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MEMORANDUM

Date: January 25, 2018

To: Steven Elmer, AICP, Planning Analyst

Organization: Metropolitan Council

From: Greta Alquist, Galen Omerso, Ciara Schlichting

Project: Regional Bicycle Barriers Study

Re: Technical Memorandum No 1: Preferred Spacing of Barrier Crossing Opportunities

Background

The Metropolitan Council is conducting the Regional Bicycle Barriers Study (the Study), examining the region's major physical barriers (freeways/expressways, rivers/streams, and rail corridors) to bicycling in the Twin Cities region. With input from the public, cities, and counties, the Study involves a robust, data-driven approach to prioritizing barrier crossing improvement opportunities. The Study results will be documented in the *Transportation Policy Plan Update* which sets policies for the regional transportation system and is used for investment direction.

Part of the Study involved applying "spacing criteria" to reflect ideal frequencies of bicycle crossings over major physical barriers. The spacing criteria were used to identify potential barrier crossing improvement opportunities to analyze. The spacing criteria were also applied when displaying analysis results in map format.

The purpose of this memo is to summarize how the preferred spacing criteria for bicycle barrier crossing opportunities were developed and applied in the Study.

Metropolitan Council staff, the Technical Advisory Work Group (TAWG), the Project Management Team (PMT), and participants of two bicycling focus groups contributed to the development of the criteria and guided their application in the Study

The TAWG included representation from the following agencies:

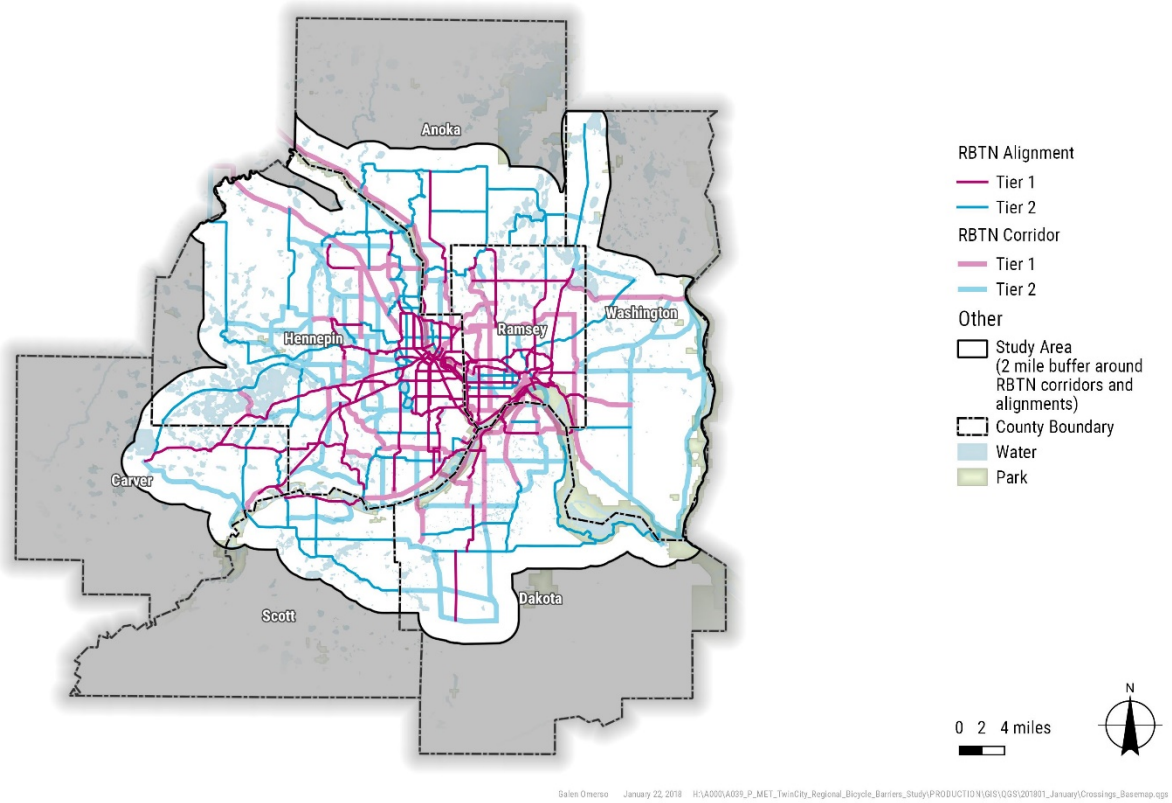
- Metropolitan Council
- Minnesota Department of Transportation, Metro District
- Anoka County

- Carver County
- Dakota County
- Hennepin County
- Ramsey County
- Scott County
- Washington County
- City of Bloomington
- City of Maplewood
- City of Minneapolis
- City of New Brighton
- City of Richfield
- City of Saint Paul
- Three Rivers Park District
- Transit for Livable Communities

Barrier Crossing Analysis Points Identification and Spacing Criteria Development

The first step of the analysis was to define the Study area and the segments of physical bicycle barriers to be analyzed. The Study area generally focuses on barriers within the Regional Bicycle Transportation Network (RBTN). The Study area also included locations within two miles of RBTN corridor centerlines and RBTN alignments, shown in Figure 1, Regional Bicycle Barriers Study Area.

Figure 1: Regional Bicycle Barriers Study Area



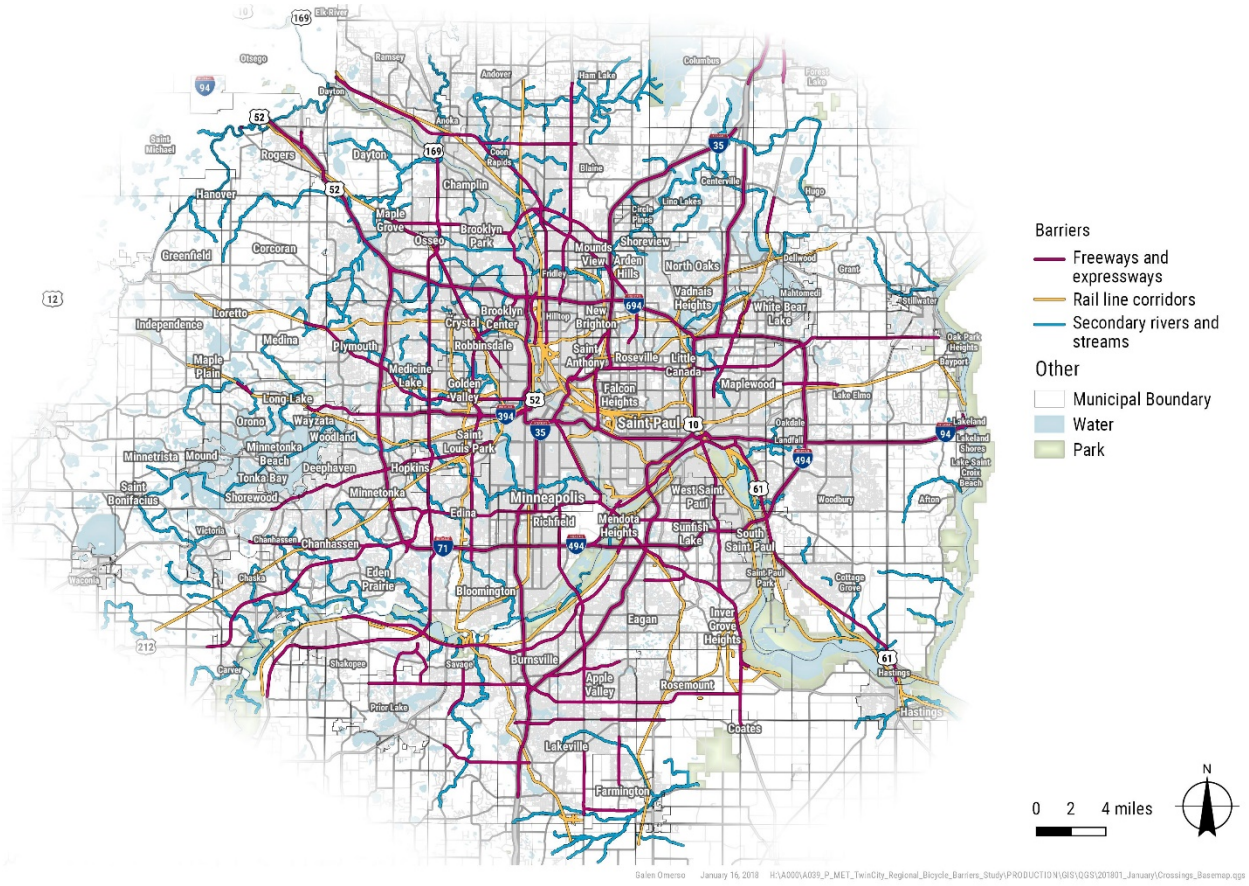
The study defined physical barriers to include secondary and third-order rivers and streams, rail line corridors, and freeways and expressways (Figure 2, Regional Bicycle Barriers).

Rivers and streams include secondary and third-order streams or basically the main tributaries of the region's primary rivers. The region's primary rivers (the Mississippi, Minnesota and Saint Croix Rivers) were not analyzed in this Study because of the large differences in approach and scale that would be required for these major rivers compared to the other smaller and less challenging barriers that were evaluated through the Study. However, this Study (based on discussions with a Technical Advisory Work Group) recognizes these major rivers as highly significant and possibly the most challenging physical barriers to bicycling in the Twin Cities region. As such, they will be addressed appropriately in the Council's forthcoming Transportation Policy Plan Update.

Freeways are highways with full access control, meaning motorists do not encounter any cross-road intersections. Expressways, for this study, were defined to include the region's non-freeway principal arterials that comprise of at least four lanes and are

divided by a median. These highways differ from freeways in that they do have cross-road intersections with traffic signals and some partial stop sign-controlled intersections with right turn in and out only access.

Figure 2: Regional Bicycle Barriers



The second step of the analysis was to identify points along the barriers that represent potential crossing improvement opportunities. These points were initially identified as locations where a barrier intersected with a local planned bikeway, a Regional Bicycle Transportation Network (RBTN) corridor or alignment, and/or a collector roadway. The resulting crossing point dataset was focused primarily on local and regional network connectivity and thus did not consider bicycle facility type in the analysis. Locations where an existing bikeway or existing local road crossed a barrier were not included as crossing improvement points to be analyzed as they were assumed to already provide an adequate crossing. Because the purpose of this Study was to identify opportunities to physically travel across bicycle barriers, level of bicyclist comfort was not evaluated.

Collector roadway crossings were initially omitted and later added to the analysis due to the highly-varied nature of collector roadway characteristics. Minor and principal arterial crossings were only analyzed where the point was on a planned bikeway crossing from a local plan.

In the third step of the analysis, additional barrier crossing opportunities were identified based on public input and those points were added to the analysis. An on-line, interactive WikiMap survey was developed for the project which displayed all streets and highways in relation to these barriers. The map highlighted each barrier and WikiMap survey participants were asked to mark points where they wanted to see a new barrier crossing provided. Rather than include every point identified by the public in the WikiMap, the analysis included all locations where at least two participants identified a barrier crossing need. These points were added to the potential barrier crossing opportunities analysis.

Step four was an additional iteration of the barrier crossing opportunity identification process. The Metropolitan Council, with support from the PMT and TAWG, determined that there were areas where barrier crossing opportunities were spaced too far apart to achieve a direct and well-connected bicycle network. Therefore, criteria were developed to define preferred crossing spacing; these criteria were later used to add barrier crossing improvement points to the analysis. Bicyclist expectations and transportation networks vary with land use and density; therefore, preferred crossing frequencies differ according to sub-regional context. The community designations defined in the Council's *Thrive MSP 2040* regional plan were aggregated to four groups to allow for the varying levels of expectation and need in the region's subareas. Draft spacing criteria were reviewed and revised by the PMT and TAWG. Table 1 summarizes the final spacing criteria applied in the Study.

Table 1: Preferred Maximum Spacing of Barrier Crossing Opportunities by Thrive MSP 2040 Community Designation

Thrive Community Designations	Preferred Maximum Spacing	Example Cities
Urban Center	½-mile	Minneapolis, Saint Paul, Richfield, Hopkins, South St. Paul
Urban	¾-mile	Golden Valley, Roseville, Maplewood, Crystal, Edina
Suburban, Suburban Edge, Emerging Suburban Edge	1 mile	Blaine, Woodbury, Maple Grove, Eagan, Lakeville
Diversified Rural, Rural Residential, Agricultural	2 miles	Grant, Afton, Ham Lake, Lake Elmo, Independence

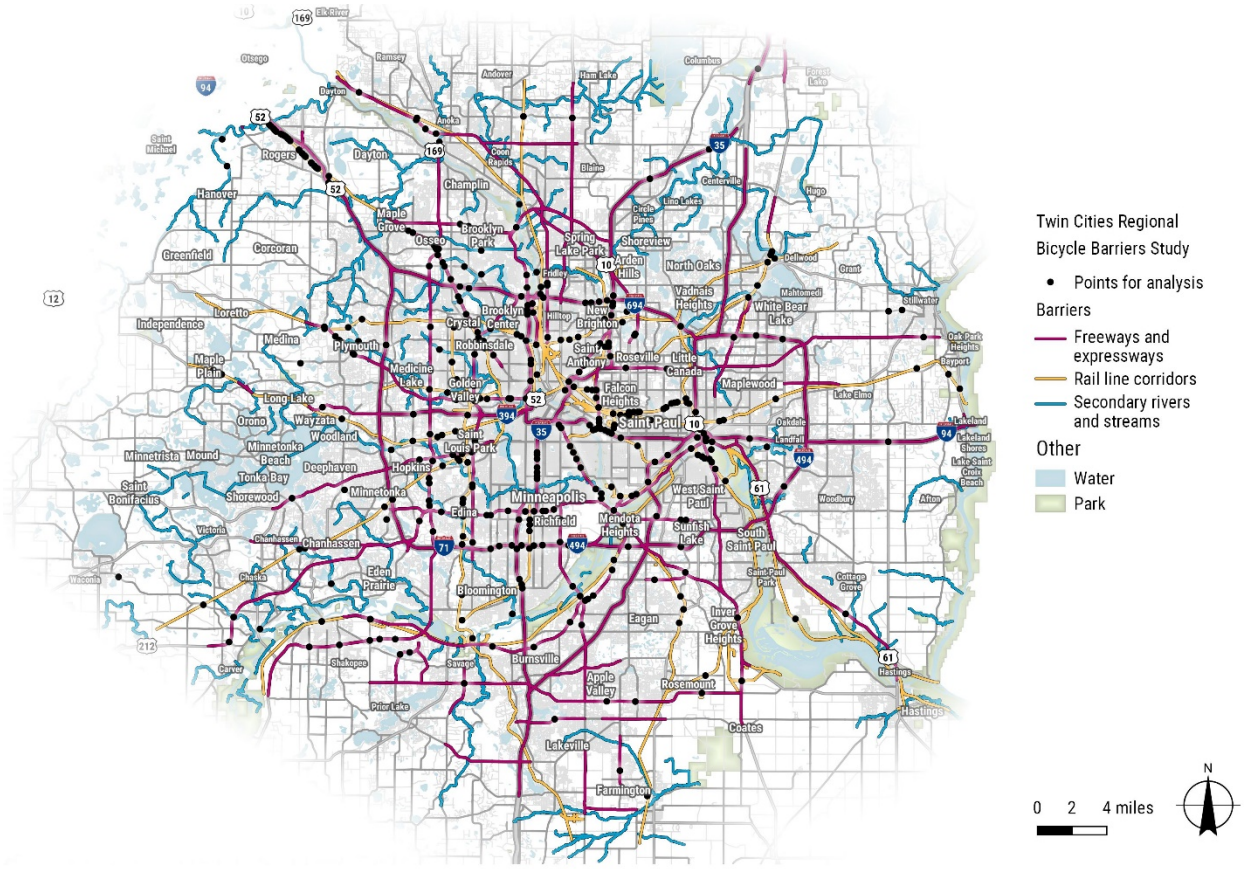
Spacing Criteria Application

The spacing criteria were used to identify additional locations that would be analyzed for their value as potential connections across physical barriers. The frequency of barrier crossing opportunities identified in steps one through three did not always meet the preferred maximum spacing criteria, which l left significant crossing gaps along some of the barriers. These "spacing-generated points" were advanced along with the other potential crossing improvement locations to the evaluation and prioritization stages of the analysis. This section details how the spacing criteria were applied to generate these additional analysis points.

A routing process was used to identify spacing-generated points by applying specific origin and destination points on either side of the barrier. Origin and destination pairs were placed at equal intervals along barrier segments based on the spacing criteria set for each community designation. Each pair was then evaluated for how far a bicyclist would need to travel to get from one side of the barrier to the other. If there was an existing or potential crossing nearby, the resulting travel distance would be relatively small, and the spacing-generated point was eliminated as unnecessary for consideration — a nearby crossing opportunity already provided adequately spaced connectivity. The distance used to search for crossings near a spacing-generated-point origin-destination pair was dependent on the spacing criteria. The analysis was then repeated from additional locations along the barrier.

The spacing-generated points identified through this analysis were reviewed by the TAWG as well as Metropolitan Council staff to determine if any of the spacing-generated points were superfluous or in an illogical location. Many were found to be superfluous and were removed as potential barrier crossings to be analyzed. The remaining spacing-generated points were included in the analysis alongside the potential crossing locations from steps one through three (shown on Figure 3, Points for Analysis).

Figure 3: Points for Analysis



Scoring Spacing-Generated and other Analysis Points

Applying the spacing criteria to fill barrier crossing frequency gaps along barrier segments resulted in an enhanced set of potential barrier crossing improvement points for analysis that would allow for more direct and connected networks. In addition to these spacing-generated points, analysis points were added, through reviews by Met Council and the TAWG, where logical or opportunity-driven locations may have been overlooked in the initial analysis points identification process.

In response to concerns from TAWG members that many of the spacing-generated points were in illogical or otherwise unfeasible locations, coupled with concern that planned crossing points had been undervalued in the points analysis, a new "point type" variable was added to the final scoring iteration under the bicycling demand factor. This new measure was scored on a 0 to 10 scale as follows:

- Planned barrier crossings 10 points
- TAWG/Council-added crossings 6 points
- Spacing-generated crossing locations 4 points

A separate technical memorandum details the complete scoring methodology and results.