

The Underline - Segment 6

BUILD Grant FY 2018

Appendix A

**Benefit Cost Analysis Report with
Supporting Worksheet**

The Underline

Segment 6 – BUILD Application

Benefit Cost Analysis

July 2018

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The Underline

Benefit Cost Analysis

Project Description

An urban project, segment 6 consists of 1.98 miles of the total 10-mile corridor extending from SW 42nd Avenue to SW 57th Avenue within the City of Coral Gables. When completed, it will serve as first and last mile accessibility solution to the University Metrorail Station by providing separate pedestrian and bicycle paths, improvements to 6 intersections along U.S.1, pedestrian and bicycle bridge over the Coral Gables Waterway, lighting, signage and way finding.

Segment 6 is one of the overall segments of The Underline a project that repurposes 120 acres of underutilized land along a 10-mile contiguous path beneath the County’s heavy rail rapid transit system into an enhanced mobility corridor, which redesigns 36 total intersections. The Underline is a “shovel ready” project – with all requisite approvals and funding of over 65% of capital costs by commitments from local, state, Federal and private sources – that serves as a transportation solution, a safety strategy and an economic catalyst. The Underline will unite all modes of transportation enhancing accessibility to the existing 8 Metrorail stations within its path and the neighboring communities. As a continuous multimodal corridor, The Underline will transverse three municipalities (City of Miami, City of Coral Gables, City of South Miami and unincorporated Miami-Dade County) and will be the primary bicycle and pedestrian connection from the southern neighborhoods and cities to downtown Miami and other destinations. It will also be a link between neighborhoods and the central spine in a regional network of existing and proposed trails.

When completed, the 10-mile Underline will provide access to multi-modal transportation to 1 University and 24 schools, 2 hospitals, 3 urgent care facilities, 4 major malls and 120,000 residents and 10,500 businesses within a 10-minute walk (.5 mile) and 203,000 residents and 15,600 businesses within a 10-minute bike ride (1 mile).

Segment 6, when completed will serve 24,700 residents and 2,800 businesses within a 10-minute walk (.5 miles) and 62,000 residents and 4,385 businesses within a 10-minute bike ride (1 mile).

There are more details in the Underline Segment 6 BUILD application and attachments.

The Underline Segment 6 Project Costs

The Project costs for The Underline Segment 6 is shown below consistent with page 2 and Attachment E in the application. The Project costs are broken down into those that are clearly eligible for Federal, State and local funding and those that are more focused and eligible for local and private funding. To be conservative the Benefit Cost Analysis assumes the full costs of Segment 6 in comparison to the benefits of these segments.

Table 1 – Underline Segment 6 Capital Costs

Segment 6			
Costs			
Capital	Eligible	Non-eligible	Total
Segment 6	20,497,000	6,003,000	26,500,000

Limits	Total Miles
SW 42nd Ave - SW 57th Ave	1.98

Capital Cost Detail	
Segment 6	
Eligible Costs	
Pedestrian and Bicycle Path Construction	\$ 10,600,000
Permits	\$ 237,000
Environmental Remediation	\$ 4,200,000
Intersection Improvements	\$ 3,960,000
New Bridge Next to Riviera Drive	\$ 1,500,000
Sub-Total	\$ 20,497,000
Non-Eligible Costs	
Landscaping, Signage, Lighting, Amenities	\$ 4,307,000
CE&I Consultant	\$ 1,394,000
Boneted Bat Survey	\$ 12,000
Limited Phase 2 Environmental+Ground Water	\$ 160,000
Environmental Monitoring	\$ 130,000
Sub-Total	\$ 6,003,000
Total	\$ 26,500,000

BUILD Funds Requested

Federal Participation Rate: \$16,397,649 (80%)

Local Match Sources

and Amounts for \$4,099,400 (20%)

requested BUILD funds: Source: Committed - City of Coral Gables Park & Mobility Fees (see documentation in Attachment P to the BUILD application)

The Underline, as designed by James Corner Field Operations identified capital and operations and maintenance costs. The capital costs have been updated based on more recent information from design and bid information for the first segment of the Underline.

Table 2 – Underline Segment 6 Annual Operations and Maintenance Costs

Annual/Ongoing Operations & Maintenance (Programming Approach)			
Calculation for the Full Underline			
20%		Per Acre	80%
\$	130,000		\$ 520,000
Underline Estimate Operations and Maintenance Costs			\$ 24,700,000

Annual Operations and Maintenance Costs for Segment 6	
Total Miles for Underline	9.30
Total O&M for Underline	\$ 24,700,000
Segment 6 Miles	1.98
Segment 6 Costs	\$ 5,353,366

The Underline Team hired a professional economic analysis consultant (HR&R Advisors, Inc.) that identified relevant high- and low-intensity urban parks that were comparable to The Underline’s sections and examined each park’s operations and maintenance budgets across three primary categories: capital maintenance, landscaping, and all other operations and maintenance. The consultant projected costs per acre for The Underline by averaging costs across these categories for comparable projects in high- and low intensity categories, applying these estimates across The Underline’s estimated total acreage as shown on page 19 of the report titled Creating Value Through Open Space: The Economic Impacts of the Underline in Attachment B to the application. The total estimate for annual operations was inflated to 2018 dollars to be consistent with the capital costs and divided by the total length of the Underline and applied to the length associated with Segment 6. The bottom of the table above shows operations and maintenance costs used for the Benefit Cost Analysis. Additional analysis on operations and maintenance costs is in Attachment C to the application, but the Benefit Cost Analysis utilized the higher estimate in Attachment B to be most conservative.

Underline Segment 6 Project Benefits

The Underline has a range of benefits that are outlined below that range from key safety improvements at major intersections and separating bike and pedestrian traffic on the Underline to provide much improved Pedestrian and Bike use in the area to enhancements that will improve the overall health of users of the Underline and forecasted economic growth in the corridor resulting in growth in property values supporting annual increases in local property tax sources with an overall increase in economic activity in the area. Each of the major benefits that are part of the Benefit Cost Analysis are described in detail below.

Safety Improvements

The Underline has a major series of safety improvements. The current trail under the existing Metrorail system (elevated above the existing trail) and the roadway crossings are not as heavily used because many people are not comfortable that the crossings and trail are safe to use. For those that do use them the roadway crossings are a major challenge and the current trail combines Pedestrian and Bike travel on the same smaller paved trail that does not have modern lighting for day and night use. A major focus of the Underline is to improve Pedestrian and Bike safety so that users will be much more comfortable crossing the highway and using the Underline. The intersection improvements and the typical sample section of the Underline in Attachment I and identification of the major and minor intersections for Segment 6 are referenced at a conceptual level in the Master Plan in Attachment F.

The Underline Team contracted with a professional team (Georgia Health Policy Center) to provide a “Health Impact Assessment for the Underline” (HIA) that outlines the expected impact of The Underline improvements on a range of health issues in Attachment O to the application. For the Benefit Cost Analysis, the Underline Team focused on the expected positive safety impacts related to Pedestrian and Bike use in the area of the Underline. For Example, the HIA, which is included as Attachment O, shows in Table 7 on page 62, that the “likelihood of Pedestrian and Bike use crashes” are likely in the area and the impact of the Underline project would be high in decreasing the incidents from a safety perspective.

Pedestrian Related Crashes – A series of years for Pedestrian related accidents are shown on pages 32 to 34 of the HIA document. On page 32, Figure 24, there are clusters in the Underline segment in the application along US-1 from 42nd Avenue to 57th Avenue, there are many clusters of up to ten Pedestrian involved crashes and a group of clusters of 50 or more Pedestrian involved crashes around 57th Avenue during a two-year period. On pages 32/33, Figures 25/26, these clusters outline the severity of the Pedestrian related crashes

Bicycle Related Crashes - A series of years for Bicycle related accidents are shown on pages 30 to 32 of the HIA document. On page 31/32, Figures 21/22, there are clusters in the Underline

segment in the application along US-1 from 42nd Avenue to 57th Avenue, there are many clusters of over four Bicycle involved crashes during a two-year period.

Improvements that Reduce Pedestrian/Bicycle Related Accidents - One of the key focuses of the Underline is to improve the safety for Pedestrians and Bicyclist in the area and on the Underline. This includes having separate paved trails for Bicycles and Pedestrians on the Underline and major improvements for Pedestrian/Bicycle crossings at key intersections along US-1 between 42nd Avenue and 57th Avenue and for the cross-streets that must be crossed to transverse the Underline. The HIA research outlines that the Underline and related improvements provide a high impact to reduce accidents that involve Pedestrians and Bicyclist. The clusters for Pedestrian related crashes in the area totals well over 100 in a two-year period and Bicycle related crashes totals over 70 in a two-year period in the area of the Underline segment. Even though the HIA shows the impact as High for reduction of Pedestrian and Bicycle related crashes in the area, the Benefit Cost Analysis conservatively assumes a reduction of Pedestrian and Bicycle related crashes as outlined in the table below.

The Benefit Cost Analysis assumes the dollar values in Appendix A of the U.S. DOT publication Benefit-Cost Analysis for Discretionary Grant Programs:

- Major Injuries Per Year – MAIS 4 Severe - \$2,553,600 per incident per year (2017\$)
- Minor Injuries Per Year – MAIS 2 Moderate - \$451,200 per incident per year (2017\$)

Table 3 – Pedestrian and Bicycle Safety Benefits

Safety (Based on MAIS) Per Year - Segment 6			
Pedestrian	Reduction	\$Value	Total
Deaths	0	\$ 9,600,000	\$ -
Severe Accidents	3	\$ 2,553,600	\$ 7,660,800
Minor Accidents	5	\$ 451,200	\$ 2,256,000
Sub-Total	8		\$ 9,916,800
Bicycle			
Deaths	0	\$ 9,600,000	\$ -
Major Accidents	7	\$ 2,553,600	\$ 17,875,200
Minor Accidents	10	\$ 451,200	\$ 4,512,000
Sub-Total	17		\$ 22,387,200
Total	25		\$ 32,304,000

The reasoning for the categories and numbers is that Bicycle use is heavier and growing in the area as this is the location for the University of Miami with facilities on both sides of US-1 and along the Underline, which is a major focus of the Underline. The Pedestrian numbers are a bit lower due to a newer Pedestrian overpass that exists in the area that is not part of the Underline project to be conservative.

It should be noted that the Underline is separating Pedestrian and Bicycle use into two separate paved trails on the Underline. This will improve the safety compared to the existing smaller single trail that exist today. The specific benefit amounts in the Benefit Cost Analysis has not been outlined for these improvements because solid data does not exist on crashes/accidents along the existing trail that operates under the Metrorail system.

Reduction in Daily Vehicle Traffic

The Underline Team contracted with a professional engineering firm (Kimley-Horn and Associates) to provide The Underline Miami-Dade Road Impact Fee Traffic Study (Traffic Study). The Traffic Study is included as Attachment G in the application and reflects that once the Underline is implemented this will result in a reduction of over 900 cars per day from US-1 in the are of the Underline segments included in the application as shown in Table 5 on page 11 of the Traffic Study (count stations 870127 – reduction 928 vehicles per day and 870178 – reduction 920 vehicles per day). For the Benefit Cost Analysis, the amount assumed is a reduction of 900 vehicles per day over a work year of 240 days per year for the 1.9 miles of the Underline segments in the application. The operating value savings per vehicle is derived from Appendix A of the U.S. DOT publication Benefit-Cost Analysis for Discretionary Grant Programs for an automobile at \$0.39 per mile. The table below shows the calculation detail for traffic savings:

Table 4 – Reduction in Traffic Benefit

Traffic Savings	
Vehicle Reduction	900
Miles	1.98
\$/Mile	\$ 0.39
Days/Year	240
Total Savings Per Year	\$ 166,795

Growth in Economic Value

The Underline Team contracted with a professional firm (HR&A Advisors, Inc.) to conduct an Economic Impact Study for the Underline titled Creating Value Through Open Space: The Economic Impacts of the Underline (Economic Impact Study) included in Attachment B to the application. The items such as jobs and economic activity directly associated with the construction and annual operations and maintenance have not been counted in the benefits as these are a “cost” of the Underline segments as outlined in the U.S. DOT guidance for the Benefit Cost Analysis.

The economic growth included for the Benefit Cost Analysis includes the growth in property values associated with the implementation of the Underline that are outlined on page 9 of the Economic Impact Study. This report forecast property values to increase in a range from \$300 million to \$485 million, generating associated property tax increase of \$6.2 million to \$10.2 million on an annual basis (2015\$).

The economic growth included for the Benefit Cost Analysis includes new development associated with the implementation of the Underline are outlined on page 10 of the Economic Impact Study. This forecast new development at \$150 million in increased property value, generating associated property tax increase of \$3 million on an annual basis (2015\$).

In addition, the county owned property along the Underline corridor (which is not part of current property tax values) is underutilized. If the county were to better utilize the property the report forecasted on page 11, that new development of \$175 million could be generated providing new county revenues up to \$9 million associated with the Underline.

The Benefit Cost Analysis takes a conservative approach to the economic impact benefits including the forecasted increase in annual property tax revenue associated with the increase in property values and new development that totals on the low end \$9.2 million on an annual basis with an additional one-time revenue increase of \$9 million for the county.

The number discussed above are for the full 10 miles of the Underline. This was then broken down for the 1.9 miles of Underline Segment 6 by dividing the total amounts by the corresponding segment length for Segment 6 results in \$1,178,000 for existing real estate incremental property tax revenue growth and \$570,000 for potential new development property tax revenue. The table below shows the detail for the property tax revenue values. The cash flow assumption is it takes five years from completion of Segment 6 of the Underline in 2020 for the growth in existing property values and the new development to occur generating half of the increase in property tax revenues and then within ten years of completion of Segment 6 of the Underline the full amount of the increase in property tax revenues occur and for each year thereafter. The amount with additional funds for the county divided by mileage totals \$1.71 million and this is assumed to come on line five years after Segment 6 is completed.

Table 5 – Economic Impact on Real Estate and associated Property Tax Revenues

Existing Real Estate						
Jurisdiction	Total SF	Property Value Assessed	Incremental Growth in Assessed Value (Low-High Range)		Incremental Growth in Property Taxes (Low-High Range)	
Miami	50+ Million	\$ 8,500,000,000	\$ 175,000,000	\$ 300,000,000	\$ 1,500,000	\$ 2,500,000
Coral Gables	10+ Million	\$ 1,500,000,000	\$ 45,000,000	\$ 70,000,000	\$ 200,000	\$ 500,000
South Miami	5+ Million	\$ 600,000,000	\$ 15,000,000	\$ 25,000,000	\$	\$ 100,000
Miami-Dade County	8+ Million	\$ 1,200,000,000	\$ 65,000,000	\$ 90,000,000	\$ 1,900,000	\$ 3,000,000
Other Taxing Entities (Schools, etc.)					\$ 2,500,000	\$ 4,100,000
Total	75+ Million	\$ 11,800,000,000	\$ 300,000,000	\$ 485,000,000	\$ 6,200,000	\$ 10,200,000

New Development	
Potential New SF	20+ Million
Estimated Taxable Value	\$ 3,000,000,000
Incremental Assessed Value	\$ 150,000,000
Annual Incremental Fiscal Revenue	\$ 3,000,000

Total Annual Tax Revenue from Increased Property Values Segment 6	
Existing Real Estate Property Tax Revenue Increase for Segment 6	\$ 1,178,000
Estimated New Development Property Tax Revenue Increase Segment 6	\$ 570,000
Total Annual Tax Revenue from Increased Property Values Segment 6	\$ 1,748,000

New Development on County Property	
Potential New SF	
Estimated Taxable Value	\$ 175,000,000
Incremental Assessed Value	\$ 175,000,000
County Incremental Revenue	\$ 9,000,000
Segment 6 Share	\$ 1,710,000

Other Non-Quantifiable Benefits

There are several categories that Segment 6 of the Underline is expected to provide benefits which are difficult to quantify and value in economic terms. For example, by improving accessibility to multimodal transit, the project increasing connectivity to large employment centers, hospitals and educational institutions for daily commuters, expanding economic opportunities.

In addition, increasing the desirability and attractiveness in public spaces is also well-documented to improve public health outcomes by serving as a pull factor for outdoor exercise and lower barriers to user selection of more active transit modes than the automobile. Healthier lifestyles reduce costs associated with negative health outcomes.

Connecting users of diverse populations and socioeconomic status has also been positively correlated with social benefits of improved community relationships.

Optimization of the design for access and egress points for maintenance vehicles in a manner that reduces erosion for the routine and special service of the adjacent heavy rail has the benefit of reducing existing and ongoing maintenance costs of both the Segment 6 installations as well as the broader Metrorail system.

In addition, designs for wastewater management, including deep injection wells and grading toward plant beds and permeable surfaces will improve storm water runoff issues and improves runoff conditions and avoids costs associated with impacting adjacent properties.

Benefit Cost Analysis Ratio Calculation

Following the guidance provided in the U.S. DOT Benefit Cost Analysis guidelines, a cash flow analysis was developed to evaluate the benefits and costs as detailed below. Key assumptions not already addressed for the cash flow analysis include the following items:

- Year of Project Implementation – 2017 dollars for benefits and costs.
 - Capital costs were expressed in 2017 dollars and did not require any adjustment
 - O&M costs were expressed in 2016 dollars and were inflated by a factor of 1.018 to inflate to 2017 dollars
 - All benefits were provided in 2017 dollars and did not require any inflation for the BCA ratio calculation
- The Term is assumed at 30 years as the construction and operations and maintenance plan for the Underline will extend for a minimum of 30 years and likely much longer life of the overall Underline.
- The Discount Rate is assumed at 7% to discount all future values to 2017 dollars.
- Benefit values are all stated in nominal dollars with no inflation built into the future values to be most conservative.
- Change in property values are assumed as follows:
 - Existing real estate and new growth (not county land) is 50 percent achieved within five years of the completion of Segment 6 and 100 percent within ten years of the completion of Segment 6.
 - New development on County property will be achieved within five years of completion of Segment 6.

The results are a positive Benefit to Cost Ratio of 4.32 times shown in the table below with the detail cash flow shown as Attachment A to the Benefit Cost Analysis.

Table 6 – Benefit Cost Calculation

Cash Flow Ratio Analysis 30-Year Time Horizon		
Discount Factor		7%
	2017 Base Year	
Costs	Real Dollars	Future Dollars
Capital Costs	\$ 26,500,000	\$ 26,500,000
Annual Operations and Maintenance	\$ 51,610,691	\$ 152,570,944
Total	\$ 78,110,691	\$ 179,070,944
Benefits		
Safety	\$ 323,758,417	\$ 936,816,000
Existing Real Estate Value Increase - Property Tax	\$ 7,045,108	\$ 26,505,000
New Development Value Increase - Property Tax	\$ 3,408,923	\$ 12,825,000
New Development on County Property	\$ 1,598,131	\$ 1,710,000
Vehicular Savings (Traffic Reduction)	\$ 1,671,661	\$ 4,837,061
Total	\$ 337,482,242	\$ 982,693,061
BCA Ratio	4.32	5.49

Attachment A Benefit Cost Analysis - Detail Cash Flows

Cash Flow Ratio Analysis 30-Year Time Horizon																																		
Discount Factor			7%																															
	2017 Base Year		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048
Costs	Real Dollars	Future Dollars																																
Capital Costs	\$ 26,500,000	\$ 26,500,000	26,500,000	-	-	-																												
Annual Operations and Maintenance	\$ 51,610,691	\$ 152,570,944	-	-	-	2,676,683	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	5,353,366	
Total	\$ 78,110,691	\$ 179,070,944																																
Benefits																																		
Safety	\$ 323,758,417	\$ 936,816,000	-	-	-	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000	32,304,000		
Existing Real Estate Value Increase - Property Tax	\$ 7,045,108	\$ 26,505,000	-	-	-	-	-	-	589,000	589,000	589,000	589,000	589,000	589,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000	1,178,000		
New Development Value Increase - Property Tax	\$ 3,408,923	\$ 12,825,000	-	-	-	-	-	-	285,000	285,000	285,000	285,000	285,000	285,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000	570,000		
New Development on County Property	\$ 1,598,131	\$ 1,710,000							1,710,000																									
Vehicular Savings (Traffic Reduction)	\$ 1,671,661	\$ 4,837,061	-	-	-	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795	166,795		
Total	\$ 337,482,242	\$ 982,693,061																																
BCA Ratio	4.32	5.49																																