

Harlem Avenue Multimodal Bridge Project

Benefit Cost Analysis Summary

Please refer the Benefit Cost Analysis provided in the Excel attachment for full details. The following provides summary data and the process for each element of the BCA.

Summary

The benefits of replacing the Harlem Avenue Multimodal Bridge vastly outweigh the \$28.6 million in costs. The benefits quantified in this analysis include transit time savings, crash reduction savings, and residual value after the maximum project life of 40 years. This total benefit, in 2016 dollars, is estimated to be over \$341 million using a 3% discount rate, or over \$91 million using a 7% discount rate.

| Project Costs and Benefits | | |
|--------------------------------|----------------------|----------------------|
| Costs | | |
| Project Capital Costs | \$ 27,700,000 | |
| Debt Financing for Local Match | \$ 888,353 | |
| Net Costs | \$ 28,588,353 | |
| Benefits | | |
| | 7% Discount Rate | 3% Discount Rate |
| Transit Value of Time Savings | \$86,140,692 | \$327,442,227 |
| Crash Reduction Savings | \$ 5,115,446 | \$ 10,413,613 |
| Residual Value | \$ 680,596 | \$ 3,779,932 |
| Net Benefits | \$91,936,733 | \$341,635,772 |

Public Transit Benefits

Since this project is a full replacement of a bridge that is over 100 years old, routine maintenance will not be able to further extend the life of the current structure. Thus, the no-build alternative results in substantial deterioration in transit service and travel time for Metra and CTA rail customers. We assume the bridge will no longer be functional for transit and freight purposes starting in 2043 (providing a 129-year life span).

The BCA measures the build option, replacement of the multimodal bridge versus the no-build option of the current structure failing in 2043. The bridge is well beyond its useful life, so mere continued maintenance is not considered sufficient.

CTA and Metra services will be greatly impacted if the 115-year-old bridge is not replaced:

- The BCA assumes that half the ridership on the CTA Green Line West Branch would experience a ten-minute deterioration in travel time. The CTA Harlem Green Line rail yard is located directly west of the project area, and CTA could lose the ability to provide service levels or turn back trains on the Green Line. This would inhibit their ability to provide current service levels, and it

could cause major service disruptions. Thus, a ten-minute impact is believed to be a conservative estimate.

- The BCA assumes that 90% of the ridership on the Metra Union Pacific West Line would experience a ten-minute deterioration in travel time. This is due to the fact that the project area is almost at the maximum flow point for inbound and outbound riders. If the bridge is not rebuilt, the existing structure's failure would result in Metra losing the ability to provide service into the Chicago Loop from the West Suburbs on the UP-West Line. Over 90% of Metra's ridership is traditional commute from the Suburbs AM peak inbound to the Chicago Loop and from the Chicago CBD to the West Suburbs in PM peak outbound.

The assumption is that current transit riders are taking the most time-competitive and cost-effective solution. This stated, whether customers would shift to other transit options, drive, walk, or do a combination of these options, additional travel time is assumed. The additional impacts per rider is set at a conservative 10 minutes. This could include additional travel time for current transit riders:

- Walking to other rapid transit and commuter rail stations
- Driving to other rapid transit and commuter rail stations
- Driving to destinations as an alternative to the reduced transit availability
- Utilizing alternative bus connections

Our Benefit-Cost Analysis also takes into account anticipated growth trends in Metra and CTA ridership levels.

- Current ridership on the Green Line West Branch (Harlem Station through Clinton Station) totals 8,611,339 annual boardings as of 2016. Based on the past ten years of ridership changes, an annual growth rate of 2.25% is used for projection purposes.
- Current ridership on the Metra UP-West Line (Elburn Station through Ogilvie Transportation Center) totals 8,373,079 annual boardings as of 2016. Based on the past ten years of ridership changes, an annual growth rate of 1.21% is used for projection purposes.

For the purpose of converting travel time impacts into dollar values, an hourly value of time for all purpose travel of \$14.10 was use based on 2017 USDOT Benefit-Cost Analysis Guidance for TIGER and INFRA Applications. The full analysis of public transit benefits can be found in the second tab of the BCA spreadsheet.

Safety Benefits

The new bridge will provide a safer environment for users of Harlem Avenue starting in 2021.

Currently, an average of 125 crashes per year occurs at the project site. Within this number, the breakdown for severity of crashes is as follows:

- 2.5 – Category AIS 1
- 1.6 – Category AIS 2
- .6 – Category AIS 3
- 20.3 – Property Damage Only

The new bridge will contain better site lines, traffic calming elements, and intersection realignments. The results of this are estimated at the following changes:

- 2.25 – Category AIS 1
- 1.45 – Category AIS 2
- .2 – Category AIS 3
- 15 – Property Damage Only

The impacts of the crash reductions were quantified utilizing the methodology in the TIGER Benefit-Cost Analysis Resource Guide. Safety analysis determined that due to project completion in 2021, there will be a crash reduction of 0.25 for AIS 1, 0.15 for AIS 2, 0.4 for AIS 3, and 5.3 for PDO crashes. Based on the 2017 USDOT Benefit-Cost Analysis Guidance for TIGER and INFRA Applications, crashes were valued at the following rates in 2016 dollars: \$28,800 for AIS 1, \$451,200 for AIS 2, \$1,008,000 for AIS 3, and \$4,252 for PDO crashes.

The full analysis of crash reduction benefits can be found in the third tab of the BCA spreadsheet.

Residual Value

Although the life span of the new bridge is anticipated to be approximately 80 years, USDOT recommends that 40 years be the maximum analysis lifetime. To capture the value of the bridge remaining at the end of this lifetime, we applied the residual value calculation shown in USDOT guidance:

$$RV = \left(\frac{U - Y}{U} \right) \times Project\ Cost - R$$

Where RV = Residual Value

U = Useful Service Life of Project

Y = Years of Analysis Period Project Operation

R = Any Post-Analysis Period Rehabilitation

Results

Calculations of project benefits were completed with a 7% discount rate per USDOT guidance. For the purposes of comparison, we also determined the value of the project's benefits using a 3% discount rate. This total benefit, in 2016 dollars, is estimated to be over \$341 million using a 3% discount rate, or over \$91 million using a 7% discount rate. **The benefit-cost ratio is estimated as 322% using a 7% discount rate, or 1,195% using a 3% discount rate.**

Finally, it should be noted that several factors will likely also contribute to this project's mixture of costs and benefits, but for various reasons they could only be assessed qualitatively:

- Travel time savings accruing to vehicles operating along Harlem Avenue due to improved traffic flow
- Reductions in the frequency and magnitude of maintenance costs associated with a modern bridge structure
- Avoided escalation of freight rail operational costs due to replacement of deteriorating structure
- Economic development benefits occurring on the underdeveloped south side of the station and resulting real estate tax revenues