------------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$88,000 | -\$88,000 | \$0 | \$119,000 | -\$119,000 | \$0 | \$208,000 | -\$208,000 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$298,000 | -\$386,000 | \$0 | \$402,000 | -\$522,000 | \$0 | \$700,000 | -\$908,000 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$2,256,000 | -\$2,643,000 | \$0 | \$3,046,000 | -\$3,568,000 | \$0 | \$5,302,000 | -\$6,210,000 |
| Year 1 | 2021 | \$1,063,000 | \$0 | \$1,062,000 | \$1,069,000 | \$4,000 | -\$1,577,000 | \$2,689,000 | \$5,000 | -\$884,000 | \$2,694,000 | \$9,000 | -\$3,525,000 |
| Year 2 | 2022 | \$994,000 | \$0 | \$2,056,000 | \$1,000,000 | \$4,000 | -\$581,000 | \$1,104,000 | \$5,000 | \$216,000 | \$1,109,000 | \$8,000 | -\$2,424,000 |
| Year 3 | 2023 | \$929,000 | \$0 | \$2,984,000 | \$935,000 | \$3,000 | \$351,000 | \$1,044,000 | \$4,000 | \$1,256,000 | \$1,049,000 | \$8,000 | -\$1,383,000 |
| Year 4 | 2024 | \$869,000 | \$0 | \$3,853,000 | \$874,000 | \$3,000 | \$1,222,000 | \$987,000 | \$4,000 | \$2,239,000 | \$991,000 | \$7,000 | -\$399,000 |
| Year 5 | 2025 | \$812,000 | \$0 | \$4,664,000 | \$817,000 | \$3,000 | \$2,036,000 | \$933,000 | \$4,000 | \$3,168,000 | \$937,000 | \$7,000 | \$531,000 |
| Year 6 | 2026 | \$758,000 | \$0 | \$5,422,000 | \$763,000 | \$3,000 | \$2,796,000 | \$882,000 | \$4,000 | \$4,046,000 | \$886,000 | \$6,000 | \$1,411,000 |
| Year 7 | 2027 | \$709,000 | \$0 | \$6,131,000 | \$713,000 | \$3,000 | \$3,507,000 | \$833,000 | \$3,000 | \$4,876,000 | \$837,000 | \$6,000 | \$2,242,000 |
| Year 8 | 2028 | \$662,000 | \$0 | \$6,792,000 | \$666,000 | \$2,000 | \$4,170,000 | \$787,000 | \$3,000 | \$5,660,000 | \$791,000 | \$6,000 | \$3,027,000 |
| Year 9 | 2029 | \$618,000 | \$0 | \$7,410,000 | \$622,000 | \$2,000 | \$4,790,000 | \$744,000 | \$3,000 | \$6,401,000 | \$747,000 | \$5,000 | \$3,768,000 |
| Year 10 | 2030 | \$577,000 | \$0 | \$7,987,000 | \$581,000 | \$2,000 | \$5,369,000 | \$703,000 | \$3,000 | \$7,101,000 | \$706,000 | \$5,000 | \$4,469,000 |
| Year 11 | 2031 | \$538,000 | \$0 | \$8,525,000 | \$542,000 | \$2,000 | \$5,909,000 | \$664,000 | \$3,000 | \$7,762,000 | \$666,000 | \$5,000 | \$5,131,000 |
| Year 12 | 2032 | \$502,000 | \$0 | \$9,027,000 | \$506,000 | \$2,000 | \$6,413,000 | \$627,000 | \$2,000 | \$8,386,000 | \$629,000 | \$4,000 | \$5,756,000 |
| Year 13 | 2033 | \$469,000 | \$0 | \$9,496,000 | \$472,000 | \$2,000 | \$6,883,000 | \$592,000 | \$2,000 | \$8,976,000 | \$594,000 | \$4,000 | \$6,346,000 |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------------------------------|------|--------------|-------|-----------------------------------|---------------|---------|-----------------------------------|---------------------|---------|-----------------------------------|--------------|---------|-----------------------------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits |
| Year 14 | 2034 | \$437,000 | \$0 | \$9,933,000 | \$440,000 | \$2,000 | \$7,321,000 | \$559,000 | \$2,000 | \$9,533,000 | \$561,000 | \$4,000 | \$6,904,000 |
| Year 15 | 2035 | \$408,000 | \$0 | \$10,341,000 | \$410,000 | \$1,000 | \$7,730,000 | \$528,000 | \$2,000 | \$10,058,000 | \$530,000 | \$3,000 | \$7,430,000 |
| Year 16 | 2036 | \$380,000 | \$0 | \$10,721,000 | \$383,000 | \$1,000 | \$8,111,000 | \$498,000 | \$2,000 | \$10,555,000 | \$500,000 | \$3,000 | \$7,927,000 |
| Year 17 | 2037 | \$354,000 | \$0 | \$11,075,000 | \$357,000 | \$1,000 | \$8,467,000 | \$470,000 | \$2,000 | \$11,023,000 | \$472,000 | \$3,000 | \$8,396,000 |
| Year 18 | 2038 | \$330,000 | \$0 | \$11,405,000 | \$332,000 | \$1,000 | \$8,798,000 | \$444,000 | \$2,000 | \$11,465,000 | \$446,000 | \$3,000 | \$8,839,000 |
| Year 19 | 2039 | \$308,000 | \$0 | \$11,713,000 | \$310,000 | \$1,000 | \$9,107,000 | \$419,000 | \$2,000 | \$11,883,000 | \$420,000 | \$3,000 | \$9,257,000 |
| Year 20 | 2040 | \$287,000 | \$0 | \$12,000,000 | \$289,000 | \$1,000 | \$9,394,000 | \$1,064,000 | \$1,000 | \$12,945,000 | \$1,495,000 | \$2,000 | \$10,749,000 |
| INTERNAL RATE OF RETURN | | N/A | | | 31.47% | | | 37.34% | | | 17.20% | | |
| NET PRESENT VALUE (7% DISCOUNT RATE) | | \$12,000,000 | | | \$9,390,000 | | | \$12,940,000 | | | \$10,750,000 | | |
| BENEFIT - COST RATIO | | N/A | | | 4.5 | | | 4.6 | | | 2.7 | | |

Table 26: Estimated Annual Cost and Benefit at 7% Real Discount Rate (Mid)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------|------|-------------|-------|-----------------------------------|---------------|-------------|-----------------------------------|---------------------|-------------|-----------------------------------|-------------|-------------|-----------------------------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Year -2 | 2018 | \$0 | \$0 | \$0 | \$0 | \$88,000 | -\$88,000 | \$0 | \$119,000 | -\$119,000 | \$0 | \$208,000 | -\$208,000 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | \$0 | \$298,000 | -\$386,000 | \$0 | \$402,000 | -\$522,000 | \$0 | \$700,000 | -\$908,000 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | \$0 | \$2,256,000 | -\$2,643,000 | \$0 | \$3,046,000 | -\$3,568,000 | \$0 | \$5,302,000 | \$6,210,000 |
| Year 1 | 2021 | \$1,063,000 | \$0 | \$1,062,000 | \$1,069,000 | \$4,000 | -\$1,577,000 | \$2,705,000 | \$5,000 | -\$868,000 | \$2,710,000 | \$9,000 | \$3,509,000 |
| Year 2 | 2022 | \$994,000 | \$0 | \$2,056,000 | \$1,000,000 | \$4,000 | -\$581,000 | \$1,134,000 | \$5,000 | \$262,000 | \$1,139,000 | \$8,000 | \$2,378,000 |
| Year 3 | 2023 | \$929,000 | \$0 | \$2,984,000 | \$935,000 | \$3,000 | \$351,000 | \$1,087,000 | \$4,000 | \$1,344,000 | \$1,091,000 | \$8,000 | \$1,295,000 |
| Year 4 | 2024 | \$869,000 | \$0 | \$3,853,000 | \$874,000 | \$3,000 | \$1,222,000 | \$1,040,000 | \$4,000 | \$2,380,000 | \$1,045,000 | \$7,000 | -\$257,000 |
| Year 5 | 2025 | \$812,000 | \$0 | \$4,664,000 | \$817,000 | \$3,000 | \$2,036,000 | \$996,000 | \$4,000 | \$3,372,000 | \$1,000,000 | \$7,000 | \$736,000 |
| Year 6 | 2026 | \$758,000 | \$0 | \$5,422,000 | \$763,000 | \$3,000 | \$2,796,000 | \$953,000 | \$4,000 | \$4,321,000 | \$957,000 | \$6,000 | \$1,686,000 |
| Year 7 | 2027 | \$709,000 | \$0 | \$6,131,000 | \$713,000 | \$3,000 | \$3,507,000 | \$911,000 | \$3,000 | \$5,229,000 | \$915,000 | \$6,000 | \$2,595,000 |
| Year 8 | 2028 | \$662,000 | \$0 | \$6,792,000 | \$666,000 | \$2,000 | \$4,170,000 | \$871,000 | \$3,000 | \$6,098,000 | \$875,000 | \$6,000 | \$3,464,000 |
| Year 9 | 2029 | \$618,000 | \$0 | \$7,410,000 | \$622,000 | \$2,000 | \$4,790,000 | \$833,000 | \$3,000 | \$6,928,000 | \$836,000 | \$5,000 | \$4,295,000 |
| Year 10 | 2030 | \$577,000 | \$0 | \$7,987,000 | \$581,000 | \$2,000 | \$5,369,000 | \$796,000 | \$3,000 | \$7,721,000 | \$799,000 | \$5,000 | \$5,089,000 |
| Year 11 | 2031 | \$538,000 | \$0 | \$8,525,000 | \$542,000 | \$2,000 | \$5,909,000 | \$761,000 | \$3,000 | \$8,479,000 | \$763,000 | \$5,000 | \$5,848,000 |
| Year 12 | 2032 | \$502,000 | \$0 | \$9,027,000 | \$506,000 | \$2,000 | \$6,413,000 | \$726,000 | \$2,000 | \$9,203,000 | \$729,000 | \$4,000 | \$6,573,000 |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------------------------------|------|--------------|-------|-----------------------------------|---------------|---------|-----------------------------------|---------------------|---------|-----------------------------------|--------------|---------|-----------------------------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits |
| Year 13 | 2033 | \$469,000 | \$0 | \$9,496,000 | \$472,000 | \$2,000 | \$6,883,000 | \$693,000 | \$2,000 | \$9,894,000 | \$696,000 | \$4,000 | \$7,264,000 |
| Year 14 | 2034 | \$437,000 | \$0 | \$9,933,000 | \$440,000 | \$2,000 | \$7,321,000 | \$662,000 | \$2,000 | \$10,554,000 | \$664,000 | \$4,000 | \$7,925,000 |
| Year 15 | 2035 | \$408,000 | \$0 | \$10,341,000 | \$410,000 | \$1,000 | \$7,730,000 | \$632,000 | \$2,000 | \$11,183,000 | \$634,000 | \$3,000 | \$8,555,000 |
| Year 16 | 2036 | \$380,000 | \$0 | \$10,721,000 | \$383,000 | \$1,000 | \$8,111,000 | \$603,000 | \$2,000 | \$11,784,000 | \$605,000 | \$3,000 | \$9,156,000 |
| Year 17 | 2037 | \$354,000 | \$0 | \$11,075,000 | \$357,000 | \$1,000 | \$8,467,000 | \$575,000 | \$2,000 | \$12,357,000 | \$577,000 | \$3,000 | \$9,730,000 |
| Year 18 | 2038 | \$330,000 | \$0 | \$11,405,000 | \$332,000 | \$1,000 | \$8,798,000 | \$548,000 | \$2,000 | \$12,904,000 | \$550,000 | \$3,000 | \$10,277,000 |
| Year 19 | 2039 | \$308,000 | \$0 | \$11,713,000 | \$310,000 | \$1,000 | \$9,107,000 | \$523,000 | \$2,000 | \$13,425,000 | \$524,000 | \$3,000 | \$10,799,000 |
| Year 20 | 2040 | \$287,000 | \$0 | \$12,000,000 | \$289,000 | \$1,000 | \$9,394,000 | \$1,166,000 | \$1,000 | \$14,590,000 | \$1,598,000 | \$2,000 | \$12,394,000 |
| INTERNAL RATE OF RETURN | | N/A | | | 31.47% | | | 38.79% | | | 18.51% | | |
| NET PRESENT VALUE (7% DISCOUNT RATE) | | \$12,000,000 | | | \$9,390,000 | | | \$14,590,000 | | | \$12,390,000 | | |
| BENEFIT - COST RATIO | | N/A | | | 4.5 | | | 14,590,000.0 | | | 3.0 | | |

Table 27: Estimated Annual Cost and Benefit at 7% Real Discount Rate (High)

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | | |
|--------------|------|-------------|-------|-----------------------------------|---------------|--------------|-----------------------------------|---------------------|--------------|-----------------------------------|-------------|--------------|-----------------------------------|------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | |
| Year -4 | 2016 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | |
| Year -3 | 2017 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | |
| Year -2 | 2018 | \$0 | \$0 | \$0 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 | -\$208,000 |
| Year -1 | 2019 | \$0 | \$0 | \$0 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 | -\$908,000 |
| Year 0 | 2020 | \$0 | \$0 | \$0 | -\$6,210,000 | -\$6,210,000 | -\$6,210,000 | -\$6,210,000 | -\$6,210,000 | -\$6,210,000 | \$6,210,000 | -\$6,210,000 | -\$6,210,000 | |
| Year 1 | 2021 | \$1,063,000 | \$0 | \$1,062,000 | -\$3,493,000 | -\$3,493,000 | -\$3,493,000 | -\$3,493,000 | -\$3,493,000 | -\$3,493,000 | \$3,493,000 | -\$3,493,000 | -\$3,493,000 | |
| Year 2 | 2022 | \$994,000 | \$0 | \$2,056,000 | -\$2,332,000 | -\$2,332,000 | -\$2,332,000 | -\$2,332,000 | -\$2,332,000 | -\$2,332,000 | \$2,332,000 | -\$2,332,000 | -\$2,332,000 | |
| Year 3 | 2023 | \$929,000 | \$0 | \$2,984,000 | -\$1,206,000 | -\$1,206,000 | -\$1,206,000 | -\$1,206,000 | -\$1,206,000 | -\$1,206,000 | \$1,206,000 | -\$1,206,000 | -\$1,206,000 | |
| Year 4 | 2024 | \$869,000 | \$0 | \$3,853,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | -\$116,000 | |
| Year 5 | 2025 | \$812,000 | \$0 | \$4,664,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | \$940,000 | |
| Year 6 | 2026 | \$758,000 | \$0 | \$5,422,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | \$1,961,000 | |
| Year 7 | 2027 | \$709,000 | \$0 | \$6,131,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | \$2,948,000 | |
| Year 8 | 2028 | \$662,000 | \$0 | \$6,792,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | \$3,902,000 | |
| Year 9 | 2029 | \$618,000 | \$0 | \$7,410,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | \$4,822,000 | |
| Year 10 | 2030 | \$577,000 | \$0 | \$7,987,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | \$5,709,000 | |
| Year 11 | 2031 | \$538,000 | \$0 | \$8,525,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | \$6,565,000 | |
| Year 12 | 2032 | \$502,000 | \$0 | \$9,027,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | \$7,389,000 | |

| Project Year | Year | No Build | | | Lane Widening | | | Underpass + Bikeway | | | Combined | | |
|--------------------------------------|------|--------------|-------|-----------------------------------|---------------|--------------|-----------------------------------|---------------------|--------------|-----------------------------------|--------------|--------------|-----------------------------------|
| | | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits | Benefits | Costs | Net Cumulative Costs and Benefits |
| Year 13 | 2033 | \$469,000 | \$0 | \$9,496,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 | \$8,182,000 |
| Year 14 | 2034 | \$437,000 | \$0 | \$9,933,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 | \$8,946,000 |
| Year 15 | 2035 | \$408,000 | \$0 | \$10,341,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 | \$9,680,000 |
| Year 16 | 2036 | \$380,000 | \$0 | \$10,721,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 | \$10,386,000 |
| Year 17 | 2037 | \$354,000 | \$0 | \$11,075,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 | \$11,064,000 |
| Year 18 | 2038 | \$330,000 | \$0 | \$11,405,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 | \$11,715,000 |
| Year 19 | 2039 | \$308,000 | \$0 | \$11,713,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 | \$12,341,000 |
| Year 20 | 2040 | \$287,000 | \$0 | \$12,000,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 | \$14,039,000 |
| INTERNAL RATE OF RETURN | | N/A | | | 31.47% | | | 40.17% | | | 19.73% | | |
| NET PRESENT VALUE (7% DISCOUNT RATE) | | \$12,000,000 | | | \$9,390,000 | | | \$16,230,000 | | | \$14,040,000 | | |
| Benefit-Cost Ratio | | N/A | | | 4.5 | | | 0.4 | | | 3.2 | | |

Table 28: Estimated Job-Years from Construction Spending (Low, Mid, and High)

| Scenario | No Build | Lane Widening | Underpass + Bikeway | Combined |
|-----------|----------|---------------|---------------------|----------|
| Job-Years | 0 | 44 | 59 | 103 |

Notes

ⁱ Ibid.

ⁱⁱ NHTS (2009). <http://nhts.ornl.gov/tables09/fatcat/2009/aptl_TRPTRANS_WHYTRP1S.html>

ⁱⁱⁱ Ibid.

^{iv} Safe Routes National Center for Safe Routes to School, Trends in Walking and Bicycling to School from 2007 to 2013 (2015). <http://www.saferoutesinfo.org/sites/default/files/SurveyTrends_2007-13_final1.pdf>

^v NHTS (2009). <http://nhts.ornl.gov/tables09/fatcat/2009/aptl_TRPTRANS_WHYTRP1S.html>

^{vi} Kitamura, R., Zhao, H., and Gubby, A. R. Development of a Pavement Maintenance Cost Allocation Model. Institute of Transportation Studies, University of California, Davis. <<https://trid.trb.org/view.aspx?id=261768>>

^{vii} State Indicators Report on Physical Activity, CDC. (2014)

<http://www.cdc.gov/physicalactivity/downloads/pa_state_indicator_report_2014.pdf>

^{viii} Inadequate Physical Activity and Health Care Expenditures in the United States.

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