Benefit-Cost Analysis Narrative

Introduction

The City of Windsor Heights, Iowa is applying to the 2025 Better Utilizing Investments to Leverage Development (BUILD) grant program for the 73rd Street Multimodal Connector Project. The project will reconstruct approximately 1.67 miles of urban arterial street to enhance a primary corridor into the city. Once complete, the corridor will have new sidewalks and improved access to regional trails for residents of the community. Additionally, the project is anticipated to improve safety for users on the corridor and improve traffic operations at key intersections throughout the corridor.

Benefit & Cost Summary

A benefit cost analysis was completed for the proposed project using the USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs document updated in November of 2024 and the USDOT Benefit-Cost Analysis Speadsheet Template. The proposed project is anticipated to start final design and construction activities beginning in 2025 with completion by 2030. The opening year for the project will be 2030 with an operational period of 20 years used for the analysis. Based on the anticipated outcomes of the project, the following benefits were calculated:

- Corridor Operation and Maintenance Savings
- Reduction in Vehicle Crashes
- Corridor Travel Time Savings
- Vehicle Operating Costs
- Changes in Vehicle Emissions
- Pavement Condition Improvements
- Residual Value

Capital costs were estimated for the BUILD grant submission and include costs for engineering, right-of-way, and construction activities. In the current year, capital costs are estimated at $21.07 million. The benefit cost analysis uses a 3.1 percent discount rate for future costs and benefits. A two percent discount rate is used for carbon emissions. Based on the estimated costs and benefits of the project, the estimated benefit cost ratio of the project is 4.43. The table below summarizes the costs and benefits of the project.

Category	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Operations and Maintenance	3.53	1.98
Safety	20.18	12.39
Travel Time Savings	8.11	4.97
Vehicle Operating Cost Savings	0.00	0.00
Non-CO2 Emissions Reduction	-0.15	-0.09
CO2 Emissions Reduction	0.00	0.00
Pavement Condition Improvement	93.81	57.50
Residual Value	7.02	3.18
Total Benefits	**132.51**	**79.92**
Total Cost	**21.07**	**18.05**
Benefit Cost Ratio		**4.43**

Scenario Assumptions

There are two scenarios being analyzed in the benefit cost analysis a no-build scenario and a build scenario. The no-build scenario includes no changes on the existing corridor for safety or traffic operations. On-going routine maintenance and planned maintenance occurs throughout the analysis period on the corridor, but conditions remain relatively unchanged.

The build scenario includes the construction of a raised median, improve roadway alignment near the railroad crossing, a speed limit reduction to 30 miles per hour, and the installation of sidewalks along the corridor. Routine maintenance occurs throughout the analysis period to maintain the improved condition of the corridor. Traffic operations are improved through signal retiming and fiber connectivity between signals on the corridor.

Traffic volumes for the no-build and build scenarios do not change as the facility does not significantly change in function, land use, or capacity between the scenarios. The Des Moines Area MPO travel demand model was used to develop annual traffic volumes on the corridor with forecasted growth between 2030 and 2050.

Benefit Descriptions

This section outlines in more detail the data used to estimate the benefits of the 73rd Street Multimodal Connector Project.

Operations and Maintenance

Operation and maintenance costs for the 73rd Street corridor were prepared by the City of Windsor Heights on-call consultants for the years 2021 to 2050. In the no-build scenario, the cost of maintenance is greater and more frequent due to the existing condition of the street. In the build scenario, maintenance costs are lower and do not start until 10 years following construction completion as the reconstruction project improves the condition of 73rd Street.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Operations and Maintenance	3.53	1.98

Safety

Crash data for 2020 to 2024 was gathered from the Iowa DOT Iowa Crash Analysis Tool (ICAT) for the 73rd Street corridor. During the five-year crash period, 146 crashes occurred on the corridor with 105 property damage only (PDO), 32 possible injury (C), 7 non-incapacitating (B), and 2 incapacitating (A). The annual average number of crashes for each crash level was calculated. In the no-build scenario, the average annual number of crashes by level continues as no improvements for safety are constructed. In the build scenario, future crashes are reduced based on crash modification factors for lowering the speed limit, resurfacing the pavement, and providing a raised median.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Safety	20.18	12.39

Travel Time Savings

Corridor level peak hour delays were developed by the City of Windsor Heights on-call consultants in a traffic study supporting the proposed improvements. Based on PM peak hour delays for both north and southbound directions, the future build analysis shows traffic operations improvement in the northbound direction and increased delays in the southbound direction. Applying the future no-build vehicle delays to no-build traffic volumes results in travel time costs for the no-build scenario. Applying future build vehicle delays to build traffic volumes results in travel time costs for the build scenario.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Travel Time Savings	8.11	4.97

Vehicle Operating Costs

USDOT guidance for vehicle operating costs is estimated on a per mile basis. Due to no forecasted change in traffic volumes between the no-build and build scenarios, there is no measurable benefit between the two scenarios in terms of vehicle operating costs.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Vehicle Operating Cost Savings	0.00	0.00

Emissions

Emissions for the no-build and build scenarios were calculated using forecasted traffic volumes, existing and proposed speed limits, and emissions factors provided by the Iowa DOT. The emissions factors are the same used for the Iowa Clean Air Attainment Program (ICAAP) for estimating emissions reductions in accordance with the state's CMAQ funding. Emissions rates were calculated for both light duty passenger vehicles and heavy-duty vehicles at 30 and 35 miles per hour. Due to slightly higher emissions at lower speeds, the build scenario produces more emissions than the no-build scenario. Therefore, emissions are a disbenefit of this project.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Non-CO2 Emissions Reduction	-0.15	-0.09
CO2 Emissions Reduction	0.00	0.00

Pavement Condition Improvement

While vehicle operating costs capture costs for gasoline, maintenance, tires, and depreciation, these capture only those regular on-going and routine costs. According to TRIP, a national transportation research nonprofit, Iowans pay $428 per driver per year for additional repairs due to poor road conditions. As the 73rd Street project will reconstruct street segments with poor pavement conditions, this increased cost is applicable to the drivers on 73rd Street. In the build scenario, the cost is reduced as the road condition is improved. The number of drivers was estimated to be half the AADT on the corridor per year.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Pavement Condition Improvement	93.81	57.50

Residual Value

The residual value of the project was estimated using the predefined formula in the USDOT template to account for benefit of the project beyond the analysis period. It is assumed the useful life of the project is 30 years.

	Undiscounted Total (in millions $)	Discounted Total (in millions $)
Residual Value	7.02	3.18