



To: York County Economic Development Authority
From: Alta Planning + Design
Date: 02/23/2024
Re: RAISE Benefit-Cost Analysis Memo

Benefit-Cost Analysis for Codorus Greenway RAISE Grant Application

Executive Summary

This Benefit-Cost Analysis (BCA) includes the benefits and costs for the proposed project that would be fully constructed if the RAISE grant is awarded. The analysis period was 22 years (2 years of construction and 20 years of operation) and assumes a useful service life of 30 years for the project. The costs and benefits are presented in 2022 dollars.

The following categories of benefits were considered in the BCA:

- **Safety:** The expected reduction in collisions and associated costs.
- **Environmental Sustainability:** Includes reductions in the following pollutants that impact air quality: CO₂, NO_x, SO₂, and PM_{2.5}.
- **Quality of Life:** Includes the health benefits of increased physical activity and decreased healthcare costs from new users of the project.
- **Economic Competitiveness:** Includes savings in household transportation costs and traffic congestion costs.
- **State of Good Repair:** Includes reductions in roadway maintenance costs.
- **Maintenance costs (dis-benefit):** Covers the ongoing costs of upkeep to the proposed project

Result Summary

Table 1 displays the total benefits by category. The capital costs included in the BCA are \$32.2 million. This BCA estimates the project compared to the no-build scenario over a 22-year evaluation (2026-2047) and at a 3.1 percent real discount rate will have a net present value of \$27,961,982 and a benefit-cost ratio of **2.0 : 1.0**.

Table 1. Total Undiscounted Benefits over 20 years of Operation

CATEGORY	MONETARY VALUE (In 2022 dollars)
Safety Benefits	\$49,280,000
Environmental Sustainability	\$178,600
Quality of Life	\$9,348,000
Economic Competitiveness	\$667,100
State of Good Repair	\$96,000
Green Infrastructure	\$26,400,000
Maintenance Costs	\$(5,200,000)
Residual Value	\$10,733,333
TOTAL BENEFITS (UNDISCOUNTED)	\$91,468,000

Table 2. Benefit-Cost Analysis Summary

CATEGORY	DISCOUNTED ¹ VALUE (in 2022 dollars)
Net Discounted Benefits	\$56,058,000
Net Discounted Capital Costs	\$(28,096,000)
Net Present Value	\$27,961,982
Benefit - Cost Ratio	2.0

Background

The benefit-cost analysis (BCA) for this project follows the principles documented in the USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs (December 2023), and uses the recommended parameter values where applicable. The BCA includes the benefits and costs for the project that would be fully constructed if the RAISE grant is awarded. The analysis period was 22 years (2 years of construction and 20 years of operation) and assumes a useful service life of 30 years for the project. The costs and benefits are presented in 2022 base year dollars. Benefits and cost streams were discounted using a 3.1% per year discount rate, except for carbon benefits which were discounted at 2% per year. This memo contains a detailed explanation of the BCA methodology and the parameter values that were used.

¹ A 3.1% discount rate was used for the benefits and costs except for carbon benefits which were discounted at 2% per year.

Approach to Benefits and Study Area

This BCA approach 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.

While construction of the project will benefit the residents of and visitors to the region, those living within three miles (about a 15-minute bike ride) and one-half mile (about a 10-minute walk) of the project will have the most convenient access and will gain the most from its completion. Accordingly, this BCA focuses on the bicycling benefits attributed to residents living within three miles of the project and on the walking benefits attributed to residents living within one-half mile project. There are several benefit categories that benefit the region more widely (reduced roadway maintenance, healthcare costs), but these ranges are used to constrain this analysis to the main beneficiaries.

Benefits were primarily calculated by comparing walking and biking activity (including collisions) under the baseline to a Build scenario in which the Connecting Communities project has been implemented. The baseline and build scenarios encompass an identical geography (Census Tracts within 3 miles of the project). **The benefits included in the Net Present Value and Benefit-Cost Ratio calculations are the net difference between the two scenarios.** Table 3 provides a summary of the project components and improvements.

Table 3: Summary Matrix

Baseline	Build Scenario	Type of Impacts
Walking and biking activity within 3 miles of the study area.	Construction of a multi-use trail to complete a citywide connection, with flood protection, stormwater and public space improvements, and the estimated impacts on walking and biking activity within 3 miles of the study area.	Reduced mortality benefits, reduced bicycle and pedestrian collisions, reduced roadway maintenance, reduced traffic congestion, increased bioretention, stream and floodplain restoration, and reduced household transportation costs.

Costs

Refer to the main application for a detailed breakdown of projects costs. The capital cost schedule is shown in **Table 4**. This schedule includes design, engineering, permitting, contracting and installation.

Table 4. Project Construction Schedule and Cost

Construction Year	Anticipated Cost
2026	\$17,100,000
2027	\$15,100,000

Construction Year	Anticipated Cost
Total Capital Costs	\$32,200,000

The total annual maintenance costs are **\$260,000 per year** (undiscounted) and they were included as a disbenefit in the benefit-cost ratio. An opinion of probable maintenance cost for the Codorus Beautification Initiative was prepared initially by engineering firm Buchart Horn on July 13, 2018, and were included in the 2020 Codorus Master Site Development Plan. These costs were updated for inflation on January 16, 2024. Additional maintenance costs for green infrastructure elements were estimated by the FEMA-BRIC BCA tool.

Maintenance costs for the shared use path were originally estimated at \$130,000 per year in 2018 – updated for inflation and anticipated inflation in 2026 and 2027, the Year 1 maintenance cost in 2028 would be \$183,000. Annual maintenance costs for the bioretention benefits were estimated by the FEMA-BRIC BCA tool at \$22,500 and annual maintenance costs for floodplain and stream restoration are \$50,000. These estimates were similarly adjusted for anticipated inflation in 2026 and 2027, thus bringing them up to an initial 2028 Year 1 of maintenance – accordingly, those costs are now \$24,000 and \$53,000 respectively.

Useful Life

The expected useful life of the proposed trail facilities is 30 years. The window of analysis used was 20 years. A residual value of \$10,733,333 (undiscounted) was claimed as a benefit in the final year of the analysis period, assuming linear depreciation.

Demand

To understand the benefits of the proposed project, demand analysis was conducted to support the 2020 DCNR Master Site Development Plan. Projected participation rates for users of the Codorus Greenway are based on the 2017 Park User Survey and Economic Impact Analysis for the nearby York County Heritage Rail Trail. The study bases its user counts on methodology published in the Rails-to-Trails Conservancy’s Trail User Survey Workbook.

In 2017, approximately 263,850 user-trips were estimated to have been made on the 21-mile Heritage Rail Trail. The MSDP estimates that users of the Codorus Greenway will come from the county at large, by providing a missing connection for York residents west of the Codorus. Additionally, some users may visit the trail from the greater South-Central Pennsylvania region. The MSDP estimates there will be approximately 180,000 user-trips on the Codorus Greenway. The MSDP covered a 1.4 mile greenway. Further assessment following the completion of the MSDP concluded that the northern sections are infeasible in the short-term due to bridge replacements needed to accommodate the trail, and right of way needed along the rail line. Thus, the RAISE grant project is submitting for a shorter 0.9-mile segment. As such, the projected user trips were adjusted for the length of the RAISE grant project. Multiplying 180,000 by 64% resulted in 115,714 annual trips, or 317 trips per day. This figure was compared with similar greenways in Pennsylvania, using the counter dashboard maintained by the Rail-Trail Conservancy.² **Table 5** presents trail counts for identified similar trails in Pennsylvania.

² Rail-to-Trail Conservancy PA Dashboard, <https://data.eco-counter.com/ParcPublic/?id=4275>

The bicycle and pedestrian mode share were determined using the heritage rail trail 2017 Park User Survey and Economic Impact Analysis report. This included a user survey of 414 trail users on the Heritage Rail Trail. Some respondents stated other trail uses aside from walking and biking, including jogging, nature studies, fishing, and geocaching. These uses were considered walking, presuming they start or end with a walking trip. Horseback riding (0.4% of users) was not included when determining the mode split, as it did not fall in either category, and will not be permitted on the Codorus Greenway. This resulted in an estimated 43% bicycle share and 57% pedestrian share (**Table 6**).

Table 5. Comparable Trail and Greenway Demand

Trail	Location	Average Daily Users
Enola Low Grade – Manor Twp.	River Road/ Turkey Hill Nature Preserve	297
NW River Trail	Old River Road (NW Lancaster)	398
Weissport D&L Trail	Lehigh Canal	213
Lackawana Heritage Trail	S 7 th Avenue (Scranton)	322

Table 6. Demand Estimate

Project Name	Length (Mi)	Estimated Daily Average of Bike Trips	Estimated Daily Average of Pedestrian Trips	Average Daily Users
Multimodal Corridor	0.9	136	181	317
Total estimate: 317 daily users (average)				

Benefits

Walking and Biking Activity

The CBA estimated current levels of walking and biking within the project area using American Community Survey (ACS) 2019 5-year data. **Table 7** displays the existing commute to work mode share for people within walking and biking distance of the proposed project. Population and demographic forecasts from the York County Planning Commission at the Transportation Analysis Zone (TAZ) level were used to estimate population growth in the study area over the analysis period. Population forecasts were collected for 2018, 2025, 2035, and 2045, and were interpolated for each intermediate year in the analysis.

Table 7. Means of Transportation to Work of People Living in the Study Area (2019 American Community Survey)

GSP Corridor	Employed Population	Drove Alone	Carpool	Public Transit	Bicycled	Walked	Worked from Home	Other
Walkshed (within half-mile)	12,606	67%	14%	6%	2%	7%	3%	1%
Bikeshed (within 3 miles)	52,156	79%	11%	2%	1%	3%	3%	0%

The means of transportation to work data was converted to daily estimates and extrapolated to annual trip volumes and broken into different trip types (i.e. commute, school, college, and utilitarian) using the existing travel patterns (Table 7) and data from the National Household Transportation Survey. The annual extrapolations account for the expected number of trips per week by trip type (i.e., commute, school, and college trips are expected five out of seven days a week, and other trip types are expected to occur seven days a week).

Table 8: Trip Purpose Multiplier³

	Bike	Walk
Utilitarian Trip Multiplier	5.33	8.77

Increase in Walking and Biking Activity

The Baseline assumes that the walking and biking mode share will remain constant and that trips will increase annually with expected population growth. In the Build scenario, the demand estimates for the proposed project were added to the existing walking and biking activity starting in 2027 (the expected opening year). The demand estimates were escalated by the expected population growth factor each year.

Decrease in Motor Vehicle Trips

Some of the estimated annual bicycle and pedestrian trips within the proposed project area are expected to replace motor vehicle trips. Calibrated to modal shift factors reported in literature⁴, a univariate regression model estimates the motor vehicle trip replacement factor based on the percentage of trips that terminate in census block groups within ¼-mile of the proposed facility that are less than 4 miles. Additional details on the methodology are included in Appendix I. Trip distance data is provided by Replica for a typical travel Thursday in Fall 2019⁵. The motor vehicle trip replacement factor for the active mode trips is **0.365**.

To estimate the number of vehicle-miles that might be replaced by bicycling and walking trips, Table 9 shows the average trip distance of bicycling and walking trips by trip purpose. The number of vehicle miles reduced due to bicycle and pedestrian trips was calculated by multiplying the number of biking or walking trips by the trip replacement and trip distance factors.

³ Travel Day Person Trips (in millions), NHTSA 2017 <https://nhts.ornl.gov/>

⁴ Volker et al (2019). Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks

⁵ Replica Places (2019). <https://replicahq.com/>

Table 9: Trip Distance (miles)

	Bike	Walk
Commuter Trips ⁶	2.47	0.72
College Trips ⁷	1.31	0.43
K-12 School Trips ⁸	1.36	0.69
Utilitarian Trips ⁹	2.28	0.83

Environmental Sustainability Benefits

For every vehicle-mile reduced, there is an assumed decrease in greenhouse gases and criteria pollutants. **Table 10** lists the reduction in greenhouse gases and criteria pollutants by vehicle-mile traveled. The cost to mitigate or clean-up those pollutants was calculated using the monetary values provided by the 2023 USDOT BCA Guidance Table A-6 for the corresponding year. Emissions types not listed in that table were not included in the analysis.

Table 10: Environmental Sustainability Multipliers

	Value (metric tons/VMT)
Particulate Matter 2.5 (PM _{2.5}) ¹⁰	0.0000000044
Nitrous Oxides (NOx) ¹¹	0.0000008
Sulfur Oxides (SO ₂) ¹²	0.00000001
Carbon Dioxide ¹³	0.00044

⁶ NHTS (2017). http://nhts.ornl.gov/tables09/fatcat/2009/aptl_TRPTRANS_WHYTRP1S.html

⁷ Ibid.

⁸ 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

⁹ NHTS (2017). http://nhts.ornl.gov/tables09/fatcat/2009/aptl_TRPTRANS_WHYTRP1S.html

¹⁰ The Safer Affordable Fuel-Efficient Vehicles Rule for MY2021-MY2026 Passenger Cars, Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2023, Table A-6, and Light Trucks Preliminary Regulatory Impact Analysis (October 2018) https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-al76_epa_pria_181016.pdf

¹¹ The Safer Affordable Fuel-Efficient Vehicles Rule for MY2021-MY2026 Passenger Cars, Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2023, Table A-6, and Light Trucks Preliminary Regulatory Impact Analysis (October 2018) https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-al76_epa_pria_181016.pdf

¹² The Safer Affordable Fuel-Efficient Vehicles Rule for MY2021-MY2026 Passenger Cars, Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2023, Table A-6, and Light Trucks Preliminary Regulatory Impact Analysis (October 2018) https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-al76_epa_pria_181016.pdf

¹³ Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866. <https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf>

Quality of Life Benefits

More people bicycling and walking can help encourage an increase in physical activity levels, increased cardiovascular health, and other positive outcomes for users. The benefits from reduced mortality were calculated using the recommended values provided in the 2023 USDOT BCA Guidance (Table A-12) and the national distribution of age ranges and travel patterns. These benefits were only applied to the estimated number of walking and biking trips induced by the project (see **Demand** section). **Table 11** displays the multipliers that were used.

Table 11: Mortality Reduction Multipliers

Mortality Reduction Benefits of Induced Active Transportation	Value
Walking Value per Induced Trip	\$7.63
Cycling Value per Induced Trips	\$6.80
Walking Ae Proportion (20-74 years old)	68%
Cycling Age Proportion (20-64 years old)	59%
Trips induced from non-active modes	89%

Economic Competitiveness Benefits

For every vehicle-mile reduced, there is a reduction in household transportation costs and congestion costs. **Table 12** displays the multipliers use to calculate economic competitiveness benefit. The estimated annual economic competitiveness benefits are shown in **Table 19**.

Table 12: Economic Competitiveness Multipliers

	Value
Household Transportation Cost Savings	\$0.43 per VMT ¹⁴
Congestion Cost Savings	\$0.06 per VMT ^{15,16}

¹⁴ Our Driving Costs, AAA (2016). http://exchange.aaa.com/automobiles-travel/automobiles/driving-costs/#.Vw_xCPkrKUK

¹⁵ Crashes vs. Congestion: What's the Cost to Society? AAA (2011). http://www.camsys.com/pubs/2011_AAA_CrashvCongUpd.pdf

¹⁶ Crashes vs. Congestion: What's the Cost to Society? AAA (2011). http://www.camsys.com/pubs/2011_AAA_CrashvCongUpd.pdf

Safety Benefits

The proposed project would decrease conflicts between people walking and biking with motor vehicles. Collision data was covering a ten-year period (January 2013 through December 2022) was extracted from the Pennsylvania Crash Information Tool (PCIT).¹⁷ Collisions under consideration involved a bicycle and/or pedestrian and were located within a ¼ mile Euclidian radius of proposed greenway, where it would be expected that people walking and biking would use the proposed project facilities when implemented (**Table 13**). The Crash Reduction Factor (CRF) “Install Shared Use Path” (CM ID: 9520) was applied to the bicycle crashes in the area, and the CRF “Install Sidewalk” (CM ID: 11246) was applied to pedestrian crashes. The crashes and the benefits were monetized using the values provided in the 2023 USDOT BCA Guidance Table A-1 on KABCO Level data.

Table 13. Summary of Collisions within a 0.25 mile Buffer Distance

TOTAL CRASHES	FATAL	SERIOUS INJURY	MINOR INJURY	POSSIBLE INJURY	UNKNOWN INJURY
Total bicycle and pedestrian crashes	3.0	13.0	29	25	29
Average annual bicycle and pedestrian crashes	.30	1.30	2.90	2.50	2.90

*PennDOT severity levels were converted to KABCO levels using [FHWA guidance](#).¹⁸

State-of-good Repair Benefits

Table 14 shows the estimated roadway maintenance cost savings associated with a reduction in vehicle-miles traveled.

Table 14: State of Good Repair Multiplier

Value (metric tons/VMT)	
Roadway Maintenance Cost Savings	\$0.08 per VMT ¹⁹

¹⁷ Pennsylvania Crash Information Tool. 2023. <https://crashinfo.penndot.gov/PCIT/welcome.html>

¹⁸ 2020 Pennsylvania Crash Facts and Statistics, Pennsylvania Department of Transportation. https://www.penndot.pa.gov/TravellnPA/Safety/Documents/2020_CFB_linked.pdf

¹⁹ 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>

Green Infrastructure Benefits

One of the most innovative features of the project is its integration of the greenway with a complete reconstruction of the existing flood control system along Codorus Creek for the City of York, York County, and the U.S. Army Corps of Engineers (USACE). The reconstructed systems would take a natural-systems infrastructure approach, reducing the number of concrete floodwalls, and increasing the areas of floodable wetland and meadow buffers. The current flood control system, built in 1947, consists of a system of levee walls that have reduced the impact of flooding from the catastrophic levels of the 1933 flood. Yet, multiple of these walls are now failing and the USACE has identified this flood control system as a priority for reconstruction.

The City and County have collaborated with USACE in developing a new flood control strategy that will maintain the performance levels of the currently decaying flood control system but using a natural-systems approach instead. The proposed streambank and stream restoration that is part of this project will remove steep flood control walls and replace them with a more natural flowing stream and terraces to manage floodwaters. Multiple green infrastructure benefits will result from this approach.

There are two primary green infrastructure benefits that were identified and monetized in the BCA analysis: bioretention benefits and floodplain and stream restoration benefits. These benefits were monetized through the FEMA-BRIC Benefit-Cost Calculator V.6.0 model²⁰. The results of these benefits are shown in Table 21.

- **Bioretention:** In addition to the local and regional flood control benefits, this project directly addresses stormwater runoff from the project area and immediate surroundings, by removing hardscape and introducing more natural vegetated surfaces that better infiltrate runoff. The conceptual design plans for the project include approximately 7 acres (out of the total project’s 25.4 acres) that will provide stormwater bioretention function. The total estimated annual bioretention benefits are \$865,192.
- **Floodplain and Stream Restoration benefits:** This project enhances the ability for York to withstand adverse weather events, for example, by being the necessary first phase for the reconfiguration of the watershed flood control system; and by providing additional shade and vegetation near downtown York, thus potentially improving the microclimate in adjacent neighborhoods, and decreasing the risks of heat stress in a warming climate. However, these benefits are difficult or currently infeasible to calculate, even with the use of the FEMA-BRIC calculator. Some of the highest green infrastructure benefits of the flood control system would require additional data collection on prior flood damages and additional modeling of proposed future damages, which were beyond the scope and schedule for this RAISE application.

One modest benefit that can be derived with this calculator, however, is a simple one: the benefit from maintaining a river crossing open and avoiding detours due to flooding. The project area contains multiple river crossings. For simplicity of analysis, the AADT for the highest volume crossing (22,000 AADT for the Market Street bridge) was used as the basis for the calculation. Inputting the one way volume (11,000 AADT), plus a potential detour distance of 2 miles and a minimum trip delay of 5 minutes, the FEMA-BRIC calculator can estimate the disbenefit of this bridge’s closure during a flood event. Accordingly, using this single bridge and single factor as a baseline, the total expected annual floodplain and stream restoration benefits are \$452,677.

Please note that these green infrastructure benefits can be considered conservative calculations. For example, only one bridge interruption was used in the Floodplain restoration calculation. In a major flood event, other

²⁰ The FEMA BRIC Benefit-Cost Calculator v6.0 and instructions on its use can be found on the FEMA website, at <https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis/full-bca>.

bridges would also be impacted. Also, only 7 acres out of the total 25.4 acres of the project were used in the bioretention calculation, because they represent the areas where impervious surfaces are being specifically removed and wetland and floodable meadow areas are being installed by the project. Other areas within the 25.4 acres will also have impervious surfaces removed, but will not be specifically designed as wetland or meadow areas.

A Sensitivity Analysis was performed to check on the potential impact of changing assumptions on the FEMA-BRC calculator. Several runs were made changing input parameters. To check for a worst-case scenario, a combined run was performed using a combination of the following criteria:

- Reducing bioretention areas from 7 acres to 5 acres, assuming that some of the proposed areas would turn out to encounter obstacles for full conversion
- Increasing expected damages after mitigation to 2 days of impact, instead of zero impact
- Increase the land use area as Urban Green Space to 100% instead of the anticipated 53%

The result of this worst-case scenario would see a reduction of annual bioretention benefits to \$617,944 and annual floodplain restoration benefits to \$273,522, a reduction of 29% and 39% respectively. Even under this scenario, the total calculated BCR for the entire project would be: 1.80 to 1.

Please refer to the FEMA-BRIC Summary Worksheet in the Appendices for further detail on these calculations.

Results

Table 15 through **Table 25** display the results of the benefit-cost analysis for each year of the analysis period. This BCA estimates the project compared to the no-build scenario over a 22-year evaluation (2026-2047) and at a 3.1 percent real discount rate will have a net present value of **\$27,961,982** and a benefit-cost ratio of **2.0 : 1.0**.

Table 15: Estimated Annual Bicycle and Walk Trips

Year	Baseline	Build Scenario	Additional Trips
2026	9,042,800	9,042,800	-
2027	9,145,600	9,145,600	-
2028	9,248,400	9,353,900	105,500
2029	9,351,200	9,457,400	106,200
2030	9,454,000	9,560,900	106,900
2031	9,556,800	9,664,400	107,600
2032	9,659,600	9,768,000	108,400
2033	9,762,400	9,871,500	109,100
2034	9,865,200	9,975,000	109,800
2035	9,968,000	10,078,500	110,500
2036	10,070,900	10,182,000	111,100
2037	10,173,700	10,285,500	111,800
2038	10,276,500	10,389,100	112,600
2039	10,379,300	10,492,600	113,300
2040	10,482,100	10,596,100	114,000
2041	10,584,900	10,699,600	114,700
2042	10,687,700	10,803,100	115,400
2043	10,790,500	10,906,600	116,100
2044	10,893,300	11,010,100	116,800
2045	10,996,100	11,113,700	117,600
2046	11,098,900	11,217,200	118,300
2047	11,201,700	11,320,700	119,000
Total Additional Trips:			2,244,700



Table 16: Estimated Annual Vehicle Miles Reduced

Year	Baseline	Build Scenario	Additional Vehicle Miles Reduced
2026	3,493,700	3,493,700	-
2027	3,533,500	3,533,500	-
2028	3,573,300	3,628,500	55,200
2029	3,613,100	3,668,700	55,600
2030	3,652,900	3,708,800	55,900
2031	3,692,700	3,749,000	56,300
2032	3,732,500	3,789,200	56,700
2033	3,772,300	3,829,300	57,000
2034	3,812,100	3,869,500	57,400
2035	3,851,900	3,909,700	57,800
2036	3,891,700	3,949,900	58,200
2037	3,931,500	3,990,000	58,500
2038	3,971,300	4,030,200	58,900
2039	4,011,100	4,070,400	59,300
2040	4,050,900	4,110,600	59,700
2041	4,090,700	4,150,700	60,000
2042	4,130,500	4,190,900	60,400
2043	4,170,300	4,231,100	60,800
2044	4,210,100	4,271,200	61,100
2045	4,250,000	4,311,400	61,400
2046	4,289,800	4,351,600	61,800
2047	4,329,600	4,391,800	62,200
Total Additional Vehicle Miles Reduced:			1,174,200



Table 17: Estimated Annual Environmental Sustainability Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$478,500	\$485,900	\$7,400
2029	\$490,200	\$497,700	\$7,500
2030	\$503,300	\$511,000	\$7,700
2031	\$517,000	\$524,900	\$7,900
2032	\$527,600	\$535,600	\$8,000
2033	\$541,600	\$549,800	\$8,200
2034	\$554,100	\$562,400	\$8,300
2035	\$566,700	\$575,200	\$8,500
2036	\$579,500	\$588,200	\$8,700
2037	\$594,200	\$603,000	\$8,800
2038	\$605,500	\$614,500	\$9,000
2039	\$618,700	\$627,900	\$9,200
2040	\$633,900	\$643,200	\$9,300
2041	\$647,400	\$656,900	\$9,500
2042	\$662,900	\$672,500	\$9,600
2043	\$676,700	\$686,500	\$9,800
2044	\$692,500	\$702,500	\$10,000
2045	\$706,600	\$716,800	\$10,200
2046	\$722,800	\$733,200	\$10,400
2047	\$739,100	\$749,700	\$10,600
Total Benefits:			\$178,600



Table 18: Estimated Annual Quality of Life Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$40,996,000	\$41,436,000	\$440,000
2029	\$41,452,000	\$41,894,000	\$442,000
2030	\$41,908,000	\$42,353,000	\$445,000
2031	\$42,363,000	\$42,812,000	\$449,000
2032	\$42,819,000	\$43,270,000	\$451,000
2033	\$43,275,000	\$43,729,000	\$454,000
2034	\$43,731,000	\$44,188,000	\$457,000
2035	\$44,186,000	\$44,646,000	\$460,000
2036	\$44,642,000	\$45,105,000	\$463,000
2037	\$45,098,000	\$45,564,000	\$466,000
2038	\$45,554,000	\$46,022,000	\$468,000
2039	\$46,009,000	\$46,481,000	\$472,000
2040	\$46,465,000	\$46,940,000	\$475,000
2041	\$46,921,000	\$47,399,000	\$478,000
2042	\$47,377,000	\$47,857,000	\$480,000
2043	\$47,832,000	\$48,316,000	\$484,000
2044	\$48,288,000	\$48,775,000	\$487,000
2045	\$48,744,000	\$49,233,000	\$489,000
2046	\$49,200,000	\$49,692,000	\$492,000
2047	\$49,655,000	\$50,151,000	\$496,000
Total Benefits:			\$9,348,000

Table 19: Estimated Annual Economic Competitiveness Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$2,031,200	\$2,062,500	\$31,300
2029	\$2,053,800	\$2,085,400	\$31,600
2030	\$2,076,400	\$2,108,200	\$31,800
2031	\$2,099,100	\$2,131,100	\$32,000
2032	\$2,121,700	\$2,153,900	\$32,200
2033	\$2,144,300	\$2,176,700	\$32,400
2034	\$2,166,900	\$2,199,600	\$32,700
2035	\$2,189,600	\$2,222,400	\$32,800
2036	\$2,212,200	\$2,245,200	\$33,000
2037	\$2,234,800	\$2,268,100	\$33,300
2038	\$2,257,400	\$2,290,900	\$33,500
2039	\$2,280,100	\$2,313,700	\$33,600
2040	\$2,302,700	\$2,336,600	\$33,900
2041	\$2,325,300	\$2,359,400	\$34,100
2042	\$2,347,900	\$2,382,200	\$34,300
2043	\$2,370,600	\$2,405,100	\$34,500
2044	\$2,393,200	\$2,427,900	\$34,700
2045	\$2,415,800	\$2,450,700	\$34,900
2046	\$2,438,400	\$2,473,600	\$35,200
2047	\$2,461,100	\$2,496,400	\$35,300
Total Benefits:			\$667,100



Table 20: Estimated Annual Safety Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$-	\$2,464,000	\$2,464,000
2029	\$-	\$2,464,000	\$2,464,000
2030	\$-	\$2,464,000	\$2,464,000
2031	\$-	\$2,464,000	\$2,464,000
2032	\$-	\$2,464,000	\$2,464,000
2033	\$-	\$2,464,000	\$2,464,000
2034	\$-	\$2,464,000	\$2,464,000
2035	\$-	\$2,464,000	\$2,464,000
2036	\$-	\$2,464,000	\$2,464,000
2037	\$-	\$2,464,000	\$2,464,000
2038	\$-	\$2,464,000	\$2,464,000
2039	\$-	\$2,464,000	\$2,464,000
2040	\$-	\$2,464,000	\$2,464,000
2041	\$-	\$2,464,000	\$2,464,000
2042	\$-	\$2,464,000	\$2,464,000
2043	\$-	\$2,464,000	\$2,464,000
2044	\$-	\$2,464,000	\$2,464,000
2045	\$-	\$2,464,000	\$2,464,000
2046	\$-	\$2,464,000	\$2,464,000
2047	\$-	\$2,464,000	\$2,464,000
Total Benefits:			\$49,280,000

Table 21: Estimated Annual State of Good Repair Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$292,400	\$296,900	\$4,500
2029	\$295,600	\$300,200	\$4,600
2030	\$298,900	\$303,400	\$4,500
2031	\$302,100	\$306,700	\$4,600
2032	\$305,400	\$310,000	\$4,600
2033	\$308,600	\$313,300	\$4,700
2034	\$311,900	\$316,600	\$4,700
2035	\$315,200	\$319,900	\$4,700
2036	\$318,400	\$323,200	\$4,800
2037	\$321,700	\$326,500	\$4,800
2038	\$324,900	\$329,700	\$4,800
2039	\$328,200	\$333,000	\$4,800
2040	\$331,400	\$336,300	\$4,900
2041	\$334,700	\$339,600	\$4,900
2042	\$338,000	\$342,900	\$4,900
2043	\$341,200	\$346,200	\$5,000
2044	\$344,500	\$349,500	\$5,000
2045	\$347,700	\$352,800	\$5,100
2046	\$351,000	\$356,000	\$5,000
2047	\$354,200	\$359,300	\$5,100
Total Benefits:			\$96,000



Table 22: Estimated Annual Green Infrastructure Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$-	\$1,320,000	\$1,320,000
2029	\$-	\$1,320,000	\$1,320,000
2030	\$-	\$1,320,000	\$1,320,000
2031	\$-	\$1,320,000	\$1,320,000
2032	\$-	\$1,320,000	\$1,320,000
2033	\$-	\$1,320,000	\$1,320,000
2034	\$-	\$1,320,000	\$1,320,000
2035	\$-	\$1,320,000	\$1,320,000
2036	\$-	\$1,320,000	\$1,320,000
2037	\$-	\$1,320,000	\$1,320,000
2038	\$-	\$1,320,000	\$1,320,000
2039	\$-	\$1,320,000	\$1,320,000
2040	\$-	\$1,320,000	\$1,320,000
2041	\$-	\$1,320,000	\$1,320,000
2042	\$-	\$1,320,000	\$1,320,000
2043	\$-	\$1,320,000	\$1,320,000
2044	\$-	\$1,320,000	\$1,320,000
2045	\$-	\$1,320,000	\$1,320,000
2046	\$-	\$1,320,000	\$1,320,000
2047	\$-	\$1,320,000	\$1,320,000
Total Benefits:			\$26,400,000



Table 23: Estimated Annual Maintenance Disbenefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2028	\$-	\$(260,000)	\$(260,000)
2029	\$-	\$(260,000)	\$(260,000)
2030	\$-	\$(260,000)	\$(260,000)
2031	\$-	\$(260,000)	\$(260,000)
2032	\$-	\$(260,000)	\$(260,000)
2033	\$-	\$(260,000)	\$(260,000)
2034	\$-	\$(260,000)	\$(260,000)
2035	\$-	\$(260,000)	\$(260,000)
2036	\$-	\$(260,000)	\$(260,000)
2037	\$-	\$(260,000)	\$(260,000)
2038	\$-	\$(260,000)	\$(260,000)
2039	\$-	\$(260,000)	\$(260,000)
2040	\$-	\$(260,000)	\$(260,000)
2041	\$-	\$(260,000)	\$(260,000)
2042	\$-	\$(260,000)	\$(260,000)
2043	\$-	\$(260,000)	\$(260,000)
2044	\$-	\$(260,000)	\$(260,000)
2045	\$-	\$(260,000)	\$(260,000)
2046	\$-	\$(260,000)	\$(260,000)
2047	\$-	\$(260,000)	\$(260,000)
Total Benefits:			\$(5,200,000)



Table 24: Estimated Annual Benefits (Undiscounted)

Year	Baseline	Build Scenario	Benefits
2026	\$-	\$-	\$-
2027	\$-	\$-	\$-
2028	\$43,798,000	\$47,803,000	\$4,005,000
2029	\$44,291,000	\$48,299,000	\$4,008,000
2030	\$44,786,000	\$48,798,000	\$4,012,000
2031	\$45,282,000	\$49,297,000	\$4,015,000
2032	\$45,774,000	\$49,792,000	\$4,018,000
2033	\$46,269,000	\$50,291,000	\$4,022,000
2034	\$46,764,000	\$50,789,000	\$4,025,000
2035	\$47,258,000	\$51,286,000	\$4,028,000
2036	\$47,752,000	\$51,784,000	\$4,032,000
2037	\$48,249,000	\$52,284,000	\$4,035,000
2038	\$48,741,000	\$52,779,000	\$4,038,000
2039	\$49,236,000	\$53,278,000	\$4,042,000
2040	\$49,733,000	\$53,778,000	\$4,045,000
2041	\$50,228,000	\$54,276,000	\$4,048,000
2042	\$50,725,000	\$54,777,000	\$4,052,000
2043	\$51,221,000	\$55,276,000	\$4,055,000
2044	\$51,718,000	\$55,777,000	\$4,059,000
2045	\$52,214,000	\$56,276,000	\$4,062,000
2046	\$52,712,000	\$56,777,000	\$4,065,000
2047	\$53,210,000	\$68,012,000	\$14,802,000
Total Benefits:			\$91,468,000



Table 25: Estimated Discounted Net Costs and Benefits (discounted at 3.1%)²¹

Year	Discounted Costs	Discounted Benefits	Net Cumulative Discounted Costs and Benefits
2026	\$(15,134,000)	\$-	\$(15,134,000)
2027	\$(12,962,000)	\$-	\$(28,097,000)
2028	\$-	\$3,335,000	\$(24,762,000)
2029	\$-	\$3,237,000	\$(21,524,000)
2030	\$-	\$3,143,000	\$(18,381,000)
2031	\$-	\$3,051,000	\$(15,331,000)
2032	\$-	\$2,962,000	\$(12,369,000)
2033	\$-	\$2,875,000	\$(9,494,000)
2034	\$-	\$2,791,000	\$(6,703,000)
2035	\$-	\$2,709,000	\$(3,993,000)
2036	\$-	\$2,630,000	\$(1,363,000)
2037	\$-	\$2,553,000	\$1,190,000
2038	\$-	\$2,479,000	\$3,669,000
2039	\$-	\$2,406,000	\$6,075,000
2040	\$-	\$2,336,000	\$8,411,000
2041	\$-	\$2,268,000	\$10,679,000
2042	\$-	\$2,201,000	\$12,880,000
2043	\$-	\$2,137,000	\$15,017,000
2044	\$-	\$2,075,000	\$17,092,000
2045	\$-	\$2,014,000	\$19,106,000
2046	\$-	\$1,955,000	\$21,061,000
2047	\$-	\$6,901,000	\$27,962,000
Total Net Discounted Costs: \$(28,096,000)		Total Discounted Net Benefits: \$56,058,000	Net Present Value: \$27,962,000
Benefit-Cost Ratio: 2.0: 1.0			

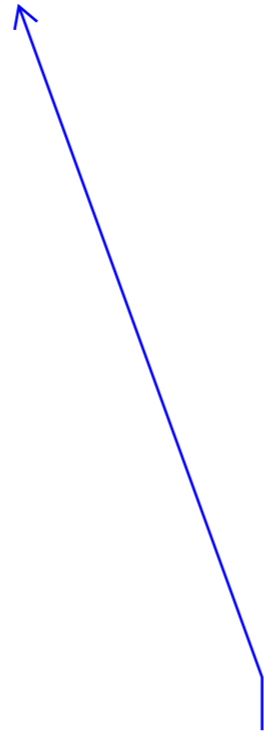
²¹ Carbon reduction benefits were discounted at 2%

APPENDICES

Benefit-Cost Analysis for Codorus Greenway RAISE Grant Application

APPENDIX A
Benefit-Cost Analysis Spreadsheet

NET PRESENT VALUE (7% DISCOUNT RATE)	\$27,961,982
IRR (7% DISCOUNT RATE)	7.40%
BENEFIT - COST RATIO	2.00



BENEFIT COST
RATIO = 2.0 TO 1

BENEFIT-COST MODEL

This spreadsheet contains confidential business information.
Worksheets with confidential business information are marked with CBI in the worksheet name.

ALTA PLANNING + DESIGN
FY 2024 RAISE GRANT

WHAT THIS MODEL DOES:

This model measures the net monetized value of benefits (what society would be willing to pay to have a project built) and costs (the total capital, maintenance, and external costs of that project) for proposed bike/ped projects and adheres to RAISE grant application guidelines. Monetized benefits and costs have been discounted at a discount rate of 3.1% (with the exception of carbon reduction benefits which were discounted at 2.0%) over a 26-year evaluation period which includes six years of construction and 20 years following implementation.

DOCUMENT ORGANIZATION:

PROJECT NAME	1 Codorus Creek Greenway
PROJECT APPLICANT	2 YCEA
TYPE OF PROJECT	3 Trail & Stormwater Improvements
DATE OF LAST UPDATE	4 1-Feb
STATE	4 Pennsylvania
BASELINE	5 2022
LAST YEAR OF ACS DATA	6 2019
INCLUDE SOCIAL/REC TRIPS	7 No

8 BASELINE

ALTERNATIVE NAME	<input type="text" value="BASELINE"/>
CONSTRUCTION START YEAR	<input type="text" value="2026"/>
LAST YEAR OF CONSTRUCTION	<input type="text" value="2027"/>
STUDY AREA MODE SHARE	
ESTIMATED BIKE	<input type="text" value="0.61%"/>
ESTIMATED WALK	<input type="text" value="7.26%"/>
ESTIMATED TRANSIT	<input type="text" value="2.49%"/>
ESTIMATED AUTO	<input type="text" value="78.86%"/>
COLLISIONS	<input type="text" value="CRF"/>
PROPERTY DAMAGE ONLY	<input type="text"/>
MINOR INJURIES	<input type="text"/>
MODERATE INJURIES	<input type="text"/>
SERIOUS INJURIES	<input type="text"/>
SEVERE INJURIES	<input type="text"/>
CRITICAL INJURIES	<input type="text"/>
FATAL INJURIES	<input type="text"/>

CAPITAL COST SCHEDULE		
YEAR 1	2026	<input type="text" value="\$0"/>
YEAR 2	2027	<input type="text" value="\$0"/>
YEAR 3	2028	<input type="text" value="\$0"/>
YEAR 4	2029	<input type="text" value="\$0"/>
YEAR 5	2030	<input type="text" value="\$0"/>
YEAR 6	2031	<input type="text" value="\$0"/>
YEAR 7	2032	<input type="text" value="\$0"/>
YEAR 8	2033	<input type="text" value="\$0"/>
YEAR 9	2034	<input type="text" value="\$0"/>
YEAR 10	2035	<input type="text" value="\$0"/>
YEAR 11	2036	<input type="text" value="\$0"/>
YEAR 12	2037	<input type="text" value="\$0"/>
YEAR 13	2038	<input type="text" value="\$0"/>
YEAR 14	2039	<input type="text" value="\$0"/>
YEAR 15	2040	<input type="text" value="\$0"/>
YEAR 16	2041	<input type="text" value="\$0"/>
YEAR 17	2042	<input type="text" value="\$0"/>
YEAR 18	2043	<input type="text" value="\$0"/>
YEAR 19	2044	<input type="text" value="\$0"/>
YEAR 20	2045	<input type="text" value="\$0"/>
YEAR 21	2046	<input type="text" value="\$0"/>
YEAR 22	2047	<input type="text" value="\$0"/>
YEAR 23	2048	<input type="text" value="\$0"/>
YEAR 24	2049	<input type="text" value="\$0"/>
YEAR 25	2050	<input type="text" value="\$0"/>
YEAR 26	2051	<input type="text" value="\$0"/>
YEAR 27	2052	<input type="text" value="\$0"/>
YEAR 28	2053	<input type="text" value="\$0"/>
YEAR 29	2054	<input type="text" value="\$0"/>
YEAR 30	2055	<input type="text" value="\$0"/>
YEAR 31	2056	<input type="text" value="\$0"/>
YEAR 32	2057	<input type="text" value="\$0"/>
YEAR 33	2058	<input type="text" value="\$0"/>
YEAR 34	2059	<input type="text" value="\$0"/>
YEAR 35	2060	<input type="text" value="\$0"/>
YEAR 36	2061	<input type="text" value="\$0"/>
YEAR 37	2062	<input type="text" value="\$0"/>
YEAR 38	2063	<input type="text" value="\$0"/>
YEAR 39	2064	<input type="text" value="\$0"/>
YEAR 40	2065	<input type="text" value="\$0"/>
TOTAL CAPITAL COSTS		<input type="text" value="\$0"/>

MAINTENANCE COSTS/YEAR	<input type="text" value="\$0"/>
INCLUDE RESIDUAL? USEFUL LIFE	<input type="text" value="No"/> <input type="text" value="0"/>

9 BUILD SCENARIO

DEMAND METHOD	10 COUNTS/CONNECTIVITY
ALTERNATIVE NAME	<input type="text"/>
CONSTRUCTION START YEAR	<input type="text" value="2026"/>
LAST YEAR OF CONSTRUCTION	<input type="text" value="2027"/>
STUDY AREA MODE SHARE	
ESTIMATED BIKE	<input type="text" value="0.61%"/>
ESTIMATED WALK	<input type="text" value="7.26%"/>
ESTIMATED TRANSIT	<input type="text" value="2.49%"/>
ESTIMATED AUTO	<input type="text" value="78.86%"/>

← IF YOU SELECTED "SPECIFIC VALUES", ENTER COLLISION DATA IN THE CELLS TO THE LEFT. IF YOU SELECTED "GENERAL ESTIMATES" or "CRF", LEAVE THE CELLS TO THE LEFT BLANK.

CAPITAL COST SCHEDULE		
YEAR 1	2026	<input type="text" value="\$17,100,000"/>
YEAR 2	2027	<input type="text" value="\$15,100,000"/>
YEAR 3	2028	<input type="text" value="\$0"/>
YEAR 4	2029	<input type="text" value="\$0"/>
YEAR 5	2030	<input type="text" value="\$0"/>
YEAR 6	2031	<input type="text" value="\$0"/>
YEAR 7	2032	<input type="text" value="\$0"/>
YEAR 8	2033	<input type="text" value="\$0"/>
YEAR 9	2034	<input type="text" value="\$0"/>
YEAR 10	2035	<input type="text" value="\$0"/>
YEAR 11	2036	<input type="text" value="\$0"/>
YEAR 12	2037	<input type="text" value="\$0"/>
YEAR 13	2038	<input type="text" value="\$0"/>
YEAR 14	2039	<input type="text" value="\$0"/>
YEAR 15	2040	<input type="text" value="\$0"/>
YEAR 16	2041	<input type="text" value="\$0"/>
YEAR 17	2042	<input type="text" value="\$0"/>
YEAR 18	2043	<input type="text" value="\$0"/>
YEAR 19	2044	<input type="text" value="\$0"/>
YEAR 20	2045	<input type="text" value="\$0"/>
YEAR 21	2046	<input type="text" value="\$0"/>
YEAR 22	2047	<input type="text" value="\$0"/>
YEAR 23	2048	<input type="text" value="\$0"/>
YEAR 24	2049	<input type="text" value="\$0"/>
YEAR 25	2050	<input type="text" value="\$0"/>
YEAR 26	2051	<input type="text" value="\$0"/>
YEAR 27	2052	<input type="text" value="\$0"/>
YEAR 28	2053	<input type="text" value="\$0"/>
YEAR 29	2054	<input type="text" value="\$0"/>
YEAR 30	2055	<input type="text" value="\$0"/>
YEAR 31	2056	<input type="text" value="\$0"/>
YEAR 32	2057	<input type="text" value="\$0"/>
YEAR 33	2058	<input type="text" value="\$0"/>
YEAR 34	2059	<input type="text" value="\$0"/>
YEAR 35	2060	<input type="text" value="\$0"/>
YEAR 36	2061	<input type="text" value="\$0"/>
YEAR 37	2062	<input type="text" value="\$0"/>
YEAR 38	2063	<input type="text" value="\$0"/>
YEAR 39	2064	<input type="text" value="\$0"/>
YEAR 40	2065	<input type="text" value="\$0"/>
TOTAL CAPITAL COSTS		<input type="text" value="\$32,200,000"/>

MAINTENANCE COSTS/YEAR	<input type="text" value="\$260,000"/>	Updated on 2/19/2024
INCLUDE RESIDUAL? USEFUL LIFE	<input type="text" value="Yes"/> <input type="text" value="30"/>	

17	18	19	20	21
2044	2045	2046	2047	2048
124,340	125,092	125,844	126,596	127,349
102,220	103,155	104,090	105,025	105,960
24,366	24,866	25,364	25,863	26,361
24,703	24,866	25,029	25,192	25,355
2044	2045	2046	2047	2048
135,444	136,315	137,186	138,057	138,929
68,409	69,060	69,710	70,360	71,010
7,999	8,074	8,149	8,224	8,299
23,094	23,259	23,411	23,569	23,727
2044	2045	2046	2047	2048
38,232	38,472	38,712	38,952	39,193
16,534	16,699	16,869	17,036	17,203
4,408	4,450	4,491	4,532	4,574
7,413	7,464	7,514	7,565	7,616

17	18	19	20	21
2044	2045	2046	2047	2048
0.006	0.006	0.006	0.006	0.006
0.011	0.011	0.011	0.011	0.011
0.006	0.006	0.006	0.006	0.006
0.006	0.006	0.006	0.006	0.006
2044	2045	2046	2047	2048
0.073	0.073	0.073	0.073	0.073
0.286	0.286	0.286	0.286	0.286
0.073	0.073	0.073	0.073	0.073
0.075	0.075	0.075	0.075	0.075

17	18	19	20	21
2044	2045	2046	2047	2048
834	830	826	822	818
304	307	310	313	316
252	257	266	274	281
2044	2045	2046	2047	2048
175	177	178	180	182
64	65	65	66	66
64	65	65	66	67
2044	2045	2046	2047	2048
277	279	280	282	284
101	101	102	103	104
137	138	139	140	141
2044	2045	2046	2047	2048
4,448	4,490	4,532	4,575	4,617
1,623	1,639	1,654	1,670	1,685
3,702	3,738	3,773	3,808	3,843
2044	2045	2046	2047	2048

17	18	19	20	21
2044	2045	2046	2047	2048
2,400	2,423	2,446	2,469	2,492
676	684	691	697	703
631	637	643	649	655
2044	2045	2046	2047	2048
2,536	2,549	2,563	2,577	2,590
922	931	939	948	956
396	400	404	408	411
2044	2045	2046	2047	2048
1,076	1,083	1,091	1,098	1,106
393	395	398	401	404
271	273	275	277	278
2044	2045	2046	2047	2048
21,660	21,660	21,660	21,660	21,660
7,887	7,760	7,833	7,906	7,979
6,400	6,461	6,522	6,583	6,643
2044	2045	2046	2047	2048

17	18	19	20	21
2044	2045	2046	2047	2048
1,923,386	1,941,527	1,959,669	1,977,810	1,995,951
702,036	708,657	715,279	721,901	728,522
1,587,825	1,602,847	1,617,868	1,632,890	1,647,912
8,969,934	9,054,602	9,139,269	9,223,937	9,308,604
3,274,026	3,304,930	3,335,833	3,366,737	3,397,641
2,422,322	2,447,104	2,471,885	2,496,666	2,521,447
10,893,321	10,994,129	11,094,938	11,201,747	11,304,555
3,976,062	4,013,587	4,051,112	4,088,637	4,126,163
4,210,148	4,249,950	4,289,753	4,329,556	4,369,359

17	18	19	20	21
2044	2045	2046	2047	2048
1,923,386	1,941,527	1,959,669	1,977,810	1,995,951
702,036	708,657	715,279	721,901	728,522
1,587,825	1,602,847	1,617,868	1,632,890	1,647,912
8,969,934	9,054,602	9,139,269	9,223,937	9,308,604
3,274,026	3,304,930	3,335,833	3,366,737	3,397,641
2,422,322	2,447,104	2,471,885	2,496,666	2,521,447
10,893,321	10,994,129	11,094,938	11,201,747	11,304,555
3,976,062	4,013,587	4,051,112	4,088,637	4,126,163
4,210,148	4,249,950	4,289,753	4,329,556	4,369,359

17	18	19	20	21
2044	2045	2046	2047	2048
0.02	0.02	0.02	0.02	0.02
3.49	3.52	3.55	3.59	3.62
0.03	0.03	0.03	0.03	0.03
0	0	0	0	0
2044	2045	2046	2047	2048
\$20,023	\$20,213	\$20,402	\$20,591	\$20,781
\$76,731	\$77,457	\$78,182	\$78,908	\$79,633
\$1,989	\$2,008	\$2,028	\$2,048	\$2,067
\$393,744	\$406,920	\$422,147	\$437,550	\$453,130
\$692,488	\$706,597	\$722,757	\$739,094	\$755,608

17	18	19	20	21
2044	2045	2046	2047	2048
\$	\$	\$	\$	\$
41,420,250.80	41,811,217.78	42,202,184.75	42,593,151.72	42,984,118.69
6,867,794.36	6,932,572.79	6,997,349.22	7,062,125.64	7,126,902.07
\$48,288,047	\$48,743,791	\$49,199,534	\$49,655,277	\$50,111,021

17	18	19	20	21
2044	2045	2046	2047	2048
\$2,080,878	\$2,100,550	\$2,120,223	\$2,139,896	\$2,159,568
\$312,305	\$315,257	\$318,210	\$321,162	\$324,115
\$2,393,182	\$2,415,807	\$2,438,433	\$2,461,058	\$2,483,683

17	18	19	20	21
2044	2045	2046	2047	2048
\$0	\$0	\$0	\$0	\$0

17	18	19	20	21
2044	2045	2046	2047	2048
\$344,467	\$347,723	\$350,980	\$354,236	\$357,493

17	18	19	20	21
2044	2045	2046	2047	2048

17	18	19	20	21
2044	2045	2046	2047	2048
\$51,124,440	\$51,606,998	\$52,089,557	\$52,572,116	\$0
\$51,718,184	\$52,213,919	\$52,711,704	\$53,209,488	\$0

17	18	19	20	21
2044	2045	2046	2047	2048
\$0	\$0	\$0	\$0	\$0
\$0	\$0	\$0	\$0	\$0
\$0	\$0	\$0	\$0	\$0



ANALYSIS - BUILD SCENARIO

ALTA PLANNING + DESIGN
FY 2024 RAISE GRANT

WHAT THIS TAB ALL ABOUT:

Cost-benefit calculations for BUILD Scenario using inputs from the "UPFRONTIS", "ACS DATA", "TAZ DATA", and "SAFETY_CRF" worksheets.

TABLE 1

COST-BENEFIT ANALYSIS SIMPLIFIED INPUTS		
BASELINE MODE SHARE (2022)		
EMPLOYED POPULATION	BIKE	WALK
	0.01	0.07
COLLEGE STUDENT POPULATION	0.01	0.29
K-12 STUDENT POPULATION	0.01	0.07
UTILITARIAN	0.01	0.07
TRIP REPLACEMENT FACTORS		
	VALUE	UNIT
TRIP REPLACEMENT FACTOR	0.365	% OF TRIPS
TRIP DISTANCE (MILES)		
	BIKE	WALK
COMMUTE TRIP	2.47	0.72
COLLEGE TRIP	1.31	0.43
K-12 SCHOOL TRIP	1.36	0.69
UTILITARIAN TRIP	2.28	0.83
SOCIAL/RECREATIONAL TRIP	2.73	1.12
TRIP PURPOSE MULTIPLIER		
	BIKE	WALK
UTILITARIAN TRIP MULTIPLIER	1.33	0.77
SOCIAL/RECREATIONAL TRIP MULTIPLIER	1.68	2.18
ENVIRONMENTAL SUSTAINABILITY MULTIPLIERS		
	VALUE (MT/VMT)	
PARTICULATE MATTER (PM)	0.00000004	
NITROUS OXIDES (NOx)	0.00000008	
SULFUR OXIDES (SOx)	0.00000000	
VOLATILE ORGANIC COMPOUNDS (VOC)	0.00000011	
CARBON DIOXIDE	0.00000000	
QUALITY OF LIFE MULTIPLIERS		
	VALUE (\$/TRIP)	VALUE (\$/TRIP)
MORTALITY REDUCTION BENEFITS	\$	3.57
ECONOMIC COMPETITIVENESS MULTIPLIERS	VALUE	UNIT
HOUSEHOLD TRANSPORTATION COST SAVINGS	\$0.49	/VMT
CONGESTION COST SAVING SAVINGS	\$0.07	/VMT
SAFETY MULTIPLIERS		
	VALUE	UNIT
COLLISION COST SAVINGS	/N/A	/VMT
STATE OF GOOD REPAIR MULTIPLIERS	VALUE	UNIT
ROADWAY MAINTENANCE COST SAVINGS	\$0.08	/VMT

IS THIS THE BASELINE?
No

TABLE 2

POPULATION FORECAST												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
TOTAL IMPACT AREA (TAZ)												
TOTAL POPULATION	107,792	108,544	109,296	110,048	110,800	111,553	112,305	113,057	113,809	114,561	115,314	116,066
EMPLOYED POPULATION	81,647	82,582	83,517	84,452	85,387	86,322	87,257	88,193	89,128	90,063	90,998	91,933
COLLEGE STUDENT POPULATION	13,405	13,903	14,402	14,900	15,398	15,897	16,395	16,893	17,392	17,890	18,388	18,886
K-12 STUDENT POPULATION	21,118	21,281	21,444	21,607	21,770	21,933	22,096	22,259	22,422	22,585	22,747	22,910
BIKE STUDY AREA (3 MILES)												
TOTAL POPULATION	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
EMPLOYED POPULATION	116,738	117,589	118,440	119,291	120,142	120,994	121,845	122,696	123,547	124,398	125,250	126,101
COLLEGE STUDENT POPULATION	54,106	54,757	55,407	56,057	56,707	57,357	58,007	58,657	59,307	59,958	60,608	61,258
K-12 STUDENT POPULATION	6,349	6,424	6,499	6,574	6,649	6,724	6,799	6,874	6,949	7,024	7,099	7,174
WALK STUDY AREA (0.5 MILE)	19,613	19,771	19,929	20,087	20,246	20,404	20,562	20,720	20,879	21,037	21,195	21,353
TOTAL POPULATION	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
EMPLOYED POPULATION	32,947	33,187	33,427	33,667	33,908	34,148	34,388	34,628	34,869	35,109	35,349	35,589
COLLEGE STUDENT POPULATION	13,077	13,235	13,392	13,549	13,706	13,863	14,020	14,177	14,335	14,492	14,649	14,806
K-12 STUDENT POPULATION	3,499	3,540	3,582	3,623	3,664	3,706	3,747	3,788	3,830	3,871	3,912	3,954

TABLE 3

MODE SHARE FORECAST												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
BIKE MODE SHARE												
COMMUTE TRIP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
COLLEGE TRIP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
K-12 SCHOOL TRIP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
UTILITARIAN TRIP	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
WALK MODE SHARE												
COMMUTE TRIP	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.05
COLLEGE TRIP	0.29	0.29	0.29	0.29	0.29	0.29	0.27	0.26	0.24	0.23	0.21	0.20
K-12 SCHOOL TRIP	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.05	0.05
UTILITARIAN TRIP	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.05

QUALITY OF LIFE BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
MORTALITY REDUCTION BENEFITS FROM WALKING	\$	\$	\$	\$	\$	\$	\$ 35,441,103.91	\$ 35,833,921.63	\$ 36,226,739.34	\$ 36,619,557.06	\$ 37,012,374.77	\$ 37,405,192.49
MORTALITY REDUCTION BENEFITS FROM CYCLING	\$	\$	\$	\$	\$	\$	\$ 5,994,484.43	\$ 6,060,353.33	\$ 6,126,222.22	\$ 6,192,091.12	\$ 6,257,960.01	\$ 6,323,828.91
TOTAL MORTALITY REDUCTION BENEFITS	\$	\$	\$	\$	\$	\$	\$ 41,435,588	\$ 41,894,275	\$ 42,352,962	\$ 42,811,648	\$ 43,270,335	\$ 43,729,021

GREEN INFRASTRUCTURE BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
STORMWATER BENEFITS	\$	\$	\$	\$	\$	\$	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00
FLOODPLAIN AND STREAM RESTORATION BENEFITS	\$	\$	\$	\$	\$	\$	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00
TOTAL GREEN INFRASTRUCTURE BENEFITS	\$	\$	\$	\$	\$	\$	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00

ECONOMIC COMPETITIVENESS BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
HOUSEHOLD TRANSPORTATION COST SAVINGS	\$	\$	\$	\$	\$	\$	\$ 1,793,390	\$ 1,813,245	\$ 1,833,100	\$ 1,852,956	\$ 1,872,811	\$ 1,892,667
TRAFFIC CONGESTION COST SAVINGS	\$	\$	\$	\$	\$	\$	\$ 269,158	\$ 272,138	\$ 275,118	\$ 278,098	\$ 281,077	\$ 284,057
TOTAL ECONOMIC COMPETITIVENESS BENEFITS	\$	\$	\$	\$	\$	\$	\$ 2,062,547	\$ 2,085,383	\$ 2,108,218	\$ 2,131,053	\$ 2,153,889	\$ 2,176,724

SAFETY BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
COLLISION COST SAVINGS	\$	\$	\$	\$	\$	\$	\$ 2,464,372	\$ 2,464,372	\$ 2,464,372	\$ 2,464,372	\$ 2,464,372	\$ 2,464,372

STATE OF GOOD REPAIR BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
ROADWAY MAINTENANCE COST SAVINGS	\$	\$	\$	\$	\$	\$	\$ 296,876	\$ 300,163	\$ 303,450	\$ 306,737	\$ 310,023	\$ 313,310

RESIDUAL												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Shared Use Paths 32,200,000							\$ 296,876	\$ 300,163	\$ 303,450	\$ 306,737	\$ 310,023	\$ 313,310
RESIDUAL VALUE												

TOTAL BENEFITS AND REGIONAL RESPONSIBILITY												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
NET BENEFITS w/o Carbon (UNDISCOUNTED)	\$	\$	\$	\$	\$	\$	\$ 3,998,812	\$ 4,002,028	\$ 4,005,239	\$ 4,008,431	\$ 4,011,623	\$ 4,014,816
Carbon (UNDISCOUNTED)	\$	\$	\$	\$	\$	\$	\$ 6,138	\$ 6,253	\$ 6,394	\$ 6,561	\$ 6,680	\$ 6,851
NET BENEFITS (Total, Undiscounted)	\$	\$	\$	\$	\$	\$	\$ 4,004,950	\$ 4,008,280	\$ 4,011,633	\$ 4,014,993	\$ 4,018,304	\$ 4,021,666

TOTAL PROJECT COSTS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
CAPITAL COSTS (RAW, UNDISCOUNTED)	\$	\$	\$	\$	\$ 17,100,000	\$ 15,100,000	\$	\$	\$	\$	\$	\$
TOTAL COSTS (RAW, UNDISCOUNTED)	\$	\$	\$	\$	\$ 17,100,000	\$ 15,100,000	\$	\$	\$	\$	\$	\$

DISCOUNTED COSTS AND BENEFITS												
PROJECT YEAR	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
YEAR	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
2.0% DISCOUNT RATE	1.00	0.98	0.96	0.94	0.92	0.91	0.89	0.87	0.85	0.84	0.82	0.80
CARBON BENEFITS (DISCOUNTED 2.0%)	\$	\$	\$	\$	\$	\$	\$ 5,450	\$ 5,444	\$ 5,457	\$ 5,490	\$ 5,480	\$ 5,510
3.1% DISCOUNT RATE	1.00	0.97	0.94	0.91	0.89	0.86	0.83	0.81	0.78	0.76	0.74	0.71
ANNUAL BENEFITS (NOT INCLUDING CARBON, DISCOUNTED 3.1%)	\$	\$	\$	\$	\$	\$	\$ 3,229,500	\$ 3,231,986	\$ 3,137,322	\$ 3,045,415	\$ 2,956,198	\$ 2,869,593
ANNUAL COSTS (DISCOUNTED, 3.1%)	\$	\$	\$	\$	\$ 15,134,269	\$ 12,962,346	\$	\$	\$	\$	\$	\$
ANNUAL BENEFITS (CARBON DISCOUNTED 2.0%, EVERYTHING ELSE 3.1%)	\$	\$	\$	\$	\$	\$	\$ 3,334,950	\$ 3,237,429	\$ 3,142,779	\$ 3,050,905	\$ 2,961,678	\$ 2,875,103
NET COSTS AND BENEFITS (CARBON DISCOUNTED 2.0%, EVERYTHING ELSE DISCOUNTED, 3.1%)	\$	\$	\$	\$	\$ -15,134,269	\$ -12,962,346	\$ 3,334,950	\$ 3,237,429	\$ 3,142,779	\$ 3,050,905	\$ 2,961,678	\$ 2,875,103
NET CUMULATIVE COSTS AND BENEFITS (CARBON DISCOUNTED 2.0%, EVERYTHING ELSE DISCOUNTED, 3.1%)	\$	\$	\$	\$	\$ -15,134,269	\$ -28,096,615	\$ -24,761,666	\$ -21,524,236	\$ -18,381,457	\$ -15,330,552	\$ -12,368,874	\$ -9,493,772

NET PRESENT VALUE (7% DISCOUNT RATE)	\$27,961,982
IRR (7% DISCOUNT RATE)	7.40%
BENEFIT - COST RATIO	2.00

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
116,818	117,570	118,322	119,075	119,827	120,579	121,331	122,083	122,835	123,588	124,340	125,092	125,844	126,596
92,868	93,804	94,739	95,674	96,609	97,544	98,479	99,414	100,350	101,285	102,220	103,155	104,090	105,025
19,385	19,883	20,381	20,880	21,378	21,876	22,375	22,873	23,371	23,869	24,368	24,866	25,364	25,863
23,073	23,236	23,399	23,562	23,725	23,888	24,051	24,214	24,377	24,540	24,703	24,866	25,029	25,192
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
126,952	127,803	128,654	129,506	130,357	131,208	132,059	132,910	133,762	134,613	135,464	136,315	137,166	138,017
61,908	62,558	63,208	63,858	64,509	65,159	65,809	66,459	67,109	67,759	68,409	69,060	69,710	70,360
7,249	7,324	7,399	7,474	7,549	7,624	7,699	7,774	7,849	7,924	7,999	8,074	8,149	8,224
21,512	21,670	21,828	21,986	22,145	22,303	22,461	22,619	22,778	22,936	23,094	23,252	23,411	23,569
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
35,829	36,070	36,310	36,550	36,790	37,031	37,271	37,511	37,751	37,992	38,232	38,472	38,712	38,952
14,963	15,120	15,277	15,434	15,592	15,749	15,906	16,063	16,220	16,377	16,534	16,692	16,849	17,006
3,995	4,036	4,078	4,119	4,160	4,202	4,243	4,284	4,326	4,367	4,408	4,450	4,491	4,532
6,905	6,956	7,007	7,057	7,108	7,159	7,210	7,261	7,311	7,362	7,413	7,464	7,514	7,565

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
0.00	0.00	0.00	0.00	0.00274	0.00244	0.00213	0.00183	0.00152	0.00122	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.00438	0.00438	0.00383	0.00328	0.00274	0.00219	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00249	0.00240	0.00210	0.00180	0.00150	0.00120	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00283	0.00252	0.00220	0.00189	0.00157	0.00126	0.00	0.00	0.00	0.00
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00
0.19	0.17	0.16	0.14	0.13	0.11	0.10	0.09	0.07	0.06	0.04	0.03	0.01	0.00
0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00
0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.00	0.00

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$ 37,798,010.20	\$ 38,190,827.92	\$ 38,883,645.63	\$ 38,976,463.35	\$ 39,369,281.06	\$ 39,762,098.78	\$ 40,154,916.49	\$ 40,547,734.21	\$ 40,940,551.92	\$ 41,333,369.64	\$ 41,726,187.36	\$ 42,119,005.07	\$ 42,511,822.79	\$ 42,904,640.50
\$ 6,389,697.81	\$ 6,455,566.70	\$ 6,521,435.60	\$ 6,587,304.49	\$ 6,653,173.39	\$ 6,719,042.29	\$ 6,784,911.18	\$ 6,850,780.08	\$ 6,916,648.98	\$ 6,982,517.87	\$ 7,048,386.77	\$ 7,114,255.66	\$ 7,180,124.56	\$ 7,245,993.46
\$44,187,708	\$44,646,395	\$45,105,081	\$45,563,768	\$46,022,454	\$46,481,141	\$46,939,828	\$47,398,514	\$47,857,201	\$48,315,888	\$48,774,574	\$49,233,261	\$49,691,947	\$50,150,634

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00	\$ 865,192.00
\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00	\$ 452,677.00
\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00	\$ 1,317,869.00

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$1,912,522	\$1,932,377	\$1,952,233	\$1,972,088	\$1,991,943	\$2,011,799	\$2,031,654	\$2,051,509	\$2,071,365	\$2,091,220	\$2,111,076	\$2,130,931	\$2,150,786	\$2,170,642
\$287,037	\$290,017	\$292,997	\$295,977	\$298,957	\$301,937	\$304,917	\$307,897	\$310,877	\$313,857	\$316,837	\$319,817	\$322,797	\$325,777
\$2,199,559	\$2,222,395	\$2,245,230	\$2,268,065	\$2,290,901	\$2,313,736	\$2,336,571	\$2,359,407	\$2,382,242	\$2,405,077	\$2,427,913	\$2,450,748	\$2,473,583	\$2,496,418

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372	\$2,464,372

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$316,597	\$319,884	\$323,171	\$326,458	\$329,745	\$333,031	\$336,318	\$339,605	\$342,892	\$346,179	\$349,466	\$352,752	\$356,039	\$359,326

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
													\$10,733,333

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$4,018,008	\$4,021,200	\$4,024,392	\$4,027,584	\$4,030,777	\$4,033,969	\$4,037,161	\$4,040,353	\$4,043,546	\$4,046,738	\$4,049,930	\$4,053,122	\$4,056,314	\$4,059,506
\$6,997	\$7,145	\$7,294	\$7,441	\$7,587	\$7,735	\$7,882	\$8,029	\$8,176	\$8,323	\$8,470	\$8,617	\$8,764	\$8,911
\$4,025,005	\$4,028,345	\$4,031,686	\$4,035,025	\$4,038,373	\$4,041,719	\$4,045,092	\$4,048,440	\$4,051,816	\$4,055,167	\$4,058,547	\$4,061,900	\$4,065,283	\$4,068,600

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

7	8	9	10	11	12	13	14	15	16	17	18	19	20
2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047
0.79	0.77	0.76	0.74	0.73	0.71	0.69	0.67	0.66	0.65	0.63	0.62	0.61	0.61
\$5,517	\$5,523	\$5,528	\$5,551	\$5,534	\$5,553	\$5,534	\$5,551	\$5,566	\$5,561	\$5,574	\$5,567	\$5,576	\$5,584
0.69	0.67	0.65	0.63	0.61	0.60	0.58	0.56	0.54	0.53	0.51	0.50	0.48	0.47
\$2,785,523	\$2,703,915	\$2,624,696	\$2,547,796	\$2,473,148	\$2,400,685	\$2,330,344	\$2,262,063	\$2,195,781	\$2,131,440	\$2,068,983	\$2,008,355	\$1,949,502	\$895,804
\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
\$2,791,041	\$2,709,438	\$2,630,224	\$2,553,347	\$2,478,682	\$2,406,220	\$2,335,897	\$2,267,614	\$2,201,347	\$2,137,001	\$2,074,556	\$2,013,921	\$1,955,078	\$890,388
\$2,791,041	\$2,709,438	\$2,630,224	\$2,553,347	\$2,478,682	\$2,406,220	\$2,335,897	\$2,267,614	\$2,201,347	\$2,137,001	\$2,074,556	\$2,013,921	\$1,955,078	\$890,388
\$6,702,731	\$3,993,293	\$1,363,069	\$1,190,278	\$3,668,960	\$6,075,180	\$8,411,077	\$10,678,691	\$12,880,038	\$15,017,039	\$17,091,595	\$19,105,517	\$21,060,594	\$27,961,982

RESULTS		BICYCLE AND PEDESTRIAN	
Project Year	Year	BASELINE	BUILD SCENARIO
-5	2022	8,630,000	8,630,000
-4	2023	8,730,000	8,730,000
-3	2024	8,837,100	8,837,100
-2	2025	8,940,000	8,940,000
-1	2026	9,042,800	9,042,800
0	2027	9,145,600	9,145,600
1	2028	9,248,400	9,353,900
2	2029	9,351,200	9,457,400
3	2030	9,454,000	9,560,900
4	2031	9,556,800	9,664,400
5	2032	9,659,600	9,768,000
6	2033	9,762,400	9,871,500
7	2034	9,865,200	9,975,000
8	2035	9,968,000	10,078,500
9	2036	10,070,900	10,182,000
10	2037	10,173,700	10,285,500
11	2038	10,276,500	10,389,100
12	2039	10,379,300	10,492,600
13	2040	10,482,100	10,596,100
14	2041	10,584,900	10,699,600
15	2042	10,687,700	10,803,100
16	2043	10,790,500	10,906,600
17	2044	10,893,300	11,010,100
18	2045	10,996,100	11,113,700
19	2046	11,098,900	11,217,200
20	2047	11,201,700	11,320,700

Total

TRIPS	VMT			Annual Environmental Susta		
	BENEFITS	BASELINE	BUILD SCENARIO	BENEFITS	BASELINE	BUILD SCENARIO
-	3,330,000	3,330,000	-	\$ -	\$ -	-
-	3,370,000	3,370,000	-	\$ -	\$ -	-
-	3,414,100	3,414,100	-	\$ -	\$ -	-
-	3,453,900	3,453,900	-	\$ -	\$ -	-
-	3,493,700	3,493,700	-	\$ -	\$ -	-
-	3,533,500	3,533,500	-	\$ -	\$ -	-
105,500	3,573,300	3,628,500	55,200	\$ 478,500	\$ 485,900	
106,200	3,613,100	3,668,700	55,600	\$ 490,200	\$ 497,700	
106,900	3,652,900	3,708,800	55,900	\$ 503,300	\$ 511,000	
107,600	3,692,700	3,749,000	56,300	\$ 517,000	\$ 524,900	
108,400	3,732,500	3,789,200	56,700	\$ 527,600	\$ 535,600	
109,100	3,772,300	3,829,300	57,000	\$ 541,600	\$ 549,800	
109,800	3,812,100	3,869,500	57,400	\$ 554,100	\$ 562,400	
110,500	3,851,900	3,909,700	57,800	\$ 566,700	\$ 575,200	
111,100	3,891,700	3,949,900	58,200	\$ 579,500	\$ 588,200	
111,800	3,931,500	3,990,000	58,500	\$ 594,200	\$ 603,000	
112,600	3,971,300	4,030,200	58,900	\$ 605,500	\$ 614,500	
113,300	4,011,100	4,070,400	59,300	\$ 618,700	\$ 627,900	
114,000	4,050,900	4,110,600	59,700	\$ 633,900	\$ 643,200	
114,700	4,090,700	4,150,700	60,000	\$ 647,400	\$ 656,900	
115,400	4,130,500	4,190,900	60,400	\$ 662,900	\$ 672,500	
116,100	4,170,300	4,231,100	60,800	\$ 676,700	\$ 686,500	
116,800	4,210,100	4,271,200	61,100	\$ 692,500	\$ 702,500	
117,600	4,250,000	4,311,400	61,400	\$ 706,600	\$ 716,800	
118,300	4,289,800	4,351,600	61,800	\$ 722,800	\$ 733,200	
\$ 119,000	4,329,600	4,391,800	\$ 62,200	739,100	749,700	
2,244,700			1,174,200			

Disability Benefits		Annual Quality of Life Benefits			Annual Economic
BENEFITS	BASELINE	BUILD SCENARIO	BENEFITS	BASELINE	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
\$ 7,400	\$ 40,996,000	\$ 41,436,000	\$ 440,000	\$ 2,031,200	
\$ 7,500	\$ 41,452,000	\$ 41,894,000	\$ 442,000	\$ 2,053,800	
\$ 7,700	\$ 41,908,000	\$ 42,353,000	\$ 445,000	\$ 2,076,400	
\$ 7,900	\$ 42,363,000	\$ 42,812,000	\$ 449,000	\$ 2,099,100	
\$ 8,000	\$ 42,819,000	\$ 43,270,000	\$ 451,000	\$ 2,121,700	
\$ 8,200	\$ 43,275,000	\$ 43,729,000	\$ 454,000	\$ 2,144,300	
\$ 8,300	\$ 43,731,000	\$ 44,188,000	\$ 457,000	\$ 2,166,900	
\$ 8,500	\$ 44,186,000	\$ 44,646,000	\$ 460,000	\$ 2,189,600	
\$ 8,700	\$ 44,642,000	\$ 45,105,000	\$ 463,000	\$ 2,212,200	
\$ 8,800	\$ 45,098,000	\$ 45,564,000	\$ 466,000	\$ 2,234,800	
\$ 9,000	\$ 45,554,000	\$ 46,022,000	\$ 468,000	\$ 2,257,400	
\$ 9,200	\$ 46,009,000	\$ 46,481,000	\$ 472,000	\$ 2,280,100	
\$ 9,300	\$ 46,465,000	\$ 46,940,000	\$ 475,000	\$ 2,302,700	
\$ 9,500	\$ 46,921,000	\$ 47,399,000	\$ 478,000	\$ 2,325,300	
\$ 9,600	\$ 47,377,000	\$ 47,857,000	\$ 480,000	\$ 2,347,900	
\$ 9,800	\$ 47,832,000	\$ 48,316,000	\$ 484,000	\$ 2,370,600	
\$ 10,000	\$ 48,288,000	\$ 48,775,000	\$ 487,000	\$ 2,393,200	
\$ 10,200	\$ 48,744,000	\$ 49,233,000	\$ 489,000	\$ 2,415,800	
\$ 10,400	\$ 49,200,000	\$ 49,692,000	\$ 492,000	\$ 2,438,400	
\$ 10,600	\$ 49,655,000	\$ 50,151,000	\$ 496,000	\$ 2,461,100	
\$ 178,600			\$ 9,348,000		

Economic Competitiveness Benefits		Annual Safety Benefits				Annual State
BUILD SCENARIO	BENEFITS	BASELINE	BUILD SCENARIO	BENEFITS	BASELINE	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
\$ 2,062,500	\$ 31,300	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 292,400	
\$ 2,085,400	\$ 31,600	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 295,600	
\$ 2,108,200	\$ 31,800	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 298,900	
\$ 2,131,100	\$ 32,000	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 302,100	
\$ 2,153,900	\$ 32,200	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 305,400	
\$ 2,176,700	\$ 32,400	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 308,600	
\$ 2,199,600	\$ 32,700	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 311,900	
\$ 2,222,400	\$ 32,800	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 315,200	
\$ 2,245,200	\$ 33,000	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 318,400	
\$ 2,268,100	\$ 33,300	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 321,700	
\$ 2,290,900	\$ 33,500	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 324,900	
\$ 2,313,700	\$ 33,600	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 328,200	
\$ 2,336,600	\$ 33,900	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 331,400	
\$ 2,359,400	\$ 34,100	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 334,700	
\$ 2,382,200	\$ 34,300	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 338,000	
\$ 2,405,100	\$ 34,500	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 341,200	
\$ 2,427,900	\$ 34,700	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 344,500	
\$ 2,450,700	\$ 34,900	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 347,700	
\$ 2,473,600	\$ 35,200	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 351,000	
\$ 2,496,400	\$ 35,300	\$ -	\$ 2,464,000	\$ 2,464,000	\$ 354,200	
	\$ 667,100			\$ 49,280,000		

ate of Good Repair Benefits		Green Infrastructure Benefits			Mainte
BUILD SCENARIO	BENEFITS	BASELINE	BUILD SCENARIO	BENEFITS	BASELINE
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ -	\$ -	\$ -	\$ -	\$ -	
\$ 296,900	\$ 4,500	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 300,200	\$ 4,600	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 303,400	\$ 4,500	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 306,700	\$ 4,600	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 310,000	\$ 4,600	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 313,300	\$ 4,700	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 316,600	\$ 4,700	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 319,900	\$ 4,700	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 323,200	\$ 4,800	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 326,500	\$ 4,800	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 329,700	\$ 4,800	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 333,000	\$ 4,800	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 336,300	\$ 4,900	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 339,600	\$ 4,900	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 342,900	\$ 4,900	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 346,200	\$ 5,000	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 349,500	\$ 5,000	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 352,800	\$ 5,100	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 356,000	\$ 5,000	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
\$ 359,300	\$ 5,100	\$ -	\$ 1,320,000	\$ 1,320,000	\$ -
	\$ 96,000			\$ 26,400,000	

Maintenance Costs (Dis-benefit)		Estimated Annual Benefits		
BUILD SCENARIO	BENEFITS	BASELINE	BUILD SCENARIO	BENEFITS
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
		\$ -	\$ -	\$ -
\$ (260,000)	\$ (260,000)	\$ 43,798,000	\$ 47,803,000	\$ 4,005,000
\$ (260,000)	\$ (260,000)	\$ 44,291,000	\$ 48,299,000	\$ 4,008,000
\$ (260,000)	\$ (260,000)	\$ 44,786,000	\$ 48,798,000	\$ 4,012,000
\$ (260,000)	\$ (260,000)	\$ 45,282,000	\$ 49,297,000	\$ 4,015,000
\$ (260,000)	\$ (260,000)	\$ 45,774,000	\$ 49,792,000	\$ 4,018,000
\$ (260,000)	\$ (260,000)	\$ 46,269,000	\$ 50,291,000	\$ 4,022,000
\$ (260,000)	\$ (260,000)	\$ 46,764,000	\$ 50,789,000	\$ 4,025,000
\$ (260,000)	\$ (260,000)	\$ 47,258,000	\$ 51,286,000	\$ 4,028,000
\$ (260,000)	\$ (260,000)	\$ 47,752,000	\$ 51,784,000	\$ 4,032,000
\$ (260,000)	\$ (260,000)	\$ 48,249,000	\$ 52,284,000	\$ 4,035,000
\$ (260,000)	\$ (260,000)	\$ 48,741,000	\$ 52,779,000	\$ 4,038,000
\$ (260,000)	\$ (260,000)	\$ 49,236,000	\$ 53,278,000	\$ 4,042,000
\$ (260,000)	\$ (260,000)	\$ 49,733,000	\$ 53,778,000	\$ 4,045,000
\$ (260,000)	\$ (260,000)	\$ 50,228,000	\$ 54,276,000	\$ 4,048,000
\$ (260,000)	\$ (260,000)	\$ 50,725,000	\$ 54,777,000	\$ 4,052,000
\$ (260,000)	\$ (260,000)	\$ 51,221,000	\$ 55,276,000	\$ 4,055,000
\$ (260,000)	\$ (260,000)	\$ 51,718,000	\$ 55,777,000	\$ 4,059,000
\$ (260,000)	\$ (260,000)	\$ 52,214,000	\$ 56,276,000	\$ 4,062,000
\$ (260,000)	\$ (260,000)	\$ 52,712,000	\$ 56,777,000	\$ 4,065,000
\$ (260,000)	\$ (260,000)	\$ 53,210,000	\$ 68,012,000	\$ 14,802,000
	\$ (5,200,000)			\$ 91,468,000

Discounted Benefits and Costs

BASELINE	BUILD SCENARIO	BENEFITS
\$ -	\$ -	\$ -
\$ -	\$ -	\$ -
\$ -	\$ -	\$ -
\$ -	\$ -	\$ -
\$ (15,134,000)	\$ -	\$ (15,134,000)
\$ (12,962,000)	\$ -	\$ (28,097,000)
\$ -	\$ 3,335,000	\$ (24,762,000)
\$ -	\$ 3,237,000	\$ (21,524,000)
\$ -	\$ 3,143,000	\$ (18,381,000)
\$ -	\$ 3,051,000	\$ (15,331,000)
\$ -	\$ 2,962,000	\$ (12,369,000)
\$ -	\$ 2,875,000	\$ (9,494,000)
\$ -	\$ 2,791,000	\$ (6,703,000)
\$ -	\$ 2,709,000	\$ (3,993,000)
\$ -	\$ 2,630,000	\$ (1,363,000)
\$ -	\$ 2,553,000	\$ 1,190,000
\$ -	\$ 2,479,000	\$ 3,669,000
\$ -	\$ 2,406,000	\$ 6,075,000
\$ -	\$ 2,336,000	\$ 8,411,000
\$ -	\$ 2,268,000	\$ 10,679,000
\$ -	\$ 2,201,000	\$ 12,880,000
\$ -	\$ 2,137,000	\$ 15,017,000
\$ -	\$ 2,075,000	\$ 17,092,000
\$ -	\$ 2,014,000	\$ 19,106,000
\$ -	\$ 1,955,000	\$ 21,061,000
\$ -	\$ 6,901,000	\$ 27,962,000
\$ (28,096,000)	\$ 56,058,000	\$ 27,962,000



MULTIPLIERS

ALTA PLANNING + DESIGN
FY 2024 RAISE GRANT

WHAT THIS TAB ALL ABOUT:

Multiplier and adjustment factors for quantifying project benefits.

CATEGORY	FACTOR	VALUE	YEAR	ADJUSTED VALUE	UNIT	CITATION	LINK	NOTES			
		1.00	2022	\$1,000.00	\$USD	Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Table A-7 (December 2023)					
		1.07	2021	\$1,000.00	\$USD						
		1.12	2020	\$880.00	\$USD						
		1.13	2019	\$870.00	\$USD						
		1.15	2018	\$850.00	\$USD						
		1.18	2017	\$820.00	\$USD						
		1.20	2016	\$800.00	\$USD						
		1.21	2015	\$790.00	\$USD						
		1.22	2014	\$780.00	\$USD						
		1.24	2013	\$760.00	\$USD						
		1.27	2012	\$730.00	\$USD						
		1.29	2011	\$710.00	\$USD						
		1.32	2010	\$680.00	\$USD						
		1.33	2009	\$670.00	\$USD						
		1.34	2008	\$660.00	\$USD						
		1.37	2007	\$630.00	\$USD						
		1.40	2006	\$600.00	\$USD						
		1.45	2005	\$550.00	\$USD						
		1.49	2004	\$510.00	\$USD						
		1.53	2003	\$470.00	\$USD						
	SHORT-TERM JOBS CREATED	\$76,923	2015	\$97,370.98	per job-year	TIGER Benefit-Cost Analysis (BCA) Resource Guide (2016)	https://www.transportation.gov/sites/dot.gov/files/docs/BCA%20Resource%20Guide%202016.pdf	that are induced in consumer goods and services industries as workers with direct and indirect jobs spend their increased incomes. These or any other well-			
EMISSIONS COST REDUCTIONS	TOTAL HYDROCARBONS (THC)	0.00	2008		metric ton/VMT for passenger	Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and Light Trucks, EPA (2008)	https://www3.epa.gov/otaq/consumer/420f08024.pdf	454 grams per pound; 2,204.62 lbs per metric ton. For alternative costs, see "Transportation Cost and Benefit Analysis II - Air Pollution Costs" (2015), Victoria Transport Policy Institute < http://www.vtppi.org/tca/tca0510.pdf >			
	FINE PARTICULATE MATTER (PM _{2.5})	0.000000004	2008		metric ton/VMT for passenger						
	PARTICULATE MATTER (PM ₁₀)	0.000000044	2008		metric ton/VMT for passenger						
	NITROUS OXIDES (NOx)	0.00	2008		metric ton/VMT for passenger						
	CARBON MONOXIDE (CO)	0.00	2008		metric ton/VMT for passenger						
	SULFUR DIOXIDE (SO ₂)	0.00	2015		metric ton/VMT for passenger						
	VOLATILE ORGANIC COMPOUNDS (VOC)	0.00	2008		metric ton/VMT for passenger						
	CARBON DIOXIDE (CO ₂)	0.00037	2008		metric ton/VMT for passenger						
	TOTAL HYDROCARBONS (THC)	0.00	2008		metric ton/VMT for light-duty						
	FINE PARTICULATE MATTER (PM _{2.5})	0.00	2008		metric ton/VMT for light-duty						
	PARTICULATE MATTER (PM ₁₀)	0.00	2008		metric ton/VMT for light-duty						
	NITROUS OXIDES (NOx)	0.00	2008		metric ton/VMT for light-duty						
	CARBON MONOXIDE (CO)	0.00	2008		metric ton/VMT for light-duty						
	SULFUR OXIDES (SOx)	0.00	2008		metric ton/VMT for light-duty						
	VOLATILE ORGANIC COMPOUNDS (VOC)	0.00	2008		metric ton/VMT for light-duty						
	CARBON DIOXIDE (CO ₂)	0.00051	2008		metric ton/VMT for light-duty						
	PASSENGER CAR	9.77	2017	9.77	miles per travel day				Average Person Trip Length by Mode and Purpose, NHTS (2017)	https://nhts.onli.gov/	
	VAN	9.36	2017	9.36	miles per travel day						
	SUV	9.66	2017	9.66	miles per travel day						
		11.01	2017	11.01	miles per travel day						
PICKUP/LIGHT DUTY TRUCK	11.01	2017	11.01	miles per travel day							
	11.01	2017	11.01	miles per travel day							
	TOTAL HYDROCARBONS (THC)	0.0000			metric ton/VMT			Weighted average of passenger cars and light-duty vehicles by miles per travel day			
	FINE PARTICULATE MATTER (PM _{2.5})	0.0000000044			metric ton/VMT						
	PARTICULATE MATTER (PM ₁₀)	0.0000000466			metric ton/VMT						
	NITROUS OXIDES (NOx)	0.00000008			metric ton/VMT						
	CARBON MONOXIDE (CO)	0.000011			metric ton/VMT						
	SULFUR OXIDES (SOx)	0.00000001			metric ton/VMT						
	VOLATILE ORGANIC COMPOUNDS (VOC)	0.0000			metric ton/VMT						
	CARBON DIOXIDE (CO ₂)	0.00044			metric ton/VMT						
	HYDROCARBONS (THC)	-	-	-	-			Applicants should carefully note whether their emissions data is reported in short tons or metric tons. A metric ton is equal to 1.1015 short tons.			
	PARTICULATE MATTER (PM)	\$350,000	2018	\$0.021	per VMT	The Safer Affordable Fuel-Efficient Vehicles Rule for MY2021-MY2026 Passenger Cars, and Light Trucks Preliminary Regulatory Impact Analysis (October 2018)	https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/ld_cafe_co2_nhtsa_2127-ai76_epa_pria_181016.pdf				
	NITROUS OXIDES (NOx)	\$8,600	2018	\$0.01	per VMT						
	CARBON MONOXIDE (CO)	-	-	-	-						
	SULFUR OXIDES (SOx)	\$50,100	2018	\$0.00	per VMT						
	VOLATILE ORGANIC COMPOUNDS (VOC)	\$2,100	2018	\$0.00	per VMT						
	CARBON DIOXIDE	\$40	2018	\$0.021	per VMT						
	TOTAL EMISSIONS COST SAVINGS			\$0.05	per VMT						
SOCIAL COST OF CARBON	2023	\$228	2023	\$0.10	per metric ton of CO ₂	Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Table A-6 (December 2023)	https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf	Social cost of carbon values are per unit metric ton of carbon dioxide and already discounted forward to the reference year (in 2007 nominal dollars). Unlike previous OMB guidance on social cost of carbon values, the latest OMB guidance shows the values to the nearest dollar only. The Resource Guide converted this to 2013 dollars and also shows the value to the nearest dollar.			
	2024	\$233	2024	\$0.10	per metric ton of CO ₂						
	2025	\$237	2025	\$0.11	per metric ton of CO ₂						
	2026	\$241	2026	\$0.11	per metric ton of CO ₂						
	2027	\$245	2027	\$0.11	per metric ton of CO ₂						
	2028	\$250	2028	\$0.11	per metric ton of CO ₂						
	2029	\$253	2029	\$0.11	per metric ton of CO ₂						
	2030	\$257	2030	\$0.11	per metric ton of CO ₂						
	2031	\$262	2031	\$0.12	per metric ton of CO ₂						
	2032	\$265	2032	\$0.12	per metric ton of CO ₂						
	2033	\$270	2033	\$0.12	per metric ton of CO ₂						
	2034	\$274	2034	\$0.12	per metric ton of CO ₂						
	2035	\$278	2035	\$0.12	per metric ton of CO ₂						
	2036	\$282	2036	\$0.13	per metric ton of CO ₂						
2037	\$287	2037	\$0.13	per metric ton of CO ₂							

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	2038		\$290	2038	\$0.13	per metric ton of CO ₂		
	2039		\$294	2039	\$0.13	per metric ton of CO ₂		
	2040		\$299	2040	\$0.13	per metric ton of CO ₂		
	2041		\$303	2041	\$0.13	per metric ton of CO ₂		
	2042		\$308	2042	\$0.14	per metric ton of CO ₂		
	2043		\$312	2043	\$0.14	per metric ton of CO ₂		
	2044		\$317	2044	\$0.14	per metric ton of CO ₂		
	2045		\$321	2045	\$0.14	per metric ton of CO ₂		
	2046		\$326	2046	\$0.15	per metric ton of CO ₂		
	2047		\$331	2047	\$0.15	per metric ton of CO ₂		
	2048		\$336	2048	\$0.15	per metric ton of CO ₂		
	2049		\$340	2049	\$0.15	per metric ton of CO ₂		
	2050		\$345	2050	\$0.15	per metric ton of CO ₂		
	2051		\$349	2051	\$0.16	per metric ton of CO ₂		
	2052		\$353	2052	\$0.16	per metric ton of CO ₂		
	2053		\$357	2053	\$0.16	per metric ton of CO ₂		
Damage Cost of Nox	2023		\$19,800		\$0.016	per metric ton of Nox	Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Table A-6 (December 2023)	
	2024		\$20,100		\$0.017	per metric ton of Nox		
	2025		\$20,300		\$0.017	per metric ton of Nox		
	2026		\$20,600		\$0.017	per metric ton of Nox		
	2027		\$21,000		\$0.017	per metric ton of Nox		
	2028		\$21,300		\$0.018	per metric ton of Nox		
	2029		\$21,700		\$0.018	per metric ton of Nox		
	2030		\$22,000		\$0.018	per metric ton of Nox		
	2031		\$22,000		\$0.018	per metric ton of Nox		
	2032		\$22,000		\$0.018	per metric ton of Nox		
	2033		\$22,000		\$0.018	per metric ton of Nox		
	2034		\$22,000		\$0.018	per metric ton of Nox		
	2035		\$22,000		\$0.018	per metric ton of Nox		
	2036		\$22,000		\$0.018	per metric ton of Nox		
	2037		\$22,000		\$0.018	per metric ton of Nox		
	2038		\$22,000		\$0.018	per metric ton of Nox		
	2039		\$22,000		\$0.018	per metric ton of Nox		
	2040		\$22,000		\$0.018	per metric ton of Nox		
	2041		\$22,000		\$0.018	per metric ton of Nox		
	2042		\$22,000		\$0.018	per metric ton of Nox		
	2043		\$22,000		\$0.018	per metric ton of Nox		
	2044		\$22,000		\$0.018	per metric ton of Nox		
	2045		\$22,000		\$0.018	per metric ton of Nox		
	2046		\$22,000		\$0.018	per metric ton of Nox		
	2047		\$22,000		\$0.018	per metric ton of Nox		
	2048		\$22,000		\$0.018	per metric ton of Nox		
	2049		\$22,000		\$0.018	per metric ton of Nox		
	2050		\$22,000		\$0.018	per metric ton of Nox		
	2051		\$22,000		\$0.018	per metric ton of Nox		
	2052		\$22,000		\$0.018	per metric ton of Nox		
	2053		\$22,000		\$0.018	per metric ton of Nox		
Damage Cost of SO2	2023		\$52,900		\$0.0004	per metric ton of SO2	Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Table A-6 (December 2023)	
	2024		\$53,800		\$0.0004	per metric ton of SO2		
	2025		\$54,800		\$0.0004	per metric ton of SO2		
	2026		\$56,100		\$0.0004	per metric ton of SO2		
	2027		\$57,400		\$0.0004	per metric ton of SO2		
	2028		\$58,700		\$0.0005	per metric ton of SO2		
	2029		\$60,100		\$0.0005	per metric ton of SO2		
	2030		\$61,500		\$0.0005	per metric ton of SO2		
	2031		\$61,500		\$0.0005	per metric ton of SO2		
	2032		\$61,500		\$0.0005	per metric ton of SO2		
	2033		\$61,500		\$0.0005	per metric ton of SO2		
	2034		\$61,500		\$0.0005	per metric ton of SO2		
	2035		\$61,500		\$0.0005	per metric ton of SO2		
	2036		\$61,500		\$0.0005	per metric ton of SO2		
	2037		\$61,500		\$0.0005	per metric ton of SO2		
	2038		\$61,500		\$0.0005	per metric ton of SO2		
	2039		\$61,500		\$0.0005	per metric ton of SO2		
	2040		\$61,500		\$0.0005	per metric ton of SO2		
	2041		\$61,500		\$0.0005	per metric ton of SO2		
	2042		\$61,500		\$0.0005	per metric ton of SO2		
	2043		\$61,500		\$0.0005	per metric ton of SO2		
	2044		\$61,500		\$0.0005	per metric ton of SO2		
	2045		\$61,500		\$0.0005	per metric ton of SO2		
	2046		\$61,500		\$0.0005	per metric ton of SO2		
	2047		\$61,500		\$0.0005	per metric ton of SO2		
	2048		\$61,500		\$0.0005	per metric ton of SO2		
	2049		\$61,500		\$0.0005	per metric ton of SO2		
	2050		\$61,500		\$0.0005	per metric ton of SO2		
	2051		\$61,500		\$0.0005	per metric ton of SO2		
	2052		\$61,500		\$0.0005	per metric ton of SO2		
	2053		\$61,500		\$0.0005	per metric ton of SO2		
Damage Cost of PM2.5	2023		\$951,000		\$0.004	per metric ton of PM2.5	Benefit-Cost Analysis Guidance for Discretionary Grant Programs, Table A-6 (December 2023)	
	2024		\$963,200		\$0.004	per metric ton of PM2.5		
	2025		\$975,500		\$0.004	per metric ton of PM2.5		
	2026		\$993,500		\$0.004	per metric ton of PM2.5		
	2027		\$1,011,900		\$0.005	per metric ton of PM2.5		
	2028		\$1,030,600		\$0.005	per metric ton of PM2.5		
	2029		\$1,049,600		\$0.005	per metric ton of PM2.5		
	2030		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2031		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2032		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2033		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2034		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2035		\$1,069,000		\$0.005	per metric ton of PM2.5		
	2036		\$1,069,000		\$0.005	per metric ton of PM2.5		

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\$169,690.98

	2037	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2038	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2039	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2040	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2041	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2042	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2043	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2044	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2045	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2046	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2047	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2048	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2049	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2050	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2051	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2052	\$1,069,000		\$0,005	per metric ton of PM2.5			
	2053	\$1,069,000		\$0,005	per metric ton of PM2.5			
VMT REDUCED	BIKE COMMUTE TRIP DISTANCE	2.47	2017	2.47	VMT reduced	NHTS, 2017	https://nhts.oml.gov/	
	WALK COMMUTE TRIP DISTANCE	0.72	2017	0.72	VMT reduced	NHTS, 2017		
	BIKE COLLEGE TRIP DISTANCE	1.31	2017	1.31	VMT reduced	NHTS, 2017		
	WALK COLLEGE TRIP DISTANCE	0.43	2017	0.43	VMT reduced	NHTS, 2017		
	BIKE K-12 TRIP DISTANCE	1.36	2017	1.36	VMT reduced	NHTS, 2017		
	WALK K-12 TRIP DISTANCE	0.69	2017	0.69	VMT reduced	NHTS, 2017		
	BIKE UTILITARIAN TRIP DISTANCE	2.28	2017	2.28	VMT reduced	NHTS, 2017		
	WALK UTILITARIAN TRIP DISTANCE	0.83	2017	0.83	VMT reduced	NHTS, 2017		
	BIKE SOCIAL/RECREATIONAL TRIP DISTANCE	2.73	2017	2.73	VMT reduced	NHTS, 2017		
	WALK SOCIAL/RECREATIONAL TRIP DISTANCE	1.12	2017	1.12	VMT reduced	NHTS, 2017		
NATIONAL MODE SHARE	COMMUTE - DROVE ALONE	0.85	2017	0.85	mode share	NHTS, 2017	https://nhts.oml.gov/	
	COMMUTE - CARPOOL	-	2017	-	mode share			
	COMMUTE - TRANSIT	0.05	2017	0.05	mode share			
	COMMUTE - BIKE	0.01	2017	0.01	mode share			
	COMMUTE - WALK	0.07	2017	0.07	mode share			
	COMMUTE - OTHER	0.02	2017	0.02	mode share			
	COMMUTE - WORKED AT HOME	-	2017	-	mode share			
	COLLEGE - DROVE ALONE	0.58	2017	0.58	mode share	NHTS, 2017	https://nhts.oml.gov/	
	COLLEGE - CARPOOL	-	2017	-	mode share			
	COLLEGE - TRANSIT	0.10	2017	0.10	mode share			
	COLLEGE - BIKE	0.02	2017	0.02	mode share			
	COLLEGE - WALK	0.28	2017	0.28	mode share			
	COLLEGE - OTHER	0.00	2017	0.00	mode share			
	COLLEGE - WORKED AT HOME	-	2017	-	mode share			
	K-12 - DROVE ALONE	0.47	2017	0.47	mode share	NHTS, 2017	https://nhts.oml.gov/	
	K-12 - CARPOOL	-	2017	-	mode share			
	K-12 - TRANSIT	0.39	2017	0.39	mode share			Includes school bus and transit
	K-12 - BIKE	0.01	2017	0.01	mode share			
	K-12 - WALK	0.09	2017	0.09	mode share			
	K-12 - OTHER	0.00	2017	0.00	mode share			
	K-12 - WORKED AT HOME	-	2017	-	mode share			
	UTILITARIAN - DROVE ALONE	0.84	2017	0.84	mode share	NHTS, 2017	https://nhts.oml.gov/	Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - CARPOOL	-	2017	-	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - TRANSIT	0.05	2017	0.05	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - BIKE	0.01	2017	0.01	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - WALK	0.10	2017	0.10	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - OTHER	0.01	2017	0.01	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	UTILITARIAN - WORKED AT HOME	-	2017	-	mode share			Assume ACS, 5-Year Estimates, omitting work at home trips
	SOCIAL/RECREATIONAL - DROVE ALONE	0.77	2017	0.77	mode share	NHTS, 2017	https://nhts.oml.gov/	
	SOCIAL/RECREATIONAL - CARPOOL	-	2017	-	mode share			
	SOCIAL/RECREATIONAL - TRANSIT	0.03	2017	0.03	mode share			
	SOCIAL/RECREATIONAL - BIKE	0.02	2017	0.02	mode share			
	SOCIAL/RECREATIONAL - WALK	0.18	2017	0.18	mode share			
	SOCIAL/RECREATIONAL - OTHER	0.01	2017	0.01	mode share			
	SOCIAL/RECREATIONAL - WORKED AT HOME	-	2017	-	mode share			
LOCAL MODE SHARE	COMMUTE - WALK AREA - DROVE ALONE	-	-	0.67	mode share			
	COMMUTE - WALK AREA - CARPOOL	-	-	0.14	mode share			
	COMMUTE - WALK AREA - TRANSIT	-	-	0.06	mode share			
	COMMUTE - WALK AREA - BIKE	0.02	-	1.86	mode share			
	COMMUTE - WALK AREA - WALK	0.073	-	1.03	mode share			
	COMMUTE - WALK AREA - OTHER	-	-	0.01	mode share			
	COMMUTE - WALK AREA - WORKED AT HOME	-	-	0.03	mode share			
	COMMUTE - BIKE AREA - DROVE ALONE	-	-	0.79	mode share			
	COMMUTE - BIKE AREA - CARPOOL	-	-	0.11	mode share			
	COMMUTE - BIKE AREA - TRANSIT	-	-	0.02	mode share			
	COMMUTE - BIKE AREA - BIKE	1%	-	0.64	mode share			
	COMMUTE - BIKE AREA - WALK	3%	-	0.46	mode share			
	COMMUTE - BIKE AREA - OTHER	-	-	0.00	mode share			
	COMMUTE - BIKE AREA - WORKED AT HOME	-	-	0.03	mode share			
	COLLEGE - WALK AREA - DROVE ALONE	-	-	0.58	mode share			
	COLLEGE - WALK AREA - CARPOOL	-	-	0.00	mode share			
	COLLEGE - WALK AREA - TRANSIT	-	-	0.10	mode share			
	COLLEGE - WALK AREA - BIKE	-	-	0.03	mode share			
	COLLEGE - WALK AREA - WALK	-	-	0.29	mode share			
	COLLEGE - WALK AREA - OTHER	-	-	0.00	mode share			
	COLLEGE - WALK AREA - WORKED AT HOME	-	-	-	mode share			
	COLLEGE - BIKE AREA - DROVE ALONE	-	-	0.74	mode share			
	COLLEGE - BIKE AREA - CARPOOL	-	-	0.00	mode share			
	COLLEGE - BIKE AREA - TRANSIT	-	-	0.12	mode share			
	COLLEGE - BIKE AREA - BIKE	-	-	0.01	mode share			
	COLLEGE - BIKE AREA - WALK	-	-	0.13	mode share			
	COLLEGE - BIKE AREA - OTHER	-	-	0.00	mode share			
	COLLEGE - BIKE AREA - WORKED AT HOME	-	-	-	mode share			
	K-12 - WALK AREA - DROVE ALONE	-	-	0.50	mode share			
	K-12 - WALK AREA - CARPOOL	-	-	0.00	mode share			
	K-12 - WALK AREA - TRANSIT	-	-	0.41	mode share			
	K-12 - WALK AREA - BIKE	-	-	0.02	mode share			
	K-12 - WALK AREA - WALK	-	-	0.07	mode share			

	K-12 - WALK AREA - OTHER			0.00	mode share				
	K-12 - WALK AREA - WORKED AT HOME				mode share				
	K-12 - BIKE AREA - DROVE ALONE			0.52	mode share				
	K-12 - BIKE AREA - CARPOOL			0.00	mode share				
	K-12 - BIKE AREA - TRANSIT			0.43	mode share				
	K-12 - BIKE AREA - BIKE			0.01	mode share				
	K-12 - BIKE AREA - WALK			0.04	mode share				
	K-12 - BIKE AREA - OTHER			0.00	mode share				
	K-12 - BIKE AREA - WORKED AT HOME								
	UTILITARIAN - WALK AREA - DROVE ALONE			0.69	mode share				
	UTILITARIAN - WALK AREA - CARPOOL			0.14	mode share				
	UTILITARIAN - WALK AREA - TRANSIT			0.06	mode share				
	UTILITARIAN - WALK AREA - BIKE			0.02	mode share				
	UTILITARIAN - WALK AREA - WALK			0.07	mode share				
	UTILITARIAN - WALK AREA - OTHER			0.01	mode share				
	UTILITARIAN - WALK AREA - WORKED AT HOME			0.03	mode share				
	UTILITARIAN - BIKE AREA - DROVE ALONE			0.81	mode share				
	UTILITARIAN - BIKE AREA - CARPOOL			0.11	mode share				
	UTILITARIAN - BIKE AREA - TRANSIT			0.03	mode share				
	UTILITARIAN - BIKE AREA - BIKE			0.01	mode share				
	UTILITARIAN - BIKE AREA - WALK			0.03	mode share				
	UTILITARIAN - BIKE AREA - OTHER			0.00	mode share				
	UTILITARIAN - BIKE AREA - WORKED AT HOME			0.03	mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - DROVE ALONE				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - CARPOOL				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - TRANSIT				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - BIKE				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - WALK				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - OTHER				mode share				
	SOCIAL/RECREATIONAL - BIKE AREA - WORKED AT HOME				mode share				
ASSUMED LOCAL	COMMUTE - WALK AREA - WALK			0.19	trips replaced				Assumes national average carpool size (2.40727953019561)
BASELINE TRIP	COMMUTE - WALK AREA - BIKE			0.19	trips replaced				Assumes national average carpool size (2.40727953019561)
REPLACEMENT	COMMUTE - BIKE AREA - WALK			0.41	trips replaced				Assumes national average carpool size (2.40727953019561)
MULTIPLIERS	COMMUTE - BIKE AREA - BIKE			0.41	trips replaced				Assumes national average carpool size (2.40727953019561)
	COLLEGE - WALK AREA - WALK			0.82	trips replaced				Assumes national average carpool size (2.40727953019561)
	COLLEGE - WALK AREA - BIKE			0.82	trips replaced				Assumes national average carpool size (2.40727953019561)
	COLLEGE - BIKE AREA - WALK			0.84	trips replaced				Assumes national average carpool size (2.40727953019561)
	COLLEGE - BIKE AREA - BIKE			0.74	trips replaced				Assumes national average carpool size (2.40727953019561)
	K-12 - WALK AREA - WALK			0.54	trips replaced				Assumes national average carpool size (2.40727953019561)
	K-12 - WALK AREA - BIKE			0.51	trips replaced				Assumes national average carpool size (2.40727953019561)
	K-12 - BIKE AREA - WALK			0.54	trips replaced				Assumes national average carpool size (2.40727953019561)
	K-12 - BIKE AREA - BIKE			0.52	trips replaced				Assumes national average carpool size (2.40727953019561)
	UTILITARIAN - WALK AREA - WALK			0.79	trips replaced				Assumes national average carpool size (2.40727953019561)
	UTILITARIAN - WALK AREA - BIKE			0.74	trips replaced				Assumes national average carpool size (2.40727953019561)
	UTILITARIAN - BIKE AREA - WALK			0.87	trips replaced				Assumes national average carpool size (2.40727953019561)
	UTILITARIAN - BIKE AREA - BIKE			0.84	trips replaced				Assumes national average carpool size (2.40727953019561)
	SOCIAL/RECREATIONAL - WALK AREA - WALK			0.16	trips replaced	Table 2 - Common Social and Recreational Trips:	https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/journals-and-magazines/social-policy-journal/spi37/37-the-		Weighted average of "Percentage of trips by walk for destination categories" and "NAE of trip numbers"
	SOCIAL/RECREATIONAL - WALK AREA - BIKE				trips replaced	National Annual Estimates of Number of Trips to Destinations and to Destinations by Mode. "Social and recreational travel: the destinations, travel modes and destinations-travel-modes-and-co2-emissions-of-new-			
	SOCIAL/RECREATIONAL - BIKE AREA - WALK				trips replaced				
	SOCIAL/RECREATIONAL - BIKE AREA - BIKE			0.16	trips replaced				
MODE SHARE GOALS (20-	COMMUTE - WALK	0.0726	2047	0.0726	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
YEAR) - ALTERNATIVE A	COMMUTE - BIKE	0.0061	2047	0.0061	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
	COLLEGE - WALK	0.2865	2047	0.0208	mode share				Derived from the difference between commute baseline and 20-year goal
	COLLEGE - BIKE	0.0109	2047	0.0001	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - WALK	0.0726	2047	0.0053	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - BIKE	0.0060	2047	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - WALK	0.0748	2047	0.0054	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - BIKE	0.0063	2047	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
MODE SHARE GOALS (20-	COMMUTE - WALK	0.0726	2047.0000	0.0726	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
YEAR) - ALTERNATIVE B	COMMUTE - BIKE	0.0061	2047.0000	0.0061	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
	COLLEGE - WALK	0.2865	2047.0000	0.0208	mode share				Derived from the difference between commute baseline and 20-year goal
	COLLEGE - BIKE	0.0109	2047.0000	0.0001	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - WALK	0.0726	2047.0000	0.0053	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - BIKE	0.0060	2047.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - WALK	0.0748	2047.0000	0.0054	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - BIKE	0.0063	2047.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
MODE SHARE GOALS (20-	COMMUTE - WALK	0.0726	2046.0000	0.0347	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
YEAR) - ALTERNATIVE C	COMMUTE - BIKE	0.0061	2046.0000	0.0197	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
	COLLEGE - WALK	0.2865	2046.0000	0.0099	mode share				Derived from the difference between commute baseline and 20-year goal
	COLLEGE - BIKE	0.0109	2046.0000	0.0002	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - WALK	0.0726	2046.0000	0.0025	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - BIKE	0.0060	2046.0000	0.0001	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - WALK	0.0748	2046.0000	0.0026	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - BIKE	0.0063	2046.0000	0.0001	mode share				Derived from the difference between commute baseline and 20-year goal
MODE SHARE GOALS (20-	COMMUTE - WALK	0.0726	2046.0000	0.0000	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
YEAR) - ALTERNATIVE D	COMMUTE - BIKE	0.0061	2046.0000	0.0000	mode share				Adjustment factor shows increase from baseline to meet 20-year goal
	COLLEGE - WALK	0.2865	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	COLLEGE - BIKE	0.0109	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - WALK	0.0726	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	K-12 - BIKE	0.0060	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - WALK	0.0748	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
	UTILITARIAN - BIKE	0.0063	2046.0000	0.0000	mode share				Derived from the difference between commute baseline and 20-year goal
PERSON TRIP RATIOS	REFUSED - RATIO TO WALK TO WORK TRIPS	0	2017	0.00	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of refused trips divided by work trips
	REFUSED - RATIO TO BIKE TO WORK TRIPS	0	2017	0.00	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of refused trips divided by work trips
	DON'T KNOW - RATIO TO WALK TO WORK TRIPS	0	2017	0.00	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of don't know trips divided by work trips
	DON'T KNOW - RATIO TO BIKE TO WORK TRIPS	0	2017	0.00	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of don't know trips divided by work trips
	NOT ASCERTAINED - RATIO TO WALK TO WORK TRIPS	0	2017	0.00	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of not ascertained trips divided by work trips
	NOT ASCERTAINED - RATIO TO BIKE TO WORK TRIPS	0	2017	0.00	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of not ascertained trips divided by work trips
	HOME - RATIO TO WALK TO WORK TRIPS	15,719	2017	4.82	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of home trips divided by work trips
	HOME - RATIO TO BIKE TO WORK TRIPS	1,504	2017	3.37	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of home trips divided by work trips
	WORK - RATIO TO WALK TO WORK TRIPS	3,259	2017	1.00	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of home trips divided by work trips
	WORK - RATIO TO BIKE TO WORK TRIPS	446	2017	1.00	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of home trips divided by work trips
	SCHOOL/DAYCARE/RELIGIOUS ACTIVITY - RATIO TO WALK TO WORK TRIPS	2,204	2017	0.48	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of school/day/religious activities trips divided by work trips
	SCHOOL/DAYCARE/RELIGIOUS ACTIVITY - RATIO TO BIKE TO WORK TRIPS	203	2017	0.46	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of school/day/religious activities trips divided by work trips
	MEDICAL/DENTAL - RATIO TO WALK TO WORK TRIPS	162	2017	0.05	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of medical/dental trips divided by work trips
	MEDICAL/DENTAL - RATIO TO BIKE TO WORK TRIPS	28	2017	0.06	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017			Number of medical/dental trips divided by work trips

	SHOPPING/ERRANDS - RATIO TO WALK TO WORK TRIPS	5,040	2017	1.55	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of shopping/errands trips divided by work trips
	SHOPPING/ERRANDS - RATIO TO BIKE TO WORK TRIPS	384	2017	0.86	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of shopping/errands trips divided by work trips
	SOCIAL/RECREATIONAL - RATIO TO WALK TO WORK TRIPS	7,093	2017	2.18	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of social/recreational trips divided by work trips
	SOCIAL/RECREATIONAL - RATIO TO BIKE TO WORK TRIPS	751	2017	1.68	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of social/recreational trips divided by work trips
	FAMILY/PERSONAL BUSINESS/OBLIGATIONS - RATIO TO WALK TO WORK TRIPS	0	2017	0.00	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of family/personal business/obligations trips divided by work trips
	FAMILY/PERSONAL BUSINESS/OBLIGATIONS - RATIO TO BIKE TO WORK TRIPS	0	2017	0.00	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of family/personal business/obligations trips divided by work trips
	TRANSPORT SOMEONE - RATIO TO WALK TO WORK TRIPS	1,145	2017	0.35	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of transport someone trips divided by work trips
	TRANSPORT SOMEONE - RATIO TO BIKE TO WORK TRIPS	50	2017	0.11	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of transport someone trips divided by work trips
	MEALS - RATIO TO WALK TO WORK TRIPS	3,138	2017	0.96	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of meals trips divided by work trips
	MEALS - RATIO TO BIKE TO WORK TRIPS	142	2017	0.32	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of meals trips divided by work trips
	OTHER - RATIO TO WALK TO WORK TRIPS	1,186	2017	0.36	ratio to walk to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of other trips divided by work trips
	OTHER - RATIO TO BIKE TO WORK TRIPS	67	2017	0.15	ratio to bike to work trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of other trips divided by work trips
	TOTAL TRIPS	38,947	2017	0.92	ratio to total trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of total walk trips divided by total trips
	TOTAL TRIPS	3,575	2017	0.08	ratio to total trips	Travel Day Person Trips (in millions), NHTSA 2017		Number of total bike trips divided by total trips
	UTILITARIAN- RATIO TO WALK TO WORK TRIPS	28,594	2017	8.77	ratio to walk to work trips			
	UTILITARIAN- RATIO TO BIKE TO WORK TRIPS	2,378	2017	5.33	ratio to bike to work trips			
STATE OF GOOD REPAIR HOUSEHOLD TRANSPORTATION COST SAVINGS	ROAD MAINTENANCE COSTS	\$0.05	2005	\$0.08	per VMT	Estimating the External Costs of Driving in San Francisco	https://www.spur.org/publications/urbanist-article/2005-09-01/estimating-external-costs-driving-san-francisco	
	OPERATING AND OWNERSHIP COSTS OF SEDANS	\$0.52	2022	\$0.52	per VMT	Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Table A-4 (December 2023)		
	OPERATING AND OWNERSHIP COSTS OF SUVs	\$0.52	2022	\$0.52	per VMT			
	OPERATING AND OWNERSHIP COSTS OF MINIVANS	\$0.52	2022	\$0.52	per VMT			
	AVERAGE CAR PERSON TRIP LENGTH PER YEAR	3471.15	2017		miles	NHTS, 2017 and NHTS, 2009	https://nhts.ornl.gov/tables09/ae/work/job64228.htm	Sum of all Trip Purposes
	AVERAGE SUV PERSON TRIP LENGTH PER YEAR	3354.35	2017		miles			
	AVERAGE VAN PERSON TRIP LENGTH PER YEAR	3219.30	2017		miles			
RATIO OF CRASH COSTS TO CONGESTION COSTS	OPERATING COSTS PER MILE FOR PASSENGER VEHICLES	\$0.43	2019	\$0.49	per VMT			Weighted average of operational costs and annual average per trip length
	>3 million	1.92			ratio	Crashes vs. Congestion: What's the Cost to Society?	http://www.camsys.com/pubs/2011_AAA_CrashvCongUpd.pdf	
	1-3 million	3.25			ratio	AAA, 2011, Figure 3, pg 13.		
	500,000-1 million	4.82			ratio			
	<500,000	5.98			ratio			
COST OF CRASHES AND CONGESTION PER VMT	All Cities	2.58			ratio			
	>3 million	\$0.22			\$USD	Average Annual Miles per Driver by Age Group. Last modified: September 26, 2014. FHWA.		
	1-3 million	\$0.25			\$USD	https://www.fhwa.dot.gov/ohim/ohh00/bar8.htm ;		
	500,000-1 million	\$0.29			\$USD	Using Figure ES.3 "Cost of Crashes and Congestion per Vehicle Mile Traveled" ratios from 2008 report and		
	<500,000	\$0.37			\$USD			
COST OF CRASHES PER VMT	All Cities	\$0.25			\$USD			
	>3 million	\$0.15	2011	\$0.21	\$USD			
	1-3 million	\$0.19	2011	\$0.27	\$USD			
	500,000-1 million	\$0.24	2011	\$0.33	\$USD			
	<500,000	\$0.31	2011	\$0.44	\$USD			
COST OF CONGESTION PER VMT	All Cities	\$0.18	2011	\$0.25	\$USD			
	>3 million	\$0.08	2011	\$0.11	\$USD			
	1-3 million	\$0.06	2011	\$0.08	\$USD			
	500,000-1 million	\$0.05	2011	\$0.07	\$USD			
	<500,000	\$0.05	2011	\$0.07	\$USD			
STUDY AREA SIZE	All Cities	\$0.07	2011	\$0.10	\$USD			
	<500,000							
MORTALITY REDUCTION BENEFITS OF INDUCED ACTIVE TRANSPORTATION	Walking Value per Induced Trip	\$	7.63	2022	\$7.63	\$USD	Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Table A-13 (December 2023)	
	Cycling Value per Induced Trip	\$	6.80	2022	\$6.80	\$USD		
	Walking Age Proportion (20-74)		68%					
	Cycling Age Proportion (20-64)		59%					
	Trips induced from non-active modes		89%					
MAIS RELATIVE DISUTILITY FACTORS BY INJURY SEVERITY LEVEL	MINOR INJURIES		0.003				USDOT Departmental Guidance. Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses (March 2021)	
	MODERATE INJURIES		0.047					
	SERIOUS INJURIES		0.105					
	SEVERE INJURIES		0.266					
	CRITICAL INJURIES		0.593					
	FATAL INJURIES		1					
SPECIFIC COLLISION COSTS	PROPERTY DAMAGE ONLY	\$9,100.00	2022	\$9,100.00	\$USD		Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Table A-1 (December 2023) and USDOT Departmental Guidance. Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses (March 2021)	
	MINOR INJURIES	\$42,068.70	2022	\$42,068.70	\$USD			
	MODERATE INJURIES	\$659,076.30	2022	\$659,076.30	\$USD			
	SERIOUS INJURIES	\$1,472,404.50	2022	\$1,472,404.50	\$USD			
	SEVERE INJURIES	\$3,730,091.40	2022	\$3,730,091.40	\$USD			
	CRITICAL INJURIES	\$8,315,579.70	2022	\$8,315,579.70	\$USD			
	FATAL INJURIES	\$14,022,900.00	2022	\$14,022,900.00	\$USD			
	TOTAL COLLISION COSTS	\$0.00	2022	\$0.00	\$USD			
SPECIFIC COLLISION COSTS (KABCO)	O - NO INJURY	\$5,000.00	2022	\$5,000.00	\$USD		Benefit-Cost Analysis Guidance for Discretionary Grant Programs. Table A-1 (December 2023)	
	C - POSSIBLE INJURY	\$111,700.00	2022	\$111,700.00	\$USD			
	B - NON-INCAPACITATING	\$233,800.00	2022	\$233,800.00	\$USD			
	A - INCAPACITATING	\$1,188,200.00	2022	\$1,188,200.00	\$USD			
	K - KILLED	\$12,500,000.00	2022	\$12,500,000.00	\$USD			
	U - INJURED (SEVERITY UNKOWN)	\$217,600.00	2022	\$217,600.00	\$USD			

APPENDIX B
FEMA-BRIC Benefit-Cost Analysis Spreadsheet

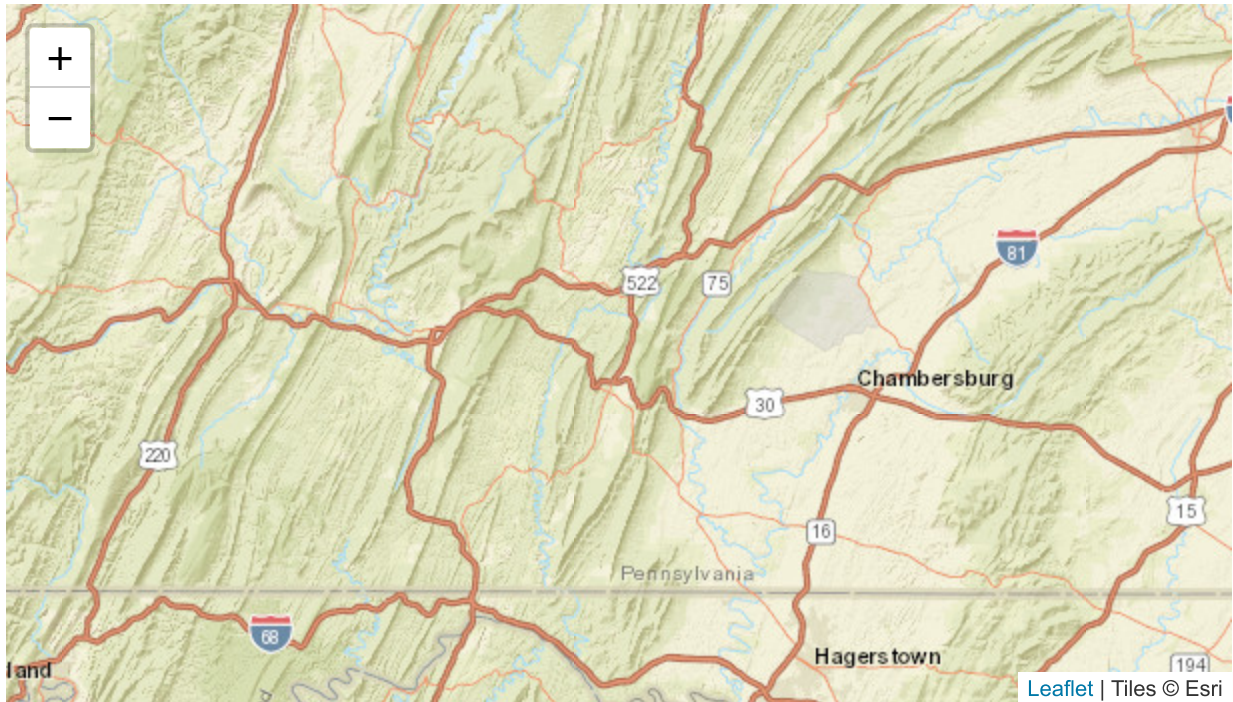


Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Codorus Creek Greenway and Flood Protection Project



Map Marker	Mitigation Title	Property Type	Hazard	Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)		
				Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)
1	Bioretention @ York County, Pennsylvania		Riverine Flood	\$ 12,304,762	\$ 26,619,995	0.46	\$ 26,129,451	\$ 26,979,517	0.97
2	Floodplain and Stream Restoration @ York County, Pennsylvania		DFA - Riverine Flood	\$ 6,509,121	\$ 27,011,100	0.24	\$ 13,822,273	\$ 27,810,038	0.50
TOTAL (SELECTED)				\$ 18,813,883	\$ 53,631,095	0.35	\$ 39,951,724	\$ 54,789,555	0.73
TOTAL				\$ 18,813,883	\$ 53,631,095	0.35	\$ 39,951,724	\$ 54,789,555	0.73

Property Configuration

Property Title:	Bioretention @ York County, Pennsylvania
Property Location:	17403, York, Pennsylvania
Property Coordinates:	39.9199157, -76.7264049
Hazard Type:	Riverine Flood
Mitigation Action Type:	Bioretention
Property Type:	Green Infrastructure
Analysis Method Type:	Modeled Damages

Cost Estimation

Bioretention @ York County, Pennsylvania

Project Useful Life (years):	80
Project Cost:	\$26,300,000
Number of Maintenance Years:	80 Use Default:Yes
Annual Maintenance Cost:	\$22,500

Standard Benefits - Green Infrastructure

Bioretention @ York County, Pennsylvania

Total Project Area (acres):	7
Expected Annual Green Infrastructure Benefits:	\$865,192

Benefits-Costs Summary

Bioretention @ York County, Pennsylvania

Total Standard Mitigation Benefits:	\$12,304,762
Total Social Benefits:	\$0
Total Mitigation Project Benefits:	\$12,304,762
Total Mitigation Project Cost:	\$26,619,995
Benefit Cost Ratio - Standard:	0.46
Benefit Cost Ratio - Standard + Social:	0.46

Property Configuration

Property Title: Floodplain and Stream Restoration @ York County, Pennsylvania
Property Location: 17403, York, Pennsylvania
Property Coordinates: 39.9199157, -76.7264049
Hazard Type: Riverine Flood
Mitigation Action Type: Floodplain and Stream Restoration
Property Type: Roads & Bridges
Analysis Method Type: Historical Damages

Cost Estimation

Floodplain and Stream Restoration @ York County, Pennsylvania

Project Useful Life (years): 80
Project Cost: \$26,300,000
Number of Maintenance Years: 80 Use Default:Yes
Annual Maintenance Cost: \$50,000

Damage Analysis Parameters - Damage Frequency Assessment

Floodplain and Stream Restoration @ York County, Pennsylvania

Year of Analysis was Conducted: 2024
Year Property was Built: 1947
Analysis Duration: 78 Use Default:Yes

Roads and Bridges Properties

Floodplain and Stream Restoration @ York County, Pennsylvania

Estimated Number of One-Way Traffic Detour Trips per Day: 11,000
Additional Time per One-Way Detour Trip (minutes): 5
Number of Additional Miles: 2
Federal Rate (\$): 0.655 Use Default:Yes
Economic Loss Per Day of Loss of Function (\$): 48,775.83

Historical Damages Before Mitigation

Floodplain and Stream Restoration @ York County, Pennsylvania

Damage Year	Recurrence Interval (years)	ROADS AND BRIDGES Impact (days)	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL		
			Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)	Current Dollars?	Inflated Damages (\$)
1972	39	4	0	0	0	0	0	195,103	No	195,103

Annualized Damages Before Mitigation
 Floodplain and Stream Restoration @ York County, Pennsylvania

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
39	195,103	5,003
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	195,103	5,003

Expected Damages After Mitigation
 Floodplain and Stream Restoration @ York County, Pennsylvania

Recurrence Interval (years)	ROADS AND BRIDGES		OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
	Impact (days)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)	
80	0	0	0	0	0	0	0	

Annualized Damages After Mitigation
 Floodplain and Stream Restoration @ York County, Pennsylvania

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
80	0	0
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	0	0

Standard Benefits - Ecosystem Services
 Floodplain and Stream Restoration @ York County, Pennsylvania

Total Project Area (acres):	17.6
Percentage of Urban Green Open Space:	53.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	47.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	\$452,677

Benefits-Costs Summary

Floodplain and Stream Restoration @ York County, Pennsylvania

Total Standard Mitigation Benefits: \$6,509,121

.....
Total Social Benefits: \$0

.....
Total Mitigation Project Benefits: \$6,509,121

.....
Total Mitigation Project Cost: \$27,011,100

.....
Benefit Cost Ratio - Standard: 0.24

.....
Benefit Cost Ratio - Standard + Social: 0.24

APPENDIX C
Benefit-Cost Sensitivity Analysis Spreadsheet for Changed FEMA-BRIC
Parameters



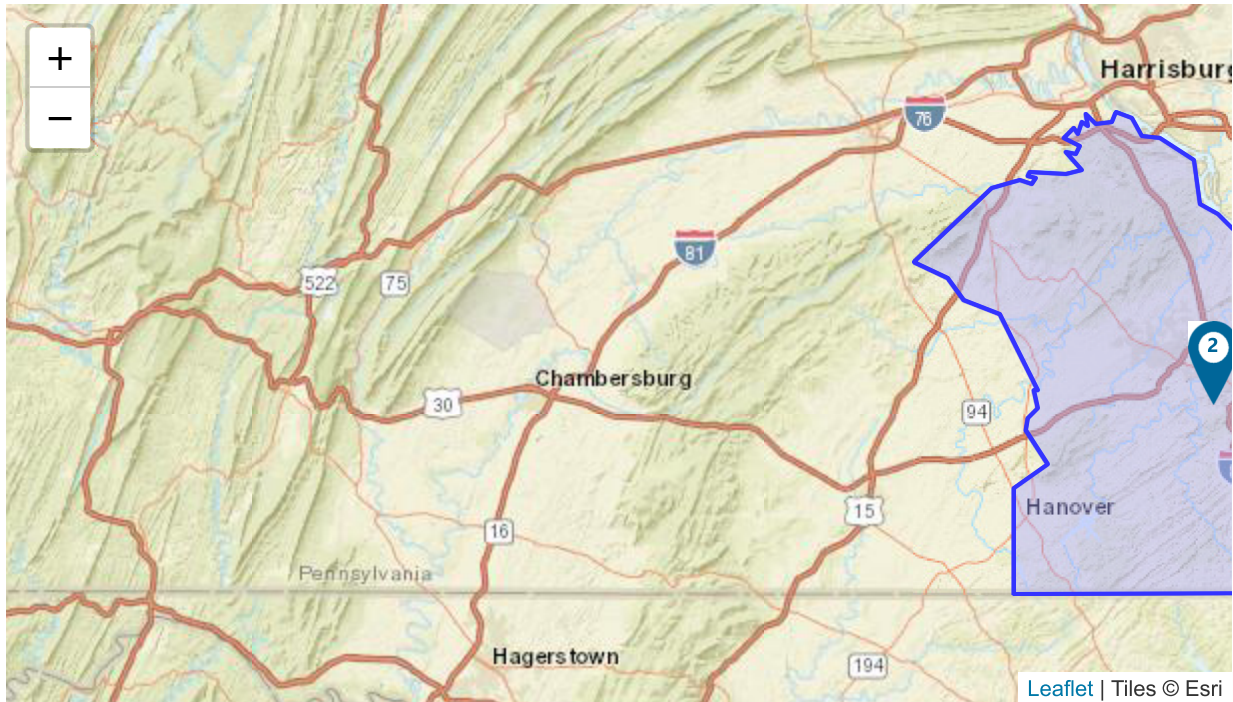
FEMA

Benefit-Cost Calculator

V.6.0 (Build 20240105.2249 | Release Notes)

Benefit-Cost Analysis

Project Name: Codorus Creek Greenway and Flood Protection Project [Copied on 2/26/2024 @ 14:38:41]



Map Marker	Mitigation Title	Property Type	Hazard	Using 7% Discount Rate			Using 3% Discount Rate (For BRIC and FMA only)		
				Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)
1	Bioretention @ York County, Pennsylvania		Riverine Flood	\$ 8,789,115	\$ 26,619,995	0.33	\$ 18,663,894	\$ 26,979,517	0.69
2	Floodplain and Stream Restoration @ York County, Pennsylvania		DFA - Riverine Flood	\$ 3,925,609	\$ 27,011,100	0.15	\$ 8,336,124	\$ 27,810,038	0.30
TOTAL (SELECTED)				\$ 12,714,724	\$ 53,631,095	0.24	\$ 27,000,018	\$ 54,789,555	0.49
TOTAL				\$ 12,714,724	\$ 53,631,095	0.24	\$ 27,000,018	\$ 54,789,555	0.49

Property Configuration

Property Title:	Bioretention @ York County, Pennsylvania
Property Location:	17403, York, Pennsylvania
Property Coordinates:	39.9199157, -76.7264049
Hazard Type:	Riverine Flood
Mitigation Action Type:	Bioretention
Property Type:	Green Infrastructure
Analysis Method Type:	Modeled Damages

Cost Estimation

Bioretention @ York County, Pennsylvania

Project Useful Life (years):	80
Project Cost:	\$26,300,000
Number of Maintenance Years:	80 Use Default:Yes
Annual Maintenance Cost:	\$22,500

Standard Benefits - Green Infrastructure

Bioretention @ York County, Pennsylvania

Total Project Area (acres):	5
Expected Annual Green Infrastructure Benefits:	\$617,994

Benefits-Costs Summary

Bioretention @ York County, Pennsylvania

Total Standard Mitigation Benefits:	\$8,789,115
Total Social Benefits:	\$0
Total Mitigation Project Benefits:	\$8,789,115
Total Mitigation Project Cost:	\$26,619,995
Benefit Cost Ratio - Standard:	0.33
Benefit Cost Ratio - Standard + Social:	0.33

Property Configuration

Property Title: Floodplain and Stream Restoration @ York County, Pennsylvania

Property Location: 17403, York, Pennsylvania

Property Coordinates: 39.9199157, -76.7264049

Hazard Type: Riverine Flood

Mitigation Action Type: Floodplain and Stream Restoration

Property Type: Roads & Bridges

Analysis Method Type: Historical Damages

Cost Estimation
Floodplain and Stream Restoration @ York County, Pennsylvania

Project Useful Life (years): 80

Project Cost: \$26,300,000

Number of Maintenance Years: 80 Use Default:Yes

Annual Maintenance Cost: \$50,000

Damage Analysis Parameters - Damage Frequency Assessment
Floodplain and Stream Restoration @ York County, Pennsylvania

Year of Analysis was Conducted: 2024

Year Property was Built: 1947

Analysis Duration: 78 Use Default:Yes

Roads and Bridges Properties
Floodplain and Stream Restoration @ York County, Pennsylvania

Estimated Number of One-Way Traffic Detour Trips per Day: 11,000

Additional Time per One-Way Detour Trip (minutes): 5

Number of Additional Miles: 2

Federal Rate (\$): 0.655 Use Default:Yes

Economic Loss Per Day of Loss of Function (\$): 48,775.83

Historical Damages Before Mitigation
Floodplain and Stream Restoration @ York County, Pennsylvania

Damage Year	Recurrence Interval (years)	ROADS AND BRIDGES Impact (days)	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL		
			Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)	Current Dollars?	Inflated Damages (\$)
1972	39	4	0	0	0	0	0	195,103	No	195,103

Annualized Damages Before Mitigation

Floodplain and Stream Restoration @ York County, Pennsylvania

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
39	195,103	5,003
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	195,103	5,003

Expected Damages After Mitigation

Floodplain and Stream Restoration @ York County, Pennsylvania

Recurrence Interval (years)	ROADS AND BRIDGES	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
	Impact (days)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)
39	2	0	0	0	0	0	97,552

Annualized Damages After Mitigation

Floodplain and Stream Restoration @ York County, Pennsylvania

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
39	97,552	2,501
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	97,552	2,501

Standard Benefits - Ecosystem Services

Floodplain and Stream Restoration @ York County, Pennsylvania

Total Project Area (acres):	17.6
Percentage of Urban Green Open Space:	100.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	\$273,522

Benefits-Costs Summary

Floodplain and Stream Restoration @ York County, Pennsylvania

Total Standard Mitigation Benefits:	\$3,925,609
Total Social Benefits:	\$0
Total Mitigation Project Benefits:	\$3,925,609
Total Mitigation Project Cost:	\$27,011,100
Benefit Cost Ratio - Standard:	0.15
Benefit Cost Ratio - Standard + Social:	0.15