US Department of Transportation

Preparing a Benefit-Cost Analysis for the Reconnecting Communities Pilot (RCP) Discretionary Grant Program

August 30, 2022

Webinar Information

Audio

- To listen via computer: Select “Computer Audio”
- To listen via phone:
  - Call: 669-254-5252
  - Webinar ID: 160 229 1255
  - Passcode: 524894
- All participants automatically join on mute, with cameras off

This webinar is being recorded and will be posted on the RCP website at www.transportation.gov/reconnecting

Technical Support

- Email Webconference@dot.gov

Questions for Presenters

- Please type your questions in the Q&A box
- Chat will not be monitored

Informal Poll Questions

What type of organization do you represent?

- State
- Local government
- Federally recognized Tribal government
- Metropolitan Planning Organization
- Nonprofit organization
- Transit Agency
- Transportation Facility Owner
- Federal government
- Consultant
- Other (insert in chat)

Do you plan to submit a Capital Construction grant application for this round?

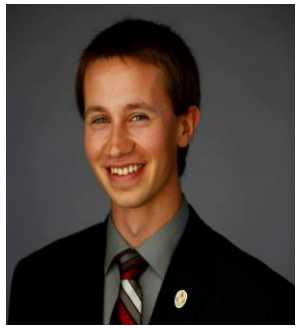
- Yes
- No
- Unsure

Presenter Introductions

Charlene Wang
Office of the Secretary
U.S. Department of Transportation

Jordan Wainer Katz
Volpe Center
U.S. Department of Transportation

Darren Timothy, Chief Economist
Office of the Secretary
U.S. Department of Transportation



Jordan Riesenberg, Economist
Office of the Secretary
U.S. Department of Transportation

Reconnecting Communities = Thriving Communities

Hands On Atlanta

Jason Cameron/Getty Images

FHWA: Pueblo of Acoma, NM

Informal Poll Questions

Geographic area

- Northeast
- Southeast
- Midwest
- West and Southwest
- Other

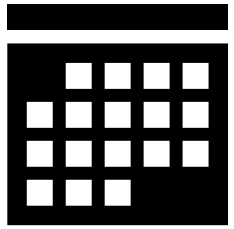
Community type

- Urban
- Suburban
- Rural
- Tribal
- Frontier
- Multiple community types

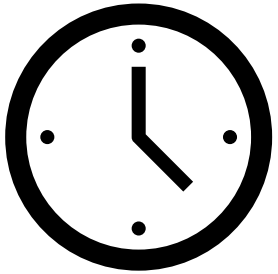
What is the approximate population of your community?

- <1,000
- 1,000-<10,000
- 10,000-<50,000
- 50,000-<100,000
- 100,000-<200,000
- 200,000-<500,000
- >500,000

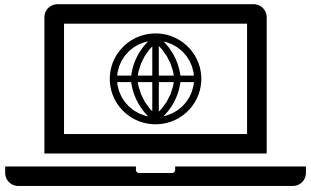
RCP NOFO Is Now Open!



Notice of Funding Opportunity is now **OPEN**
Grants.gov Opportunity Number: DOT-RCP-FY22-01
Assistance Listing: 20.940 – Reconnecting Communities



APPLY by Thursday, October 13, 2022, at 11:59 pm EDT
(no late applications accepted)
Submit on grants.gov



Additional resources
at www.transportation.gov/reconnecting
Subscribe for email updates!

Eligible Lead Applicants & Recipients for the RCP Program

- The lead applicant is the entity that submits the application. The recipient administers the award
- **The Eligible applicants for Planning Grants** are States, units of local government, Federally recognized Tribal governments, Metropolitan Planning Organizations, and nonprofit organizations. These entities are also eligible to serve as the **recipient** to administer the award
- **Eligible applicants for Capital Construction Grants** are the 1) the Facility Owner or 2) Eligible applicants to Planning Grants may also submit the application for a Capital Construction Grant, as long as the Owner of the eligible transportation facility is a joint applicant, with evidence of endorsing the application
  - **IMPORTANT NOTE: Only Facility Owners may serve as the recipient of the Capital Construction grant. The Facility Owner may ultimately choose to administer the award through a sub-recipient**

Partnerships bring perspectives and resources to your project

- Partnerships can:
  - Ensure and reflect community buy-in
  - Support multi-jurisdictional collaboration

- Partnerships with Facility Owners can involve multiple entities and take multiple forms. Some examples:
  - A State DOT, city government, and several local community foundations to remove a section of aging Interstate Highway and conversion to a new use.
  - A Federally recognized Tribal government, several community-based organizations, and the rail operator seek funds to address a crossing over a rail yard.
  - A County public works, County health department, public transportation provider, and State DOT apply for funds to install accessible pedestrian bridges to bus stops that cannot be accessed without crossing the highway.
  - A County public works department, several non-profits, and the State DOT apply to reconfigure a State Highway that bifurcates a small town.
  - Multiple adjacent local governments and the rail operator submit a single application for a series of bundled projects that reconnects communities around the rail-line through retrofits and mitigation of the infrastructure.
- See Merit Criterion #3: Community-based Stewardship, Management, and Partnerships

RCP BCA Requirements

- The RCP statute requires USDOT to consider the results of a cost-benefit analysis of the project when evaluating capital construction projects
- Sponsors of planning grant applications **do not need** to submit a benefit-cost analysis

Use of the BCA in Project Evaluation

- USDOT will consider the relative magnitude of estimated project benefits and costs in its evaluation
- Assign projects one of three ratings
  - Positive (benefits outweigh costs)
  - Negative (costs outweigh benefits)
  - Uncertain
- Projects with negative ratings may be selected for an award only if the project demonstrates clear potential benefits to connectivity, community engagement, quality of life for economically disadvantaged communities, particularly in geographically remote or less populated areas, which may not be fully reflected in the BCA analysis.

Informal Poll Questions

Is this the first time you are putting together a benefit-cost analysis for a USDOT grant program?

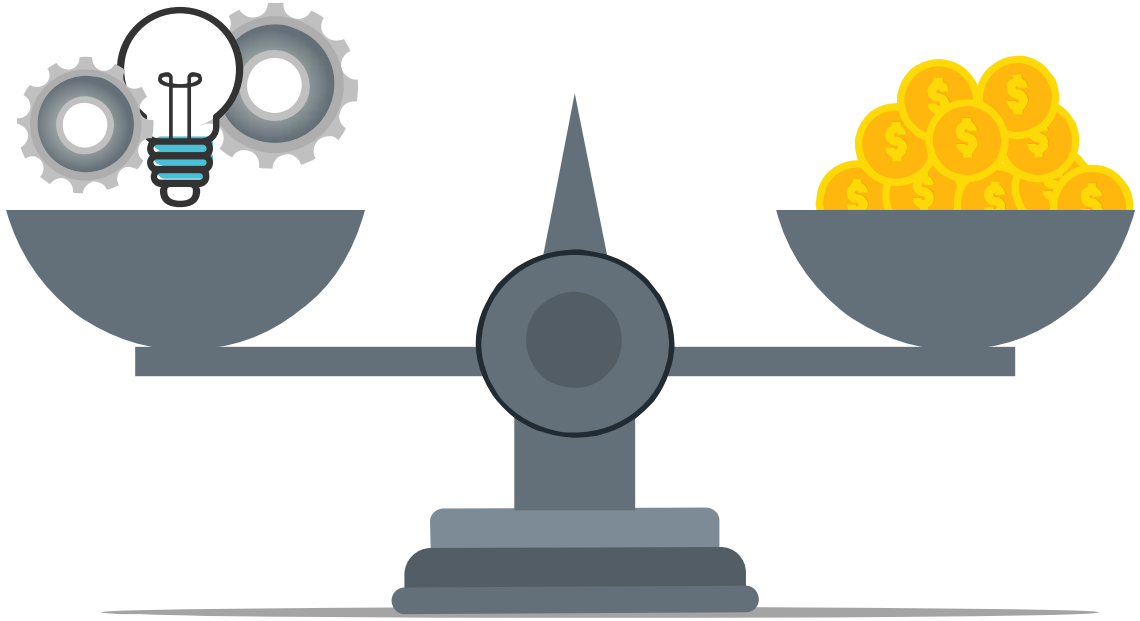
- Yes
- No

Is this your first USDOT BCA webinar?

- Yes
- No

What is BCA?

- Benefit-cost analysis (BCA) is a systematic process for identifying, quantifying, and comparing expected economic benefits and costs of a proposed infrastructure project.

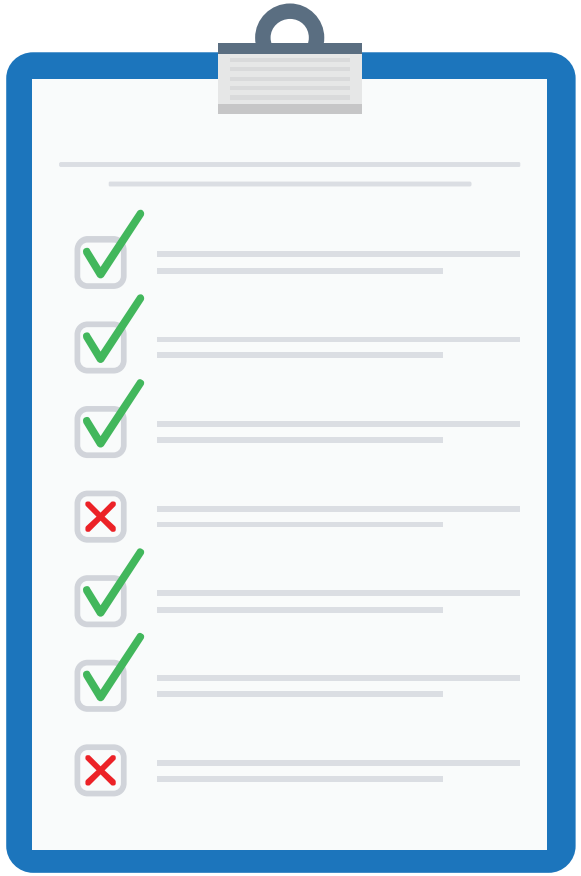


USDOT BCA Review

- USDOT economists will review the applicant's BCA
  - Examine key assumptions
  - Correct for any technical errors
  - Perform sensitivity analysis on key inputs
  - Consider any unquantified benefits

Why do we do BCA?

- Provides a useful benchmark from which to evaluate and compare potential transportation investments
- Adds a degree of rigor to the project evaluation process

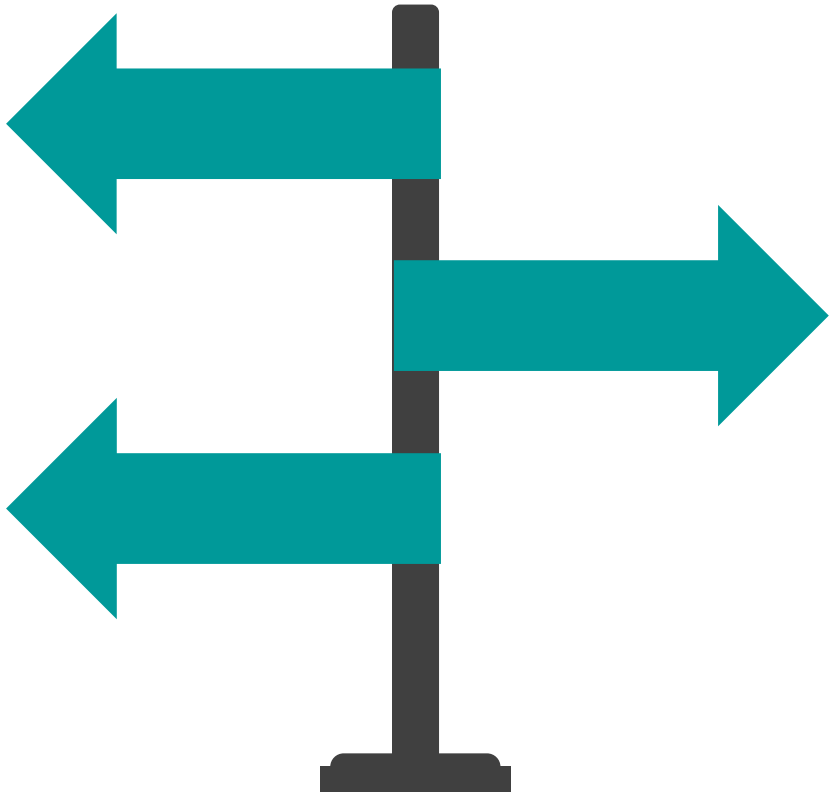


What do I need to do BCA?

- Clear understanding of the problem the project is intended to solve (baseline conditions) and how the project addresses the problem (measures of effectiveness)
- Well-defined project scope and cost estimate
- Monetization factors for key project benefits

What do I need to do BCA?

- Sources of information may include:
  - Project planning and engineering documents
  - Industry technical references and analytical tools
  - DOT BCA Guidance
  - Partners

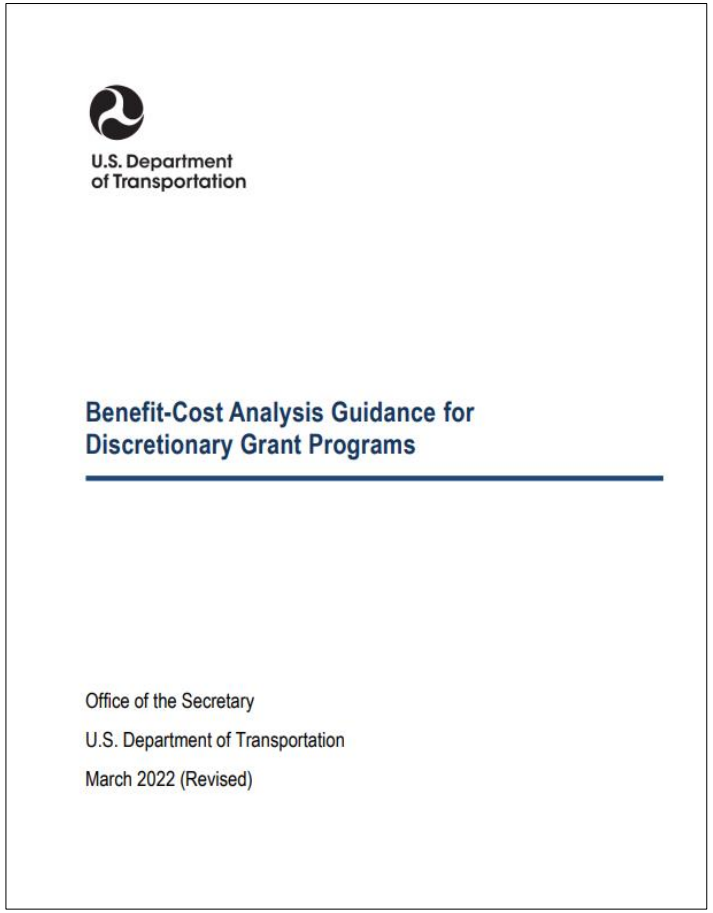


What should my BCA submission include?

- Technical memo/discussion describing the analysis, including any unquantified benefits, and documenting sources of information used (assumptions and inputs)
  - If provided as an appendix, does not count against page limit for the application narrative
- An unlocked spreadsheet (e.g., an Excel workbook) showing the calculations used to produce the estimates of benefits and costs

USDOT BCA Guidance

- Covers all USDOT discretionary grant programs
- Updated March 2022
- Available at https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0


U.S. Department of Transportation

Benefit-Cost Analysis Guidance for Discretionary Grant Programs

Office of the Secretary

U.S. Department of Transportation

March 2022 (Revised)

Baselines

- **Should measure costs and benefits of a proposed project against a baseline alternative (“base” or “no build”)**
- **“Do’s”**
  - Factor in any projected changes that would occur even in the absence of the requested project
  - Factor in ongoing routine maintenance
  - Consider the full long-term impacts of the no build
  - Explain and provide support for the chosen baseline
- **“Don’t’s”**
  - Assume that the same (or similar) improvement will be implemented later
  - Use unrealistic assumptions about alternative traffic flows or travel

Demand Forecasts

- **Most benefit estimates depend on ridership or usage, including for walking and cycling projects**
- **Provide supporting info on forecasts**
  - Geographic scope, assumptions, data sources, methodology
- **Provide forecasts for intermediate years**
  - Or at least interpolate –don't apply forecast year impacts to interim years
- **Exercise caution about long-term growth assumptions**
  - Consider underlying capacity limits of the improved and/or replacement facility

Analysis Period

- **Should cover both initial development/construction and a subsequent operational period**
- **Generally tied to the expected service life of the improvement or asset**
  - i.e., the number of years until you would anticipate having to take the same action again
  - Lesser improvements should have shorter service lives
  - Recommend 20 years maximum for capacity expansion or other operational improvements
- **Avoid excessively long analysis periods (over 30 years of operations)**
  - Use residual value to cover out-years of remaining service life for long-lived improvements

Inflation and Discounting

- **Inflation Adjustments**
  - Recommend using a 2020 base year for all cost and benefit data
- **Discounting**
  - Use a 7% discount rate for all benefits and costs (except CO_2)
  - Recommend using a 2020 base year for discounting

Scope of the Analysis

- **Project scope included in estimated costs and benefits must match**
- **Scope should cover a project that has independent utility**
  - May need to incorporate costs for related investments necessary to achieve the projected benefits
- **Project elements with independent utility should be individually evaluated in the BCA**
  - BCA evaluation will cover both independent elements and the submitted project as a whole

Benefits

- **Should be presented on an annual basis**
  - Don’t assume constant annual benefits without a good reason to do so
- **Negative outcomes should be counted as “disbenefits”**
  - E.g., work zone impacts
- **Avoid double-counting benefits**

Safety Benefits

- **Typically associated with reducing fatalities, injuries, and property damage**
- **Projected improvements in safety outcomes should be explained and documented**
  - Justify assumptions about expected reductions in crashes, injuries, and/or fatalities
  - Document any crash modification factors (CMFs) used
  - Show clear linkage between project and improved outcomes
  - Use facility-specific data history for baseline where possible
- **Crash-related injury and fatality data may be available in different forms**
  - KABCO injury scales
  - Fatal/Injury crashes vs. fatalities/injuries
  - BCA Guidance provides values covering all of these

Mobility and Access Benefits (Travel Time Savings)

- **Recommended monetization values found in BCA Guidance**
  - See footnotes for discussion of value of time for walking, cycling, waiting, standing, transfers, long-distance travel, business travel
- **Can be a function of both changes in travel speed and/or travel distance (e.g., new connections across a highway allowing for shorter walking or cycling trips)**
- **Consider vehicle occupancy where appropriate**
  - Local/facility-specific values preferred
  - National-level values provided in BCA Guidance
- **If valuing travel time reliability:**
  - Carefully document methodology and tools used
  - Show how valuation parameters are distinct from general travel time savings

Operating Cost Savings

- **Avoid double counting operating savings and other impacts**
  - E.g., truck or rail travel time savings, fuel consumption reductions
- **Localized, specific data preferred**
- **Standard per-mile values for light duty vehicles and commercial trucks provided in DOT BCA Guidance**

Environmental Benefits (Emissions Reduction)

- **For infrastructure improvements, emission reductions will typically be a function of reduced fuel consumption**
- **Recommended year by year unit values for CO_2, SO_x, NO_x, and $PM_{2.5}$ found in BCA Guidance**
  - Be careful about the measurement units being applied
- **Reductions in CO_2 emissions should be discounted at 3 percent, while all others should be discounted at 7 percent**

Amenity Benefits

- **Pedestrian, cycling, and transit facility/vehicle improvements can improve the quality or comfort of journeys**
- **Recommended values for different types of improvements found in BCA Guidance**
  - Pay attention to whether value is on a “per-trip” or “per-person-mile” basis
- **Carefully document baseline amenities, as well as specifically how the proposed project will add any amenity benefit categories being claimed**

Health Benefits

- Trips diverted to active transportation (walking and cycling) from other modes may yield health benefits to users
- Recommended monetization values, on a per trip basis, are found in DOT BCA Guidance
- Absent local data on existing mode share and estimated age profiles of users, applicants may apply national averages included in the BCA Guidance

Benefits to Existing and Additional Users

- **Primary benefits typically experienced directly by users**
- **Includes both "existing" users and "additional" users attracted as a result of the improvement**
  - Economists apply the "rule of half" when estimating benefits to new users (see BCA Guidance)

Mode Shift

- **Projected magnitude**
  - Should be based on careful analysis of local conditions and potential for shift from other modes that might be attributable to the project
- **Benefit estimates should not be based on comparing user costs of "old" and "new" mode**
  - Would be reflected in benefits to additional users
- **Reductions in external costs would be relevant**
  - E.g., emissions costs, congestion reduction, noise reduction
  - Values for noise and congestion costs included in BCA Guidance

Other Benefits

- **Agglomeration Economies**
- **Noise, Stormwater Runoff, and Wildlife Impact Reduction**
- **Emergency Response**
- **State of Good Repair**
- **Resilience**
  - Consider expected frequency of events and their consequences
- **Property Value Increases**
  - Is a measure rather than a benefit –avoid double-counting
- **Quality of Life**

Unquantified Benefits

- Many benefits of RCP Program projects may be difficult to quantify and monetize but should be explained as well as possible, whether such benefits are quantified or unquantified
- Should quantify magnitudes/timing of the impacts wherever possible
- Should clearly link specific project outcomes to any claimed unquantified benefits

Capital Costs

- **Include all costs of implementing the project**
  - E.g., design, ROW acquisition, construction
  - Regardless of funding source
  - Include previously incurred costs
- **Three forms of capital costs**
  - Nominal dollars (project budget)
  - Real dollars (base year)
  - Discounted Real dollars (use in BCA)

Maintenance Costs

- **Net maintenance costs may be positive or negative**
  - New facilities would incur ongoing maintenance costs over the life of the project
  - Rehabilitated/reconstructed facilities may result in net savings in maintenance costs between the build/no-build

Residual Value

- **For assets with remaining service life at the end of the analysis period, may calculate a "residual value" for the project**
  - Recall that service life does not necessarily match the physical life of the asset
- **Simply approach: assume linear depreciation**
- **Be sure to properly apply discounting**

Comparing Benefits to Costs

- **Net Present Value (Benefits – Costs)**
- **Benefit-Cost Ratio (Benefits / Costs)**
  - Denominator should only include capital costs (i.e., net maintenance costs and residual value should be in the numerator)
  - Dis-benefits should be subtracted from the numerator

Other Types of Economic Analysis

- **Examples**
  - Economic Impact Analysis (e.g., job creation)
  - Financial Impacts (e.g., revenue impacts)
  - Distributional Effects (e.g., equity)
- **Issues**
  - Use different approaches and answer different questions than does BCA
  - Do not represent additional benefits to include in BCA

Q&A

QUESTIONS?

Hypothetical BCA Example #1

Hypothetical BCA Example #1

Hypothetical BCA Example #1

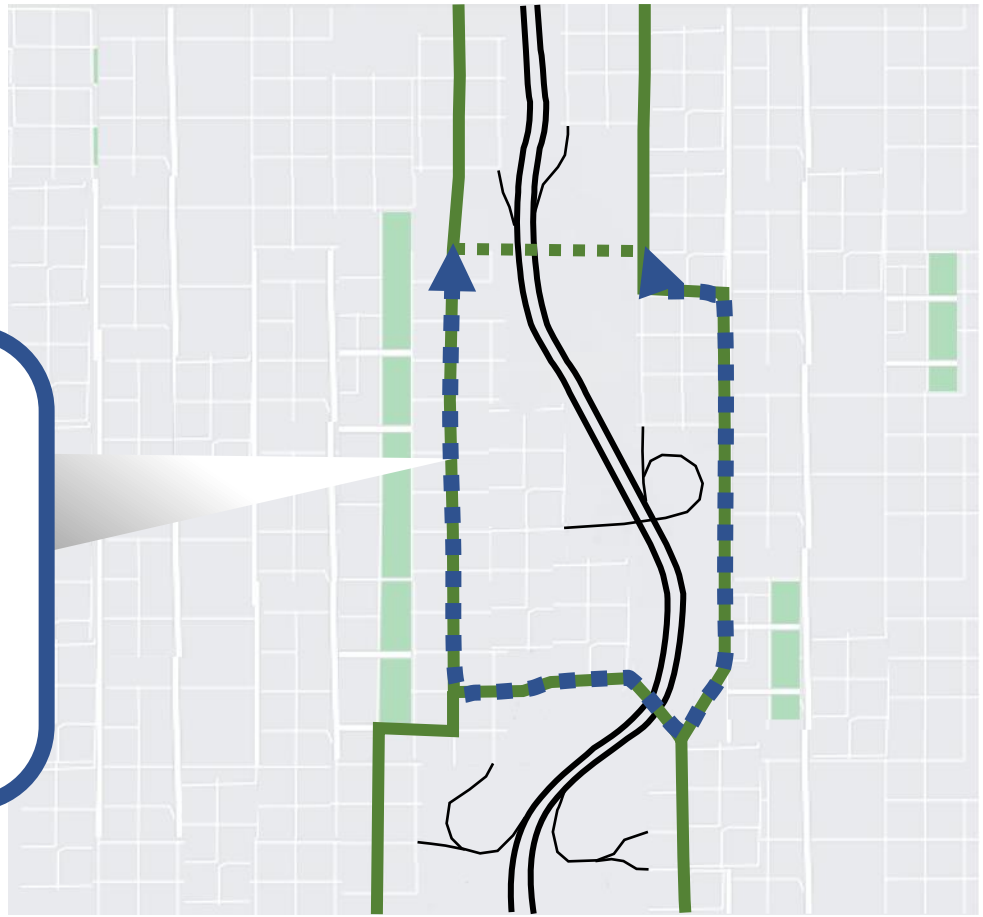
Proposed Project: Add new bike/pedestrian bridge over freeway to reconnect local neighborhoods.

Project Cost: $10.0 million

Hypothetical BCA Example #1

No-Build Scenario: Cyclists and pedestrians continue to use crossing to the south.
(2.6-mile route)

Daily users doing this route:
1,000 cyclists (Trail Counters)



Hypothetical BCA Example #1

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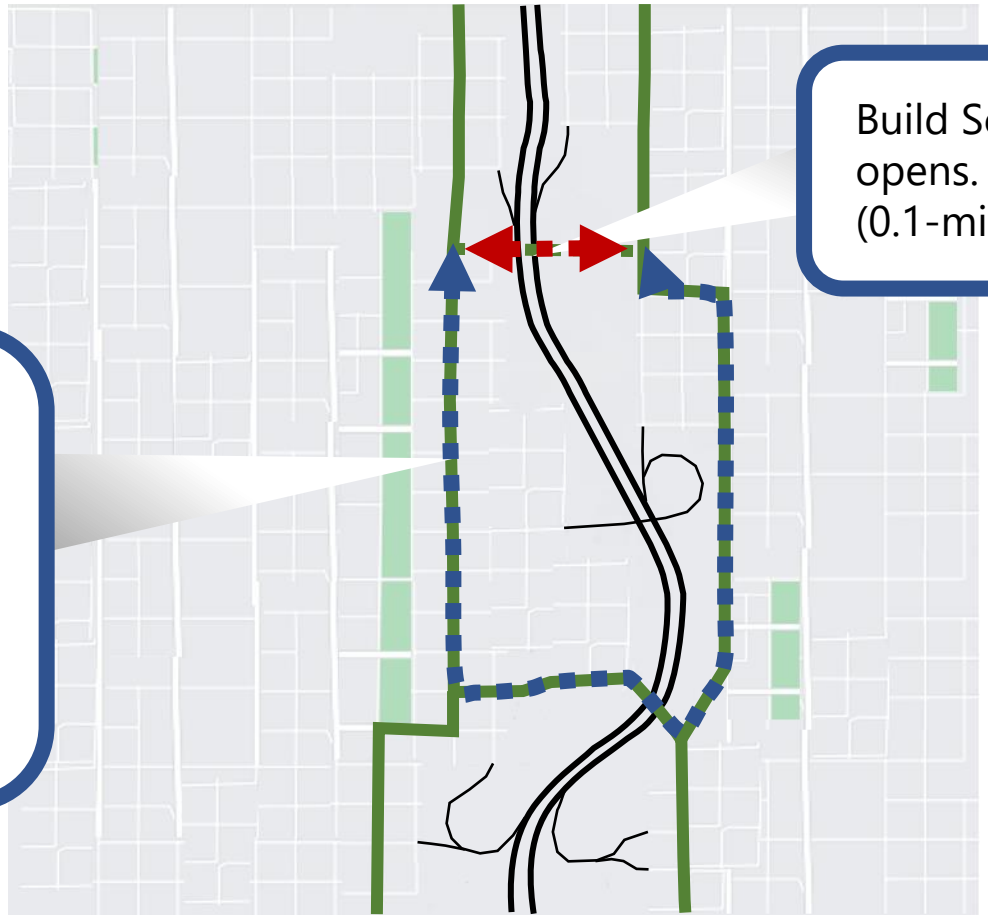
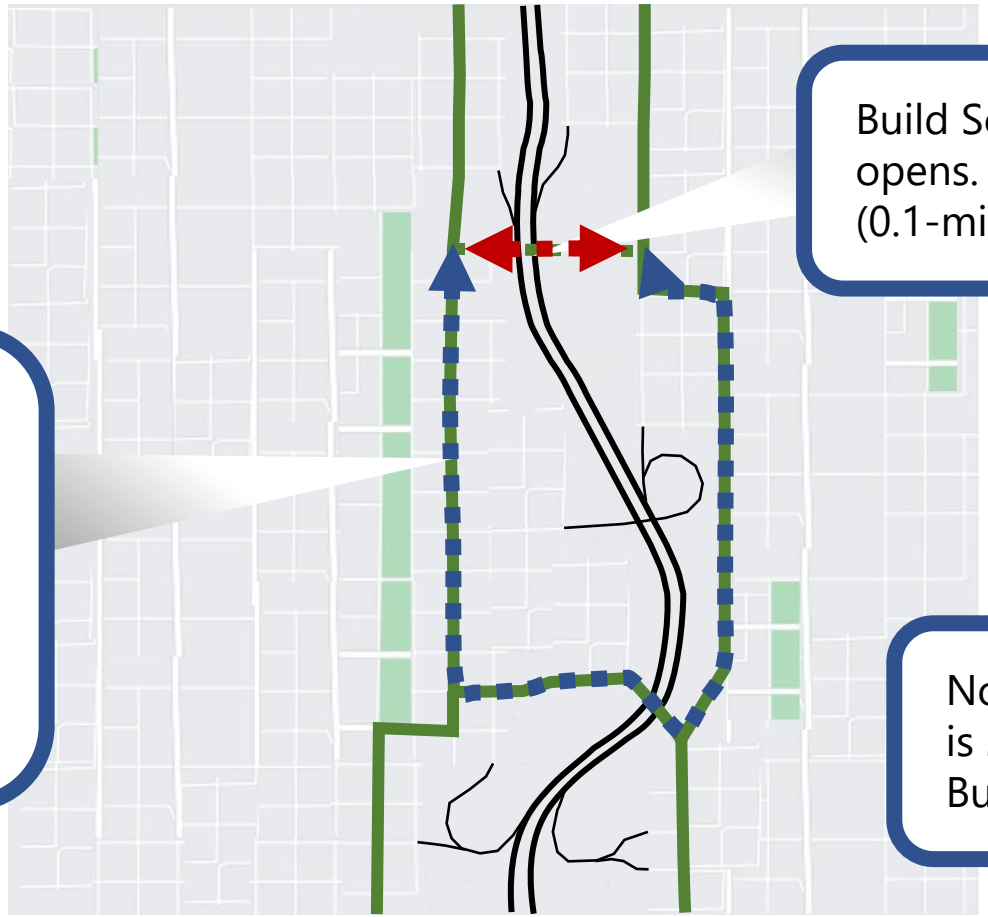


Build Scenario: Bridge opens.
(0.1-mile route)

Hypothetical BCA Example #1



Build Scenario: Bridge opens.
(0.1-mile route)

No-Build Scenario: Cyclists and pedestrians continue to use crossing to the south.
(2.6-mile route)

Daily users doing this route:
1,000 cyclists (Trail Counters)

No-Build Scenario route is 2.5 miles longer than Build Scenario route.

Approach

- **We want to compare the state of the world with and without the proposed project improvement**
  - No-Build Scenario: Cyclists use 2.6-mile route.
  - Build Scenario: Bridge opens, new route is 0.1 miles.
- **The expected major benefit category in this case would be the travel time savings for mitigating 2.5-miles of additional travel, starting when the project opens**

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

Annual Travel Time Savings*	=	Marginal Detour Time	x	Daily Users	x	Hourly Value of Time	x	Annualization Factor

*Undiscounted.

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

$$\text{Annual Travel Time Savings*} = \text{Marginal Detour Time} \times \text{Daily Users} \times \text{Hourly Value of Time} \times \text{Annualization Factor}$$

$$\text{Annual Travel Time Savings*} = \frac{\text{2.5 Miles}}{\text{9.8 mph}} \times$$

No-Build Scenario route: 2.6 miles
Build Scenario route: 0.1 miles

Speed: Observed average speed on both routes

*Undiscounted.

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

Annual Travel Time Savings* = Marginal Detour Time x Daily Users x Hourly Value of Time x Annualization Factor

Annual Travel Time Savings* = $\frac{2.5 \text{ Miles}}{9.8 \text{ mph}}$ x 1,000 x

Recent trail count

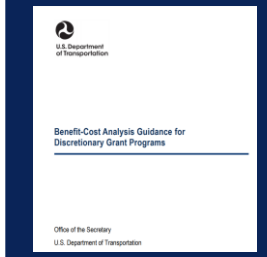
*Undiscounted.

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

Annual Travel Time Savings*	=	Marginal Detour Time	x	Daily Users	x	Hourly Value of Time	x	Annualization Factor
Annual Travel Time Savings*	=	$\frac{2.5 \text{ Miles}}{9.8 \text{ mph}}$	x	1,000	x	$32.40	x	

USDOT BCA Guidance



(Appendix A)

*Undiscounted.

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

Annual Travel Time Savings*	=	Marginal Detour Time	x	Daily Users	x	Hourly Value of Time	x	Annualization Factor
Annual Travel Time Savings*	=	$\frac{2.5 \text{ Miles}}{9.8 \text{ mph}}$	x	1,000	x	$32.40	x	365

We expect this project to have an impact each day (not just weekdays, for example).

*Undiscounted.

Travel Time Savings Example

- **For simplicity, let's assume no pedestrians, an average cycling speed of 9.8 mph, and no cycling growth over time**

Annual Travel Time Savings*	=	Marginal Detour Time	x	Daily Users	x	Hourly Value of Time	x	Annualization Factor
Annual Travel Time Savings*	=	$\frac{2.5 \text{ Miles}}{9.8 \text{ mph}}$	x	1,000	x	$32.40	x	365
	=	$3,016,837 Per Year						

*Undiscounted.

Hypothetical BCA Example #1

- **Assume construction in 2023, ten years of project operations, and $10,000 in annual maintenance costs for the project**

Year	Capital Cost	Discounted Costs	Travel Time Savings	O&M Costs	Discounted Benefits
2023	$10,000,000		$0	$0	
2024	$0		$3,016,837	$10,000	
2025	$0		$3,016,837	$10,000	
2026	$0		$3,016,837	$10,000	
2027	$0		$3,016,837	$10,000	
2028	$0		$3,016,837	$10,000	
2029	$0		$3,016,837	$10,000	
2030	$0		$3,016,837	$10,000	
2031	$0		$3,016,837	$10,000	
2032	$0		$3,016,837	$10,000	
2033	$0		$3,016,837	$10,000	

Hypothetical BCA Example #1

- **Next, we discount costs and benefits using a 7% discount rate**

Discounted Value = Future Year Value / (1+Discount Rate)^(Future Year - Base Discounting Year)

Year	Capital Cost	Discounted Costs	Travel Time Savings	O&M Costs	Discounted Benefits
2023	$10,000,000	**$8,162,979**	$0	$0	$0
2024	$0	$0	$3,016,837	$10,000	**$2,293,901**
2025	$0	$0	$3,016,837	$10,000	$2,093,833
2026	$0	$0	$3,016,837	$10,000	$2,003,582
2027	$0	$0	$3,016,837	$10,000	$1,872,507
2028	$0	$0	$3,016,837	$10,000	$1,750,006
2029	$0	$0	$3,016,837	$10,000	$1,635,520
2030	$0	$0	$3,016,837	$10,000	$1,528,523
2031	$0	$0	$3,016,837	$10,000	$1,428,526
2032	$0	$0	$3,016,837	$10,000	$1,335,071
2033	$0	$0	$3,016,837	$10,000	**$1,247,730**

$10,000,000 / (1+0.07)^(2023-2020)

($3,016,837-$10,000) / (1+0.07)^(2024-2020)

($3,016,837-$10,000) / (1+0.07)^(2033-2020)

Note: Totals may differ slightly due to rounding

Hypothetical BCA Example #1

- **Next, we sum the discounted benefits and costs to get total discounted benefits and total discounted costs**

Year	Capital Cost	Discounted Costs	Travel Time Savings	O&M Costs	Discounted Benefits
2023	$10,000,000	$8,162,979	$0	$0	$0
2024	$0	$0	$3,016,837	$10,000	$2,293,901
2025	$0	$0	$3,016,837	$10,000	$2,143,833
2026	$0	$0	$3,016,837	$10,000	$2,003,582
2027	$0	$0	$3,016,837	$10,000	$1,872,507
2028	$0	$0	$3,016,837	$10,000	$1,750,006
2029	$0	$0	$3,016,837	$10,000	$1,635,520
2030	$0	$0	$3,016,837	$10,000	$1,528,523
2031	$0	$0	$3,016,837	$10,000	$1,428,526
2032	$0	$0	$3,016,837	$10,000	$1,335,071
2033	$0	$0	$3,016,837	$10,000	$1,247,730
TOTAL		**$8,162,979**			**$17,239,201**

Note: Totals may differ slightly due to rounding

Results – The NPV and BCR

- **Lastly, we calculate the project's net present value (NPV) and benefit-cost ratio (BCR)**

$$\text{Net Present Value (NPV)} = \text{Total Discounted Benefits} - \text{Total Discounted Costs}$$

$$= \$17{,}239{,}201 - \$8{,}162{,}979$$

$$= \mathbf{\$9{,}076{,}223}$$

$$\text{Benefit-Cost Ratio (BCR)} = \frac{\text{Total Discounted Benefits}}{\text{Total Discounted Costs}}$$

$$= \frac{\$17{,}239{,}201}{\$8{,}162{,}979}$$

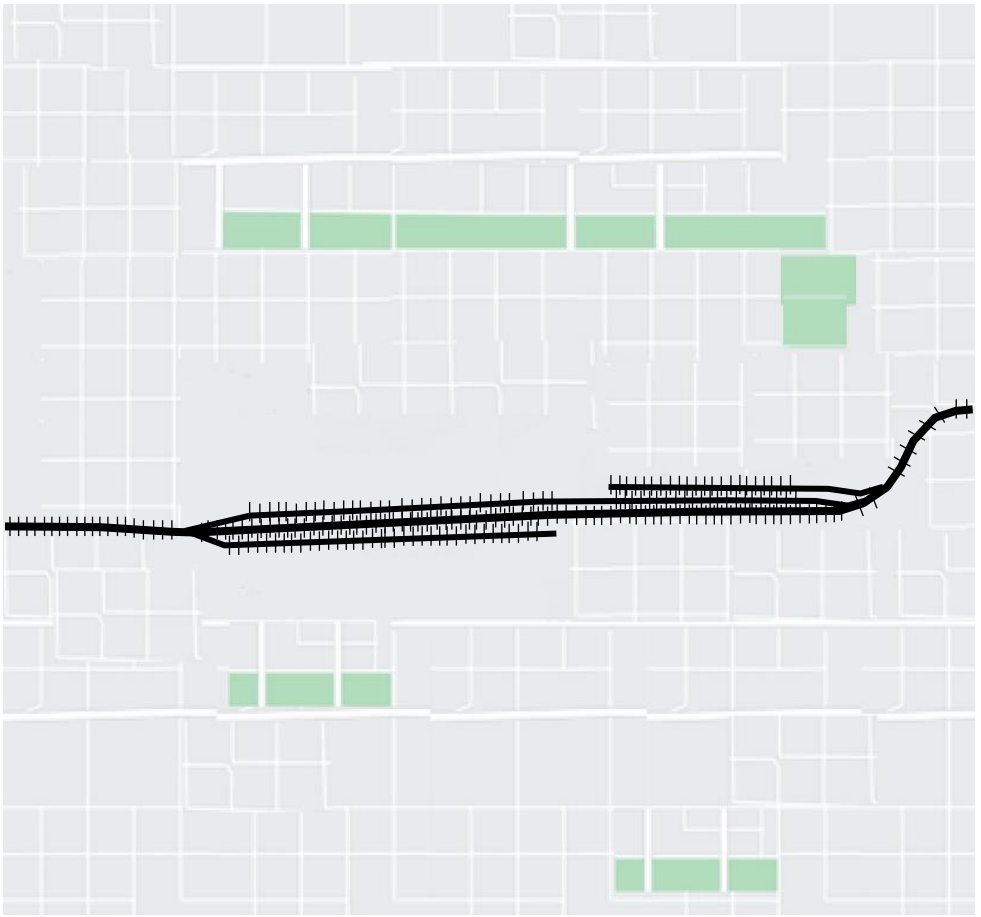
$$= \mathbf{2.1}$$

Note: Totals may differ slightly due to rounding

Hypothetical BCA Example #1

- **Other potential benefits such a project might have:**
  - Travel time savings for pedestrians
    - Different speed assumptions and number of users as the example just given, but otherwise the method would be the same
  - Mortality reduction from induced walking and cycling trips
  - Reduced emissions from modal shift to active transportation
  - Amenity benefits
    - If the no-build route did not already have a dedicated cycling or pedestrian facility
  - Safety benefits
    - Shorter walking and cycling distances for existing users
  - Residual value
- **This is not meant to be an exhaustive list**

Hypothetical Example #2



Hypothetical Example #2

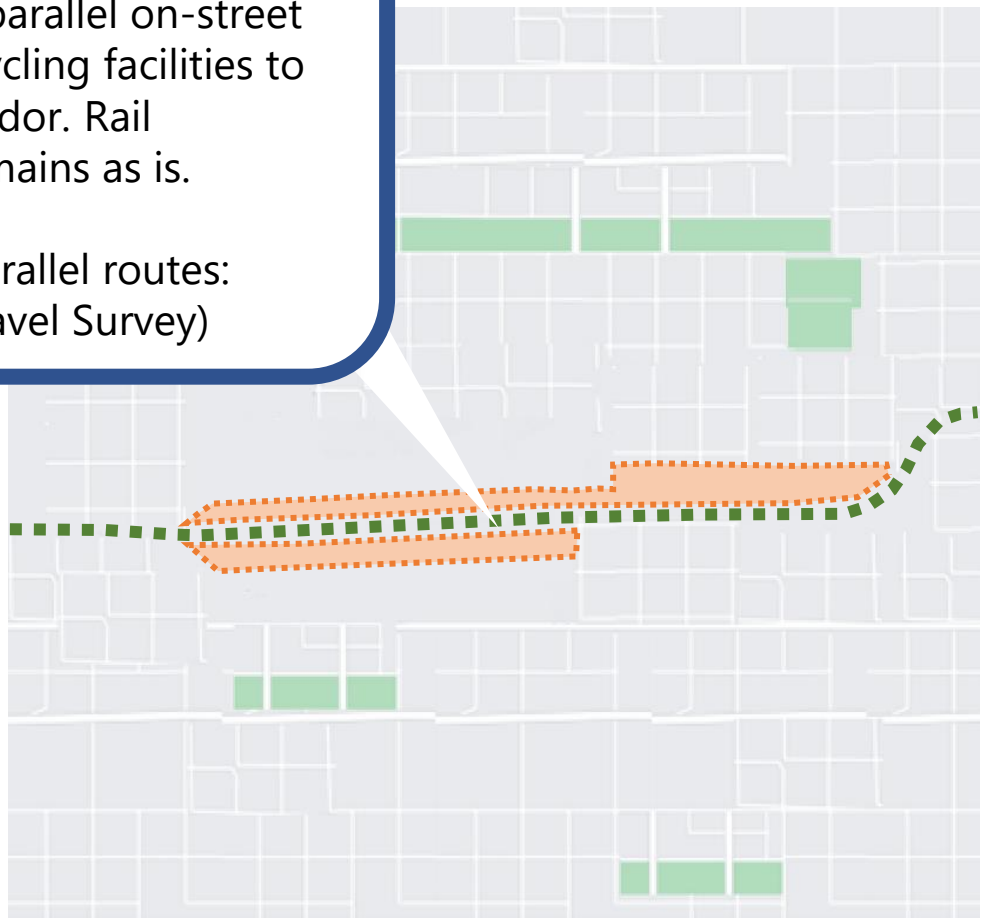
Proposed Project: Convert 2.0 miles of an abandoned rail line to a cycling path and sell 40 acres of excess right-of-way for future mixed-use development.

Project Cost: $20.0 million

Hypothetical Example #2

No-Build Scenario: Cyclists continue to use parallel on-street routes with no cycling facilities to traverse the corridor. Rail infrastructure remains as is.

Daily users on parallel routes: 3,000 cyclists (Travel Survey)



Hypothetical Example #2

No-Build Scenario: Cyclists continue to use parallel on-street routes with no cycling facilities to traverse the corridor. Rail infrastructure remains as is.

Daily users on parallel routes: 3,000 cyclists (Travel Survey)

Build Scenario: The rail infrastructure is removed and the new cycling path is completed. Cyclists on parallel routes shift to new facility. Excess right-of-way of 40 acres is sold.

Land price per acre: $90,000 (Local Sale Comps)

Approach

- **We want to compare the state of the world with and without the proposed project improvement**
  - No-Build Scenario: Abandoned rail infrastructure remains as is and cyclists use on-street parallel routes
  - Build Scenario: 2.0 miles of the abandoned rail line are converted to a cycling path for use by 3,000 daily cyclists and 40 acres of excess right-of-way are sold for future mixed-use development
- **The expected major benefit categories in this case would be:**
  - Amenity benefits to users given the addition of 2.0-miles of off-street cycling path, starting when the project opens
  - The sale of unused right-of-way for other purposes

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor

*Undiscounted.

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor
Annual Amenity Benefits*	=	2.0 Miles	x					

Distance traveled over new cycling path per user

*Undiscounted.

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor
Annual Amenity Benefits*	=	2.0 Miles	x	3,000	x			

Estimate based on travel survey

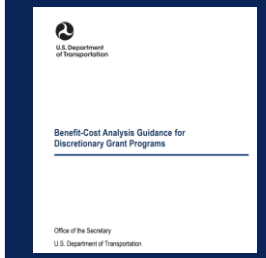
*Undiscounted.

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor
Annual Amenity Benefits*	=	2.0 Miles	x	3,000	x	$1.42	x	

USDOT BCA Guidance



(Appendix A)

*Undiscounted.

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor
Annual Amenity Benefits*	=	2.0 Miles	x	3,000	x	$1.42	x	365

We expect this project to have an impact each day (not just weekdays, for example).

*Undiscounted.

Amenity Benefits Example

- **For simplicity, let's assume that all cyclists use the entire length of the facility, and no cycling growth over time**

Annual Amenity Benefits*	=	Improved Facility Length	x	Daily Users	x	Amenity Value Per Mile Cycled	x	Annualization Factor
Annual Amenity Benefits*	=	2.0 Miles	x	3,000	x	$1.42	x	365
	=	$3,109,800 Per Year						

*Undiscounted.

Excess Right-of-Way Sale Example

- **For simplicity, let's assume all excess land is sold at a single price per acre after project completion**

Excess ROW Benefits*	=	Amount of Land Made Available for Sale	x	Land Price

*Undiscounted.

Excess Right-of-Way Sale Example

- **For simplicity, let's assume all excess land is sold at a single price per acre after project completion**

Excess ROW Benefits*	=	Amount of Land Made Available for Sale	x	Land Price
Excess ROW Benefits*	=	40 Acres	x	

Excess right-of-way remaining after project

*Undiscounted.

Excess Right-of-Way Sale Example

- **For simplicity, let's assume all excess land is sold at a single price per acre after project completion**

Excess ROW Benefits*	=	Amount of Land Made Available for Sale	x	Land Price
Excess ROW Benefits*	=	40 Acres	x	$90,000 per Acre

Based on recent land sale comps in the area

*Undiscounted.

Excess Right-of-Way Sale Example

- **For simplicity, let's assume all excess land is sold at a single price per acre after project completion**

Excess ROW Benefits*	=	Amount of Land Made Available for Sale	x	Land Price
Excess ROW Benefits*	=	40 Acres	x	$90,000 per Acre
	=	$3,600,000 after Project Completion		

*Undiscounted.

Hypothetical BCA Example #2

- **Assume construction in 2023, ten years of project operations, and no change in maintenance costs**

Year	Capital Cost	Discounted Costs	Amenity Benefits	Excess Land Sale	Discounted Benefits
2023	$20,000,000		$0	$0	
2024	$0		$3,109,800	$3,600,000	
2025	$0		$3,109,800	$0	
2026	$0		$3,109,800	$0	
2027	$0		$3,109,800	$0	
2028	$0		$3,109,800	$0	
2029	$0		$3,109,800	$0	
2030	$0		$3,109,800	$0	
2031	$0		$3,109,800	$0	
2032	$0		$3,109,800	$0	
2033	$0		$3,109,800	$0	

Hypothetical BCA Example #2

- **Next, we discount costs and benefits using a 7% discount rate**

Discounted Value = Future Year Value / (1+Discount Rate)^(Future Year - Base Discounting Year)

Year	Capital Cost	Discounted Costs	Amenity Benefits	Excess Land Sale	Discounted Benefits
2023	$20,000,000	**$16,325,958**	$0	$0	$0
2024	$0	$0	$3,109,800	$3,600,000	**$5,118,874**
2025	$0	$0	$3,109,800	$0	$2,967,244
2026	$0	$0	$3,109,800	$0	$2,072,191
2027	$0	$0	$3,109,800	$0	$1,936,627
2028	$0	$0	$3,109,800	$0	$1,809,932
2029	$0	$0	$3,109,800	$0	$1,691,525
2030	$0	$0	$3,109,800	$0	$1,580,865
2031	$0	$0	$3,109,800	$0	$1,477,444
2032	$0	$0	$3,109,800	$0	$1,380,788
2033	$0	$0	$3,109,800	$0	**$1,290,456**

$20,000,000 / (1+0.07)^(2023-2020)

($3,109,800+$3,600,000) / (1+0.07)^(2024-2020)

$3,109,800 / (1+0.07)^(2033-2020)

Note: Totals may differ slightly due to rounding

Hypothetical BCA Example #2

- **Next, we sum the discounted benefits and costs to get total discounted benefits and total discounted costs**

Year	Capital Cost	Discounted Costs	Amenity Benefits	Excess Land Sale	Discounted Benefits
2023	$20,000,000	$16,325,958	$0	$0	$0
2024	$0	$0	$3,109,800	$3,600,000	$5,118,874
2025	$0	$0	$3,109,800	$0	$2,217,244
2026	$0	$0	$3,109,800	$0	$2,072,191
2027	$0	$0	$3,109,800	$0	$1,936,627
2028	$0	$0	$3,109,800	$0	$1,809,932
2029	$0	$0	$3,109,800	$0	$1,691,525
2030	$0	$0	$3,109,800	$0	$1,580,865
2031	$0	$0	$3,109,800	$0	$1,477,444
2032	$0	$0	$3,109,800	$0	$1,380,788
2033	$0	$0	$3,109,800	$0	$1,290,456
TOTAL		**$16,325,958**			**$20,575,947**

Note: Totals may differ slightly due to rounding

Results – The NPV and BCR

- **Lastly, we calculate the project's net present value (NPV) and benefit-cost ratio (BCR)**

$$\text{Net Present Value (NPV)} = \text{Total Discounted Benefits} - \text{Total Discounted Costs}$$

$$= \$20{,}575{,}947 - \$16{,}325{,}958$$

$$= \mathbf{\$4{,}249{,}989}$$

$$\text{Benefit-Cost Ratio (BCR)} = \frac{\text{Total Discounted Benefits}}{\text{Total Discounted Costs}}$$

$$= \frac{\$20{,}575{,}947}{\$16{,}325{,}958}$$

$$= \mathbf{1.3}$$

Note: Totals may differ slightly due to rounding

Hypothetical BCA Example #2

- **Other potential benefits such a project might have:**
  - Travel time savings for cyclists and pedestrians
    - If the new cycling path provides new shorter-distance connections
  - Mortality reduction from induced walking and cycling trips
  - Reduced emissions from modal shift to active transportation
  - Benefits to any induced cyclists
    - Remember to apply the "rule of half," see Appendix B of BCA Guidance
- **This is not meant to be an exhaustive list**

Hypothetical BCA Example #3

Proposed Project: Construct cap and park on top of a freeway, reconnecting two neighborhoods

Approach

- **We want to compare the state of the world with and without the proposed project improvement**
  - No-Build Scenario: Freeway remains a barrier, noise affects local neighborhood
  - Build Scenario: Cap park constructed, lessening noise and providing shorter walking connections and a new park.
- **The expected major benefit categories in this case would be:**
  - Noise abatement to local neighborhood near the new freeway cap
  - Parkland creation
  - Shorter walking and cycling trips from new connectivity

Hypothetical BCA Example #3

- **Noise abatement to surrounding neighborhoods**
  - Would require analysis of decibel levels impacting neighboring properties with and without the project, and research relating noise and property value to monetize the noise mitigation impact
- **Parkland creation**
  - Would require information on the value of parkland in the community
- **Shorter walking and cycling trips from new connectivity**
  - Approach would be similar to Hypothetical Example #1
- **Avoid double-counting, consider each effect in isolation**

Remember Key Resources

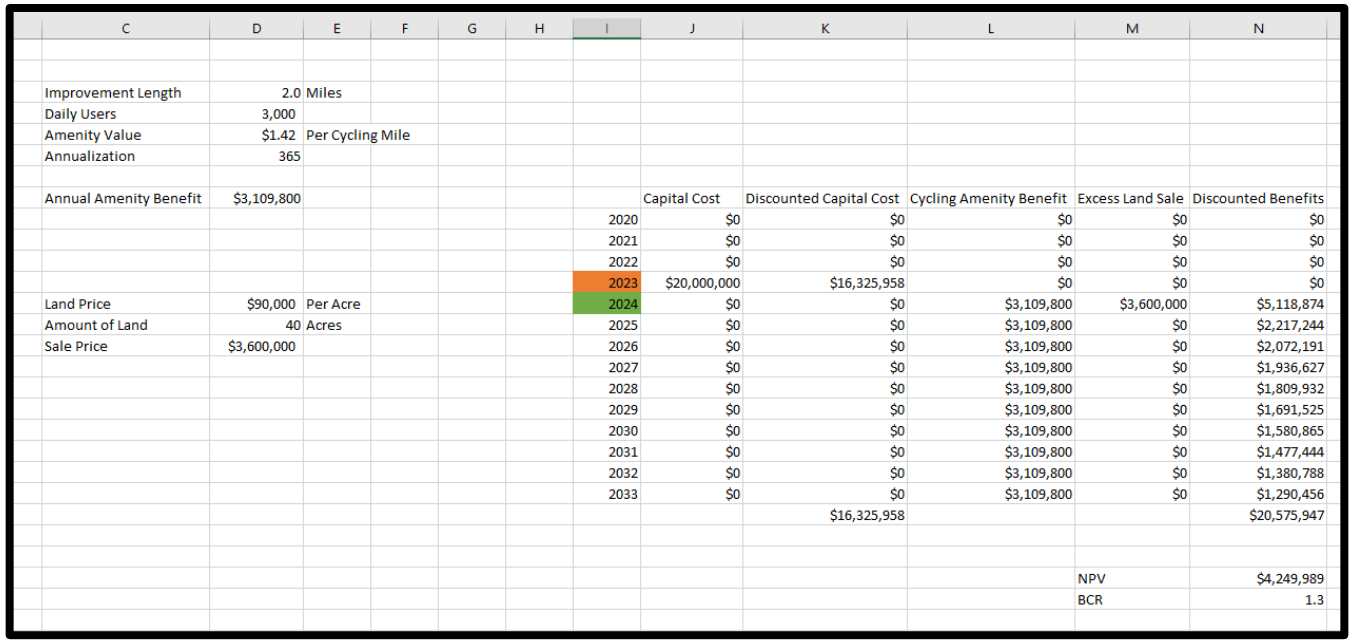
- **The BCA Guidance**
  - https://www.transportation.gov/office-policy/transportation-policy/benefit-cost-analysis-guidance-discretionary-grant-programs-0
  - The main body of the Guidance discusses methodology
  - Appendix A has many useful input values
  - Appendix B shows sample calculations
- **BCA webinars for previous USDOT discretionary grant programs**
  - https://www.transportation.gov/grants/reconnecting-communities/reconnecting-communities-additional-guidance
- **Project engineering and planning documents**
- **Local traffic counts and travel survey data**

Remember Key Resources

- **U.S. Census Bureau**
- **Project partners (higher levels of government, MPOs, universities, etc.)**
- **Many BCAs submitted for other programs are publicly available via web search**
- **FRA's Crossing Inventory and Accident Reports**
  - https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx
- **NHTSA's Fatality Analysis Reporting System**
  - https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
- **The Crash Modification Factors Clearinghouse**
  - https://www.cmfclearinghouse.org/
- **Technical questions can be submitted to ReconnectingCommunities@dot.gov**

Avoiding Common Mistakes

- Make sure inputs and assumptions in the BCA are sourced and documented
- Make sure the submitted BCA and claimed benefits match the project being proposed for grant funding
- Show individual utility of different separable project components
- Provide an unlocked BCA spreadsheet (rather than a PDF of a spreadsheet)



	Improvement Length	2.0	Miles								
	Daily Users	3,000									
	Amenity Value	$1.42	Per Cycling Mile								
	Annualization	365									
	Annual Amenity Benefit	$3,109,800					Capital Cost	Discounted Capital Cost	Cycling Amenity Benefit	Excess Land Sale	Discounted Benefits
						2020	$0	$0	$0	$0	$0
						2021	$0	$0	$0	$0	$0
						2022	$0	$0	$0	$0	$0
						2023	$20,000,000	$16,325,958	$0	$0	$0
	Land Price	$90,000	Per Acre			2024	$0	$0	$3,109,800	$3,600,000	$5,118,874
	Amount of Land	40	Acres			2025	$0	$0	$3,109,800	$0	$2,217,244
	Sale Price	$3,600,000				2026	$0	$0	$3,109,800	$0	$2,072,191
						2027	$0	$0	$3,109,800	$0	$1,936,627
						2028	$0	$0	$3,109,800	$0	$1,809,932
						2029	$0	$0	$3,109,800	$0	$1,691,525
						2030	$0	$0	$3,109,800	$0	$1,580,865
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						2032	$0	$0	$3,109,800	$0	$1,380,788
						2033	$0	$0	$3,109,800	$0	$1,290,456
								$16,325,958			$20,575,947
										NPV	$4,249,989
										BCR	1.3

Q&A

QUESTIONS?

Thank You

Thank you for participating.

We will post a recording and slides on the website and notify registrants next week.

RCP Program Website: https://www.transportation.gov/reconnecting

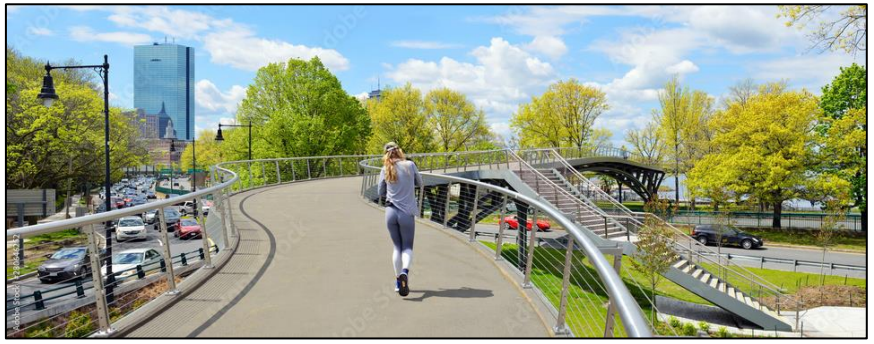
- Includes a link to the Notice of Funding opportunity (NOFO), Frequently Asked Questions, Additional Guidance, Resources, Webinars, and more.

Application Information

- Applications are due Thursday, October 13, 2022, via grants.gov

Contact us: ReconnectingCommunities@dot.gov

Hands On Atlanta



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