Midtown Corridor Alternatives Analysis

Initial Screening Analysis

7/24/2013

Prepared by the
SRF Consulting Group Team
for
Metro Transit

Table of Contents

Tables

Figures

Appendices

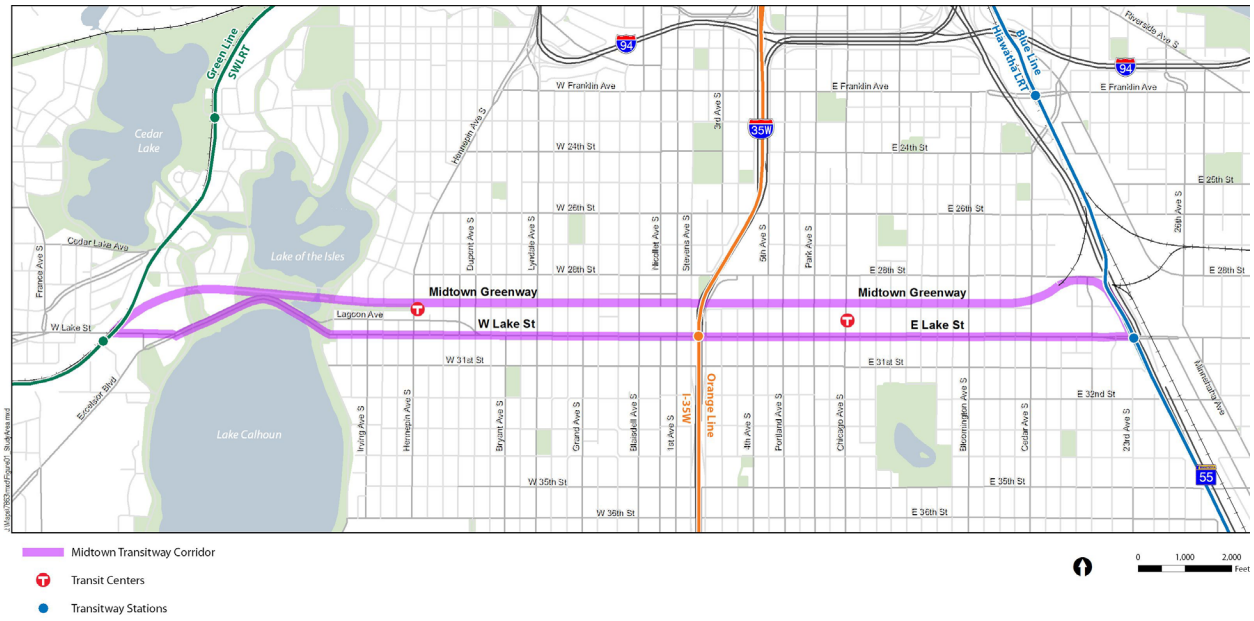
Purpose

The purpose of the initial screening analysis is to evaluate the full range of alternatives – often called the "universe of alternatives" – against project's purpose and need. Only those alternatives that meet the overall project purpose and need will be advanced to the next level of analysis where the costs, benefits and impacts of the alternatives will be estimated.

Initial Screening Analysis Methodology

The initial screening analysis began by identifying the universe of alternatives along Lake Street and the Midtown Greenway as shown in Figure 1. Ten alternatives were identified for inclusion in the initial screening analysis. The initially considered alignments and modes that make up each alternative are described in the next section.

Figure 1: Study Area Alignments



Modes Considered

Enhanced Bus: Enhanced bus is a transit mode that uses bus vehicles while incorporating many of the premium characteristics of light rail transit (LRT). Enhanced bus on arterial streets incorporates limited-stop service, technology improvements, and branding to provide a fast trip and differentiate the service from regular bus routes. The primary objectives of enhanced bus are to provide faster and more frequent service as well as an improved customer experience. Faster service is accomplished by reducing signal and passenger boarding delay, and stopping at fewer locations. An improved passenger experience is achieved through more comfortable vehicles, stations, information technology, and improved service reliability. Enhanced bus generally operates in mixed-flow traffic conditions; however, semi-exclusive lane treatments in targeted locations and transit signal priority are desirable to help improve transit travel time. An example of an enhanced bus vehicle and station is shown in Figure 2. Other characteristics of enhanced bus include:

- Uses rubber tired vehicles with either diesel or diesel electric hybrid propulsion systems. Some battery electric-only technologies are currently being tested.
- Typically uses low-floored articulated vehicles that can accommodate 40 - 58 seated passengers and a full standing load of 60 - 105 passengers.[1]
- Vehicles travel 10 to 20 mph.[2]
- Stations are spaced approximately ¼ to ½ mile apart.[3]
- Station platforms area positioned to allow for level or near-level passenger boarding and alighting.
- Stations vary in size, but are equipped with premium amenities such as off-board fare collection systems and real time signage.
- All system elements have a unique branding identity that distinguishes the service from local bus service.

Figure 2: Enhanced bus in Kansas City, Missouri

[1] Metro Transit, 2011. "Arterial Transitway Corridors Study: Technical Memorandum #2 Arterial Transit Modes," pg. 6
[2] Ibid. 1, pg. 4
[3] Metropolitan Council, 2012: "Regional Transitway Guidelines," pg. 23

Streetcar: Streetcar is a rail transit mode that typically operates on tracks running on city streets, however for the Midtown AA we are considering both street running and dedicated right-of-way alternatives. Streetcars on Lake Street would operate in mixed traffic conditions and make frequent stops, similar to local bus, however in the Midtown Greenway streetcars would operate in an exclusive right-of-way and stop less frequently. Streetcars function more as a part of a local circulation system as opposed to a regional transportation system. Some "rapid streetcar" corridors are planned with limited stop spacing. Still, most existing modern streetcar lines are designed for shorter-distance trips. Most often, streetcars are powered by electricity supplied through an overhead wire. An example of a streetcar vehicle is shown in Figure 3. Other characteristics of streetcars include:

- Vehicles are generally powered by electricity supplied through an overhead wire; however off-wire technologies are emerging.
- Modern street car vehicles are single-unit low-floor vehicles with articulated sections that allow them to navigate tight turns.
- Vehicles travel 6 to 12 mph[4] in mixed-traffic; up to 30 to 45 mph in dedicated right-of-way
- Modern street car vehicles can accommodate 30 - 70 seated passengers and a full standing load of 115 - 160 passengers.[5]
- Stations are spaced approximately ¼ to ½ mile apart.[6]
- Station platforms are positioned to allow for level or almost level passenger boarding and alighting
- Stations vary in size, but are equipped with premium amenities such as off-board fare collection systems and real time signage.

Figure 3: Streetcar in Portland, Oregon

[4] Ibid. 1, pg. 4
[5] Ibid. 1, pg. 6
[6] Ibid. 2, pg. 23

Dedicated Busway: A dedicated busway system uses the same vehicles, station amenities, and branding strategies as enhanced bus; however dedicated busways operate in fixed guideways that are separated from mixed traffic. The goal of a dedicated busway is to approach the service quality of LRT, while still enjoying the cost savings and flexibility of bus transit. An example of a dedicated busway vehicle and station is shown in Figure 4. Other characteristics of dedicated busway include:

- Uses rubber tired vehicles with either diesel or diesel electric hybrid propulsion systems. Some battery electric-only technologies are currently being tested.
- Typically uses low-floored articulated vehicles that can accommodate 40 - 58 seated passengers and a full standing load of 60 - 105 passengers.[7]
- Vehicles travel 15 to 25+ mph[8]
- Stations are spaced approximately ½ to 1 mile apart.[9]
- Station platforms are positioned to allow for level or almost level passenger boarding and alighting
- Stations vary in size, but are equipped with premium amenities such as off-board fare collection systems and real time signage.
- All system elements have a unique branding identity that distinguishes the service from local bus service.

Figure 4: Fixed Guideway BRT in Cleveland, Ohio

[7] Ibid. 2, pg. 45
[8] Ibid. 1, pg. 4
[9] Ibid. 2, pg. 23

Light Rail Transit (LRT): LRT is a rail transit mode that operates on tracks within an exclusive fixed guideway. LRT systems operate at higher speeds and have a higher passenger capacity than streetcar systems. Station platforms are larger when compared to the other modes; however, they are equipped with the same premium amenities. An example of a LRT vehicle is shown in Figure 5. The footprint of LRT is larger than a dedicated busway, but smaller than commuter rail. Other characteristics of LRT include:

- Vehicles are generally powered by electricity supplied through an overhead wire.
- Vehicles generally travel at 40 mph, but travel at slower speeds in denser areas[10]
- LRT vehicles currently in operation in the Twin Cities metro region can accommodate 66 seated passengers and a full standing load of 120 passengers. [11] Vehicles can be coupled together to increase passenger capacity.
- Stations are spaced approximately ½ to 1 mile apart.[12]
- Station platforms are positioned to allow for level or near-level passenger boarding and alighting

Figure 5: Light rail vehicle in Minneapolis, Minnesota

[10] Metro Transit, "Facts About Trains and Construction." http://metrotransit.org/facts-about-trains-and-construction.aspx.
[11] Ibid. 10
[12] Ibid. 2, pg. 23

Personal Rapid Transit (PRT): PRT is transit mode that uses small cars on a network of fixed guideways intended to accommodate an individual or a single party of travelers. PRT fixed guideways are narrower than an LRT fixed guideway and can be located above ground or at ground level. PRT is meant to be completely automated and provide non-stop, on-demand service to a passenger's destination. The theoretical benefits of this type of service include shorter wait times, shorter trip times as PRT has no interim stops, and a comfortable seated trip. However, there are currently no large-scale PRT systems in operation. An example of a PRT test vehicle is shown in Figure 6. Other characteristics of PRT include:

Figure 6: PRT Test Vehicle

- PRT fixed-guideways must be completely separated from pedestrian and automobile crossings to allow for safe PRT automation.
- Cars are designed to carry 4 – 6 passengers
- Stations are located off-line to allow in service vehicles to bypass stations

Commuter Rail: Commuter rail is a rail transit mode that operates on tracks within an exclusive fixed guideway. Unlike the other initially considered modes, commuter rail is intended to serve trip origins seven miles or more from the Twin Cities metro region's central business districts.[13] Commuter rail stations are generally very large and include park and ride lots. An example of a commuter rail vehicle is shown in Figure 7. The footprint of commuter rail is the largest of all six initially considered modes. Other characteristics of commuter rail include:

Figure 7: Northstar Commuter Train

- Vehicles are powered by diesel electric locomotives.
- Vehicles currently in operation in the Twin Cities metro region can accommodate 139 – 145 seated passengers with additional space for standing passengers.[14]
- Vehicles have a top speed of 79 mph[15]
- Stations are spaced approximately 5 – 7 miles apart.[16]

Table 1 shows a side-by-side comparison of all six initially considered transit modes.

[13] Ibid. 2, pg. 19
[14] Metro Transit, "Northstar facts and funding." http://www.metrotransit.org/facts--funding.aspx.
[15] Ibid. 14
[16] Ibid. 2, pg. 23

Table 1: Mode Characteristics

	DEDICATED GUIDEWAY				MIXED TRAFFIC	
	Dedicated Busway	**Light Rail (LRT)**	**Commuter Rail**	**PRT**	**Streetcar**	**Enhanced Bus**
Runningway	Vehicles operate in right-of-way exclusively for buses. Sometimes a mixed-traffic lanes is used for short distances	Operates in right-of-way exclusively for the LRT vehicles	Operates in right-of-way exclusively for commuter rail vehicles	Operates in right-of-way exclusively for PRT vehicles	Typically operates in mixed-traffic lanes, but can also be in right-of-way exclusively for streetcar vehicles	Enhanced bus vehicles operate in mixed traffic
Station Spacing	In exclusive right-of-way corridors, stations are located every ½ to one mile	Station located every ½ to one mile	Station located every 5 - 7 miles	Very frequently spaced stations	Stations located every ¼ to ½ mile	Stations located every ¼ to ½ mile
Station Amenities	Distinct shelters with passenger amenities like real-time information, fare-collection, and security features	Distinct shelters with passenger amenities like real-time information, fare-collection, and security features	Distinct shelters with passenger amenities like real-time information, fare-collection, and security features	Minimal amenities	Stations can range from basic stops with minimal passenger amenities to LRT-like stations	Stations can range from basic stops with minimal passenger amenities to LRT-like stations
Vehicle Type	Diesel or diesel-electric hybrid vehicles. Some vehicles testing battery electric-only operation.	Electrically powered vehicles with overhead wires	Diesel electric locomotives	Electrically powered vehicles	Electrically powered vehicles with overhead wires. Some vehicles are testing on-board batteries for short distances	Diesel or diesel-electric hybrid vehicles. Some vehicles testing battery electric-only operation.
Operating Speed	15 – 25 + mph	Less than 40 mph	Top speed of 79 mph	Unknown	6 – 12 mph	10 – 20 mph
Passenger Capacity	40 - 58 seated passengers and a full standing load of 60 - 105 passengers.	66 seated passengers and a full standing load of 120 passengers. LRT vehicles can be coupled together to increase capacity.	139 – 145 seated passengers with additional space for standing passengers	4 – 6 passengers per vehicle	30 - 70 seated passengers and a full standing load of 115 - 160 passengers. Unlike LRT, vehicles operate as single units.	40 - 58 seated passengers and a full standing load of 60 - 105 passengers.
Example Operating Locations	Boston, Cleveland, Los Angeles	Minneapolis, Dallas, San Diego	Twin Cities metro,	Morgantown, West Virginia	Portland, Seattle, Toronto	Kansas City, Oakland, Seattle

Universe of Alternatives

The initial screening analysis evaluated the following ten alternatives:

- Enhanced bus on Lake Street
- Streetcar on Lake Street
- LRT on Lake Street
- Dedicated Busway on Lake Street
- Double/Single Track Streetcar on the Greenway
- Full Double Track LRT/Streetcar on the Greenway
- Dedicated Busway on the Greenway
- Personal Rapid Transit on the Greenway
- Commuter Rail on the Greenway
- Streetcar Lake Street/Greenway Loop (uses both Lake Street and the Midtown Greenway)

Screening

The initial screening analysis used six screening criteria, listed below and summarized in Table 2, to evaluate the project's universe of alternatives. The screening criteria reflect different aspects of the project's purpose and need statement. Alternatives were given a score of Poor, Fair, Good or Best depending on how well they fulfilled each criterion. The following section discusses the measures used to generate a score for each screening criteria.

Screening Criteria

Screening Criteria 1: Consistency with regional and local plans

For screening criteria 1, each alternative was assessed to determine if it was consistent with the guidelines and recommendations from the Metropolitan Council's *Transportation Policy Plan* and the *Regional Transitway Guidelines*; both documents lay out the vision and set guidelines for transit investments in the region. Also, each alternative was assessed to determine consistencies with local plans and polices such as the *Arterial Transitway Corridors Study* and the *Minneapolis Streetcar Feasibility Study*. Alternatives that were consistent with a higher number of regional and local plans received higher scores.

Screening Criteria 2: Level of access provided to jobs and residents

Screening criteria 2 gauged how well each alternative provided access to jobs and residents in the Midtown Corridor. Scores were given based on the number of people and jobs within ¼ mile and ½ mile of the alternative's station locations. Station locations were based on previous studies and the station spacing guidelines listed in the *Regional Transitway Guidelines*. Alternatives received a score based on the *relative* number of jobs and residents served. The alternative that served the highest number of jobs and residents received a score of 'Best;' then each remaining alternative was scored in comparison to the 'Best' alternative. Finally, scores for alternatives that operated in the Midtown Greenway were adjusted downward, because reduced visibility in the Greenway would make it more difficult for users to locate transit stations.

Screening Criteria 3: Ability to provide desired transit capacity and speed increases

Screening criteria 3 assessed how well each alternative would provide transit capacity and speed increases. Alternatives were scored based on the accepted operating speed of each transit mode, if the

alternative would be affected by traffic congestion, and other high level operational assumptions. Scores were also affected by the assumed passenger vehicle capacity of each mode. Alternatives that would operate at higher speeds and provide higher passenger capacities received higher scores.

Screening Criteria 4: Compatibility with existing transportation modes and infrastructure

Screening criteria 4 assessed each alternative's compatibility with existing transportation modes and infrastructure. For example, high level assumptions were used to determine how well each alternative would connect with the existing and planned LRT stations along the Blue Line (Hiawatha) and the Green Line (Southwest) LRT station, and how each alternative would affect existing transit, car, bicycle and pedestrian networks. Alternatives that offered better connections to the existing/planned LRT stations and had fewer effects on existing transportation networks received higher scores.

Screening Criteria 5: Potential right-of-way (ROW) impacts

Screening criteria 5 used general assumptions (i.e. how much area each alternative would require for a guideway, stations and power source infrastructure) to gauge how much ROW each alternative would require. Alternatives that required less ROW received higher scores.

Screening Criteria 6: Community and stakeholder sentiment

Screening criteria 6 scored each alternative based on how well it conformed to five sentiments consistently expressed by the public and the project advisory and stakeholder committees. The five sentiments were:

- Does not require reconstruction of Lake Street
- Does not remove a travel lane or greatly impact parking on Lake Street
- Minimizes impacts to Greenway historic and cultural resources
- Minimizes impacts to Greenway bicycle and pedestrian facilities
- Mode is felt to have potential to spur economic development

Alternatives that were the most compatible with these sentiment statements received higher scores.

Screening Process

The initial screening used a two-step screening process to narrow down the universe of alternatives. First, all alternatives were screened using Criteria 1, consistency with regional and local plans. Any alternatives that scored a 'Poor,' for this criterion were considered fatally flawed and were not advanced further in the screening process. Then all remaining alternatives were scored against the rest of the criteria. Alternatives with the highest overall score were advanced to the next phase of the study for further in-depth technical analysis and comparison to a no-build alternative.

Table 2: Initial Screening Criteria

Screening Criteria	Screening Requirements
1. Consistency with regional and local plans	• Mode characteristics are consistent with Metropolitan Council recommendations stated in the *Transportation Policy Plan* and in the *Regional Transitway Guidelines* • Mode characteristics are consistent with local and other plans and policies
2. Level of access provided to jobs and residents	• Mode station spacing guidelines provide sufficient numbers of stations within the study area to adequately serve major destination and activity centers
3. Ability to provide desired transit capacity and speed increases	• Mode design characteristics allow for transit speed increases • Mode is appropriate scale current ridership levels but also provides room for growth
4. Compatibility with existing transportation modes and infrastructure	• Mode integrates well with existing transportation infrastructure and systems.
5. Potential ROW impacts	• Mode requires minimal right-of-way
6. Community and stakeholder sentiment	• Mode is compatible with the following five sentiments consistently expressed by the public and the project advisory and stakeholder committees: • Does not require reconstruction of Lake Street • Does not remove a travel lane or greatly impact parking on Lake Street • Minimizes impacts to Greenway historic and cultural resources • Minimizes impacts to Greenway bicycle and pedestrian facilities • Mode is felt to have potential to spur economic development

Summary of Initial Screening Analysis Results

The results of the Initial Screening Analysis are shown in Figure 8. The detailed analysis and scoring of each alternative is included in Appendix A and a map of each alternative is included in Appendix B.

Of the ten initially considered alternatives, two alternatives, Commuter Rail on the Greenway and PRT on the Greenway, were not consistent with regional and local plans, and were dropped from the screening process. The remaining eight alternatives were all fully screened and given an overall rating. As shown in Figure 8, enhanced bus on Lake Street and Double/Single Track Rail had the highest overall scores and were advanced for further in-depth analysis.

Figure 8: Initial Screening Analysis Results

		Lake Street				Midtown Greenway			Both
	Screening Criteria	Enhanced Bus	Streetcar	LRT	Dedicated Busway	Double / Single-Track	Full Double-Track	Dedicated Busway	Streetcar Loop
1	Consistency with regional and local plans	Very Good	Fair	Good	Good	Very Good	Good	Good	Good
2	Level of access provided to jobs and residents	Fair	Good	Fair	Fair	Fair	Fair	Fair	Poor
3	Ability to provide desired transit capacity and speed increases	Fair	Fair	Good	Good	Good	Very Good	Good	Fair
4	Compatibility with existing transportation modes and infrastructure	Very Good	Good	Poor	Poor	Good	Poor	Good	Fair
5	Potential right of way impacts	Very Good	Fair	Poor	Poor	Good	Good	Good	Poor
6	Community and stakeholder sentiment	Good	Fair	Poor	Poor	Very Good	Poor	Poor	Fair
	Overall rating	Good	Fair	Poor	Poor	Good	Fair	Fair	Poor
		Alternative Advanced				Alternative Advanced			

Alternatives Advanced for Further Study

The initial screening process advanced two alternatives for in-depth analysis and comparison to the no-build alternative: enhanced bus on Lake Street and streetcar in the Midtown Greenway. A third alternative of both enhanced bus on Lake Street and a streetcar on the Greenway is also being considered. In this scenario enhanced bus could be extended east outside of the study area, which was done in response to interest expressed by project stakeholders during the initial screening process. The three alternatives advanced for further study and in-depth analysis and the No-Build alternative are described in this section.

2030 No-Build Alternative

The No-Build Alternative is included in every AA to establish a starting point for evaluating the benefits and costs of other alternatives, as well as to identify the consequences of doing nothing. The 2030 No-Build Alternative includes current services as well as planned enhancements to the existing transit as stated in the Metropolitan Council's 2030 Transportation Policy Plan, as amended in May 2013. These changes are based upon approved funding and are being built into the operational planning. The 2030 No-Build Alternative assumes that no additional transit service changes will be made within the Midtown Corridor, representing a fiscally constrained plan that is consistent with service policies. However, the 2030 No-Build Alternative includes several significant improvements to the regional transit system, as outlined in Table 3. Each of the projects in Table 3 has an associated local service connectivity plan. The No-Build alternative also assumes the changes outlined these plans, along with all other local and regional bus improvements as consistent with guidance from the Metropolitan Council.

Table 3: Regional Transit Improvements Included in the No-Build Alternative

Type of Transit Improvement	Project
Light Rail Transit	• Central Corridor LRT (Future Green Line) LRT • Southwest LRT (Future Green Line Extension) • Bottineau LRT (Future Blue Line Extension)
Highway BRT	• I-35W BRT (Future Orange Line)
Enhanced bus	• West Broadway Enhanced bus • Chicago-Emerson/Freemont Enhanced bus • Snelling Avenue Enhanced bus • Central Avenue Enhanced bus • Nicollet Avenue Enhanced bus

Enhanced Bus on Lake Street

The enhanced bus on Lake Street alternative is a little over four miles long and operates almost exclusively along Lake Street. The alignment begins at the planned Green Line (Southwest LRT) West Lake Street Station and ends at the Blue Line (Hiawatha LRT) Midtown Station, as shown on Figure 1 in Appendix B. A former streetcar corridor and current high-frequency bus corridor, Lake Street is the primary east-west commercial corridor in south Minneapolis and contains a mix of retail and residential uses. The majority of the alignment has two travel lanes per direction and street parking is allowed in many locations. A small section of Lake Street between Dupont Avenue South and East Lake Calhoun

Parkway operates as a one-way pair with Lagoon Ave; the alternative follows this existing traffic pattern. The alternative has 13 potential stations located approximately every 1/3 mile. Enhanced bus on Lake Street will use diesel electric hybrid buses that will run in mixed traffic along the alignment. The stations and transit vehicles will all be branded with a unique identity to distinguish the service from local bus service.

Double/Single-Track Rail in the Greenway

The double/single-track rail alternative in the Greenway is 4.4 miles long and runs almost exclusively along the Midtown Greenway. The alignment begins at the planned Green Line West Lake Street Station and ends at the Blue Line Lake Street-Midtown Station, as shown in Figure 4 in Appendix B. Owned by the Hennepin County Regional Railroad Authority (HCRRA), the Midtown Greenway is a former Canadian Pacific Railway/Soo Line freight rail facility. The property was purchased by HCRRA in 1993 for the purpose of constructing LRT or other transportation systems and associated facilities. One of the unique features of the Greenway is that the alignment is mostly grade-separated from the existing street network. The alignment's right of way is generally 100 feet wide, but the width between the embankments varies. The alternative leaves the Greenway briefly at the eastern end of the alignment to access the Blue Line station. The alternative has nine potential station locations, located approximately every ½ mile. Double/Single-Track Rail in the Greenway will use a streetcar or LRT vehicle that will be propelled along rails by electricity supplied through an overhead wire. The rails will run in an exclusive guideway along the Midtown Greenway.

Dual Alternative - Combination of Enhanced Bus and Streetcar

The third build alternative combines the first two alternatives: an enhanced bus on Lake Street combined with a double/single track rail in the Greenway. For the details of each piece of the combined alternative please see the descriptions of the first two alternatives.

Enhanced Bus Extension

The configuration is a response to stakeholder interest in providing transitway improvements on Lake Street east of Hiawatha Ave. This alternative will extend the enhanced bus alignment east of the Hiawatha LRT station and into Saint Paul and will be analyzed in conjunction with the Dual Alternative. With the extension included, the enhanced bus alignment is approximately eight and a half miles long. East of the Blue Line Hiawatha LRT station, the extension continues to operate on Lake Street; after crossing the Mississippi River it operates on Marshall Avenue, as shown in Figure 1 in Appendix C. East of Hiawatha, the configuration of Lake Street remains generally the same with two travel lanes per direction and street parking many locations. In contrast, Marshall Avenue consists of one lane per direction with striped bike lanes. Street parking is also allowed in many locations along Marshall Avenue. With the potential extension included, the enhanced bus alignment has 24 proposed station locations, spaced approximately every 0.4 miles.