

# Step 1 Evaluation Results

In Step 1, the performance of each solution type was evaluated on a yes/no basis against the primary project needs of vehicle mobility and vehicle safety. The objective of Step 1 was to identify solution types that have the potential to meet both primary needs. Solution types that do not address both needs have been dismissed from further consideration, as shown below.

Solution Type	Improves Vehicle Safety?	Improves Vehicle Mobility?	Recommendation
No Build Alternative	No	No	<b>Retain</b> as per NEPA requirements. Serves as a baseline condition against which other alternatives are compared.
Restricted Crossing U-Turn (RCUT) <i>Fully Signalized</i>	Yes	Yes	<b>Retain</b> for further consideration.
Median U-Turn (MUT) <i>Fully Signalized</i>	Yes	Yes	<b>Retain</b> for further consideration.
Median U-Turn (MUT) with Unsignalized U-Turns	Yes	No	<b>Dismiss</b> from further consideration.
Partial Median U-Turn (MUT) <i>Fully Signalized</i>	Yes	No	<b>Dismiss</b> from further consideration.
Partial Median U-Turn (MUT) with Unsignalized U-Turns	Yes	No	<b>Dismiss</b> from further consideration.
Bowtie	Yes	Yes	<b>Retain</b> for further consideration.
Single Loop	Yes	Yes	<b>Retain</b> for further consideration.
Partial Displaced Left Turn (Continuous Flow Intersection)	Yes	Yes	<b>Retain</b> for further consideration.
Quadrant	No	Yes	<b>Dismiss</b> from further consideration.
Split Intersection	Yes	No	<b>Dismiss</b> from further consideration.
Roundabout (multilane)	Yes	No	<b>Dismiss</b> from further consideration.
Restricted Crossing U-Turn <i>Fully Unsignalized</i>	Yes	No	<b>Dismiss</b> from further consideration.
Traditional Diamond	Yes	Yes	<b>Retain</b> for further consideration.
Diverging Diamond	Yes	Yes	<b>Retain</b> for further consideration.
Michigan Urban Diamond	Yes	Yes	<b>Retain</b> for further consideration.
Single Point Urban	Yes	Yes	<b>Retain</b> for further consideration.
Single Roundabout	Yes	Yes	<b>Retain</b> for further consideration.
Partial Cloverleaf	Yes	Yes	<b>Retain</b> for further consideration.
Double Roundabout	Yes	Yes	<b>Retain</b> for further consideration.

## Step 1A

Working with the 12 intersection solution types that passed the initial safety and mobility screening, the project team placed similar intersection types into groups. Then, each group was reviewed and lower performing options with similar functions as others in the group were removed from consideration. This Step 1A process allows the more detailed Step 2 evaluation to focus on those options that are more likely to better address the project needs while still considering a range of solution types.

The following describes the results of the Step 1A evaluation:

- Intersections (At-Grade Signalized)

Of the five at-grade signalized intersection options that passed the Step 1 screening, three fall within the U-Turn Based Concepts category, or group. These include the RCUT, MUT, and Bowtie options. The fully signalized RCUT was identified as the alternative to progress into Step 2 evaluation. Reasoning for this selection over the alternative options is provided below:

- Median U-Turn (MUT) - Fully Signalized: The forecast 2046 volume levels on CSAH 17 are far below the level at which a MUT would be considered feasible compared to an RCUT. This design also has worse signal progression. Finally, it would be more susceptible to driver confusion than the RCUT option due to unfamiliarity; no signalized MUTs have been constructed in MN as of 2022).
- Bowtie: This option would be expected to result in greater overall travel times than the signalized RCUT due to both TH 36 and CSAH 17 left turn movements being rerouted through the roundabouts (as opposed to the lower-volume CSAH 17 lefts and throughs being rerouted in the RCUT option). Secondly, unlike the fully signalized RCUT option, no bowtie intersections have been constructed in Minnesota as of 2022. As a result, this option would be more susceptible to driver confusion.

- Intersections (At-Grade Unsignalized)

- No changes from Step 1. All at-grade unsignalized intersection options were dismissed following Step 1 screening.

- Interchanges

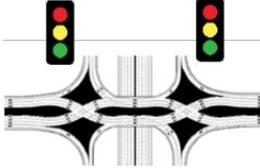
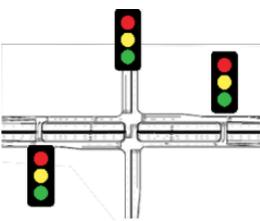
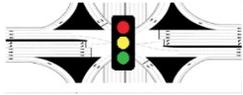
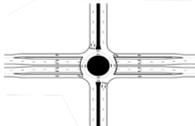
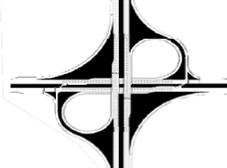
- No changes from Step 1. No redundancy, notably poor performance, or substantial implementation issues were identified for interchange options. All seven options are to be advanced to Step 2.

# Intersection Types Carried Forward to Step 2

The following 10 concepts and the No Build Alternative are recommended to be retained for further evaluation and will be included in *Step 2 – Preliminary Assessment of Needs, Additional Considerations, and SEE Impacts*.

**Table 1. Intersection Types Carried Forward to Step 2**

Solution Type Alternative		Description	Illustration
<b>At-Grade Signalized Intersection Concepts</b>			
No Build Alternative			
U-Turn Based Concepts	<p>Restricted Crossing U-Turn (RCUT)</p> <p><i>Fully Signalized</i></p>	<p>Minor roadway left-turn and through movements are removed from the main intersection. These vehicles turn right onto the major roadway before making a U-turn at a downstream median opening. The main intersection and U-turn crossover intersections are signalized.</p>	
Partial Grade Separated Concepts	<p>Single Loop</p>	<p>All four left-turn movements and some right-turn movements are rerouted onto a connector road in one quadrant, while the major and minor roadways are grade-separated. The intersections can be signalized or unsignalized.</p>	
Displaced Movement/Crossover Based Concepts	<p>Partial Displaced Left Turn (Continuous Flow Intersection)</p>	<p>The arterial left-turning vehicles cross over to the other side of the roadway at a signalized intersection several hundred feet in advance of the main intersection. At the signalized main intersection, the protected left turns occur simultaneously with the opposing through movements. This design is also referred to as a Continuous Flow Interchange (CFI).</p>	
<b>Interchange Concepts</b>			
Traditional Concepts	<p>Traditional Diamond</p>	<p>The traditional diamond interchange is a grade-separated interchange with two intersections on the arterial. The intersections may be signalized or unsignalized. Each direction of travel on the freeway has one on-ramp and one off-ramp.</p>	

Displaced Movement/Crossover Based Concepts	Diverging Diamond	The diverging diamond interchange is an alternative to the traditional diamond interchange where arterial traffic crosses over to the other side of the roadway in between the two ramps. This allows vehicles to turn left onto the on-ramps without crossing over opposing lanes of traffic. This design is also referred to as the double crossover diamond interchange.	
	Michigan Urban Diamond	The Michigan urban diamond interchange is a variation of the traditional diamond interchange that removes left-turn movements from the arterial intersections. These vehicles instead make U-turns at directional crossovers on frontage roads. This design is also referred to as a Median U-Turn (MUT) Interchange. This intersection can be designed as fully signalized or partially unsignalized.	
Single Intersection Concepts	Single Point Urban (SPUI)	The single point urban interchange is an alternative to the traditional diamond interchange in which all ramps begin or end at a single intersection on the arterial.	
	Single Roundabout	The single roundabout interchange is a grade-separated interchange in which all ramps begin or end at a single roundabout on the arterial.	
Other Concepts	Partial Cloverleaf	The partial cloverleaf interchange is a grade-separated interchange with a combination of directional ramps and loop ramps. This configuration may include up to two intersections on the arterial. The intersections may be signalized or unsignalized.	
	Double Roundabout	The double roundabout interchange is a grade-separated interchange in which all ramps begin or end at one of two roundabouts on the arterial. This design typically allows for a narrower bridge width than the single roundabout interchange.	