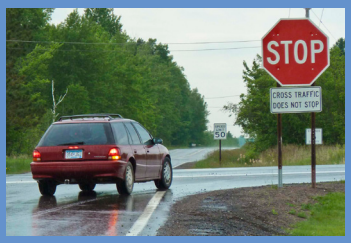
FINAL REPORT

Intersection Control Evaluation Planning Study for the Duluth Area

March 2013



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Intersection Control Evaluation Planning Study for the Duluth Area

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Background

The Arrowhead Regional Development Commission (ARDC), in partnership with St. Louis County and the Cities of Duluth and Hermantown, recently conducted a traffic study to evaluate various traffic control alternatives (e.g., stop signs, traffic signals, roundabouts, reduced conflict intersection, etc.) at eight problematic intersections in the Duluth area. The study included collecting traffic data, analysis of existing conditions, and review of appropriate traffic control alternatives using technical evaluation criteria. The primary goals of the study were to:

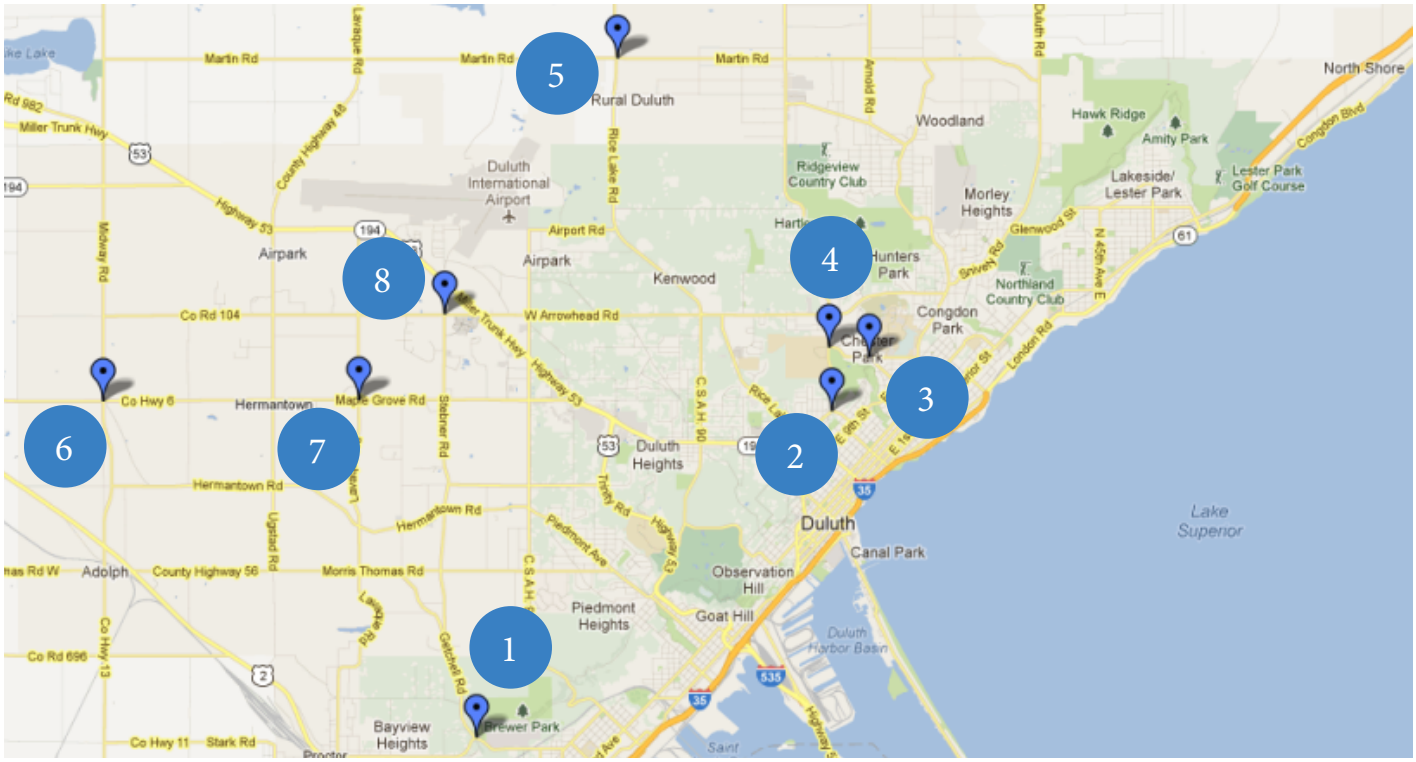
- Determine the optimal form of traffic control for each intersection to enhance both traffic operations and safety.
- Consider other multimodal users such as transit buses, pedestrians and bicyclists.
- Develop the framework for future planning and public education.

A Study Advisory Committee (SAC) was formed to manage project scope, schedule, methodologies, progress, and deliverables. The SAC guided the study process and met four times in late 2012. Subsequently, presentations were made to the Duluth Superior Metropolitan Interstate Council Technical Advisory Committee and Policy Board at their February 2013 meetings.

Intersection Control Evaluation (ICE) Reports were developed (under separate cover) that included detailed engineering analysis and recommendations for each of the study intersections. The following is a brief summary of the study.

Study Intersections

The following intersections were included in the study: 1) Skyline/Highland/Vinland/Getchell, 2) Skyline/Kenwood/Martha, 3) College Street/Junction Avenue/19th Avenue East, 4) College Street/Kenwood Avenue/Lyons Street, 5) Martin Road/Rice Lake Road, 6) Maple Grove Road/Midway Road, 7) Maple Grove Road/LaVaque Road, 8) Stebner Road/West Arrowhead Road.



Scoping Phase

The project began with a scoping phase that included collecting traffic data, crash history, and site specific information at each intersection. 20-year traffic forecast volumes were developed at each location based on historical growth data, and future traffic volumes published in the Duluth-Superior Long Range Transportation Plan. Various concept alternatives were developed and screened in an effort to identify prospective alternative(s) to be further evaluated in the next study phase.

Alternative Evaluation Phase

The prospective concept alternatives developed during the scoping phase were subsequently evaluated against selection criteria which included site specific considerations, including: current traffic patterns, pedestrian/bicycle needs, transportation system requirements, topography/sight distance issues, and current/future land uses. A more detailed traffic operations analysis was also performed using traffic analysis software to better understand the near- and long-term performance of each alternative. The following is a brief description of the study intersections, alternatives that were considered, and the basic rationale used to identify a preferred alternative at each location.

1) Skyline/Highland/Vinland/Getchell

This low volume intersection lies in a natural setting and has a below average crash rate. However, poor geometry and sightlines cause driver and pedestrian confusion and frustration. Existing intersection control includes an all-way stop. Parking and pedestrian/bicyclist accommodations are key issues at this location given its proximity to the Superior-Hiking-Trail.

Viable traffic control alternatives studied at this location included stop control and roundabout control, as a traffic signal would not meet warrants. Two-way stop control coupled with geometric improvements was chosen as the preferred alternative because it will provide acceptable long-term operations, improve geometry and sightlines, and improve traffic flow and trailhead access.

2) Skyline/Kenwood/Martha

Similar to the previous intersection, poor geometry and sightlines cause confusion and hesitation; however, there is a below average crash rate with no predominate crash type. This intersection is located on the Duluth hillside near the colleges and has heavy pedestrian and bicycle volumes. From a traffic operations standpoint, the existing configuration is not acceptable long-term.

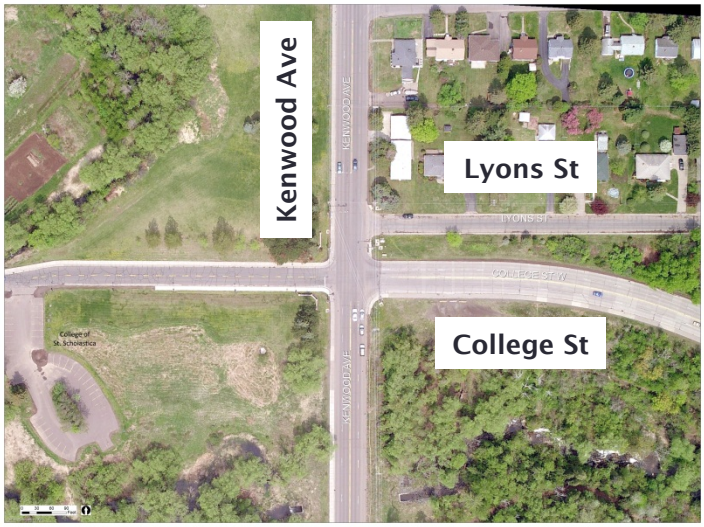
Three traffic control alternatives were studied at this location including roundabout control, traffic signal control, and all-way stop control. The latter was

chosen along with geometric realignments and improvements that should provide acceptable long-term operations, improve geometry and sightlines, and enhance pedestrian accommodations.

3) College Street/Junction Avenue/19th Avenue E

This intersection is located at the west entrance to the UMD campus and is currently controlled by a traffic signal. Heavy pedestrian and bicycle volumes are key issue as well as high crash rates, most of which are rear end crashes. Moreover, all legs of the intersection are designated on-street bike routes. This intersection is not operationally acceptable long-term without traffic control and geometric improvements.

It was determined that roundabout control would be preferred at this location because it would provide acceptable long-term operations, reduce intersection approach speeds, virtually eliminate right-angle crashes, and reduce pedestrian crossing exposure. A roundabout treatment could also provide an opportunity for a "gateway" feel into the UMD campus.



4) College Street/Kenwood Avenue/Lyons Street

This busy intersection is located between the UMD and CSS campuses and has heavy pedestrian and bicycle volumes. The north, south, and east legs are designated on-street bike routes. Problems at this intersection include right-angle and rear-end crashes coupled with operational issues largely due to the Lyons Street connection. The existing traffic signal at this location is not operationally acceptable long-term without traffic control and geometric improvements.

Roundabout control was evaluated at this location versus revising the traffic signal. While both alternatives would provide acceptable long-term operations, a roundabout would likely require a multi-lane design approach which would cause additional property impacts. Therefore, revising the traffic signal system, coupled with geometric improvements including a potential closure of the Lyons Street connection was identified as the preferred alternative.

5) Martin Rd/Rice Lake Rd

This high-speed intersection has a high crash rate with mostly right-angle and rear-end crashes and is currently controlled by an all-way stop. The south, east, and west legs are designated on-street bike routes. The north-bound approach experiences long traffic queues in the P.M. peak hour. The existing all-way stop control is not operationally acceptable long term.

Three viable alternatives were analyzed at this location including roundabout control, traffic signal control, and an alternative intersection control known as a reduced conflict intersection. Ultimately, the roundabout alternative was chosen as it would provide the best long-term solution by improving operations and safety, reducing intersection approach speeds, virtually eliminating right angle crashes, and reducing crash severity.

6) Maple Grove Road/Midway Road

Similar to the previous intersection, this location has high-speed approaches and a high crash rate with mostly right-angle and rear-end crashes. The north, south, and east legs are designated on-street bike routes. Long westbound approach queues are experienced in the P.M. peak-hour. Based on the analysis, the existing side-street stop control is not operationally acceptable long-term.

Roundabout control, traffic signal control, and a reduced conflict intersection were considered at this location. Ultimately the roundabout alternative was chosen as it would provide the best long-term solution by improving operations and safety, reducing intersection approach speeds, virtually eliminating right-angle crashes, and reducing crash severity.

7) Maple Grove Road/LaVaque Road

This intersection is currently controlled by an existing all-way stop which is not operationally acceptable long-term based on the analysis. Traffic volumes are unbalanced at this intersection with heavy westbound approach volumes in the P.M. peak hour. While the crash rate is fairly low, 64% are right-angle crashes. The east-leg and west-leg are designated on-street bike routes and there is an existing traffic signal one half mile to the east.

Roundabout control and traffic signal control were analyzed at this location, both of which would provide

acceptable long-term operations. However, the traffic signal control with geometric improvements was determined as most appropriate because it should reduce the right-angle crash problem, require less right of way than a roundabout, and would be consistent with other nearby intersections. This intersection can continue to operate as an all-way stop until a traffic signal is warranted.

8) Stebner Road/West Arrowhead Road

Similar to the previous intersection, the current all-way stop is not operationally acceptable long-term. This location also has a fairly low crash rate, however 67% are right-angle crashes. The south and west legs are designated on-street bike routes and there are nearby traffic signals to the north, south, and east.

Again, the traffic signal control with geometric improvements was determined as most appropriate at this location because it should reduce the right angle crash problem, require less right of way than a roundabout, and would be consistent with other nearby intersections.

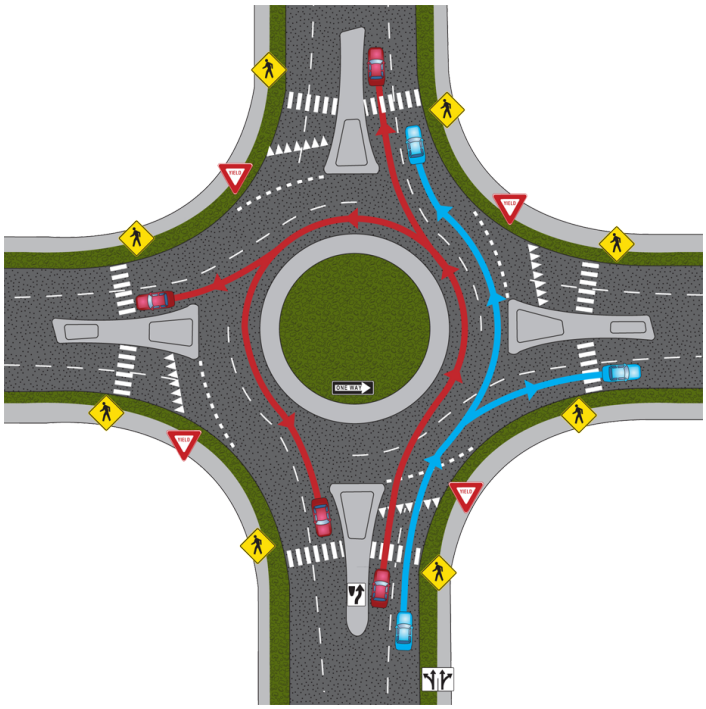
Preferred Alternatives

By thoroughly reviewing the study data, forecasts, and analysis, the SAC was able to make an informed recommendation as to a preferred traffic control alternative at each intersection. As noted above, three of the eight locations studied identified modern roundabouts as the best alternative to achieve the study goal. The following table summarizes the preferred intersection control at each study intersection.

Study Intersection	Existing	All-Way Stop	Roundabout	Traffic Signal	Reduced Conflict Intersection	Two-Way Stop
1) Skyline/Highland/Vinland/Getchell	All-way stop					✔
2) Skyline/Kenwood/Martha	All-way stop	✔				
3) College St./Junction Ave./19th Ave. E	Traffic signal		✔			
4) College St./Kenwood Ave./Lyons St.	Traffic signal			✔		
5) Martin Rd./Rice Lake Rd.	All-way stop		✔			
6) Maple Grove Rd./Midway Rd.	Side-street stop		✔			
7) Maple Grove Rd./LaVaque Rd.	All-way stop			✔		
8) Stebner Rd./W Arrowhead Rd.	All-way stop			✔		

Preliminary Roundabout Concepts

For the intersections that yielded roundabout control as the preferred alternative, conceptual geometric layouts were developed to gauge their relative size/footprint, how large trucks and emergency vehicles move through them, and how pedestrian/bicyclist accommodations might work. Prior to implementing a roundabout, more extensive design work and analysis are required to better define geometrics and to quantify potential impacts and construction costs.



Next Steps

The project partners will utilize the study findings as a planning tool to aid in future planning and public improvement projects. Should a modern roundabout be considered for implementation, a proper public education outreach campaign should be deployed being that they are a relatively new forms of traffic control in the Twin Ports. The ARDC and their partners are currently developing a public education campaign so users can learn more about the inherent benefits of modern roundabouts and how to properly navigate them.