

# SUMMARY OF BENEFIT-COST ANALYSIS AND RESULTS

## General Assumptions:

- Assumes the proposed project is constructed between 2026 and 2027
- Benefits and costs associated with the proposed project were quantified for the 20 year period between 2028 and 2047
- The present value of project costs and benefits is presented in 2022 dollars
- A 4 percent inflation rate was assumed when estimating project costs in future years
- A 3 percent discount rate was used when converting future benefits/costs to present values
- Monetary values of user benefits/costs are based on information published in:
  - USDOT's Benefit-Cost Analysis Guidance for Discretionary Grant Programs (2023)
- Remaining capital values for investments are based on factors provided by MnDOT

## Benefits Assessment Methodology:

- Travel time and vehicle operating benefits were estimated using results from traffic simulation. Key assumptions for traffic simulation are provided in a section below
- Safety benefits are based on existing crash patterns and anticipated crash reductions. More details related to safety analysis assumptions are provided in a section below
- Environmental benefits were estimated based on simulation results

## Key Traffic Simulation Assumptions:

- Traffic simulation models were developed using Synchro/SimTraffic Version 11
- Key outputs from VISSIM include:
  - Vehicle-hours traveled
  - Vehicle-miles traveled
  - NOx emissions
- Traffic models were developed for the following time periods
  - AM and PM Peak Hour
  - Analysis for the remaining hours of the day were based on the peak hour results and the hourly volume breakdown at the intersection of TH 5 and Rolling Acres Road which is a key intersection along the corridor
- Traffic models were developed for the following scenarios
  - 2019 Existing Conditions
  - 2019 Build
  - 2040 No Build
  - 2040 Build
- Traffic models were based on the following traffic data:
  - 2019 conditions were based on field-collected turning movement data at the intersections. Heavy vehicles percentage was assumed based on the existing turning movement counts at 3% throughout the project area.

## Safety Analysis Assumptions:

- Crash patterns under the existing roadway configuration are based on crash data obtained for the period between 2013 and 2022
- Traffic safety benefits associated with the proposed project improvements were estimated using the following Crash Modification Factors (CMF) from the CMF Clearinghouse.
  - CMF ID 9823: Install right-in/right-out (RIRO) operations at stop-controlled intersection
    - Applies to crashes of severity K (fatal), A (serious injury), B (minor injury), C (possible injury)

- Applies to crashes of all type
- This CMF was applied to the injury crashes at the intersections of 78th St at TH 5, Stieger Lake Ln at TH 5 and Crimson Bay Rd at TH 5 as these three intersections are proposed to be converted to RIRO
- o CMF ID 9821: Install right-in/right-out (RIRO) operations at stop-controlled intersection
  - Applies to crashes of all type and severity
  - This CMF was applied to the property damage only crashes at 78th St at TH 5, Stieger Lake Ln at TH 5 and Crimson Bay Rd at TH 5 as these three intersections are proposed to be converted to RIRO
- CMF ID 320: Install a traffic signal
  - Applies to angle crashes of severity K (fatal), A (serious injury), B (minor injury), C (possible injury)
  - This CMF was applied to the angle crashes that resulted in fatality or injury at the intersections of Park Dr/Kochia Ln at TH 5 and Minnewashta Pkwy at TH 5 as signals are proposed at these two intersections.
- o CMF ID 7849: Install a traffic signal
  - Applies to angle crashes of all severity
  - This CMF was applied to the angle crashes that resulted in property damage only at the intersections of Park Dr/Kochia Ln at TH 5 and Minnewashta Pkwy at TH 5 as signals are proposed at these two intersections.
- o CMF ID 7488: Install a traffic signal
  - Applies to crashes of all type and severity
  - This CMF was applied to all the non-angle crashes at the intersections of Park Dr/Kochia Ln at TH 5 and Minnewashta Pkwy at TH 5 as signals are proposed at these two intersections.
- o CMF ID 292: Physical channelization of both major and minor roads
  - Applies to crashes of severity K (fatal), A (serious injury), B (minor injury), C (possible injury)
  - Applies to crashes of all type
  - This CMF was applied to the injury crashes at the intersection of Rolling Acres Rd and TH 5 as this intersection since the project will add median channelizing the turn lanes on each approach.
- o CMF ID 293: Physical channelization of both major and minor roads
  - Applies to crashes of all type and severity
  - This CMF was applied to the property damage only crashes at the intersection of Rolling Acres Rd and TH 5 as this intersection since the project will add median channelizing the turn lanes on each approach.
- o CMF ID 10895: Convert intersection to a displaced left turn intersection
  - Applies to rear end crashes of all severity
  - This CMF was applied to the rear end on crashes at the intersection of TH 41 and TH 5 as the intersection will be converted to a partial displaced left turn
- o CMF ID 10896: Convert intersection to a displaced left turn intersection
  - Applies to head on crashes of all severity
  - This CMF was applied to the head on crash at the intersection of TH 41 and TH 5 as the intersection will be converted to a partial displaced left turn
- o CMF ID 7572: Convert 2 lane roadway to a 4 lane divided roadway
  - Applies to crashes of all type and severity
  - This CMF was applied to all segment related crashes on the TH 5 corridor
- o CMF ID 207: Conversion of Stop-Controlled Intersection into Single-Lane Roundabout
  - Applies to crashes of all type and severity
  - This CMF was applied to all the crashes at the intersection of TH 5 and Commercial Ave as a roundabout is proposed for the existing stop-controlled intersection.

## Benefit Cost Analysis Results

- The analysis shows a benefit cost ratio of 10.31 with all items considered. A ratio greater than one indicates the project cost is less than the anticipated benefit from the investment. A ratio lower than one, or a negative ratio, indicates the anticipated benefit does not offset the cost. With a benefit cost ratio above 1, the project has benefits that are higher than the project cost. The table below shows a summary of the full benefit cost.

<i>Item</i>	<i>Build (PV –3% Discount Rate)</i>
Travel Time Benefit	\$ 1,132,331,000.00
Collision Reduction Benefit	\$ 36,475,000.00
Operation and Maintenance Benefit	\$1,501,000.00
Emissions Benefit	\$(10,413,000.00)
Vehicle Operating Benefit	\$ (121,724,000.00)
<b>PV Total Benefit</b>	<b>\$ 1,038,170,000.00</b>
Major Structures	\$ 31,508,000.00
Surfacing	\$15,281,000.00
Grading and Drainage/Sewer	\$ 20,360,000.00
Lighting/Signals	\$ 411,000.00
Subbase/Base	\$ 6,541,000.00
Engineering	\$ 19,465,000.00
Right-of-Way	\$ 5,487,000.00
Other Costs	\$ 23,990,000.00
<b>PV Total Cost</b>	<b>\$123,043,000.00</b>
PV Salvage Value	\$22,396,000.00
<b>(PV Total Cost - Salvage Value)</b>	<b>\$100,647,000.00</b>
<b>Benefit-Cost Ratio</b>	<b>10.31</b>