



City of Minneapolis



# Minneapolis Streetcar Feasibility Study Phase II Evaluation Report

November 2006

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consulting associates



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# Executive Summary

The Phase I Screening Report evaluated each of the 14 candidate corridors based on geometric and physical characteristics that support the feasibility of streetcar operations. The Phase I evaluation eliminated several candidate corridors from further study, as well as portions of several others. Corridors carried forward to the Phase II analysis include:

- W Broadway Avenue – Robbinsdale Transit Center to downtown
- Central Avenue NE – 29<sup>th</sup> Avenue NE to downtown
- Chicago Avenue S – Lake Street to downtown
- Franklin Avenue – between Nicollet Avenue S and Chicago Avenue S
- Hennepin Avenue S – Lake Street (Uptown) to downtown
- Lake Street / Midtown Greenway – Southwest Corridor LRT to Hiawatha LRT
- Nicollet Avenue S – 66<sup>th</sup> Street to downtown
- University Avenue SE / 4<sup>th</sup> Street SE – University Village to downtown
- Washington Avenue – Plymouth Avenue to I-35W
- Lyndale Avenue S – Lake Street to downtown

## Downtown Connections

A key element in defining the future streetcar network involves connecting a potential streetcar corridor with a potential route into and through downtown. By pairing the downtown routes with corridors that extend beyond downtown, it is possible to determine which corridors have the highest potential for streetcars in the long term, and also point to areas that would have higher potential in the short term.

Most of the corridors carried forward from the Phase I analysis have logical connections through downtown. The following summarizes the assumed routing through downtown for proposed streetcar corridors. In cases where there are obvious alternates, these are also described below.

- **W. Broadway Avenue.** This corridor would include Washington Avenue west of Nicollet Avenue and would continue through downtown either via Nicollet or Chicago Avenue.
- **Central Avenue NE.** This corridor could include the 3<sup>rd</sup> Avenue bridge and Washington Avenue to Nicollet Avenue or Hennepin Avenue. Alternatively, if streetcar service is not feasible on the 3<sup>rd</sup> Avenue bridge, the Hennepin Avenue bridge could be used as an alternative routing into downtown. This corridor would either continue across downtown via Nicollet Avenue or Hennepin Avenue.

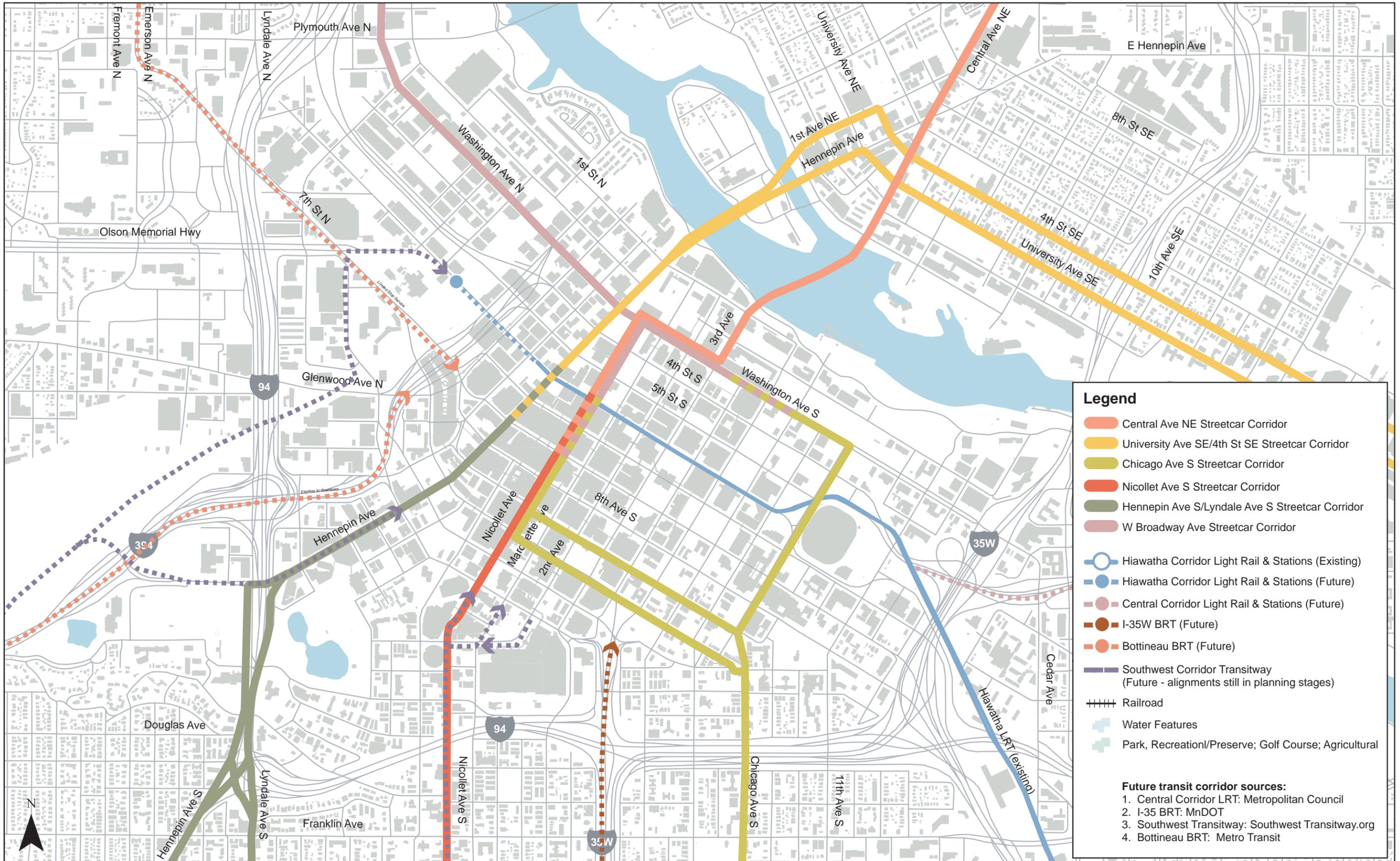
- **Chicago Avenue S.** Several alternative downtown routings are possible for this corridor. The first option would be via 9<sup>th</sup> and 10<sup>th</sup> Street S to Nicollet Avenue. The second option would include Chicago Avenue as far north as Washington Avenue, as well as Washington Avenue between Chicago Avenue and Nicollet Avenue.
- **Hennepin Avenue S.** This corridor would continue on Hennepin Avenue to Washington Avenue.
- **Nicollet Avenue S.** This corridor would continue on Nicollet Avenue to Washington Avenue.
- **University Avenue SE/4<sup>th</sup> Street SE.** This corridor would also include Hennepin Avenue E and 1<sup>st</sup> Avenue NE and then Hennepin Avenue into and through downtown.
- **Washington Avenue.** Rather than be evaluated individually, this corridor will be evaluated as part of the W Broadway Avenue and Chicago Avenue S corridors.
- **Lyndale Avenue S.** This corridor would include Hennepin to Washington Avenue.
- **Franklin Avenue.** This corridor includes Franklin Avenue between Nicollet Avenue S and Chicago Avenue S.

Defining the operating routes through downtown is important for several reasons. Historically, streetcar routes in Minneapolis did not terminate in the heart of downtown, but rather traveled through the downtown and provided connections on either side of downtown. Second, establishing the path of travel through downtown makes it possible to evaluate initial segments for implementation that have the land uses and travel density that would support streetcar service, but that may not have adequate capacity on the Metro Transit system. As the figure illustrates, this broad network creates a number of strategic connections in the potential streetcar network which maximize operating flexibility with full implementation. These connections include:

- Broadway to Chicago – via Nicollet
- Broadway to Chicago – via Chicago and Washington
- Central to Nicollet – via Nicollet
- Central to Hennepin – via Hennepin
- Hennepin to University/4<sup>th</sup> - via Hennepin
- Lyndale to University/4<sup>th</sup> – via Hennepin

It should be noted that two corridors, Franklin Avenue and the Midtown Greenway/Lake Street corridor do not serve downtown, but rather provide east-west connections with other potential streetcar and light rail services outside of downtown. Figure ES-1 below shows this network.

# Figure ES-1 Downtown Minneapolis Connections between Corridors

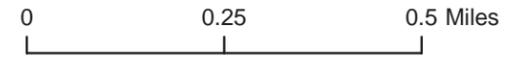


**Legend**

- Central Ave NE Streetcar Corridor
- University Ave SE/4th St SE Streetcar Corridor
- Chicago Ave S Streetcar Corridor
- Nicollet Ave S Streetcar Corridor
- Hennepin Ave S/Lyndale Ave S Streetcar Corridor
- W Broadway Ave Streetcar Corridor
- Hiawatha Corridor Light Rail & Stations (Existing)
- Hiawatha Corridor Light Rail & Stations (Future)
- Central Corridor Light Rail & Stations (Future)
- I-35W BRT (Future)
- Bottineau BRT (Future)
- Southwest Corridor Transitway (Future - alignments still in planning stages)
- + Railroad
- + Water Features
- + Park, Recreation/Preserve; Golf Course; Agricultural

**Future transit corridor sources:**

1. Central Corridor LRT: Metropolitan Council
2. I-35 BRT: MnDOT
3. Southwest Transitway: Southwest Transitway.org
4. Bottineau BRT: Metro Transit



## Phase II Evaluation Criteria

The Phase II evaluation criteria follow the evaluation plan presented in Phase I of the analysis. In some cases, the evaluation criteria have been modified slightly to better reflect available data. The criteria are organized in broad categories, each with several sub-criteria. A summary of the evaluation criteria used in the Phase II analysis is shown below:

- **Transit Supportive Land Use (Chapter 3)**
  - Special Use Generators and Corridor Anchors
  - Transit Supportive Land Use
- **Economic Development Potential (Chapter 4)**
  - Area Targeted for Redevelopment
- **Transit Operations (Chapter 5)**
  - Ability to Maintain Adequate Speed and Reliability
  - Relationship to other potential streetcar corridors
  - Relationship to current/future high capacity transit investments
  - Competition with LRT or BRT lines
  - Replacement of existing bus service
- **Transit Demand (Chapter 6)**
  - Projected Population Density Within Corridor
  - Projected Employment Density Within Corridor
  - Low Income Household Density Within Corridor
  - Zero Car Household Density Within Corridor
- **Cost-Effectiveness (Chapter 7)**
  - Utilities
  - Capital Costs

This report follows the evaluation criteria as an outline. A discussion of how the corridors were assessed based on these criteria is included throughout the report.

## Summary and Recommended Long-Term Streetcar Network

All of the corridors that passed the Phase I screening completed earlier in this study are at least technically feasible for operation as a streetcar corridor. However, not all corridors are equally well suited for streetcar operations in the short term.

Figure ES-2 below provides a summary of the results of the Phase II analysis and identifies those corridors that best meet each of the criteria used in this phase of the evaluation. The table identifies the opportunities and constraints presented by each corridor based on the broad criteria of Transit Supportive Land Use, Economic Development Potential, Transit Operations, Demand Potential, and Cost Effectiveness. Other considerations are identified, where they are evident.

Figure ES-2 Summary of Phase II Analysis

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Ave NE	Lake St	Nicollet Ave S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Ave S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
<b>Transit-Supportive Land Use</b>	Serves only one special generator but has relatively strong anchors. Low transit supportive land use.	Does not serve any special generators and weak anchor on north end. Moderate to low transit supportive land use.	Serves a moderate number of special generators and has high transit-supportive land use.	Does not serve special generators and no anchors. Not scored for transit supportive land use, but serves dense neighborhood.	Serves many special generators, has strong anchors and has moderately high transit-supportive land use.	Serves several special use generators and has strong anchors. Moderate transit supportive land use.	Serves several special use generators and has strong anchors. Moderate transit supportive land use.	Serves moderate number of special generators, has moderately strong anchors and moderate transit supportive land use (higher north of Lake).	Serves several important special generators, has strong anchors and high transit supportive land use.	Serves moderate number of special generators, but weak anchor on south end. Moderately high transit supportive land use.
<b>Economic Development Potential</b>	Strong potential for high intensity development in North Loop area. Some potential for moderate to low intensity development along the rest of the corridor.	Some potential for moderate intensity development in East Hennepin area and along corridor near Lowry. Good potential downtown.	Strong potential for high-intensity development downtown and moderate intensity development at Midtown Greenway/Lake Street.	Relatively low redevelopment potential.	Strong potential for high-intensity infill development in Uptown, and in several locations in downtown (near Washington Avenue and near 10 <sup>th</sup> Street).	Good potential for moderate intensity development along Greenway – especially at major nodes.	Good potential for moderate intensity development at major nodes – Hennepin, Lyndale, Nicollet, Chicago and to a lesser degree, Bloomington.	Good potential for moderate intensity development at Greenway and Lake Street and between Lake and downtown.	Good potential for high intensity development along river (south of University) and moderate intensity development in East Hennepin area.	Some potential for moderate intensity development at Midtown Greenway/Lake Street, and in several locations downtown.
<b>Transit Operations</b>	Good potential to impact bus volumes; relatively good connections with other modes; minor duplication with Bottineau BRT.	Limited ability to impact bus volumes; relatively good connection with other modes; potential duplication with University/4 <sup>th</sup> corridor.	If extended to 38 <sup>th</sup> Street, good potential to impact bus volumes; good connections to other modes.	Limited utility as a connecting corridor.	Limited ability to impact bus volumes; relatively good connections to other modes.	Limited potential to impact bus volumes; strong ability to connect Southwest Corridor LRT to Hiawatha LRT. No connection to other modes downtown.	Strong potential to impact bus volumes; moderate ability to connect Southwest Corridor LRT to Hiawatha LRT; no connection to other modes downtown.	Strong potential to impact bus volumes; good connections to other modes.	Strong potential to impact bus volumes; good connections to other modes.	Limited ability to impact bus volumes; relatively good connections to other modes.
<b>Transit Demand</b>	Scored low in all indicators, especially population density and density of low-income and zero-vehicle households.	Scored low to moderate in for all indicators.	Scores high in all indicators, especially population and employment density.	Corridor not evaluated	Scores high in population and employment density, moderate in other indicators.	Scored moderate in all indicators.	Scored moderate in all indicators.	Scores moderate in all indicators but is the longest corridor under evaluation. The corridor north of Lake would likely score very high.	Scored high in employment density, average in other indicators.	Highest scoring corridor in most indicators.
<b>Cost Effectiveness</b>	Limited utility conflicts; no major increase over standard capital costs/mile.	Strong potential for utility conflicts; potential for higher capital costs due to long bridge crossing.	Limited utility conflicts; no major increase over standard capital costs/mile.	Limited utility conflicts; no major increase over standard capital costs/mile.	Limited utility conflicts; moderate potential for higher capital costs due to Lowry Hill tunnel.	Limited utility conflicts; no major increase over standard capital costs/mile – potentially could be less costly if single-track.	Minor potential for utility conflicts; moderate potential for higher capital costs due to several bridges and reconstruction project	Potential for utility conflicts on Nicollet Mall; capital costs higher in some segments, but relatively low overall.	Strong potential for utility conflicts in University area; potential for moderately high capital costs due to bridge crossings.	Moderate potential for utility conflicts; potential for higher capital costs due to Lowry Hill tunnel.
<b>Other Issues (not included in evaluation criteria)</b>	No other major issues.	No other major issues.	No other major issues.	No other major issues.	No other major issues.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT; Major reconstruction and streetscaping project on Lake Street.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT.	No other major issues.	No other major issues.

Figure ES-3 below summarizes the recommendations developed as a result of this phase of the analysis and Figure ES-4 provides a map of the corridors recommended for the long-term streetcar network.

**Figure ES-3 Streetcar Corridors Carried Forward to Phase III Evaluation**

<b>Candidate Corridor</b>	<b>Included in Long-Term Streetcar Network?</b>	<b>Comments / Explanation</b>
<b>W Broadway Avenue</b>	<b>Yes</b>	Lacks high intensity land uses but shows long-term potential, especially east of Penn Avenue N.
<b>Central Avenue NE</b>	<b>Yes</b>	Lacks high intensity land uses but shows long-term potential, especially near Lowry Avenue NE and in East Hennepin area.
<b>Chicago Avenue S</b>	<b>Yes</b>	High intensity land uses along entire corridor with both short- and long-term potential. At least two potential alignments through downtown are included.
Franklin Avenue	No	Does not work as a stand-alone corridor.
<b>Hennepin Avenue S</b>	<b>Yes</b>	High intensity land uses in Uptown and in downtown with short-and long-term potential.
Lake Street	No	Good potential to impact local bus network and more traditional streetcar corridor. However, has less potential as a regional connection between LRT lines compared to Midtown Greenway and corridor in process of major reconstruction and streetscaping project.
<b>Midtown Greenway</b>	<b>Yes</b>	Good redevelopment potential and ease of transit operations. Better than Lake Street at providing regional connection between Hiawatha and Southwest Corridor LRT lines.
<b>Nicollet Avenue S</b>	<b>Yes, only as far as 38<sup>th</sup> Street</b>	High intensity land uses (north of Lake Street) with strong potential to impact local transit services. <i>Note: would not be included if the Uptown/Nicollet alignment is chosen for the Southwest Corridor LRT line.</i>
<b>University Avenue SE / 4<sup>th</sup> Street SE</b>	<b>Yes</b>	High intensity land uses in downtown, East Hennepin area and around the University of Minnesota. Both short and long-term potential.
Lyndale Avenue S	No	Less redevelopment potential and minimal impact on transit operations. Higher capital costs than other corridors.

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**Figure ES-4 Long-Term Streetcar Network Carried Forward to Phase III Analysis**



**Legend**

Transit Centers

- Existing (Red T icon)
- Planned (White T icon)

Phase III Corridors

- Hiawatha Corridor Light Rail Line Alignment & Stations (Blue line with circles)
- I-35 BRT and Stations (future) (Red dashed line with circles)
- Central Corridor Light Rail Line Alignment & Stations (future) (Red dashed line with circles)
- Bottineau BRT Alignment & Stations (future) (Red dashed line with circles)
- Southwest Corridor Transitway Alignment (future - alignments still in planning stages) (Blue dashed line)

Other Features:

- Minneapolis City Boundary (Grey outline)
- Water Features (Blue)
- Park, Recreation/Preserve; Golf Course; Agricultural (Green)
- Undeveloped (Light Grey)
- Central Business Districts (CBD) (Dark Grey)

**Streetcar Corridors Carried Forward to Phase III**

- A** W Broadway Ave (Robbinsdale Transit Center to downtown) - via Washington
- B** Hennepin Ave S (downtown to Lake Street)
- C** Midtown Greenway (SW LRT to Hiawatha LRT)
- D** Nicollet Ave S (downtown to 38th St)
- E** University Ave SE/4th Street SE (downtown to Stadium Village) - via E Hennepin Ave
- F** Chicago Avenue S (downtown to 38th St) - downtown via 9th/10th St or Chicago Ave/Washington Ave
- G** Central Avenue NE (downtown to 29th Ave NE) - via 3rd Avenue

Source: MetroGIS, Met Council, and the City of Minneapolis



- Future transit corridor sources:**
1. Central Corridor LRT: Metropolitan Council
  2. I-35 BRT: MnDOT
  3. Southwest Transitway: Southwest Transitway.org
  4. Bottineau BRT: Metro Transit





# Chapter 1. Summary of Phase I Screening Evaluation

The Phase I Screening Report evaluated each of the 14 candidate corridors based on geometric and physical characteristics that are supportive of streetcar operations. The Phase I evaluation eliminated several candidate corridors from further study, as well as portions of several others. The results of that initial evaluation are summarized in Figure 1-1 below. Figure 1-2 shows a city-wide map of the remaining candidate corridors.

**Figure 1-1 Candidate Streetcar Corridors Carried Forward to Phase II Evaluation (Table)**

Candidate Corridor	Carried Forward from Phase I Evaluation	Phase II Corridor	Reason for Not Carrying Forward from Phase I Evaluation
W Broadway Ave	Yes, entire corridor	Downtown to Robbinsdale Transit Center	–
Central Ave NE	Yes, south of 29 <sup>th</sup> Ave NE	Downtown to 29 <sup>th</sup> Ave NE	Railroad crossing at 36 <sup>th</sup> Ave NE
Chicago Ave S	Yes, north of Lake St	Downtown to Lake St	Low transit-supportive land use south of Lake St
15 <sup>th</sup> Ave SE / Como Ave	No	–	Low underpass at 8 <sup>th</sup> St SE
Franklin Ave	Yes, between Nicollet Ave S and Chicago Ave S	Nicollet Ave S and Chicago Ave S	Steep grade east and west of Lyndale Ave S; low overpass at Hiawatha Ave
Fremont Ave N / 44 <sup>th</sup> Ave N / Osseo Rd	No	–	No strong anchor north of 44 <sup>th</sup> Ave N / Penn; Difficult turns at Fremont/Plymouth; Low transit-supportive land use along entire corridor
Hennepin Ave S	Yes, entire corridor	Downtown and Lake St / Lagoon Ave	–
Lake St / Midtown Greenway	Yes, west of Hiawatha Avenue	Southwest LRT to Hiawatha LRT	Low transit-supportive land use east of Hiawatha
Nicollet Ave S	Yes, entire corridor	Downtown to 66 <sup>th</sup> St	–
University Ave SE /	Yes, entire corridor	Downtown to	–

Candidate Corridor	Carried Forward from Phase I Evaluation	Phase II Corridor	Reason for Not Carrying Forward from Phase I Evaluation
4 <sup>th</sup> St SE		Washington Ave SE	
Cedar Ave / Riverside Ave	No	–	Turning movements at Seven Corners; possible duplication with Hiawatha and Central LRT
Washington Ave	Yes, entire corridor	Plymouth Ave to I-35W	–
Penn Ave N / Hwy 55	No	–	No strong anchor north of 44 <sup>th</sup> Ave N / Penn; Low transit-supportive land use along entire corridor
Lyndale Ave S / Bryant Ave S	Yes, north of Lake	Downtown to Lake St	No strong anchor south of Lake St; Low transit-supportive land use south of Lake St

The purpose of the Phase II evaluation is to convert candidate corridor segments into logical streetcar routes which can be developed into an eventual streetcar system. This potential streetcar system is a long range vision, which can not be implemented in a single phase. Later analysis phases will determine the optimal segments for initial implementation.

Over the next 20 years, many land use changes are predicted for Minneapolis, which may increase or decrease the viability of a particular corridor for streetcar service. New corridors that may not have high potential in this analysis may appear more feasible in the future. The long term streetcar network proposed in this report is based on existing and projected information, and may evolve over time.

**Figure 1-2 Candidate Streetcar Corridors Carried Forward to Phase II Evaluation**



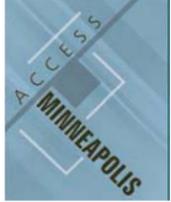
0 0.25 0.5 1 1.5 2 Miles

Source: MetroGIS, Met Council, and the City of Minneapolis

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**Future transit corridor sources:**

1. Central Corridor LRT: Metropolitan Council
2. I-35 BRT: MnDOT
3. Southwest Transitway: Southwest Transitway.org
4. Bottineau BRT: Metro Transit



## Downtown Connections

A key element in defining the future streetcar network involves connecting a potential streetcar corridor with a potential route into and through downtown. Most modern streetcar implementations have been in locations that are adjacent to downtown, but just outside of the area where high frequency transit is available with available capacity. By pairing the downtown routes with corridors that extend beyond downtown, it is possible to determine which corridors have the highest potential for streetcar in the long term, and also point to areas that would have higher potential in the short term.

Most of the corridors carried forward from the Phase I analysis have logical connections through downtown using Primary Transit Network (PTN) corridors. Several of these corridors, however, do not logically follow PTN corridors through downtown, or may have alternative routing options that serve potential redevelopment areas and/or provide connections to other streetcar corridors. A fundamental question which will need to be resolved about these routes is whether they should be focused on areas outside of the PTN network that have new development potential, or whether they should be designed to serve the existing core, where travel demand is established.

The following summarizes the assumed routing through downtown for proposed streetcar corridors. In cases where there are obvious alternates, these are also described below. A map showing this expansive streetcar network is shown on Figure 1-3.

- **W. Broadway Avenue.** This corridor would include Washington Avenue west of Nicollet Avenue and would continue through downtown either via Nicollet or Chicago Avenue.
- **Central Avenue NE.** This corridor could include the 3<sup>rd</sup> Avenue bridge and Washington Avenue to Nicollet Avenue or Hennepin Avenue. Alternatively, if streetcar service is not feasible on the 3<sup>rd</sup> Avenue bridge, the Hennepin Avenue bridge could be used as an alternative routing into downtown. This corridor would either continue across downtown via Nicollet Avenue or Hennepin Avenue.
- **Chicago Avenue S.** Several alternative downtown routings are possible for this corridor. The first option would be via 9<sup>th</sup> and 10<sup>th</sup> Street S to Nicollet Avenue. The second option would include Chicago Avenue as far north as Washington Avenue, as well as Washington Avenue between Chicago Avenue and Nicollet Avenue.
- **Hennepin Avenue S.** This corridor would continue on Hennepin Avenue to Washington Avenue.
- **Nicollet Avenue S.** This corridor would continue on Nicollet Avenue to Washington Avenue.
- **University Avenue SE/4<sup>th</sup> Street SE.** This corridor would also include Hennepin Avenue E and 1<sup>st</sup> Avenue NE and then Hennepin Avenue into and through downtown.

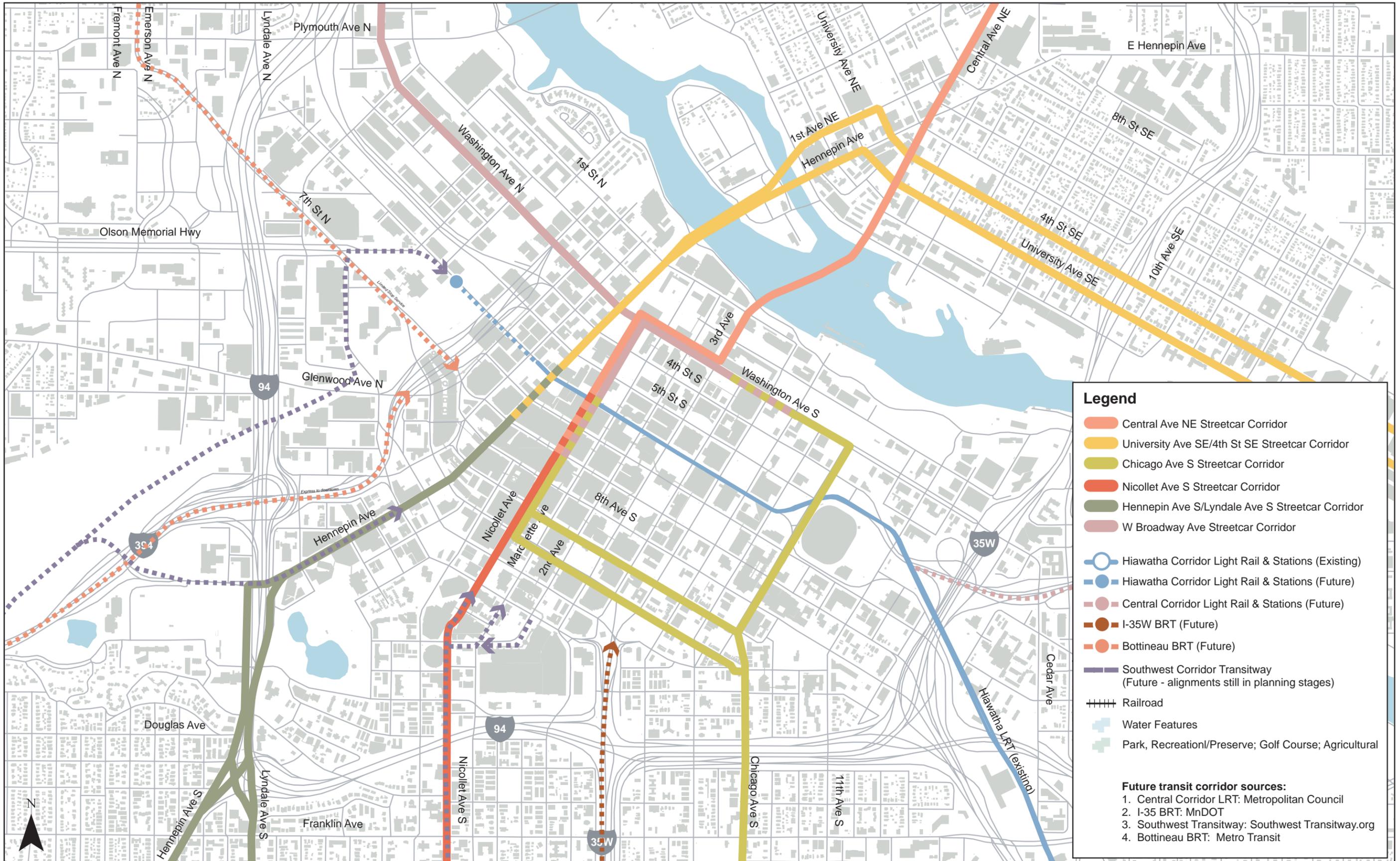
- **Washington Avenue.** Rather than be evaluated individually, this corridor will be evaluated as part of the W Broadway Avenue and Chicago Avenue S corridors.
- **Lyndale Avenue S.** This corridor would include Hennepin Avenue to Washington Avenue.
- **Franklin Avenue.** This corridor includes Franklin Avenue between Nicollet Avenue S and Chicago Avenue S.

Defining the operating routes through downtown is important for several reasons. Historically, streetcar routes in Minneapolis did not terminate in the heart of downtown, but rather traveled through the downtown and provided connections on either side of downtown. Second, establishing the path of travel through downtown makes it possible to evaluate initial segments for implementation that have the land uses and travel density that would support streetcar service, but that may not have adequate capacity on the Metro Transit system. As the figure illustrates, this broad network creates a number of strategic connections in the potential streetcar network which maximize operating flexibility with full implementation. These connections include:

- Broadway to Chicago – via Nicollet
- Broadway to Chicago – via Chicago and Washington
- Central to Nicollet – via Nicollet
- Central to Hennepin – via Hennepin
- Hennepin to University/4<sup>th</sup> - via Hennepin
- Lyndale to University/4<sup>th</sup> – via Hennepin

It should be noted that two corridors, Franklin Avenue and the Midtown Greenway/Lake Street corridor do not serve downtown, but rather provide east-west connections with other potential streetcar and light rail services outside of downtown.

# Figure 1-3 Downtown Minneapolis Connections between Corridors



**Legend**

- Central Ave NE Streetcar Corridor
- University Ave SE/4th St SE Streetcar Corridor
- Chicago Ave S Streetcar Corridor
- Nicollet Ave S Streetcar Corridor
- Hennepin Ave S/Lyndale Ave S Streetcar Corridor
- W Broadway Ave Streetcar Corridor
- Hiawatha Corridor Light Rail & Stations (Existing)
- Hiawatha Corridor Light Rail & Stations (Future)
- Central Corridor Light Rail & Stations (Future)
- I-35W BRT (Future)
- Bottineau BRT (Future)
- Southwest Corridor Transitway (Future - alignments still in planning stages)
- Railroad
- + Water Features
- + Park, Recreation/Preserve; Golf Course; Agricultural

**Future transit corridor sources:**

1. Central Corridor LRT: Metropolitan Council
2. I-35 BRT: MnDOT
3. Southwest Transitway: Southwest Transitway.org
4. Bottineau BRT: Metro Transit

0 0.25 0.5 Miles

## Chapter 2. Phase II Evaluation Criteria

The goal of this Phase II report is to develop a potential long range set of streetcar corridors operating primarily within the City of Minneapolis. Many of these streetcar corridors could easily be extended beyond their currently proposed outer terminus to serve additional suburban destinations. Expanding on the earlier, Phase I evaluation, this report includes additional analysis of:

- Transit Supportive Land Use
- Economic Development Potential
- Transit Operations
- Transit Demand
- Cost-Effectiveness

It should be noted that all of the corridors that “passed” the Phase I screening analysis are feasible and may at some time become higher priorities for implementation; however, the goal of this phase of analysis is to reduce the number of high priority corridors being carried through to the quantitative, third analysis phase, which will be completed in early 2007.

The Phase II evaluation criteria follow the evaluation plan presented earlier in this project. In some cases, the evaluation criteria have been modified slightly to better reflect available data. Finally, public outreach and stakeholder interviews will be a key component of Phase III of the study where a detailed assessment of economic development potential and interest among the development community will be conducted.

A summary of the Evaluation Criteria used in Phase II is presented in Figure 2-1. This table shows the criteria that were completed in the Phase I evaluation, the criteria that are used in this report, and those criteria that will be used in Phase III of the evaluation.

This report follows the evaluation criteria as an outline. A discussion of how the corridors were assessed based on these criteria is included throughout the report.

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**Figure 2-1 Phase II Evaluation Criteria**

Evaluation Criteria and Description	Conducted in Phase I (previous report)	Conducted in Phase II (this report)	Conducted in Phase III (next report)
<b>Transit Supportive Land Use</b>			
<b>Special Use Generators and Corridor Anchors.</b> Evaluates how well the corridor serves major transit generators, categorized by two different types of generators: “special use generators” and corridor anchors, such as major activity centers. This analysis is based on an evaluation of access to special use generators within ½ mile of the streetcar line.		Listing of “special transit generators” served within ½ mile of each corridor (as the crow flies). Also evaluates strength of anchors for each corridor.	
<b>Transit Supportive Land Use.</b> Measures transit supportive <i>planned</i> land use types (by land area) within ½ mile (as the crow flies) from the streetcar corridor. Existing zoning should be adjusted for planned land uses where significant differences are known.	Assessment of all candidate corridors as supplement to other Phase I evaluation criteria.	Modified to include extended corridors from Phase I analysis (Nicollet, Central and Broadway). Incorporates maximum zoning to measure intensity of development potential.	
<b>Economic Development Potential and Community Support</b>			
<b>Economic Development Potential.</b> Evaluates in more detail the potential of the corridor to generate significant economic development. Existing land use/density compared to ideal density with streetcars (based on the ¼ mile and ½ mile density estimate done for Hiawatha)			Land use/density comparison of corridors.
<b>Area Targeted for Redevelopment.</b> Measures whether or not a corridor is targeted for redevelopment, either in the Minneapolis Plan or other neighborhood planning initiatives.		Evaluates redevelopment and community planning initiatives in the corridor and assesses the intensity of development potential in each corridor.  Assesses maximum zoning potential in each corridor.	
<b>Community Support.</b> Evaluates level of community support for streetcar technology in the corridor.			Additional evaluation conducted after stakeholder and community meetings held.
<b>Coordination with Other Jurisdictions.</b> Evaluates the need to coordinate with other jurisdictions and assessment of barriers.			High level assessment of coordination with other jurisdictions and overall assessment of implementation barriers.
<b>Transit Operations</b>			
<b>Ability to Maintain Adequate Speed and Reliability.</b> Evaluates existing traffic conditions in the corridor to determine whether or not streetcar operations would be able to maintain adequate speed and reliability. (For purposes of evaluating LOS, assumes that streetcars would operate in mixed-flow traffic as buses do currently and therefore be exposed to the same level of delay). Analysis will not assume preemptive signals.  This analysis will identify areas along each corridor where transit priority (either ROW, signalization, etc) is needed to maintain PTN levels of speed and reliability.	Identify LOS at each intersection along the corridor	Evaluate existing transit speed as percent of speed limit (Peak and Midday)  High level assessment of need for transit priority treatments to maintain speed and reliability (e.g., exclusive ROW or signalization).	
<b>Relationship to other potential streetcar corridors.</b> Evaluates the relationship between the corridor and a future expanded streetcar network.		Evaluates how well a streetcar corridor fits into an overall network of streetcar service.	

Evaluation Criteria and Description	Conducted in Phase I (previous report)	Conducted in Phase II (this report)	Conducted in Phase III (next report)
<b>Relationship to current/future high capacity transit investments.</b> Measures the relationship (connectivity, distribution of high-capacity transit investments, etc.) between streetcar and current or future LRT or BRT corridors.		Evaluates how well the streetcar corridor connects with future high-capacity transit investments.  Includes an assessment of how potential streetcar lines may enhance or duplicate proposed high capacity service.	
<b>Competition with LRT or BRT lines.</b> Evaluates whether or not the streetcar corridor is in competition with a future LRT or BRT corridor.		Evaluates whether or not streetcars would be in competition with current or future LRT or BRT services.	
<b>Replacement of existing bus service.</b> Evaluates how well streetcar would fit in the corridor and what impact streetcars would have on existing bus volumes. Evaluation based on initial operating plans and potential impact on underlying bus network.		Measures estimated change in operating hours and daily vehicle volumes if streetcar were introduced along the corridor.	Estimated operating cost per rider based on high level ridership estimates adjusted from PTN.
<b>Transit Demand</b>			
<b>Bi-directional all day demand.</b> Measures travel demand patterns in the corridor, ranking corridors with bi-directional all day demand higher than corridors that have primarily a peak oriented or single directional demand pattern.			Total trips into and out of the corridor by time of day from travel model data.
<b>Projected Population Within Corridor.</b> Measures total population served within ½ mile of the corridor.		Total population and population density within corridor – 2020 forecasted data.	
<b>Projected Employment Within Corridor.</b> Measures the total number of jobs within ½ mile of the corridor.		Total employment and employment density within corridor – 2020 forecasted data.	
<b>Low Income Households.</b> Measures low income households within ½ mile of the corridor.		Total and density of low income households (under \$25,000 annual household income) – 2000 data.	
<b>Zero Car Households.</b> Measures zero-car households within ½ mile of the corridor.		Total and density of zero-car households – 2000 data.	
<b>Current and Future Transit Ridership.</b> Measures current transit ridership and mode share, and evaluates potential future ridership based on future population and employment and route productivity.			Ridership estimates based on current travel demand and how streetcar service might change ridership in a given corridor. This analysis is not a traditional model approach but is based on a comparison of travel options in the corridor.
<b>Cost-Effectiveness</b>			
<b>Utilities.</b> Corridors that would require relocation of major utilities (such as water, storm and sanitary) would make streetcar service too costly to be provided cost effectively.		Presence and diameter of water, storm and sanitary utilities along the corridor.	More detailed assessment to be completed in next phase of the evaluation for high priority corridors only.
<b>On-Street Parking Impact.</b> Evaluates the width of the street and whether or not a streetcar line would significantly impact on-street parking – especially through local business districts. Parking could be eliminated to create a transit lane and/or to provide for turning movements when streetcars are operating in mixed flow traffic.		High-level analysis of impact to on-street parking based on initial operating plans.	Detailed evaluation of impact on on-street parking to be completed only for high-priority corridors.

Evaluation Criteria and Description	Conducted in Phase I (previous report)	Conducted in Phase II (this report)	Conducted in Phase III (next report)
<p><b>Maintenance Site.</b> Unlike a bus maintenance facility, which can be located wherever land is available, a streetcar garage will need to be located on track connected to the main alignment. This criterion evaluates the presence of land within ½ mile of the corridor that could be used for a maintenance facility. Sites that are within public ownership will receive a higher score.</p>	<p>Proximity or connectivity to existing rail maintenance facilities.</p>		<p>Availability of publicly owned sites within ½ mile of corridor.</p>
<p><b>Capital Costs.</b> Identification of major cost items that deviate from a standard cost/mile for streetcar capital costs. Evaluation assumes double-track along entire length of corridor. Examples of items that will create additional capital costs over a standard streetcar section include bridges, tunnels, exclusive ROW, property acquisition, etc. Detailed costing will be conducted in the next phase of the evaluation.</p>		<p>Major capital cost items above standard cost/mile.</p>	<p>Planning level capital costs and estimated capital cost per rider.</p>
<p><b>Time to Implement.</b> Factors that might affect implementation and/or cost such as scheduled street reconstruction, available funding, etc.</p>			<p>Evaluates corridors (or segments) that are slated for major reconstruction and/or other factors that may delay implementation.</p>
<b>Funding</b>			
<p><b>Private Financing Support.</b> Evaluates the level of business/developer support for private financing of streetcars in the corridor.</p>			<p>Assesses private development interest and support and identifies potential private funding sources. Based on stakeholder interviews with development community in each priority corridor.</p>
<p><b>Federal Funding.</b> Assessment of potential for attracting federal funding, including Small Starts.</p>			<p>Assessment of obtaining local, State or Federal funds, including the FTA Small Starts program. Identification of other potential funding options.</p>



## Chapter 3. Evaluation of Transit-Supportive Land Use

While overall density of housing and employment is the single factor most responsible for determining transit ridership, it is also useful to evaluate “special generators and anchors” that may attract a broader transit market. These “special generators and anchors” include museums, cultural institutions, major medical facilities, and sporting venues and other places where tourists, visitors and other occasional users may be attracted to transit.

Special generators along a streetcar line are not always positive. For example, a major football stadium has the potential for generating large numbers of riders, but this occurs only on a small number of days when there are football home games. Moreover, the large surges of riders that would be arriving and leaving at game time could easily overwhelm a streetcar system, with vehicles that typically carry less than 100 passengers per car fully loaded.

Anchors may include special generators but may also include a significant district where a variety of locals and visitors would like to travel. Anchors are important because they represent principle origins and destinations for trips, which can help define logical streetcar segments.

This chapter explores the opportunities and constraints presented by special generators and anchors along each of the streetcar corridors as well as continuing the discussion of overall transit supportive land use that was presented in the Phase I Screening Report.

### Special Generators and Corridor Anchors

A number of the potential streetcar corridors serve special generators such as sport stadiums, major entertainment facilities, major hospitals, and the convention center. Service to special generators is important because their impact on ridership is not typically captured in daily ridership estimates that are based on recurring or routine activities. Because special generators tend to attract large numbers of occasional riders who may not be familiar with the service, it is important to include only those generators that are very close to the proposed corridor. For the purposes of this analysis, special generators within  $\frac{1}{4}$  mile (approximately 3-4 city blocks) are described.

Corridor anchors may be single nodes or may be a district with regional importance and especially high trip generation. Like special generators, these anchors are important to the ridership calculation, but are also important because they help to define viable segments that connect important nodes and will generate ridership even before a full corridor is completed.

For the purposes of this analysis, regional transit connections, such as Light Rail or Transit Center connections are also described as anchors. While a transit station may not generate trips per se, providing new connectivity will increase the ridership of a proposed segment and will help a segment to be sustainable before an entire corridor can be completed. Chapter 5 further assesses how well the streetcar corridor integrates with existing and planned transit services.

Streetcar services can be well utilized even without serving a special generator or without a strong anchor. Streetcar service to corridors with high residential and employment density will generate significant ridership even if they don't serve specific nodes. However, corridors that do serve special generators and have strong anchors will have a "leg up" on generating ridership. Figure 3-1 shows a map of the major special use generators, as well as areas that serve as strong anchors for each corridor.

In order to assess the difference between these corridors in terms of special generators, some judgment was used to assess the significance of the generator and their potential for transit ridership. This evaluation is summarized at the end of the chapter in Figure 3-4 and discussed below for each corridor. It is important to note that this analysis includes only existing or known future generators. It does not take into account any new development that is not actually planned at this time.

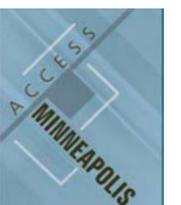
**Figure 3-1 Special Use Generators and Corridor Anchors**



0 0.25 0.5 1 1.5 2 Miles

Source: MetroGIS, Met Council, and the City of Minneapolis

**Nelson|Nygaard**  
consulting associates



## **W Broadway Avenue**

Outside of downtown, only one special generator – North Memorial Hospital – is located within ¼ mile of this corridor. The new Twin’s stadium is just over 1/4 mile south of Washington Avenue on 3<sup>rd</sup> Avenue N.

Outside of the hospital itself, the only major anchor on the northern end of the corridor is Downtown Robbinsdale. This is both a strong node on its own and is a major transit connection point. Downtown Minneapolis is clearly a very strong anchor on the south end.

## **Central Avenue NE**

While there are no special generators within a ¼ mile distance of this corridor, the new Guthrie Theater is about 1/3 mile east of 3<sup>rd</sup> Avenue on S. 2<sup>nd</sup> Street, just outside of the quarter mile boundary. The route serves very important intermediate anchor points in the Mill District and the inner core of downtown once the route turns into 3<sup>rd</sup> Avenue.

North of the river, the East Hennepin area and the commercial node between Lowry Avenue and 29<sup>th</sup> Avenue NE, serve as potential anchors on the north end of the corridor. Due to the size and density of activity, the East Hennepin area is a stronger anchor than the commercial node at Lowry.

## **Chicago Avenue S**

In downtown, there are at least two potential alignment options for this corridor – one via Chicago Avenue and the other via 9<sup>th</sup>/10<sup>th</sup> Streets. Both of these corridors serve a number of major generators. Via the S 9<sup>th</sup>/10<sup>th</sup> Street alignment, this corridor directly serves the inner core of downtown and is within ¼ mile of the convention center. The Chicago Avenue alignment directly serves the Metrodome and the Hennepin County Medical Center (HCMC) and would also serve the new Guthrie Theatre a block north of Washington on S 2<sup>nd</sup> Street.

Outside of downtown, this corridor serves several special generators: the Midtown Exchange at Lake Street and several major medical facilities (Children’s Hospital and Abbott Northwestern Hospital).

The Chicago Lake Transit Center combined with the Midtown Exchange, create an anchor for this corridor on the south end. On the north end, downtown Minneapolis clearly serves as a very strong anchor. While this area provides a good north-south anchor, it does not provide a strong enough east-west anchor.

## **Franklin Avenue**

The Minneapolis Institute of Art and Minneapolis College of Art and Design are two blocks (about ¼ mile) south of Franklin between 1<sup>st</sup> Avenue S and 3<sup>rd</sup> Avenue S.

Although Nicollet Avenue S and Chicago Avenue S are major neighborhood oriented corridors, they are not especially strong anchors for a streetcar line.

### **Hennepin Avenue S**

This corridor has very strong anchors along nearly its entire route. Within downtown, this corridor serves the theatre district along Hennepin Avenue, the Target Center, and the inner core of downtown. Outside of the core of downtown, this corridor serves the Minneapolis Community College, the Minneapolis Sculpture Garden and the new Walker Art Center. This corridor would be just over ¼ mile from the planned Twin's Stadium near 3<sup>rd</sup> Avenue N and 5<sup>th</sup> Street N.

On the south end of the corridor, the Uptown area and the Uptown Transit Station serves as a very strong anchor for this corridor. On the north end, downtown Minneapolis also serves as a very strong anchor. This area could also serve as an east-west anchor.

### **Midtown Greenway/Lake Street**

For the purposes of this analysis, these two corridors, which are less than 1/4 mile apart can be analyzed together.

The Midtown Greenway is located between one and four blocks north of Lake Street and bisects "Midtown" Minneapolis. Several special transit generators were identified along this corridor: Lake Calhoun, the Midtown Exchange and Abbott Northwestern Hospital. The only major commercial node located directly along the corridor is at Hennepin. Important commercial nodes along the corridor are located a block south of the Greenway at Lyndale, Nicollet, Chicago and to a lesser degree, Bloomington.

Lake Street itself is an important neighborhood commercial street, with high intensity development from the Lake Calhoun area to Chicago.

The strongest anchors along this corridor, regardless of alignment, include the Hiawatha LRT station on the east end and either Uptown on the west end, or the planned West Lake station along the Southwest LRT line. The Hiawatha LRT station is a strong anchor on the east side, even though land uses east of Hiawatha area are less intensely developed than other areas along the corridor. The future West Lake station along the Southwest LRT line will be a strong anchor, and land uses in the area are planned for high intensity conducive to streetcar.

### **Nicollet Avenue S**

In downtown, Nicollet is one of Minneapolis' most prominent streets. Special generators include the Nicollet Mall itself and the Convention Center. The Target Center is located less than ¼ mile west of Nicollet on 1<sup>st</sup> Avenue N. The Nicollet corridor also serves the eastern edge of the Loring Park area, the Minneapolis Institute of Art (MIA), and the Minneapolis College of Art and Design.

Commercial activity along Nicollet extends south to approximately 32nd Street. The densest part of the activity on Nicollet ends at Lake Street, going south from downtown. The Lake and Nicollet area creates a significant node, though less intense than the area north of Lake. While the Lake/Nicollet area provides a good north-south anchor, it does not provide a strong enough east-west anchor. South of Lake Street, smaller commercial nodes are located at 38<sup>th</sup> Street, 46<sup>th</sup> Street, Diamond Lake Road, and 66<sup>th</sup> Street. Of these smaller commercial nodes, 38<sup>th</sup> Street forms the best anchor south of Lake Street, though none of these by themselves are more than neighborhood attractors.

### **University Avenue SE / 4<sup>th</sup> Street SE**

This corridor directly serves the inner core of downtown, the commercial node at East Hennepin, as well as Dinkytown, and the University of Minnesota. The University of Minnesota itself serves as a major special generator, especially the sports facilities located along University Avenue SE and 4<sup>th</sup> Street SE. A new football stadium is planned near the intersection of 4<sup>th</sup> Street SE and Oak Street SE, which would be a major special generator.

This corridor has a strong anchor at University and Washington Avenue SE and the future Central LRT line, and a smaller anchor in the East Hennepin area. Downtown is a very strong anchor on the western end of the corridor.

### **Lyndale Avenue S**

As with the Hennepin Avenue S corridor, special generators along this corridor include the Minneapolis Community College campus, the Loring Park area, the Walker Art Center and the Minneapolis Sculpture Garden. South of Douglas Avenue, however, there are no large special generators; however, the intersection of Lake and Lyndale is a major commercial node (Lyn-Lake area). In downtown, this corridor serves the same special generators as Hennepin – the theatre district along Hennepin Avenue, the Target Center, and the inner core of downtown. As with the Hennepin corridor, the Lyndale corridor would be just over ¼ mile from the planned Twin's Stadium near 3<sup>rd</sup> Avenue N and 5<sup>th</sup> Street N.

Downtown would serve as a strong anchor on the north end of this corridor. On the south end, the Lyndale/Lake area would serve as the most logical anchor, though there are no major attractors south of I-94. While Lyndale/Lake provides a good north-south anchor, it does not provide a strong enough east-west anchor.

## **Major Generators and Anchors – Conclusions**

While most of the proposed streetcar corridors serve a number of important generators, a few corridors stand out, either for the number of generators they serve, or the number of visitors they are likely to attract. These include:

- **Chicago Avenue S.** This corridor connects downtown with the Chicago/Lake area and the Midtown Exchange. Major attractors include the inner core of downtown,

the Metrodome and Hennepin County Medical Center (on Chicago Avenue), the Guthrie Theatre (on 2<sup>nd</sup> Street S), Children’s Hospital, Abbot Northwestern Hospital, and the Midtown Exchange. The Convention Center is 2-3 blocks south of the 9<sup>th</sup>/10<sup>th</sup> Street alignment.

- **Hennepin Avenue S.** This corridor connects downtown to Uptown. Major attractors include the theatre district, the inner core of downtown, the Target Center, Minneapolis Community College, Minneapolis Sculpture Garden/Loring Park, Walker Art Museum and Uptown.
- **University Avenue SE / 4<sup>th</sup> Street SE.** This corridor connects downtown with the East Hennepin Area, Dinkytown and the University of Minnesota. The University is the second largest activity center in the region and a new stadium is planned on the north end of the campus. The new Central LRT line would connect with this corridor at Washington Avenue SE.
- **Nicollet Avenue S.** North of Lake Street, this corridor serves the Convention Center and the inner core of downtown, as well as Loring Park and “Eat Street” between downtown and Lake Street. Corridor also serves the Minneapolis Institute of Arts / Children’s Theater / Minneapolis College of Art and Design area.

## Land Use Type and Intensity

This criterion measures the level of “transit supportive” planned land use (by area) within approximately ¼ mile of each candidate corridor. The analysis included in this section builds on earlier work done in the Phase I Screening Report, but adding the downtown corridors and new information about development potential derived from interviews with the City’s Sector Planners. The overall methodology for this analysis is described below:

### Methodology for Determining “Transit Supportive” Land Use

The first step in this process was to obtain the most recent planned land use dataset for the Twin Cities. This information was available from the Metropolitan Council, and is based on each community’s comprehensive plan that includes a depiction of what each community expects or is planning for their land use in the year 2020.

This dataset includes many major land use classifications, ranging from agricultural to high-density housing. Within Minneapolis, there are 39 different land use types. These land use types were categorized into low, medium and high “transit-supportive” land uses, as shown in Figure 3-2 below:

**Figure 3-2 Transit-Supportive Land Uses**

Low	Medium	High
Airport General Area	Commercial Small Scale	Commercial General
Golf Course	Downtown Secondary Office	Downtown Edge
Industrial General	Office- Residential Medium Density	Downtown Entertainment
Industrial Light	Mixed Use - Residential Medium	Downtown Primary Office
Institutional (Cemetery)	Office / Convertible Space	Downtown Retail
Institutional Uses	Residential Medium Density	Light Rail Hiawatha Line
Minneapolis Parks		Live Work Units
Water		Residential High Density
Protected Open Space		Mixed Use - Residential High
Railway		Mixed Use with Retail on Ground Floor
Residential Low Density (Institutional Vet's Home)		Office- Residential High Density
Retail Single Story		Residential Highest Density
Trolley Railway		Transit Oriented Use
United States Army Reserve		
Vehicular Right-of-Way		
United States Army Reserve		

The entire land use dataset was then coded based on one of the three categories (either 1, 2 or 3 with 1 being “low,” 2 being “moderate” and 3 being “high”). Next, a ¼ mile buffer was drawn around each of the candidate corridors.

Based on land uses within this ¼ mile buffer, the total land area that fell within the low, medium and high transit-supportive categories was calculated and a “score” was produced that indicates the degree of transit supportive land use in that corridor. For example, a score of 3 would indicate that all land use in that corridor is transit supportive. A score of 1 would indicate that no land use in that corridor is transit supportive.

The results of this analysis are presented in Figure 3-3 (on the next page) for the corridors that remain. There are several areas where the planned land use data used for this comparative analysis does not reflect recent planning initiatives, as discussed below:

- **Central Avenue NE:** The Shorham Yards area between 27<sup>th</sup> Avenue NE and 31<sup>st</sup> Avenue NE should include a small strip of mixed use or commercial adjacent to Central Avenue NE. While the planned land use data used for this analysis shows this area as industrial, it was adjusted to “medium” transit supportive land use and the score was adjusted accordingly.
- **University Avenue SE/4<sup>th</sup> Street SE:** Between 2<sup>nd</sup> Avenue SE and I-35W, the area between University Avenue SE and the river is planned for medium- to high-density residential. While the planned land use data used for this analysis shows this area as industrial, it was adjusted to “high” transit supportive land use, and the score was adjusted accordingly.
- **Midtown Greenway:** Between Uptown and Hiawatha Avenue, much of the industrial land use on either side of the Greenway is planned for conversion to mixed use, medium- to high-density residential and commercial uses. A significant amount of the planned land use data used for this analysis shows this area as industrial, but was adjusted to “medium” transit supportive land use. The score for this corridor was adjusted accordingly.
- **Nicollet Avenue S:** The intersection of Nicollet Avenue S and the Midtown Greenway is planned for either mixed use, medium- to high-density residential, or commercial uses. The planned land use data used for this analysis shows this area as industrial, but was adjusted to “high” transit supportive land use. The score for this corridor was adjusted accordingly.
- **W Broadway Avenue:** The North Loop area is quickly converting from a mostly industrial area to moderate- to high-density housing with small neighborhood commercial uses. This trend is expected to continue in the future. The planned land use data used for this analysis shows the entire North Loop area as industrial, but was adjusted to “medium” transit supportive lands use. The score for this corridor was adjusted accordingly.

**Figure 3-3 “Transit-Supportive” Average Land Use Score**

<b>Corridor and/or Corridor Segment</b>	<b>Average Transit Supportive Land Use Score</b>	<b>Qualitative Rating (HIGH, MODERATE, LOW)</b>
Nicollet (north of Lake Street)	2.53	HIGH
Chicago (via 9 <sup>th</sup> /10 <sup>th</sup> Street to Nicollet)	2.26	HIGH
Chicago (via Chicago Avenue and Washington Avenue to Nicollet)	2.23	HIGH
University/4 <sup>th</sup> (entire corridor)	2.20	HIGH
Lyndale (entire corridor)	2.09	MODERATE
Hennepin (entire corridor)	2.06	MODERATE
Midtown (entire corridor)	1.80	MODERATE
Lake (entire corridor)	1.75	MODERATE
Nicollet (entire corridor)	1.75	MODERATE
Central (entire corridor)	1.69	MODERATE
Broadway (east of Memorial Drive)	1.58	LOW
Broadway (entire corridor)	1.55	LOW
Nicollet (south of Lake Street)	1.22	LOW

## Transit Supportive Land Use – Conclusions

Based on this analysis, a few corridors stand out in terms of their ability to serve transit supportive land use:

- **Nicollet Avenue S.** Overall, this corridor had the highest score (north of Lake Street) and a moderate score for the entire corridor.
- **Chicago Avenue S.** This corridor bisects one of Minneapolis’ most dense neighborhoods, and serves some major activity centers (three major hospitals, the Metrodome) and serves the inner core of downtown. This corridor also serves the Elliot Park neighborhood.
- **University Avenue SE/4<sup>th</sup> Street SE.** This short corridor is almost continuous in terms of transit-supportive land use, and includes downtown, the East Hennepin area, Dinkytown and the University of Minnesota.

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Figure 3-4 Summary of Transit Supportive Land Use Criteria

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Avenue NE	Lake St	Nicollet Avenue S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Avenue S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
Number of Special Generators	<b>Downtown:</b> Future Twin's stadium (just over ¼ mile) <b>Outside of Downtown:</b> North Memorial Hospital	None identified	<b>Downtown:</b> HCMC, Metrodome (Chicago/Washington) Convention Center, Nicollet Mall (9 <sup>th</sup> /10 <sup>th</sup> /Nicollet) <b>Outside of Downtown:</b> Children's Hospital, Abbott (Northwestern Hospital)	None identified	<b>Downtown:</b> Theatre district, Target Center, inner core of downtown, Minneapolis Community College. <b>Outside of Downtown:</b> Loring Park, Walker Art Center, Minneapolis Sculpture Garden	Lake Calhoun, Midtown Exchange, Hiawatha LRT station	<b>Downtown:</b> Minneapolis Convention Center, Nicollet Mall <b>Outside of Downtown:</b> Minneapolis Institute of Art (MIA), Minneapolis College of Art and Design (MCAD), Loring Park, Minneapolis Convention Center	<b>Downtown:</b> Inner core of downtown <b>Outside of Downtown:</b> University of Minnesota, U of M sports facilities, future U of M football stadium	<b>Downtown:</b> Theatre district, Target Center, inner core of downtown, Minneapolis Community College. <b>Outside of Downtown:</b> Loring Park, Walker Art Center, Minneapolis Sculpture Garden	
Potential Anchors	<b>North:</b> downtown Robbinsdale <b>South:</b> downtown Minneapolis	<b>North:</b> East Hennepin area or commercial node at Lowry <b>South:</b> downtown Minneapolis	<b>North:</b> downtown Minneapolis <b>South:</b> Lake/Chicago (Midtown Exchange and Chicago-Lake Transit Center)	No strong anchors along corridor	<b>North:</b> downtown Minneapolis <b>South:</b> Uptown (Lake/Lagoon and Hennepin)	<b>West:</b> West Lake Station (Southwest LRT line) or Uptown <b>East:</b> Hiawatha LRT	<b>North:</b> downtown Minneapolis <b>South:</b> Nicollet/Lake or Nicollet/38th	<b>East:</b> University and Washington (Central LRT) <b>West:</b> downtown Minneapolis	<b>North:</b> downtown Minneapolis <b>South:</b> Lake/Lyndale	
Transit Supportive Land Use	LOW (east of Memorial Dr) LOW (entire corridor) Corridor scored low due to large sections of low-density residential or industrial uses.	MODERATE (entire corridor) Corridor scored low to moderate due to low-density residential and industrial uses.	HIGH (via 9 <sup>th</sup> /10 <sup>th</sup> ) HIGH (via Chicago/Washington) Very strong corridor due to numerous major activity centers and very dense residential neighborhoods.	Not scored. Only considered a connecting corridor.	MODERATE (entire corridor) Moderately strong corridor due to downtown, Uptown and high-density housing in Loring Park and north part of the Wedge. Low- to moderate-density housing beyond 1-2 blocks of Hennepin between downtown and Uptown.	MODERATE (Midtown Greenway) MODERATE (Lake Street) Although this corridor serves several commercial nodes (Hennepin, Lyndale, Nicollet, Chicago), and has development potential along the corridor, it also includes major sections of industrial land uses (on the east side) and low-density housing and parks on the west end.	HIGH (north of Lake) MODERATE (entire corridor) LOW (south of Lake) Because of the length of the corridor, scores varied greatly depending on the section. Section north of Lake was very strong and had the highest score of any corridor or section. The segment south of Lake had the lowest score due to large sections of low-density residential and 1-35W.	<b>Score:</b> HIGH (entire corridor) Very strong corridor due to connection between downtown, East Hennepin, Dinkytown and the University of Minnesota.	<b>Score:</b> MODERATE (entire corridor) Moderately strong corridor due to downtown and high-density housing in Loring Park and north part of the Wedge. Low- to moderate-density housing beyond 1 block on either side of Lyndale between downtown and Lyn-Lake.	

## Chapter 4. Evaluation of Economic Development Potential

While earlier chapters evaluated existing and planned land use, this chapter focuses on the potential for the streetcar to catalyze redevelopment and intensification. Many of the modern streetcars implemented or planned in the US were designed to be integral to an overall strategy for redevelopment. Nowhere is this more clear than in Portland, Oregon where the Phase I Streetcar (NW Portland to Portland State University) was developed specifically to catalyze redevelopment of a warehouse district on the edge of downtown. The streetcar was designed in close cooperation with the development community who then paid approximately 17% of the capital cost of the streetcar through a Local Impact District. Between 1997 and 2004, approximately \$1.5 billion in new development has occurred in the Pearl, and the streetcar has been extended to several other developing areas in the City (Riverfront area and the South Waterfront). While these close-in neighborhoods may have developed on their own, the presence of a streetcar, which was seen as a necessary amenity to attract development, may have catalyzed and organized the development along the route. Similarly, approximately 50% of the capital costs for the South Lake Union Streetcar in Seattle will be paid by landowners through a Local Improvement District. The South Lake Union Area is close to both downtown and the University of Washington campus, and is expected to experience major development of housing and biotechnology businesses.

In Minneapolis, there is significant variation in the potential or desirability for redevelopment along the proposed streetcar corridors. This chapter provides an initial assessment of economic development potential, and whether the corridor is targeted for redevelopment through City planning initiatives. A more detailed discussion of the approach used to assess these elements, along with a discussion for each corridor, is provided below.

The next phase of this study will take a more detailed look at the economic development potential for the long-term streetcar network, and through stakeholder meetings in the community, assess the level of interest to support streetcar service by the private sector in each priority corridor. Ultimately, this assessment will lead to identification of an initial starter line that builds toward the long-term network. Figure 4-1 presents a summary of this analysis.

### Area Targeted for Redevelopment

This criteria qualitatively assesses whether or not a corridor is targeted for redevelopment, either in the Minneapolis Plan or through other neighborhood planning initiatives. To help with this assessment, the consultant team held a meeting with sector planners from

the City's Community Planning and Economic Development (CPED) department. The meeting began with a discussion of each of the candidate corridors, a status update on the streetcar study, and an explanation of what this phase of the evaluation was trying to accomplish. Next, each sector planner was asked to discuss planning initiatives along the candidate corridors. In addition, the planners were asked to compare redevelopment initiatives in each corridor to the other corridors being studied.

Through this process, it was clear that because these candidate corridors include some of Minneapolis' most prominent streets, some level of redevelopment is assumed for all corridors. It should be reiterated that this evaluation is not intended to provide an *exhaustive* list of *all* redevelopment initiatives occurring within the corridor. Rather, the goal for this phase of the study is to conduct a qualitative, high-level assessment of the corridors *compared to each other* with regard to redevelopment and the relative intensity of that redevelopment. This chapter will also assess whether a corridor has redevelopment potential, with the understanding that the potential is usually a function of support by the development community. Redevelopment potential will also be a major focus of the stakeholder interviews conducted with private developers in the next phase of the analysis.

**Figure 4-1 Summary of Economic Development Potential and Community Support Criteria**

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Ave NE	Lake St	Nicollet Ave S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Ave S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
<b>Area Targeted for Redevelopment</b>	<p>East of Penn and west of Lyndale has the greatest potential, but relatively small scale (1/2 to 1 block from Broadway). Market has yet to fully respond to significant redevelopment in this area.</p> <p>Good redevelopment potential in downtown Robbinsdale, but at a relatively small scale.</p> <p>Very high redevelopment potential in North Loop area on both sides of Washington (mostly residential and neighborhood commercial).</p>	<p>Good potential between Shorham Yards and Lowry – ½ to 1 block from Central Avenue (market just beginning to respond to redevelopment potential).</p> <p>Good infill development potential in the East Hennepin area, with somewhat higher intensity than northern part of corridor.</p> <p>3<sup>rd</sup> Avenue South / Mill District continues to redevelop at very high intensity (mostly residential).</p>	<p>Strong redevelopment potential in Elliot Park area (especially residential), along 9<sup>th</sup>/10<sup>th</sup> closer to Nicollet, as well as in Downtown East area.</p> <p>Mill District north of Washington Avenue currently experiencing major residential development. Potential exists south of Washington Avenue.</p> <p>Some redevelopment potential at Chicago/Lake and along Midtown Greenway.</p> <p>Corridor between Chicago/Lake and downtown dominated by institutional uses - growth in hospital area expected to continue.</p> <p>Some potential south of Lake and at 38<sup>th</sup>/Chicago, but market has yet to respond to this area.</p>	<p>Some redevelopment interest between Nicollet and Hiawatha LRT, mostly at the major intersections (Nicollet, Chicago, Bloomington, Hiawatha).</p>	<p>Moderate potential along Hennepin, but corridor mostly built out.</p> <p>Greatest potential in and around Uptown with moderate density commercial and residential development.</p> <p>Continued redevelopment potential along Hennepin Avenue in downtown – especially around Washington and around 10<sup>th</sup> Street.</p>	<p>Strong redevelopment potential, especially between Lake and 28th Street between Uptown and Chicago Avenue S. Moderate-density, residential infill development, occurring mostly at the major nodes (Hennepin, Lyndale, Nicollet, Chicago).</p>	<p>Good redevelopment potential at Nicollet and Lake.</p> <p>Infill development potential between Lake and downtown – ½ to 1 block on either side of Nicollet.</p> <p>The 26th and 38th Street intersections are also identified as "investment areas."</p> <p>Nicollet Mall mostly built out with the exception of the north end of the Mall.</p>	<p>Good potential along river, south of University Ave SE (mostly residential).</p> <p>Neighborhood north of 4th between I-35W and Hennepin to remain mostly unchanged.</p> <p>New stadium planned for U of M campus on east end of corridor.</p>	<p>Mostly built-out corridor with some redevelopment potential within ½ - 1 block of corridor.</p> <p>Some redevelopment potential between Midtown Greenway and Lake Street.</p>	



## **W Broadway Avenue**

According to the sector planner for this corridor, the City is in the beginning phases of more intensive planning for this corridor – called the West Broadway Alive! Plan. The potential for new housing is strong, especially for medium-density housing that fits into the scale of the corridor. However, the housing market has not responded to this corridor as it has in other areas of the city, and the intensity of this development is likely to be small to moderate in scale. Most of the potential for redevelopment in this corridor is between Penn Avenue N and Lyndale Avenue N, or the core of the commercial development on W Broadway. Between W Broadway and downtown (via Washington), this corridor will remain mostly industrial, with the exception of some potential for new housing along the river and future conversion of industrial land uses in the North Loop area.

Between Penn Avenue N and downtown Robbinsdale is relatively low density with some small-scale commercial uses along the corridor. Downtown Robbinsdale, however, has seen a renaissance over the past several decades, and the Robbinsdale Comprehensive Plan presents a vision for future development in this area. A focus of this Plan is on historic W Broadway and Hubbard Avenues, and making downtown Robbinsdale a destination for shopping, services and cultural amenities. This line would also serve the Apache Mall redevelopment area. In addition, the Robbinsdale Transit Center provides a strong connection point for the end of this corridor. The intensity of this redevelopment is expected to be relatively low.

The North Loop area (south of Plymouth Avenue) is currently experiencing high intensity redevelopment – mostly residential with small-scale neighborhood commercial. Nearly a dozen new condominium projects (approximately 1,200 units) have recently been completed, are under construction or are in the planning phases. Although dependent on the housing market, redevelopment in this area is expected to continue in the future. Near the intersection of Washington Avenue and Nicollet Ave, the new Minneapolis Public Library has recently opened, which has increased redevelopment potential in the middle section of this corridor.

## **Central Avenue NE**

Several areas along this corridor show redevelopment potential. On the north end of the corridor, the area between approximately 18<sup>th</sup> Avenue NE and 29<sup>th</sup> Avenue NE shows good potential. While this is one of NE Minneapolis' most active retail/commercial corridors, the market has yet to respond fully to the potential in this area. Still, housing and redevelopment in this area is occurring, though only ½ to 1 full block on either side of Central Avenue. Just north of this area, some potential for redevelopment exists at the Shorham Yards property, west of Central Avenue NE between 27<sup>th</sup> Avenue NE and 32<sup>nd</sup> Avenue NE. While redevelopment planning for this area has just begun, the initial vision for this area includes retail/commercial adjacent to Central Avenue and light industrial uses

further west. This area is identified in the Minneapolis Plan as an Activity Center and a Major Housing Site.

Redevelopment potential also exists along this corridor in the East Hennepin area, which is also an Activity Center as identified in the Minneapolis Plan. While the southern part of this area is mostly built out, and commercial and housing infill developments have been occurring in this area for many years, the north part of this area is starting to redevelop. A new Lund's grocery store that has just opened at the corner of University Avenue SE and Central Avenue SE and the Cobalt condominiums are currently under construction above the grocery store. The intensity of development in this area is also higher than along the northern section of the corridor.

Just east of the East Hennepin area, redevelopment is continuing to occur along the river, notably the East Bank Mills project which will include around 960 residential units.

In downtown, the 3<sup>rd</sup> Avenue S corridor, and the Mill District to the east of the corridor, is continuing to redevelop. The new Carlyle condominium project is slated to open in the near future, the Mill District continues to infill. With the exception of the new Guthrie Theatre, most of the development in this area is residential, with some small-scale neighborhood commercial development.

### **Chicago Avenue S**

Between downtown and Lake Street, the Chicago Avenue S corridor has relatively limited redevelopment potential compared to other corridors. In general, this segment of the corridor is dominated by institutional uses (Children's Hospital and Abbot Northwestern Hospital). While some growth of the hospital area is expected, other areas in the segment of the corridor have relatively little redevelopment activity. The area outside of downtown with the greatest redevelopment potential includes the Midtown Greenway and the area surrounding the Midtown Exchange at Lake Street.

In downtown, the Elliot Park area has experienced a tremendous amount of residential growth over the past decade. This trend is expected to continue as several high-density residential developments (approximately 700 units), are currently under construction or in the planning stages. The Downtown East / North Loop Master Plan envisions the expansion of the core of downtown to the west (around the planned ballpark) and to the east to the area around the Metrodome.

Washington Avenue east of Nicollet has seen significant redevelopment over the past decade. This has occurred along the entire corridor, but mostly between Washington Avenue and the river. Numerous large housing projects are still under way or are in the planning stages along the entire corridor. The new Guthrie Theatre has just opened up in this corridor, which adds significantly to the redevelopment wave that has occurred in the Downtown East area. Near the intersection of Washington Avenue and Nicollet Avenue,

the new Minneapolis Public Library has recently opened, which has increased redevelopment potential in the middle section of Washington Avenue.

Although the market has responded extremely favorably to the area north of Washington Avenue, the area south of Washington has yet to redevelop to any great degree. Recent planning initiatives to redevelop the area south of this corridor are best summarized by the Downtown East / North Loop Master Plan. Although this is not a redevelopment plan, the vision for this area is one in which the core of downtown expands to the west (around the planned ballpark) as well as to the east around the Metrodome. The plan is generally focused around the area within ¼ mile of the existing Hiawatha LRT line (on 5<sup>th</sup> Street).

South of Lake Street, some redevelopment potential exists (mostly at 38<sup>th</sup> Street), and future planning efforts are currently underway, but the market has yet to respond to redevelopment in this area.

### **Franklin Ave**

Although some redevelopment has taken place along this corridor over the past decade, this has largely occurred only at the major nodes (Nicollet, Chicago and Bloomington) and is fairly low intensity development. While some redevelopment potential remains along this corridor, it is relatively low compared to other candidate corridors.

### **Hennepin Avenue S**

Because the Hennepin Avenue S corridor is mostly built out, and is already one of the most vibrant corridors outside of downtown in the city, relatively little redevelopment potential exists along this corridor. However, in the Uptown area, and near the Midtown Greenway, additional redevelopment potential exists. It was also noted in the Hennepin Avenue Strategic Plan (1995) that there are several auto-oriented shopping centers that have the potential for redevelopment, which has occurred in several areas along the corridor. The City is currently in the early stages of preparing the Uptown Small Area Plan, which will prepare a master plan for this area. In addition, several other plans have been developed for Uptown and the Hennepin Avenue S corridor over the past decade:

- Uptown Parking and Transportation Study (2005)
- Hennepin Avenue Strategic Plan (1995)

Although both of these studies, and studies conducted in the past, reinforce the notion that Hennepin Avenue S is one of south Minneapolis' most important commercial and transit corridors, Hennepin Avenue S is largely built out – with the exception of additional medium-density commercial and residential redevelopment in the Uptown area and along the Midtown Greenway.

## Midtown Greenway

Based on conversations with City planners, the Midtown Greenway (and Lake Street) show good potential in terms of redevelopment. Much of the land use along the Greenway is currently zoned industrial but future plans for the corridor call for conversion of this land to medium- and high-density housing along the entire corridor. Initially, the greatest potential exists between Hennepin Avenue and Chicago Avenue, but longer-term the vision is to extend this type of development along the entire corridor.

A key document guiding future development in this corridor is the Midtown Greenway Land Use Development Plan, which is currently in the public review stages. The goal of this document is to develop a clear policy direction for land use and development along the Midtown Greenway. This report clearly states that the Midtown Greenway plays a prominent role in fulfilling the vision of The Minneapolis Plan, which has a major emphasis on increasing density and the role of transit. The Greenway is identified as a Major Study Area in the Minneapolis Plan, and intersects two major Activity Centers (Uptown and Lyndale/Lake). In addition, the Greenway connects with several Major Housing Sites between Hennepin and Lyndale, at Chicago and at Bloomington.

## Lake Street

As with the Midtown Greenway, Lake Street has good redevelopment potential – especially between Lake Street and the Midtown Greenway and between Uptown and Chicago Avenue S. Several nodes are Activity Centers, as identified in the Minneapolis Plan (Hennepin/Lake and Lyndale/Lake) and as with the Midtown Greenway, is close to several major housing sites. Unlike the Midtown Greenway, however, Lake Street is already a relatively strong commercial corridor for the entire length, and several of the major intersections have recently started to see redevelopment occur (Chicago/Lake, for example). Also, the Nicollet Avenue S and Lake Street intersection shows strong promise for future redevelopment. Finally, the Lake/Hiawatha LRT station forms a strong terminus on the east side of the corridor, and as discussed in the Hiawatha/Lake Station Area Master Plan, as much as 20% of the land in this area has redevelopment potential. Redevelopment of the existing commercial center to mixed use (including housing) is being considered on the northwest corner of Lake and Hiawatha.

## Nicollet Avenue S

The section of Nicollet Avenue between Lake Street and downtown is one of Minneapolis' most active commercial streets – also known as “Eat Street.” In 2000, the Nicollet Avenue Task Force produced a plan entitled “Nicollet Avenue: The Revitalization of Minneapolis' Main Street.” This plan identified recommendations that were intended for the corridor as a whole, as well for specific areas. The plan identified four basic strategies, all with the goal of revitalizing the corridor and encouraging redevelopment and improved livability of the corridor. Several of these goals explicitly state redevelopment of some key areas along the corridor, especially reconnecting Nicollet Avenue at Lake Street. As discussed in the

plan, the K-Mart store is a major barrier to the redevelopment of this corridor, and was identified as the single most important element to revitalizing Nicollet Avenue. Likewise, strategies were developed for numerous intersections between 15<sup>th</sup> Street and 58<sup>th</sup> Street. The 26<sup>th</sup> and 38<sup>th</sup> Street intersections are also identified as "investment areas" in the Minneapolis Plan.

Redevelopment potential along this corridor is relatively strong between Lake Street and downtown within one full block of the corridor. Several residential developments have recently been completed along this corridor (at Franklin and at 26<sup>th</sup>), further enhancing vitality of this corridor.

### **University Avenue SE / 4<sup>th</sup> St SE**

According to the sector planner responsible for this area, the greatest potential for redevelopment in this corridor is along the river, between University Avenue SE and Main Street SE in the Marcy Homes neighborhood. At least four major condominium projects are planned or underway in this area (accounting for over 1,000 new housing units).

The neighborhood north of 4<sup>th</sup> Street SE (between I-35W and East Hennepin Avenue) is likely to remain mostly unchanged. The University Avenue SE and 4<sup>th</sup> Street SE corridor connects to the East Hennepin neighborhood, which also has strong redevelopment potential (as noted under the Central Avenue section).

The University of Minnesota will continue to serve as a strong impetus for redevelopment in Dinkytown and the surrounding areas. A new stadium is planned for the north part of the campus and will serve as a major activity center. Finally, the future Central LRT line will serve the University Avenue/Washington Avenue SE area, which will likely aid in future redevelopment of the area.

### **Lyndale Avenue S**

As with the Hennepin Avenue S corridor, Lyndale Avenue S is mostly built out between Franklin and Lake, and the Wedge neighborhood is generally interested in keeping development unchanged, and whatever redevelopment does occur should happen directly on Lyndale. Some infill development and redevelopment of existing properties has occurred in this corridor over the past few decades (such as a new condominium project at 29<sup>th</sup> Street), but most of it has been relatively small scale and mostly ½ to 1 block on either side of the corridor.

The greatest redevelopment potential along this corridor exists on a relatively small scale at Franklin and Lyndale and to a greater degree along the Midtown Greenway and at Lake Street. Development in this corridor is likely to include a mix of residential and commercial development.

## Area Targeted for Redevelopment – Summary and Conclusions

Based on this initial assessment of economic development potential, several corridors (or areas) stand out in terms of their redevelopment potential:

- **W Broadway Avenue.** While the market has yet to fully respond to redevelopment along W Broadway, the North Loop area along Washington is quickly adding new residential and commercial uses.
- **Hennepin Avenue S.** The Uptown area of this corridor offers relatively high potential for redevelopment. A Small Area Plan is being conducted to evaluate the potential in this area.
- **Midtown Greenway/Lake Street.** This corridor between Uptown and Chicago Avenue (especially along the Greenway) is slated for major redevelopment. Although not as intense as some of the development occurring in the downtown area, moderate- to high-density housing is planned at the major nodes (Hennepin, Lyndale, Nicollet, and Chicago) as well as between Lyndale and Hennepin.
- **Chicago Avenue S.** Although there is less redevelopment potential between Lake Street and downtown, the Chicago/Lake area (especially along the Greenway), Elliot Park and the Downtown East area all show strong potential for redevelopment.
- **University Avenue SE / 4<sup>th</sup> Street SE.** Although this corridor has less potential overall, the area south of University Avenue and the river is slated for major residential redevelopment. In addition, a new stadium in the University area along with the future Central LRT line will create strong redevelopment potential. Also, the downtown to East Hennepin portion of this corridor exhibits some potential for additional infill development.
- **Central Avenue NE.** The downtown portion of this corridor shows relatively strong potential, but will likely be built out in several years. The northern half of the East Hennepin area also shows some potential, as does the commercial corridor around Lowry Avenue.

## Chapter 5. Evaluation of Transit Operations

This chapter evaluates how an initial streetcar operation might work in each of the candidate corridors, and makes an assessment of the impact initial streetcar operations would have on the underlying bus network. Ideally, from an operations and operating cost perspective, when converting a PTN line to streetcar operations, the entire line would be converted at once, allowing buses to be replaced by streetcars essentially one for one. While this may be ideal, it is simply not practical – most of the PTN routes are very long, coming into central Minneapolis from outlying suburbs, while the streetcar corridors being studied are either entirely within the City of Minneapolis or continue only to the next adjacent jurisdiction. Corridors can certainly be extended, however it is much more likely that an initial segment would be much shorter. Most modern streetcar implementations have initially been very short – only a mile or two in length for starters. This means that for a significant period of time, it is likely that streetcars and buses would need to be able to coexist in the PTN corridors.

Although streetcar service has some operational benefits over buses, as discussed in the Phase I evaluation, the short length of initial streetcar corridors makes it difficult to simply replace buses with streetcars. Some buses may be replaced with streetcars when the streetcar carries a significant portion of the bus route demand. For example, if riders on the inner part of a route choose streetcar, bus frequencies may be reduced to what is needed only to serve the outer part of a line. Some bus demand may be reduced if stops in the inner part of the route can be wider spaced because of the streetcar, allowing overall bus speeds to increase. Given the fact that streetcar routes are quite short this factor is probably minor.

One alternative would be to terminate the long line of buses at the first streetcar stop and force a transfer for all riders from the bus to the streetcar. This is certainly possible, and would reduce bus demand the most of any initial operating scheme, but would be so inconvenient for so many passengers, this is not seen as desirable.

To evaluate how an initial streetcar plan might operate, several factors were considered. First, a qualitative analysis of the ability of the streetcar and underlying bus service to maintain adequate speed and reliability were assessed. Then connectivity and potential conflicts with high capacity transit investments, including LRT and BRT were assessed. Finally, initial operating plans were developed and an initial assessment of the opportunity to reduce bus demand with the implementation of streetcar service was completed.

## Ability to Maintain Adequate Speed and Reliability

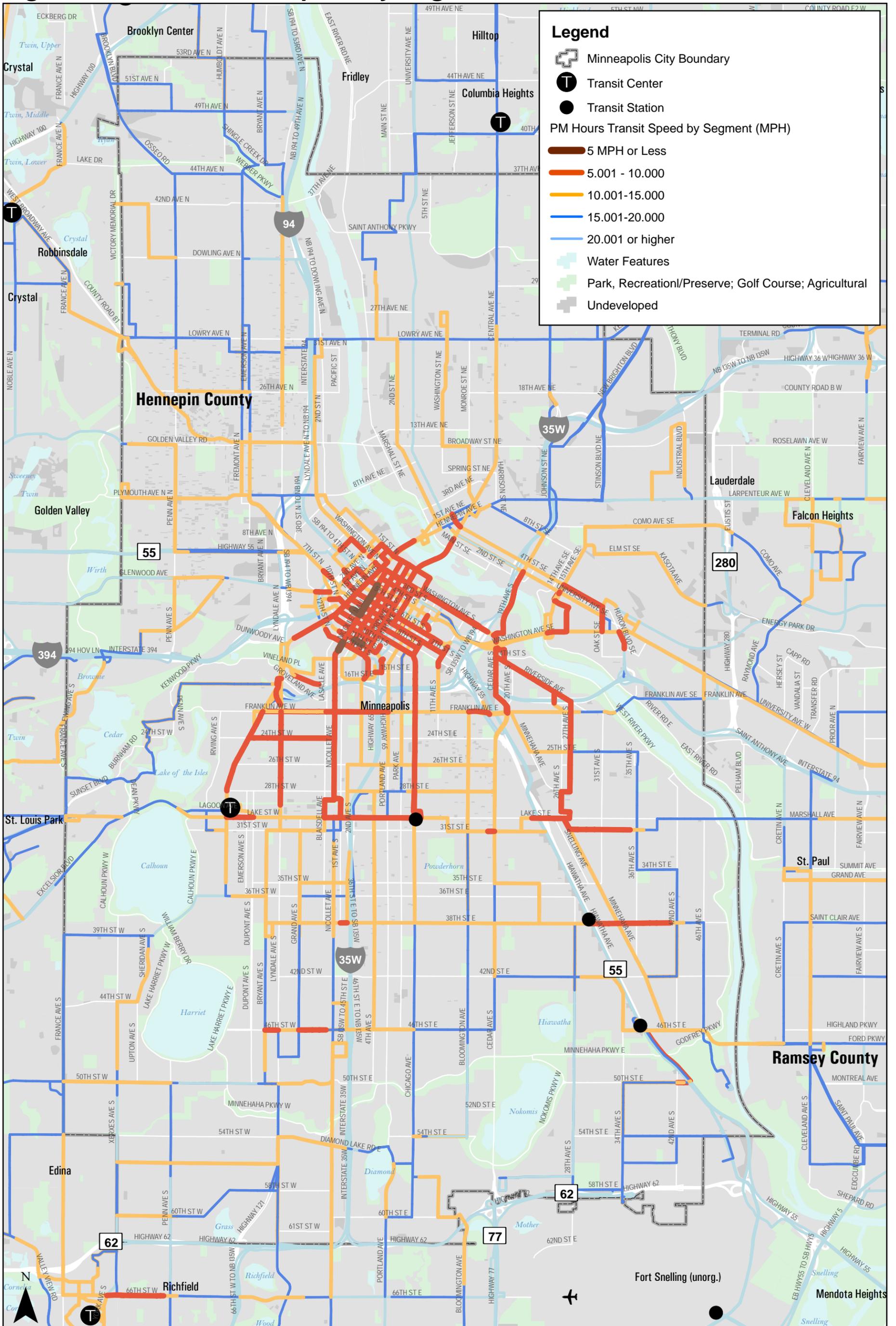
This criteria examines existing peak and midday transit operating speeds to assess areas where streetcar service may not be able to operate at an acceptable speed or maintain a reliable headway. It is assumed at this phase of the analysis that streetcars will have similar operating speeds as buses, though streetcar speeds can be impacted by their lack of mobility to travel around obstacles such as double-parked vehicles, delivery vehicles or emergency situations where the track is blocked.

A goal of 8 mph has been established for very urban operating environments (such as downtown). The overall goal established in Access Minneapolis states that average operating speed (including time for stops) should be at least 30% of the speed limit. Assuming the speed limit in most of these corridors is 30 mph, acceptable transit speeds outside of downtown should be at least 9 mph.

Figures 5-1 and 5-2 present peak and midday transit operating speed by segment. It should be noted that these maps show scheduled operating speed rather than actual operating speed. According to Metro Transit, these maps generally reflect actual operating conditions.

Where transit speeds do not currently meet PTN required speeds, some capital or operating improvements would be necessary to meet this criteria, whether the service is provided by bus or streetcar. In some cases, streetcar service can help improve overall transit speed by allowing for wider bus stop spacing in the area where streetcar service is provided as an overlay to the bus service. Also, modern streetcars (similar to those used in Portland) generally utilize all-door boarding and on-board payment, which can greatly reduce dwell times over standard buses. On the other hand, congestion and physical constraints (such as double-parked vehicles or accidents) will make it more difficult for a streetcar to maintain adequate speed compared to buses operating in the same area.

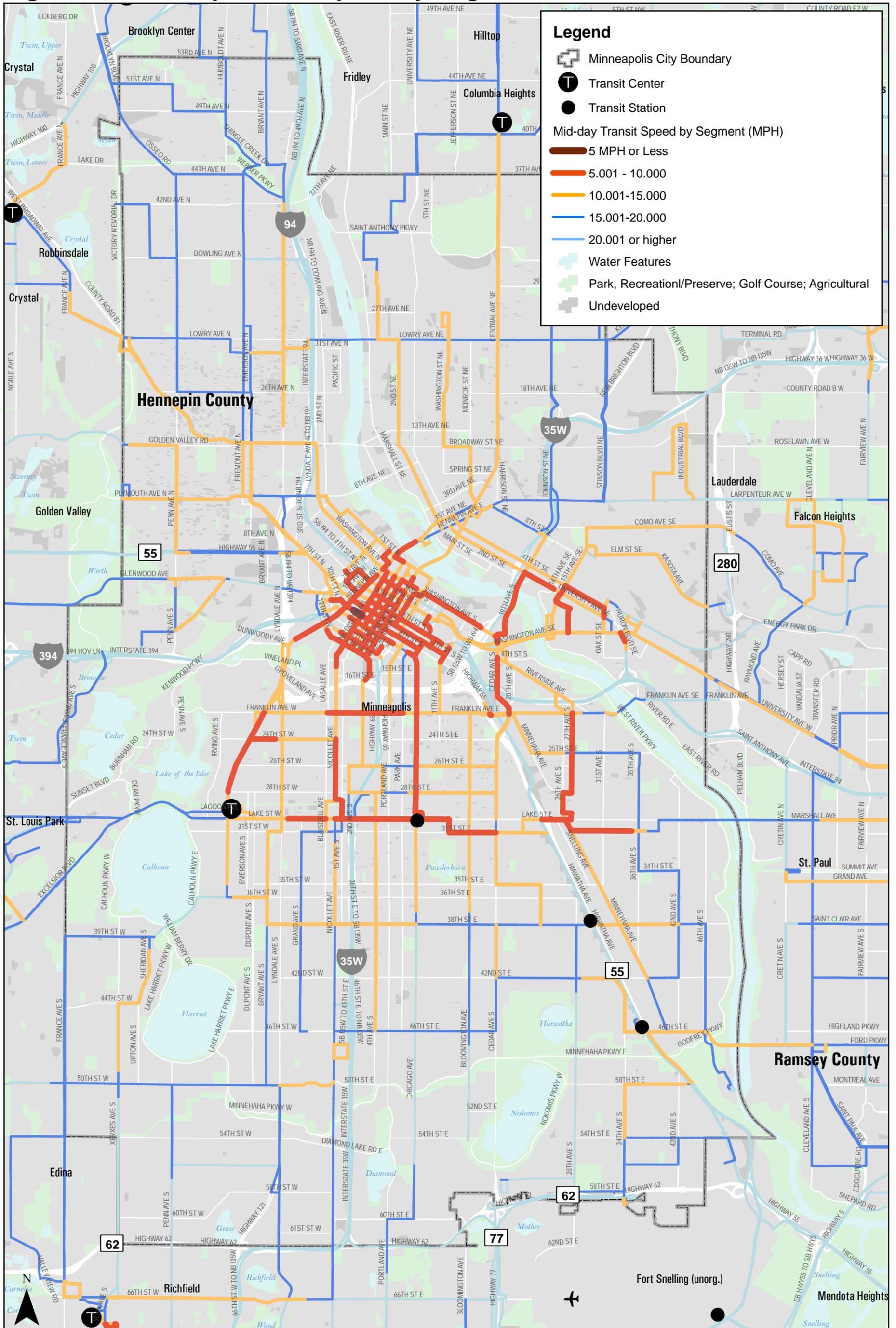
**Figure 5-1 Peak Transit Speed by Segment**



0 0.25 0.5 1 1.5 2 Miles

Source: MetroGIS, Met Council, and the City of Minneapolis

# Figure 5-2 Midday Transit Speed by Segment



0 0.25 0.5 1 1.5 2 Miles

Source: MetroGIS, Met Council, and the City of Minneapolis

Where transit operating speed is an issue, and where transit priority treatments are necessary to maintain acceptable operating speed, this will ultimately translate to a capital cost. This section of the analysis identifies areas along each corridor where techniques to improve transit operating speed might be required to achieve established speed goals. Later in this report, an initial assessment of capital cost impacts that may be incurred to maintain adequate speeds will be identified for all corridors. Examples of possible techniques that can be used to improve transit operating speed include:

- Minor signal pre-emption
- Exclusive transit lane
- Queue bypasses

In addition to the capital investments described above, several other methods could be applied to the system as a whole (or to certain parts of the system) to help maintain transit operating speeds:

- Proof of payment and/or on-board payment that does not require driver
- All-door boarding
- Free fare zones
- Wider stop spacing (when provided as an overlay to bus service)

In order to assess the difference between these corridors in terms of operating speed, some judgment was used to assess the significance this might have in terms of overall speed and reliability along the corridor. A summary of this evaluation is provided in Figure 5-4 and discussed below for each corridor.

### **W Broadway Avenue**

Transit operating speeds in the W Broadway corridor generally meet PTN goals, with speeds between 10-15 mph throughout the day. There are a few short segments of Washington Avenue in downtown Minneapolis that have operating speeds between 5-10 mph during peak periods. Based on existing speeds, no significant additional investment would be required to maintain streetcar speeds in this corridor.

### **Central Avenue NE**

Outside of downtown, this route also generally meets PTN speed requirements. The only speed issues along this corridor include the 3<sup>rd</sup> Avenue bridge, 3<sup>rd</sup> Avenue in downtown and Washington Avenue in downtown, all of which are operating between 5-10 mph during the PM peak period. Operating speeds during the midday improve to at least 10 mph, even on the 3<sup>rd</sup> Avenue bridge and on Washington Avenue. Although significant investment would not be required to maintain streetcar speeds in this corridor, some level of minor signal pre-emption might be explored in downtown (on 3<sup>rd</sup> Avenue S and Washington Avenue).

## Chicago Avenue S

This corridor barely maintains PTN speeds for almost its entire length from Lake Street north into downtown Minneapolis (with the exception of Chicago Avenue in downtown). During the PM peak period, speeds approach 8 mph closer to downtown. Speeds on 9<sup>th</sup> and 10<sup>th</sup> Streets in downtown are currently between 7-9 mph during midday and peak periods. Currently, there is no through service on Chicago Avenue in downtown, but speeds on Washington between Chicago Avenue and Nicollet Avenue are between 8-9 mph throughout the day. Based on current speeds, some level of transit priority is appropriate along this corridor to at least maintain current speeds and hopefully improve speeds – especially downtown. As a result of the planning work in Access Minneapolis, the buses that use this corridor will eventually use 8<sup>th</sup> Street, which is planned to include at least a single transit lane in each direction. Minor signal pre-emption for transit should also be explored along Chicago Avenue between downtown and Lake Street.

## Franklin Ave

Between Blaisdell Avenue S and Chicago Avenue S, operating speeds are around 9-10 mph during peak periods and slightly better (around 11 mph) midday. No major investment would be necessary to maintain streetcar service on this corridor.

## Hennepin Avenue S

This corridor generally meets PTN speed criteria outside of downtown. Within downtown, speeds drop to between 7 and 8 mph, consistent with other major downtown transit corridors. The Access Minneapolis project is addressing travel speeds along key downtown transit corridors, including Hennepin Avenue.

## Midtown Greenway

Because the Greenway is a protected right-of-way and will not compete with any other traffic, streetcars should be able to operate unconstrained in this corridor.

## Lake Street

Lake Street is quite congested for an east-west street that does not serve downtown. Speeds are below PTN requirements, between 7 and 8 mph between Nicollet and Chicago Avenue. Operating speeds are somewhat faster between Nicollet and Hennepin, with some slowing on Lake between Hennepin Avenue and Dupont Avenue.

Given the competition with other modes, the most obvious solutions for improving transit speed on this street would be queue bypass lanes (which requires parking removal), something that would be considered highly undesirable by neighborhood merchants. Other less effective transit priority options include minor pre-emption at key intersections.

It should be noted that the I-35W Access project will address existing traffic issues at Lake Street and I-35W.

### **Nicollet Avenue S**

South of Lake Street, transit speeds are able to exceed PTN requirements. Between Lake Street and downtown, speeds diminish to around 8 mph throughout the day, just below the PTN minimums. During peak periods, the Nicollet Mall has speeds between 4-6 mph. It should be noted, however, that the Nicollet Mall is an exclusive transit right-of-way, and the Access Minneapolis project seeks to improve speeds along this corridor. No additional treatments would be required to maintain transit speeds for streetcar operations, however, great care will be needed to ensure that streetcar operations do not further slow buses on the mall in a very constrained right of way.

### **University Avenue SE / 4<sup>th</sup> Street SE**

Transit operating speed in this corridor is between 12-14 mph, exceeding the PTN minimums, except on the Hennepin Avenue bridge, at Hennepin/University and in Dinkytown where peak period and midday speeds are around 8 mph. No significant investment would be required to maintain PTN speeds throughout the corridor.

### **Lyndale Avenue S**

No major speed issues were identified during the midday, but during the PM peak period, operating speeds are approaching 9 mph between Franklin and Lake. While no significant investment would be required to maintain PTN speeds throughout the corridor, if streetcars were introduced, this corridor should be monitored to ensure adequate speeds are maintained.

Operating speeds in downtown along Hennepin Avenue are between 5-10 mph throughout the day. As noted under the Hennepin Avenue corridor, the Access Minneapolis project is addressing transit speed in downtown Minneapolis.

## **Adequate Speed and Reliability – Summary and Conclusions**

As noted earlier, streetcar service could actually be slower than bus service in some of these corridors because of its inability to pass temporary obstructions in the roadway. Based on this assessment of transit operating speeds, several corridors have segments where streetcar operating speeds would likely be below PTN standards and would justify some level of transit priority:

- **Chicago Avenue S.** While speeds are slightly lower in downtown, this corridor is at or below PTN speed standards along the entire corridor. The Access Minneapolis project is addressing transit operating speed in downtown. Transit priority measures should be explored between downtown and Lake Street.
- **Lake Street.** Transit operating speeds are relatively slow along this entire corridor, especially between Nicollet and Chicago and in the Uptown area. While the I-35W Access project will address congestion at I-35W, some level of transit priority (such as queue jumps or transit signal priority) should be explored at key intersections.
- **Downtown corridors.** As expected, downtown corridors are the most congested segments of the candidate corridors. The Access Minneapolis project is addressing transit operating speeds within downtown by consolidating transit services on fewer corridors which then justifies exclusive transit lanes or other transit priority measures.

## Relationship to Other Streetcar, LRT or BRT Lines

The following section evaluates how well streetcar integrates service with other high investment transit modes, such as BRT and LRT, as well as other streetcar lines. This section measures several aspects of integrating with these other modes separately:

- **Relationship to the Other Potential Streetcar Lines.** Evaluates how well each corridor relates to other streetcar corridors in the system, with the ultimate goal of forming a long-term streetcar network.
- **Relationship to Current/Future LRT or BRT.** Measures how well the streetcar corridors connect with LRT. This evaluation includes current and future LRT/BRT corridors.
- **Competition with LRT or BRT.** This evaluates whether or not each streetcar corridor would be in competition with a current or future LRT or BRT corridor and if this streetcar line introduces an imbalance in the distribution of high-capacity transit investments in the city.

### W Broadway Avenue

This corridor provides good connections to other streetcar corridors in downtown, especially the Chicago Avenue corridor via Washington Avenue or via Nicollet/9<sup>th</sup>/10<sup>th</sup>.

Streetcar service in this corridor would not directly connect with any of the current or future LRT lines, but if connected to the Chicago Avenue corridor, would have good connections to either the Nicollet Mall or Downtown East/Metrodome Hiawatha LRT (and future Central LRT) station.

Some potential duplication in high-capacity transit service exists if the Bottineau BRT line uses W Broadway through north Minneapolis. Although the Bottineau BRT service would provide limited stop service, and streetcar would provide local service with many more stops, some duplication would exist at major stops (Penn, Fremont/Emerson and Lyndale). Given the differences in operating plan, this apparent duplication may actually be an advantage, as BRT stops can be widely spaced and streetcar service can provide the underlying distribution network.

### Central Avenue NE

This corridor integrates well with other streetcar corridors, such as Nicollet, Lyndale, Hennepin or Chicago – though there would be some minor duplication in service between this corridor and the University/4<sup>th</sup> corridor in the East Hennepin area if all lines were developed.

Although this corridor would not directly connect with an LRT or BRT line, a connection to any of the south Minneapolis corridors (Nicollet, Lyndale, Hennepin or Chicago) would provide good connections to the Hiawatha and Central LRT stations along 5<sup>th</sup> Street.

No duplication in high-capacity transit service was identified if streetcars were introduced in this corridor.

### **Chicago Avenue S**

Because of the existing bus network, this corridor has a strong logical connection to the W Broadway corridor in downtown, but could also connect with the Central Avenue NE corridor via the 9<sup>th</sup>/10<sup>th</sup>/Nicollet alignment. This corridor also connects with the Midtown Greenway and/or Lake Street corridor, but it is unlikely that service would be interlined.

Streetcar service would directly connect with the Hiawatha/Central LRT stations in downtown (either at the Nicollet Mall or Downtown East/Metrodome station).

No duplication in high-capacity transit service was identified if streetcars were introduced in this corridor.

### **Franklin Ave**

Franklin Avenue has limited potential as a streetcar line on its own, and provides limited use as a connection between Nicollet and Chicago. This short section of Franklin does not connect with any existing high capacity investment.

No duplication in high-capacity transit service was identified if streetcars were introduced in this corridor.

### **Hennepin Avenue S**

The Hennepin Avenue S corridor shows strong potential for connections to the University/4<sup>th</sup> corridor, or to the Central Avenue NE corridor. This corridor also connects to the Midtown Greenway/Lake Street corridor.

This corridor would connect with the Hiawatha/Central LRT line at the Warehouse District/Hennepin Avenue station. If the Southwest LRT corridor is implemented via the Greenway/Nicollet alignment, this corridor will provide an important connection to that corridor.

If Southwest LRT is implemented via the Kenilworth/Royalston alignment, it would be approximately 1 mile west of the Hennepin streetcar corridor (as the crow flies). Although these corridors are parallel to each other, and both serve downtown, the Lake of the Isles and circuitous street network in this area creates a barrier between these two areas, thus eliminating any potential duplication between services. In addition, the Hennepin

streetcar corridor would provide local service with stops every few blocks, whereas the Southwest Corridor LRT line would provide regional service with much wider stop spacing.

### **Midtown Greenway**

A key advantage of this east-west corridor is its potential to connect two major light rail corridors, as well as potentially having an interface with the Hennepin, Lyndale, Nicollet and Chicago streetcar corridors.

The Midtown Greenway could provide a connection between the planned Southwest LRT and existing Hiawatha LRT (if the Kenilworth/Royalston alignment is chosen). The Greenway line would connect with the Southwest Corridor line at the West Lake station, and would terminate at the Lake Street station of the Hiawatha line on the east. Having this connection service would enhance both light rail lines by providing a convenient connection between those lines and major employment and medical facilities that are directly served by the Greenway. Similarly, riders living near the Greenway could use the streetcar as their mode of access to light rail, which is too far for many passengers to access by walking.

If the Uptown to Nicollet alignment for Southwest LRT is chosen, there would be obvious competition between streetcar service and LRT in this corridor – at least between Nicollet and the West Lake station. If this alignment is chosen, streetcars could still provide a connection between the 28<sup>th</sup> Street station and the Hiawatha LRT station at Lake Street<sup>1</sup>.

### **Lake Street**

As with the Midtown Greenway, the Lake Street corridor connects with the Hennepin, Lyndale, Nicollet and Chicago streetcar corridors. However, none of these corridors logically interline with the Lake Street corridor.

The Lake Street corridor provides a connection between the planned West Lake station on the Southwest Corridor LRT line and existing Lake Street station on the Hiawatha LRT line. While this corridor accomplishes the same connection as the Midtown Greenway, Lake Street would be much slower due to lower operating speeds. This assumes the Kenilworth alignment is chosen.

If the Uptown to Nicollet corridor is chosen for Southwest LRT, streetcars could still operate along Lake Street, though this would introduce potential duplication of high-capacity service in this corridor.

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<sup>1</sup> A potential alignment for this connection would be via 28<sup>th</sup> Street to 5<sup>th</sup> Avenue S to the Greenway. 5<sup>th</sup> Avenue S is the only at-grade crossing along the Greenway.

## **Nicollet Avenue S**

Because this corridor includes the Nicollet Mall, there is very strong potential for connections to other streetcar corridors, especially Central Avenue NE.

A strong connection would also be made to the Hiawatha/Central LRT station at the Nicollet Mall. If the Southwest LRT alignment via Uptown and Nicollet is chosen, however, there would be obvious duplication of service in the Nicollet corridor.

## **University Avenue SE / 4<sup>th</sup> Street SE**

This corridor has strong potential for connections to either the Hennepin or Lyndale streetcar corridors.

This corridor also has the ability to connect to the future Central LRT near the University of Minnesota, and the Hiawatha/Central LRT stations along 5<sup>th</sup> Street in downtown.

Although this corridor and Central LRT both connect downtown to the University of Minnesota, this corridor is too far away from the Central LRT corridor to be considered duplication of service.

## **Lyndale Avenue S**

As with the Hennepin Avenue corridor, Lyndale Avenue S has the potential to connection to other streetcar corridors downtown, either University/4<sup>th</sup> or Central Avenue NE. This corridor also connects to the Midtown Greenway/Lake Street corridor. Between Lake Street and Franklin Avenue, the Lyndale and Hennepin corridors increasingly compete with each other as Hennepin merges with Lyndale north of Franklin Avenue. It should be noted that bus ridership on Hennepin is stronger than on Lyndale, which indicates that service in these two corridors is duplicative to some degree. Lyndale is also ½ mile west of Nicollet and some potential duplication in service could exist if streetcar were implemented in both corridors.

As with the Hennepin Avenue corridor, the Lyndale corridor would connect with the Hiawatha/Central LRT line at the Warehouse District/Hennepin Avenue station.

If the Southwest LRT corridor is implemented via the Greenway/Nicollet alignment, this corridor will provide an important connection to that corridor as well. However, some duplication would likely exist since Lyndale Avenue is ½ mile away from Nicollet Avenue and LRT service would likely be slightly faster<sup>2</sup> with fewer stops.

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<sup>2</sup> Southwest LRT service along the Uptown/Nicollet alignment would be underground between 28<sup>th</sup> Street and Franklin Avenue.

## Relationship to Other Streetcar, LRT or BRT Lines – Summary and Conclusions

With the exception of the Franklin Avenue corridor, all of the corridors have relatively logical connections with other streetcar corridors. The only corridor (besides Franklin Avenue) that does not interline with another corridor is the Midtown Greenway/Lake Street corridor.

Likewise, most of the proposed streetcar lines fit well into the system of high capacity transit either already in place or planned by Metro Transit. Of the corridors being considered, only the Franklin Avenue corridor does not have at least one light rail connection. It is assumed that if streetcar service were implemented in the W Broadway Avenue and Central Avenue corridors, it would at least connect with a LRT station in downtown.

Several corridors offer the greatest opportunity to capitalize on high capacity investments by expanding access to Light Rail or BRT to a new corridor of streetcar riders, including:

- Hennepin Avenue S
- Lyndale Avenue S
- University Avenue SE / 4<sup>th</sup> Street SE
- Chicago Avenue S
- Central Avenue S
- Nicollet Avenue S (if Southwest Corridor alignment via Uptown/Nicollet is not chosen)
- Lake Street/Midtown Greenway

On the other hand, it is important not to invest in streetcar corridors that will simply take ridership away from high capacity investments. Corridors with potential conflicts include:

- **Lake Street/Midtown Greenway.** If the Uptown to Nicollet alignment for the Southwest Corridor LRT line is chosen, streetcar service in the Greenway between the West Lake station and Nicollet would be duplicative. Likewise, streetcar service on Lake Street would be duplicative, though this service would be less duplicative than streetcar service in the Greenway since this would be local service. Streetcar service between Nicollet Avenue and the Lake Street station of the Hiawatha LRT line would still be possible if the Uptown/Nicollet alignment is chosen for the Southwest Corridor LRT line.

- **Lyndale Avenue/Hennepin and Nicollet.** A Lyndale Avenue streetcar corridor would compete with streetcar investments in the Hennepin and Nicollet corridors. This is true today in the bus system, and as a result Lyndale is a lower transit ridership corridor than either of the other two corridors. It is unlikely that a future streetcar network could support development in all three corridors.

## Replacement of Existing Bus Service

This criteria evaluates how well streetcar service in each corridor would integrate with the existing Metro Transit regional bus system. To conduct this analysis, *initial* operating plans were developed for each candidate corridor and reviewed with Metro Transit. In developing the initial operating plans, several guidelines were used for each candidate corridor:

- Streetcars should only replace bus volumes where significant overlap occurs.
- Forced transfers are undesirable, unless at major turnover locations (such as downtown).
- No major route restructuring was proposed.
- To justify the investment, minimum streetcar service frequency is assumed to be 15 minutes, 16-18 hours per day (PTN levels). More frequent streetcar service would be provided if ridership demanded higher service levels.
- Initial streetcar operating plans assumed service is operated for the full corridor alignment, unless there was a compelling reason to extend or shorten the proposed alignment.

Based on these guidelines, bus service was evaluated in each candidate corridor and an assessment was made as to which, if any, bus routes or trips would be affected if streetcars were present. In the absence of major route restructuring, several strategies were considered for the underlying bus network if streetcar service were introduced:

- **Replacement of bus trips.** If a significant number of buses *could* be replaced by streetcars, then the base service frequency for streetcars was adjusted accordingly. In other words, if all buses along a particular segment are replaced by streetcars, and the existing service levels are greater than 15 minutes, then streetcar service levels mimic the bus service.
- **Limited stop bus operation.** If it did not make sense to eliminate bus trips with streetcars present, another way to improve the cost effectiveness of operating streetcars is to operate some or all buses along the streetcar corridor on a limited stop basis. This not only speeds up the buses (making the service more attractive to riders beyond the streetcar corridor), but has an impact on bus operating costs.
- **No change to underlying bus network.** In some cases, it was not possible to replace buses, there is no underlying bus service, or there was no significant

advantage to limited stop bus operation along the streetcar corridor. In this case, the streetcar was simply another mode and was added to total vehicle volumes and operating costs.

Based on this process, initial service hours and the peak vehicle requirement were developed for streetcar service in each candidate corridor. Likewise, if bus trips were replaced, or buses operated limited stop, an initial estimate of reduced service hours associated with this change was developed. This is summarized for each corridor in Figure 5-3.<sup>3</sup>

As noted earlier, the strategies used to develop the initial operating plans did not include major route restructuring. It is important to emphasize that if streetcar service were being initiated in each of the corridors at the same time, major route restructuring *would* be required. It should also be noted that these preliminary operating plans are designed to allow for comparison between corridors, and do not represent a final recommendation or the only way a corridor could operate.

A more detailed summary of the operating plan by corridor is presented in the Appendix.

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<sup>3</sup> Washington Avenue and Franklin Avenue are not included in this table because separate initial operating plans were not developed for these corridors.

**Figure 5-3 Initial Operating Plans and Estimated Change in Operating Hours**

Corridor	Length of Corridor, one-way (in miles)	Peak Streetcar Vehicle Requirement	Net Change in Annual Operating Hours (+ or -)	Net Change in Daily Vehicle Volumes – NB or EB (+)	Net Change in Daily Vehicle Volumes – SB or WB (+)
Broadway	5.2	4	12,000	33	27
Central	3.1	3	12,500	72	72
Chicago	3.1	4	10,000	30	34
Hennepin	2.9	4	16,000 (6)	67	68
Midtown Greenway (1)	4.7	3	18,000	72 (3)	72 (3)
Midtown Greenway (2)	4.7	5	27,000 (4)	72 (3)	72 (3)
Lake	4.6	10	13,000	4	7
Nicollet	6.9	12	20,000 (5)	28	33
University/4 <sup>th</sup>	2.6	4	8,000	28	28
Lyndale	2.8	4	18,000 (6)	72	72

(1) Two-way via Greenway.

(2) One-way Greenway, one-way Lake Street.

(3) Operates in exclusive ROW and is not adding or replacing an existing bus line.

(4) No impact on bus routes has been determined yet. This figure will be lower if service on parallel corridors is replaced.

(5) May be additional impacts on bus service if 18G is replaced by neighborhood circulator.

(6) No impact on bus routes has been determined yet. One potential strategy to reduce operating hours and bus volumes includes midday service transfers at Lake and peak service operating limited stop between Lake and downtown. See corridor summaries below for more detail.

## **W Broadway Avenue**

Streetcar service in this corridor would begin at the Robbinsdale Transit Center (TC), travel south via Broadway Avenue, France Avenue, Oakdale Avenue, and then W Broadway Avenue, Washington Avenue to Hennepin Avenue. The portion of Washington Avenue between W Broadway Avenue and Hennepin Avenue was determined to be the most logical connection to downtown.

Only Route 14 trips could be affected if streetcars were present in this corridor – even though Route 32 operates in a portion of this corridor, Route 32 also serves Lowry Avenue. Most Route 14 trips operate from the Robbinsdale Transit Center to south Minneapolis through downtown. Very few existing bus trips on Route 14 end in downtown.

If streetcars were present, it was assumed that all Route 14 trips that follow the exact alignment as the streetcar corridor would be replaced. All other Route 14 trips operating on Broadway would run limited stop into downtown (approximately every 4 blocks). All local service on Broadway would be handled by streetcars. It should be noted that Route 14 buses between downtown and south Minneapolis would still continue to operate. Some additional costs would be associated with severing this route in downtown, but at this stage of the analysis that difference was assumed to be negligible.

Although some buses are replaced by streetcars, 15 minute frequency, 18 hours a day, was determined to be sufficient for streetcars in this corridor. Streetcar service in this corridor would require approximately 26,000 annual service hours, offset by the reduction of 14,000 in bus hours. If additional route restructuring were done in this corridor (especially in Robbinsdale), streetcars could replace all Route 14 buses between Robbinsdale and downtown.

## **Central Avenue NE**

Streetcar service in this corridor would operate via Central Avenue NE from 29<sup>th</sup> Avenue NE to downtown via the 3<sup>rd</sup> Avenue bridge. In downtown, this corridor includes a small portion of Washington between 3<sup>rd</sup> Avenue and Nicollet. This corridor was extended to 29<sup>th</sup> Avenue NE because of the potential for redevelopment in the Shorham Yards property west of Central Avenue.

The only bus route that would be affected by streetcar service in this corridor is Route 10. However, all Route 10 buses operate at least as far as the Columbia Heights Transit Center (1.5 miles to the north). This corridor was not extended further north because of an at-grade railroad crossing (at 36<sup>th</sup> Avenue NE) and because of low-density land use north of Lowry Avenue NE. Therefore, no Route 10 trips are replaced if streetcars were present, but all Route 10 buses could operate limited stop between Lowry Avenue NE and downtown. Streetcars would provide service at all local stops on Central Avenue.

Based on the fact that bus service would not be significantly reduced in this corridor, 15 minute frequency, 18 hours a day, was determined to be sufficient for streetcar in this corridor. Streetcar in this corridor would require approximately 18,000 annual service hours, offset by approximately 5,500 bus hours for limited stop service. Because extending this streetcar corridor to the north would be difficult, it is unlikely that streetcars will be able to replace any buses in this corridor without significant route restructuring and major inconveniences to passengers.

## Chicago Avenue S

Initially, this candidate streetcar corridor extended only as far south as Lake Street. Since Route 5 is the only local route that would be affected by streetcar service, and because no Route 5 buses begin their trips at Lake Street, streetcar service in this corridor was extended to 38<sup>th</sup> and Chicago where some short line Route 5 buses begin their trip. Connections to the crosstown Route 23 could also be made at 38<sup>th</sup> Street, further strengthening the case to extend the corridor. The streetcar alignment would then follow Chicago from 38<sup>th</sup> Street to 9<sup>th</sup>/10<sup>th</sup> Street in downtown. From this point, several alignments are possible: 1) via 9<sup>th</sup>/10<sup>th</sup> Street to Nicollet and 2) via Chicago Avenue to Washington Avenue to Nicollet. Both alignments would logically flow into the Broadway corridor via Washington Avenue.

It should be noted that 8<sup>th</sup> Street was determined to be a transit corridor in the Access Minneapolis Ten Year Transportation Action Plan. However, due to a low skyway on 8<sup>th</sup> Street, 9<sup>th</sup> and 10<sup>th</sup> Streets were selected as a potential connection between Chicago Avenue and Nicollet Avenue.

All Route 5 buses that operate from 38<sup>th</sup> Street to downtown could be replaced by streetcars under this scenario. All other Route 5 buses that operate south of 38<sup>th</sup> Street would operate limited stop between downtown and 38<sup>th</sup> Street (with stops approximately every 4 blocks). Streetcars would provide service to all stops on Chicago Avenue. It should be noted that Route 5 buses between downtown and north Minneapolis would still continue to operate, and serve a very important market. Some additional costs would be associated with severing this route in downtown, but at this stage of the analysis that difference was assumed to be negligible.

Because only a portion of buses was replaced in this corridor, 15 minute frequency, 18 hours a day, was determined to be sufficient for streetcars in this corridor. Streetcars in this corridor would require approximately 21,000 annual service hours, offset by approximately 11,000 bus hours for some eliminating bus trips and operating limited stop bus service north of 38<sup>th</sup> Street. Without extending the streetcar corridor significantly to the south, or significant restructuring of Route 5 which could potentially be inconvenient to passengers, it is unlikely that streetcars will be able to replace additional buses in this corridor.

## **Franklin Ave**

Because this corridor was only retained as a possible connection between the Nicollet and Chicago Avenue S corridors, no operating plan was developed. Although Franklin Avenue is an important east-west transit corridor, it has less potential as a streetcar corridor.

## **Hennepin Avenue S**

Streetcar service in this corridor would operate via Hennepin/Lake to downtown Minneapolis via Hennepin. Three local bus routes operate on this section of Hennepin: Routes 6, 12, and 17.

Because Route 17 only serves a portion of Hennepin, and provides a link between Hennepin and Nicollet, this route would be unaffected if streetcars were present. Route 12 operates mostly peak hour service and serves the western suburbs of Minnetonka, Hopkins and St. Louis Park. Although Route 12 buses could be terminated at Hennepin, it was felt that this would be an inconvenience to passengers, and with limited or no time savings advantage. Likewise, Route 6 serves a similar function to southwest Minneapolis and Edina. Forcing a transfer to a streetcar in Uptown would be a major inconvenience to many passengers. Only the Route 6 buses that start or end at 36<sup>th</sup> and Hennepin could be replaced by streetcars.

Although all Route 6 and 12 buses could operate limited stop between Uptown and downtown, there would be little time savings to this approach. Therefore, streetcar operation on Hennepin would be an additional mode unless significant route restructuring was considered. Based on this initial plan, 15 minute frequency, 18 hours a day, was determined to be sufficient for streetcars in this corridor. Streetcars in this corridor would require approximately 18,000 annual service hours, offset by approximately 2,000 bus hours for eliminating buses that operate only from 36<sup>th</sup> Street to downtown.

One option for replacing buses in this corridor would be to operate peak hour trips limited stop into downtown and terminate all midday Route 6 trips in Uptown with a transfer to the streetcar. Although this option was not included in the initial operating plan, it could be explored further if Hennepin has strong potential for a starter streetcar line.

## **Midtown Greenway**

Streetcar service in the Midtown Greenway would operate from the future SW LRT West Lake station (at approximately Chowen Avenue and Lake Street) to the Hiawatha LRT station. This initial operating plan assumes a very similar operation to that envisioned by the Midtown Greenway Coalition<sup>4</sup>, which evaluated the potential of a single-track operation with some passing bays. Although streetcar service in this corridor would

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<sup>4</sup> Source: THE FEASIBILITY OF A SINGLE-TRACK VINTAGE TROLLEY IN THE MIDTOWN GREENWAY, Midtown Greenway Coalition, March 2001.

operate parallel to Lake Street, it was assumed that this service would not replace any buses along Lake Street. Therefore, streetcar service in the Greenway would be a total add in terms of vehicles and operating costs. Based on the Midtown Greenway Coalition's plan, service would operate on 15-minute headways throughout the day with service 17 hours a day. This service would require approximately 18,000 annual service hours. There would be no reduction in service hours due to modifications to the existing bus network.

An alternative operating plan was also developed that uses the Greenway for one direction of travel and Lake Street for the other direction. Several issues arise with this configuration:

- The markets served by the two corridors are very different. The Greenway would function similar to a light rail connector line (with less capacity), whereas Lake Street would function like a traditional urban streetcar line.
- The distance between the Greenway and Lake Street ranges from 2-4 blocks, which means passengers cannot see service in both directions. This situation makes short, local trips, much less attractive.
- Service in the Greenway would be much less visible than service on Lake Street.
- By splitting service between Lake Street and the Midtown Greenway would likely reduce rather than reinforce the attractiveness of the service in both corridors.
- Finally, the Greenway is going to be much faster to operate streetcars than Lake Street – which introduces significant challenges from an operational standpoint<sup>5</sup>.

Based on these drawbacks, it was assumed that service in one direction in the Greenway, and the other direction on Lake Street, would not only be less cost effective (it would require approximately 27,000 annual service hours) and difficult for passengers to understand, but have no impact on bus volumes on Lake Street.

It should be noted that the chosen alignment of the future SW LRT line will likely dictate the feasibility of streetcar service in the Greenway. If the Uptown/Nicollet alignment is chosen, it is assumed that streetcar service would no longer be feasible between Nicollet and the West Lake station because LRT would serve the exact function. If this is the chosen alignment, the potential for streetcar service between the 28<sup>th</sup> Street station (just north of the Greenway) and Hiawatha LRT still exists.

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<sup>5</sup> In order to maximize the use of transit vehicles, it is important to have similar operating speeds in both directions of travel. Because the Midtown Greenway would allow much faster operating speeds than Lake Street, this situation would not result in any cost savings over operating service on Lake Street, since the vehicle requirement is determined by the slowest direction of travel.

## Lake Street

Streetcars operating on Lake Street would travel from the future West Lake LRT station (Southwest Corridor) to the Hiawatha LRT station at Lake Street. Because service would be both directions on Lake Street, several bus routes would be impacted by streetcars on Lake Street – Routes 21 and 53. Assuming streetcars serve all local stops, it would be possible to terminate all Route 21 buses on Lake Street at the Hiawatha LRT station. Although forced transfers were avoided on other corridors, the Hiawatha LRT station is the one location where turnover is high – especially as this node becomes more developed in the future. For passengers who are interested in traveling the entire length of Lake Street, Route 53 (which operates limited stop during peak periods on weekdays only) would continue to operate.

Based on this initial plan, service frequencies of streetcars would need to mimic those of Route 21 – one of Metro Transit’s Hi-Frequency routes. During the weekday, eight minute frequencies are assumed during peak hours, and at least 15 minute frequencies during other periods of the day. Likewise, the service span would also need to be 22 hours to mimic service span on Route 21. Service levels on the weekends would also need to be more frequent than 15 minutes and operate longer than 18 hours a day. The estimated 46,000 revenue hours of streetcar service would be offset by approximately 33,000 bus service hours that could be taken out of service if streetcars were present.

As with the Midtown Greenway, the chosen alignment of the future SW LRT line will influence the need for streetcar service in this corridor. Because LRT operating in the Greenway would be more regional in nature with wide stop spacing, local transit service would still be required on Lake Street. While this local service could include streetcar, the potential for duplication of service is higher if local service on Lake Street were provided with streetcar instead of bus.

## Nicollet Avenue S

Because the Nicollet Avenue S corridor is so long and land use patterns variable, it was proposed to introduce a short and long streetcar line. The short line would operate between 38<sup>th</sup> Street and the Nicollet Mall and the long line would operate from 66<sup>th</sup> Street to the Nicollet Mall. A short and long line allows less frequency along the southern portion of this route (where demand is lower), and greater frequency where demand is higher. The route that would be impacted by streetcars in this corridor is Route 18. Assuming streetcar service does extend as far south as 66<sup>th</sup> Street, all bus service along Nicollet Avenue S could be replaced by streetcars. Route 18 service that operates south of 66<sup>th</sup> Street would transfer to streetcars.

Based on this operation plan, the long line would operate every 15 minutes, 22 hours a day (to mimic current Route 18 service hours). Likewise, the short line would operate every 15 minutes, but for only 16 hours a day. The combined frequency of the two lines would produce 7.5 minute service between 38<sup>th</sup> Street and downtown, which is similar to

current bus service in this corridor. During the weekends, the long line would operate every 20 minutes and the short line would operate every 20 minutes, producing a combined headway of 10 minutes north of 38<sup>th</sup> Street. Service hours on weekends would be slightly shorter than weekdays.

Streetcar service in this corridor would require approximately 71,000 annual service hours but could be offset by approximately 51,000 bus hours due to eliminating most Route 18 buses that operate only from 66<sup>th</sup> Street to downtown.

### **University Avenue SE / 4<sup>th</sup> Street SE**

Streetcar service in this corridor would begin in downtown (at Hennepin Avenue and Washington Avenue) and operate across the Hennepin Avenue bridge to University Avenue SE and 4<sup>th</sup> Street SE. The terminal for this corridor would be at the U of M east bank campus, where connections can be made to the future Central LRT line. The only bus route significantly impacted by streetcars in this corridor is Route 6. Although Route 6 serves an important connection to the University, current service terminates every other trip in downtown. If streetcar service were present, it is assumed that all Route 6 trips that serve the University would be replaced by streetcars. It should be noted that other transfer opportunities will be available from downtown to the University, including the Central LRT line and Route 50<sup>6</sup>.

Based on this initial plan, weekday service frequency would need to be every 10 minutes during peak periods, with 15 minute service other times of the day. Streetcars would operate approximately 18 hours a day, seven days a week. Streetcars in this corridor would require approximately 19,000 annual service hours and be offset by approximately 11,000 bus hours for eliminating Route 6 buses between downtown and the University.

This corridor logically connects with the Hennepin Avenue S corridor between downtown and Uptown. Depending on the impact on bus volumes in the Hennepin Avenue S corridor, streetcar service has the capability of replacing most Route 6 buses in this corridor.

### **Lyndale Avenue S**

Streetcar service in the Lyndale Avenue S corridor would operate from around Lake Street to downtown Minneapolis, sharing the Hennepin Avenue alignment north of the bottleneck. The only bus route that would be impacted by streetcar service on Lyndale is Route 4. However, no Route 4 buses begin or end their trip at Lake Street, and the only significant short line of Route 4 is at 50<sup>th</sup> Street. Terminating Route 4 buses at Lake Street, and forcing a transfer to streetcars, would be a major inconvenience for many passengers. Likewise, the Lyndale corridor from Lake Street to Franklin Avenue is only a mile, so

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<sup>6</sup> It is assumed that Central LRT would replace the existing Route 16.

limited stop service would have little advantage. Therefore, no impact on the existing bus service was assumed for this corridor.

Because no buses were replaced in this corridor, streetcar service is assumed to operate every 15 minutes, 18 hours a day – the minimum level of service for the PTN network and to justify the investment in streetcars. Streetcars in this corridor would require approximately 18,000 annual service hours. There would be no reduction in service hours due to modifications to the existing bus network.

Similar to the Hennepin Avenue corridor, another option for maximizing the efficiency of service in this corridor is to operate peak hour trips limited stop into downtown and terminate all midday Route 4 trips at Lake Street with a transfer to the streetcar.

## Replacement of Existing Bus Service – Summary and Conclusions

Based on the initial operating plans, several corridors stand out in terms of the ability to replace existing bus service if streetcars were introduced in the corridor:

- **Lake Street.** Although forced transfers are not desirable, this is the one corridor where a connection could be made between streetcars and the Hiawatha LRT line. Based on this initial plan, all Route 21 buses on Lake Street could be replaced by streetcar, with a net increase of 13,000 annual service hours. It was assumed that no bus service was replaced if streetcar operated in the Midtown Greenway.
- **Nicollet Avenue S.** Because of the length of this corridor, it was possible to eliminate most buses in this corridor and replace them with streetcars. Although the length of the corridor would result in significant capital costs, the net increase in operating costs was 20,000 annual service hours. Although this is still a significant increase, due to the length of the corridor it is low on a per mile basis.
- **University Avenue SE/4<sup>th</sup> Street SE.** Streetcar service in this corridor could replace most Route 6 buses operating between downtown and the University, resulting in a net increase of 8,000 annual service hours.
- **Chicago Avenue S.** All buses operating between 38<sup>th</sup> Street and downtown could be replaced, and other buses could operate limited stop, resulting in a net increase of 10,000 annual service hours.
- **W Broadway Avenue.** A significant number of Route 14 buses could be replaced if streetcar operated in this corridor, and other buses could operate limited stop, resulting in a net increase of 12,000 annual service hours. Although this is still a significant cost increase, on a per mile basis it is low compared to other corridors.

Several corridors, on the other hand, stood out for their inability to impact existing bus volumes:

- **Hennepin Avenue S.** Although some buses could operate limited stop service, it was assumed that streetcars would not be able to reduce bus volumes in this corridor without significant route restructuring and inconvenience to passengers. Streetcar service would result in a significant net increase in operating hours (16,000), which is high on a per mile basis compared to other corridors.
- **Lyndale Avenue S.** As with Hennepin Avenue, this corridor could operate limited stop bus service but would still have a limited impact. Net increase in service hours with streetcars would be approximately 18,000, which is high on a per mile basis compared to other corridors.
- **Midtown Greenway.** Because bus service on Lake Street would still be required if streetcars operated in the Greenway, this resulted in a significant net increase of 18,000, which is relatively high given the length of the corridor.

Figure 5-4 Summary of Transit Operations Criteria

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Ave NE	Lake St	Nicollet Ave S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Ave S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
Ability to Maintain Adequate Speed and Reliability	No major issues north of downtown. Minor speed issues on Washington Ave close to Hennepin Ave.	No major issues north of downtown. 3rd Avenue bridge, 3 <sup>rd</sup> Avenue and Washington Avenue between 5-10 mph during peak periods.	Entire corridor between 5-10 mph during peak and midday periods.	Approaching midday and peak speeds less than 10 mph between Blaisdell Ave and Park Ave S.	Downtown speeds between 7-8 mph; speeds between 24th St and Uptown between 5-10 mph during peak and midday periods.	Exclusive right-of-way, no speed or reliability issues anticipated.	Midday and peak speeds approaching 8 mph along entire corridor.	No major issues south of Lake St. Speed between Lake and downtown between 8 and 10 mph. Speeds along Nicollet Mall range from 4-8 mph throughout the day.	Midday and peak speeds above 12 mph except on Hennepin bridge, in East Hennepin area and near Dinkytown where speeds are around 8 mph.	No major issues midday, approaching 8 mph between Lake and Franklin during the peak.
Relationship to Future Streetcar Network	Good connections to downtown corridors, especially Chicago Avenue corridor.	Good connections with all downtown corridors. Some potential duplication with University/4 <sup>th</sup> corridor in East Hennepin area.	Good connections to downtown corridors, especially the W Broadway corridor; also connects with Midtown Greenway and Lake Street corridor.	Limited utility as a connecting route between Nicollet and Chicago.	Good connections with other streetcar corridors downtown, especially to the University/4 <sup>th</sup> corridor; also connects with Midtown Greenway and Lake Street corridor.	Connects with all south Minneapolis corridors – no interlining opportunities between corridors.	Connects with all south Minneapolis corridors – no interlining opportunities between corridors.	Good connections to all downtown corridors, especially the Central Avenue NE corridor; also connects with Midtown Greenway and Lake Street corridor.	Good connections with all downtown corridors, especially the Hennepin or Lyndale Avenue S corridors; potential duplication with Central Ave NE corridor.	Good connections with other streetcar corridors downtown, especially to the University/4 <sup>th</sup> corridor; also connects with Midtown Greenway and Lake Street corridor.
Relationship to Current/Future LRT or BRT	No direct connection, but close to Hiawatha/Central LRT stops on 5 <sup>th</sup> St.	No direct connection, but close to Hiawatha/Central LRT stops on 5 <sup>th</sup> St.	Direct connections to either the Nicollet Mall or Downtown East/Metrodome LRT station.	Potential connection to SW Corridor LRT at Nicollet.	Connection to Hiawatha/Central LRT station at Hennepin Avenue station.	Potential connection with SW Corridor LRT and Hiawatha LRT (Kenilworth / Royalston alignment only).	Potential to connect SW Corridor LRT and Hiawatha LRT, but slower connection than Greenway (Kenilworth / Royalston alignment only).	Connection to Hiawatha/Central LRT station at Nicollet Mall.	Connection to Central LRT station on U of M campus; close to downtown LRT stations on 5 <sup>th</sup> Street.	Connection to Hiawatha/Central LRT station at Hennepin Avenue station.
Competition with Current/Future LRT or BRT	Potential duplication with Bottineau BRT.	No duplication identified.	No duplication identified.	No duplication identified.	Very minor competition with SW Corridor LRT.	Duplication with SW Corridor LRT between Nicollet and West Lake Station (Uptown/Nicollet alignment only)	Potential duplication with SW Corridor LRT between Nicollet and West Lake Station (Uptown/Nicollet alignment only)	Direct duplication with SW Corridor LRT (Uptown / Nicollet alignment only).	No duplication with Central LRT, even though both serve downtown and the U of M.	Some duplication with SW Corridor LRT (Uptown/Nicollet alignment is only).
Replacement of Existing Bus Service	Corridor Length (one-way): 5.2 miles Streetcar Annual Service Hours: 26,000 Reduction in Bus Service Hours: 14,000 Net Change in Service Hours: +12,000	Corridor Length (one-way): 3.1 miles Streetcar Annual Service Hours: 18,000 Reduction in Bus Service Hours: 5,500 Net Change in Service Hours: +12,500	Corridor Length (one-way): 3.1 miles Streetcar Annual Service Hours: 21,000 Reduction in Bus Service Hours: 11,000 Net Change in Service Hours: +10,000	No operating plan developed for this connecting corridor.	Corridor Length (one-way): 2.9 miles Streetcar Annual Service Hours: 18,000 Reduction in Bus Service Hours: 2,000 Net Change in Service Hours: +16,000	Corridor Length (one-way): 4.7 miles Streetcar Annual Service Hours: 18,000 Reduction in Bus Service Hours: 0 Net Change in Service Hours: +18,000	Corridor Length (one-way): 4.6 miles Streetcar Annual Service Hours: 46,000 Reduction in Bus Service Hours: 33,000 Net Change in Service Hours: +13,000	Corridor Length (one-way): 6.9 miles Streetcar Annual Service Hours: 71,000 Reduction in Bus Service Hours: 51,000 Net Change in Service Hours: +20,000	Corridor Length (one-way): 2.6 miles Streetcar Annual Service Hours: 19,000 Reduction in Bus Service Hours: 11,000 Net Change in Service Hours: +8,000	Corridor Length (one-way): 2.8 miles Streetcar Annual Service Hours: 18,000 Reduction in Bus Service Hours: 0 Net Change in Service Hours: +18,000



## Chapter 6. Evaluation of Demographic Factors Influencing Demand

This chapter presents the demographic factors most correlated with transit ridership for each of the corridors. Included in this evaluation is a comparison of total population and total employment within each corridor – both using 2020 projections to estimate future growth. Also, population and employment *density* is calculated for each corridor so that the length of the corridor is factored out of the comparison. Likewise, total households with no vehicle available, and total low income households (less than \$25,000), are presented for each corridor. As with population and employment, density figures are also calculated for household income and zero vehicle households. Although total figures are important, the focus of this analysis is on density, which is the single most important factor determining transit demand.

To conduct the analysis, a buffer of ½ mile was drawn around each of the candidate corridors and totals within that boundary were counted for each indicator. Census Block Groups were used for the zero-vehicle and income data and Transportation Analysis Zones (TAZs) were used for population and employment data. Census data is from the 2000 US Census and the TAZ data is 2020 projection data from the Metropolitan Council. Where a Block Group or TAZ extended beyond the ½ mile buffer, that area was eliminated and those figures excluded from the totals.

One corridor, Chicago Avenue S, has two possible alignments in downtown – one via 9<sup>th</sup> and 10<sup>th</sup> Streets to Nicollet Avenue and the other via Chicago Avenue and Washington Avenue to Nicollet Avenue. Also, Franklin Avenue is not considered a stand-alone corridor, and is not included in this analysis.

Figure 6-1 presents a summary of this analysis.

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**Figure 6-1 Summary of Transit Demand Criteria**

Principal Streets	Broadway	Central	Chicago (1)	Chicago (2)	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Ave NE	Lake St	Nicollet Ave S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Ave S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
Population Within Corridor	40,677	32,650	38,584	40,478	42,833	51,307	52,434	83,208	33,484	47,075
Population Density (per sq. mile)	6,779	7,915	12,903	11,641	11,556	10,452	9,862	11,418	9,381	13,112
Employment Within Corridor	106,782	118,786	170,563	154,080	154,450	27,426	26,363	173,576	118,620	156,545
Employment Density (per sq. mile)	17,794	28,795	57,037	44,313	41,668	5,587	4,958	23,818	33,234	43,602
Low Income Households Within Corridor	4,571	4,855	7,994	7,557	7,089	7,402	7,324	12,914	4,727	8,530
Low Income Density (per sq. mile)	762	1,177	2,673	2,173	1,913	1,508	1,378	1,772	1,324	2,376
Zero Car Households Within Corridor	3,186	3,310	6,453	5,873	5,476	4,947	4,844	9,772	2,612	6,783
Zero Car Density (per sq. mile)	531	802	2,158	1,689	1,477	1,008	911	1,341	732	1,889
Square Miles	6.0	4.1	3.0	3.5	3.7	4.9	5.3	7.3	3.6	3.6

(1) via 9<sup>th</sup>/10<sup>th</sup> Street to Nicollet Avenue

(2) via Chicago Avenue and Washington Avenue to Nicollet Avenue



### **W Broadway Avenue**

The W Broadway corridor does not stand out as a high ridership corridor. There are several reasons for this. First, the area of North Minneapolis bisected by the Broadway corridor has the lowest household density of all the corridors analyzed, and the eastern portion of the corridor has the greatest concentration of industrial land uses. Second, this corridor has the highest ratio of persons per household (2.9 compared to an average of 2.2 for other corridors), which may partially explain the lower density of zero-vehicle households. This corridor also has a relatively low incidence of low-income households, which may relate to household size, rather than overall financial status. Finally, this corridor is one of the longest being evaluated and includes portions of Robbinsdale, which is relatively affluent and low density.

### **Central Avenue NE**

Central Avenue NE is also a relatively low density corridor compared with the other streetcar candidates. Population density in this area is somewhat higher when compared to the W Broadway corridor, but below the average of all corridors. Employment density is closer to the average of all corridors analyzed.

### **Chicago Avenue S**

The Chicago Avenue S corridor has high ridership potential based on demographic factors, regardless of the downtown alignment chosen. Both Chicago Avenue S alignments (via 9<sup>th</sup>/10<sup>th</sup> Streets and via Chicago/Washington) scored high in all indicators, with high population density and density of low income and zero car households. Both alignments also scored the highest in terms of employment density.

### **Hennepin Avenue S**

Hennepin Avenue S also has high ridership potential, based on demographic factors. Both population and employment density is high in this corridor. Likewise, the density of low-income and zero-car households is high compared to other corridors.

### **Midtown Greenway and Lake Street**

Because the Midtown Greenway and Lake Street are so close to each other, they scored very similar in all indicators. These two corridors are about average in most indicators, primarily because of the wide range of densities and demographics along the corridor. While both corridors had relatively high population density, most households have at least one vehicle. Employment density along this corridor is not as high as others.

### **Nicollet Avenue S**

Nicollet Avenue S will also generate high ridership based on demographics, scoring well in nearly all indicators. However, because this is the longest corridor being evaluated (to

66<sup>th</sup> Street), certain indicators such as employment density, are inconsistent over the length of the corridor. Overall, the Nicollet corridor would serve the greatest number of people and jobs.

### **University Avenue SE / 4<sup>th</sup> Street SE**

The University Avenue SE and 4<sup>th</sup> Street SE corridor scored high in total employment and employment density (largely because of the University of Minnesota), but average or below average on other indicators.

### **Lyndale Avenue S**

Lyndale Avenue S scored very well in all indicators – especially in terms of population and employment density. The density of low income and zero-vehicle households is high in this corridor compared to others, but the population per household is one of the lowest (1.8 compared to an average of 2.2).

## **Transit Demand – Summary and Conclusions**

Overall, a few corridors stand out in terms of how high likely they are to generate high ridership based entirely on demographics and density:

- **Lyndale Avenue S.** Overall, this corridor scored the highest in terms of population and employment density and scored very high in terms of low-income and zero-vehicle household density. This corridor is one of the shortest corridors under evaluation.
- **Chicago Avenue S.** Both alternative alignments of this corridor scored well in nearly all indicators – especially employment density and density of low-income and zero-vehicle households. This corridor is the shortest under evaluation.
- **Hennepin Avenue S.** This corridor scored well in terms of population and employment density, but lower than the other high-ranking corridors in terms of low-income and zero-vehicle household density. This corridor was one of the shortest corridors under evaluation.
- **Nicollet Avenue S.** For the longest corridor under evaluation (downtown to 66<sup>th</sup> Street), the population and employment density of this corridor is very strong. Likewise, the density of zero-vehicle and low-income households is high given the length of this corridor. If the Nicollet corridor were shortened to either Lake Street or 38<sup>th</sup> Street, it would likely be one of the strongest corridors in the system.

## Chapter 7. Evaluation of Cost Effectiveness

Modern streetcars have now been implemented in a number of cities; enough to produce a very rough estimate of the cost per track mile<sup>1</sup> for developing a streetcar line. These costs generally range from \$10M to \$15M per track mile, but can **vary greatly** depending on the type of construction, difficulty of utility work, and the overall costs for construction in each City.

Figure 7-1 summarizes capital costs for several recently implemented systems in the United States. It should be noted that the capital costs presented in Figure 7-1 **do not include** the cost of vehicles or maintenance facilities. As a point of reference, modern streetcar vehicles used in Portland cost between \$2-3 million each, and the maintenance facility cost approximately \$4 million.

This chapter does not attempt to provide individual cost estimates for each corridor, but rather evaluates three factors that often drive costs up or down. They are:

- Presence of significant utilities which will either constrain streetcar development or will require extensive relocation.
- The need to eliminate on-street parking which may then trigger the need for new parking facilities to be constructed near the corridor.
- Other unique factors which may make one corridor more or less expensive than another.

Unique factors may include the opportunity to begin service with a single track; the need for elevators or other vertical circulation; and/or the need to address particular bottle necks or physical changes in the street. Extensive movement of curb lines, changing drainage, etcetera all contribute to higher costs for streetcar development.

A more detailed cost estimate will be prepared for the highest priority segments for implementation in the next phase of analysis.

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<sup>1</sup> One-way section of track.

**Figure 7-1 Capital Costs for Recently Completed Streetcar Segments**

City	Agency/ Organization	Most Recently Opened Line	Track Miles	Construction Cost (2006\$)	Cost per Track Mile (2006\$)
San Francisco	San Francisco Municipal Railway (Muni)	2000: Embarcadero to Fisherman's Wharf	4.8	\$88.6M <sup>(1)</sup>	\$18.5M
Portland	Portland Streetcar Inc.	July 2001: Phase I and II	4.8	\$45.6M <sup>(2)</sup>	\$9.5M
		May 2005: Riverplace extension	1.2	\$16.1M <sup>(3)</sup>	\$13.4M
		November 2006: Gibbs extension	0.6	\$8.3M <sup>(4)</sup>	\$13.8M
Little Rock	Central Arkansas Transit Authority	November 2004	2.5	\$15.9M <sup>(5)</sup>	\$6.36M

**NOTES:**

(1) Total costs were \$70.0M, 1998 dollars. This cost adjusted to \$88.6M in 2006 dollars (3% inflation/year).

(2) Total costs were \$54.6M, in 2001 dollars. This cost includes 5 vehicles (estimated at \$2.25M each) and a maintenance facility (at \$4.0M). Excluding vehicle and maintenance facility costs: \$54.6M - \$15.3M = \$39.3M (2001\$). This cost adjusted to \$45.6M in 2006 dollars (3% inflation/year).

(3) Total costs were \$15.6M, in 2005 dollars. This cost adjusted to \$16.1M in 2006 dollars (3% inflation/year).

(4) Total capital costs were \$15.8M, including three vehicles (estimated at \$2.5M each). Excluding vehicle costs: \$15.8M - \$7.5M = \$8.3M. All figures in 2006 dollars.

(5) Total cost of \$20.0M includes 3 replica vehicles and a maintenance facility, in 2004 dollars. Replica vehicles are estimated at \$1.0M each and the maintenance facility is estimated at \$2.0M. Excluding vehicle and maintenance facility costs: \$20.0M - \$5.0M = \$15.0M. This cost adjusted to \$15.9M in 2006 dollars (3% inflation/year).

## Utilities

Many streets in Minneapolis, as in any major city, cover a significant number of both public and private utilities. These can include underground electrical, gas and water utilities, as well as private utilities for telephone, fiber optics and others. Private utilities can generally be relocated when there is a public need for the street, though with fiber optics, moving utilities can be very costly and disruptive. Modern streetcar designs have been developed to avoid utilities to the extent possible, moving the streetcar to an alternate lane; operating in the center versus the curb lane, and generally choosing the “path of least resistance” on corridors with utilities. In addition, modern streetcar implementation techniques, developed in Portland, Oregon and replicated elsewhere require only between 12 and 18 inches of pavement removal – this translates to far less disruption than might be experienced for light rail or other heavier rail implementation.

Even with these techniques, however, major utilities, especially the largest water mains present a unique challenge for streetcars. To evaluate potential utility impacts, the study team reviewed utility maps provided by the City of Minneapolis Engineering Services. Obvious potential conflicts which would need to be dealt with in any future streetcar development are described below. Once a high priority set of initial corridors are developed, a more detailed assessment of utility impacts will be completed.

### **W Broadway Avenue**

Based on a preliminary assessment, there are no major issues with water, storm or sanitary lines along this corridor. However, the City of Robbinsdale would need to be consulted regarding utilities along this corridor that are within their city limits, assuming that the corridor is extended to Robbinsdale.

### **Central Avenue NE**

Based on a preliminary assessment of utilities in this corridor, a 24" water main exists between 12th Avenue NE and Lowry, a 30" water main exists north of Lowry Avenue NE (to the city limits) and a 40" water main exists north of 31st Avenue NE. Depending on the exact location and depth of these utilities, this could have a significant cost impact associated with streetcar service in this corridor.

### **Chicago Avenue S**

Based on a preliminary assessment, there are no major issues with water, storm or sanitary lines along this corridor.

### **Franklin Avenue**

Based on a preliminary assessment, there are no major issues with water, storm or sanitary lines along this corridor.

### **Hennepin Avenue S**

Based on a preliminary assessment, there are no major issues with water, storm or sanitary lines along this corridor.

### **Midtown Greenway**

Based on a preliminary assessment, there are no major issues with water, storm or sanitary lines along this corridor.

### **Lake Street**

Based on a preliminary assessment of utilities in this corridor, a 12" water main exists along the entire length of Lake Street. Depending on the exact location and depth of this main, this could create significant additional costs associated with streetcars in this corridor.

### **Nicollet Avenue S**

Based on an initial assessment of utilities in this corridor, a 16" water main exists between 3rd Street S and 12th Street S in downtown (along the Nicollet Mall). Depending on the exact location and depth of this main, this could create moderate additional costs associated with streetcar in this corridor.

### **University Avenue SE / 4<sup>th</sup> Street SE**

Based on an initial assessment of utilities in this corridor, a 24" water main exists between 18th Avenue NE and Oak Street SE and a 48" water main exists between Oak Street SE and Ontario Street SE. Depending on the exact location and depth of these utilities, this could have a significant cost impact associated with streetcar service in this corridor.

### **Lyndale Avenue S**

Based on an initial assessment of utilities in this corridor, a 24" water main exists between Franklin Avenue and 27th Street W. Depending on the exact location and depth of these utilities, this could have a significant cost impact associated with streetcar service in this corridor.

## **Utilities – Summary and Conclusions**

As noted above, several corridors have the potential to present significant additional costs in terms of utilities, including:

- **Lyndale Avenue S.** This corridor has a 24" water main between Franklin Avenue and 27<sup>th</sup> Street W.

- **Central Avenue.** This corridor has the greatest number of issues in terms of potential utility conflicts – a 24", 30" and 40" water main along various segments of the corridor north of 12<sup>th</sup> Avenue NE.
- **University Avenue SE / 4th Street SE.** This corridor also has the potential to create additional costs associated with a 24 and 48" water main utilities in the University of Minnesota area.
- **Nicollet Avenue.** A 16" water main is located along the Nicollet Mall 3<sup>rd</sup> Street and 12<sup>th</sup> Street.

## On-Street Parking

On-street parking impacts result when additional space is required for streetcar stops, streetcar maneuverability, and/or to add a lane for improved reliability. Removal of on-street parking has both a neighborhood impact and a cost impact, since, in busy commercial areas, parking often has to be replaced in some other location. Creating off-street parking adds significantly to the cost of streetcar development.

This phase of the analysis provides a high-level qualitative assessment of on-street parking impacts based on the width of the street, turning movements and travel through local business districts. The next phase of this study will provide a more detailed evaluation of on-street parking impacts for the initial segments of the highest-priority corridors.

### W Broadway Avenue

Some loss of parking may occur due to 90 degree turns in downtown Robbinsdale and potentially for stops on Broadway between Fremont and Lyndale Avenue N. Compared to the length of this corridor, the overall impact streetcar would have in terms of on-street parking is relatively minor. No major parking issues were identified downtown along Washington Avenue.

### Central Avenue NE

Some potential on-street parking impacts may occur at 29th Avenue NE where a streetcar line would need to turn around and layover, as well as for stops between 27th Avenue NE and 18th Avenue NE. Likewise, streetcars through the East Hennepin area would likely have some on-street parking impacts, though relatively minor. No major parking impacts were identified downtown.

### Chicago Avenue S

Although there may be some loss of parking at 38<sup>th</sup> due to layover, there would be less of an impact on Chicago north of Lake – primarily because there is less commercial/retail compared to other corridors. Some on-street parking loss will occur downtown (on both

9<sup>th</sup>/10<sup>th</sup> Streets and Washington Avenue) due to stops, but this impact will likely be relatively minor.

### **Franklin Avenue**

Because Franklin is a wide street along the entire corridor, with relatively small neighborhood commercial nodes at Nicollet Avenue and Chicago Avenue, the on-street parking impact in this corridor is determined to be relatively minor.

### **Hennepin Avenue S**

Hennepin Avenue S is lined with commercial and relatively high-density residential uses, and Uptown is one of the largest commercial centers outside of downtown. For this reason, the on-street parking impact in this corridor is determined to be relatively significant in some areas due to turns and stops. The impact on on-street parking downtown for stops will be relatively minor.

### **Midtown Greenway**

Very minimal on-street parking impacts are assumed with streetcars in the Greenway.

### **Lake Street**

Lake Street serves Uptown and is lined with commercial uses along the entire corridor. Because there are no turns involved, and streetcar could share stops with existing bus stops, the on-street parking impact would be relatively minor in this corridor. It should also be noted that many reconstructed intersections on Lake Street will include curb extensions. While these curb extensions may need to be longer if streetcar were present, because they have already been constructed, extending them will have less impact than if there are no curb extensions. Also, streetcar stops may actually require *less* curb space than a bus stop since streetcars would not be required to pull in and out from the curb.<sup>2</sup>

### **Nicollet Avenue S**

The section of Nicollet south of Lake Street would have a relatively minor on-street parking impact. North of Lake Street, however, this corridor is lined with commercial uses and a mix of medium- to high-density housing. In addition, Nicollet is only one lane in each direction north of Lake. Although the on-street parking impact of streetcars is determined to be moderate north of Lake Street, the impact along the entire corridor is determined to be less severe. In addition, streetcar on the Nicollet Mall would have very little impact on on-street parking.

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<sup>2</sup> A standard bus stop requires between 82-95 feet, depending on the location of the stop – either near-side or far-side. Modern streetcar vehicles are 66 feet long and streetcar stops are approximately 70 feet long.

### University Avenue SE / 4<sup>th</sup> Street SE

Streetcars operating in this corridor would need to make several turns – one at University/4<sup>th</sup> and Hennepin and one near the University to connect with Washington Avenue SE. In addition, this corridor passes through the East Hennepin area and Dinkytown – two vibrant commercial areas. Between these commercial areas, however, University Avenue SE and 4<sup>th</sup> Street SE are relatively wide and pass through a moderate density residential neighborhood. No major parking impacts were identified downtown.

### Lyndale Avenue S

Although Lyndale Avenue S has less commercial development compared to Hennepin Avenue S, there is a significant amount of commercial uses compared to other corridors. There is also a mix of medium- and high-density housing along the corridor that vie for on-street parking. For these reasons, the on-street parking impact in this corridor is determined to be relatively significant. No major parking impacts for stops were identified downtown.

## On-Street Parking – Summary and Conclusions

Based on this preliminary assessment of on-street parking impacts, none of the corridors presented major issues in terms of on-street parking. However, a few corridors present issues in certain areas or along certain segments, primarily due to turning movements:

- **Hennepin Avenue S.** The Uptown area is relatively congested and relies heavily on on-street parking, and a streetcar through this area has the potential to take on-street parking for stops and turning movements.
- **Lyndale Avenue S.** As with Hennepin Avenue, the Lyndale Avenue corridor (especially at Lake Street) depends heavily on on-street parking. Any turning movements in this area could create a significant on-street parking impact.
- **University Avenue SE / 4<sup>th</sup> Street.** Turning movements in the University area could result in the loss of on-street parking.
- **Chicago Avenue S.** The end point of this corridor – extended to 38<sup>th</sup> Street – could result in loss of parking if a turn-around is required (assuming a layover location would not be on Chicago Avenue).
- **Central Avenue NE.** Assuming a layover/turn-around location would need to be off of Central Avenue, some loss of on-street parking may result.

## Capital Costs

As Figure 7-1 showed, most modern streetcars developed in the United States in the last decade experienced costs per track mile that were relatively consistent, depending on the average construction costs in a given city, and other unique factors impacting a particular line. All streetcar corridors have many common elements including the cost for tracks, overhead wire, passenger amenities, etc. What will differentiate the cost for developing one corridor versus another in the same city, built at the same time, has more to do with the unique features of the corridor – the need for expensive over or underpasses, unusual earth movement, or unusual circulation features that are not “standard” with streetcar development.

This section identifies the unique features of each corridor that are likely to impact the cost of developing streetcar in that corridor. A number of “conditions” were identified and then assessed based on their estimated cost differential over a standard implementation. The resulting cost differential is a combination of the presence of a unique condition (i.e., The need for an overpass or bridge) and the length of that condition (i.e., a short bridge will cost less than a major new river crossing). Each of these conditions were then rated as **HIGH**, **MODERATE** or **LOW** cost impact. A **LOW** rating indicates that there are fewer estimated capital cost implications above a standard street. A **HIGH** rating indicates that the estimated capital cost implications associated with streetcar are greater in that corridor.

Conditions that will create additional capital costs over a standard cost per mile include:

- **Bridges.** The estimated cost of adding streetcar rails to an existing bridge is approximately \$1,000 per lineal foot, in each direction. This condition is estimated as having a greater cost differential compared to a standard street, depending on the condition of the bridge.
- **Underpasses.** Several locations along the candidate corridors require streetcars to pass under a bridge. In some of these situations, the vertical clearance is very close to the minimum required, which will likely result in some modification to construction methods. This condition is estimated as having a small impact on cost differential.
- **Unique Streets.** There are several “non-standard” features on some corridors that would likely increase costs over a standard street. These include special street paving (such as brick) and crossing of existing LRT tracks. Most of these conditions were identified in downtown. Special street paving is estimated as having a minimal additional cost, whereas LRT crossings are estimated as having a slightly higher cost differential but still relatively low.
- **Other Special Conditions.** Other unique situations along the candidate corridors will have an impact on the differential costs associated with streetcars. Several of these conditions are as follows:

- **Bridge Reconstruction.** The bridge over the Midtown Greenway at Nicollet Avenue S has been closed to traffic for over 10 years and will likely require some additional rehabilitation to be placed back in service. The estimated cost differential over a standard street is relatively low.
- **Hennepin-Lyndale Bottleneck.** The confluence of Hennepin and Lyndale Avenues over the Lowry Hill tunnel will require some non-standard construction procedures for streetcars. Based on an initial assessment, the estimated cost differential over a standard street is relatively low.
- **Nicollet Mall.** Unique challenges exist whenever changes that impact the streetscape along the Nicollet Mall are proposed. Although the curvature is not anticipated to present significant engineering challenges, the granite paving and potential conflict with existing streetscape structures will likely result in additional costs. Although a more detailed evaluation of the Mall will be required, the estimated cost differential for the Nicollet Mall is considered moderate.
- **Midtown Greenway.** The Greenway has a number of unique costing elements that could either increase or decrease the cost of streetcar development. Because the streetcar will not operate in a lane with other traffic, it is the only corridor with the opportunity for substantial signal track operation. Since over half of the costs to implement a streetcar line accrue on a “track mile” basis, a single track operation would generally be much less expensive than a double track operation. Some of these costs are offset by the need for siding or passing tracks, and additional switches for a safe single track operation. In addition, any single track operations limits the frequency of service that can be reliably operated over the line, since streetcars operating in opposite directions can not “meet” on the single track. Based on an initial analysis of streetcar operating in this corridor, three passing tracks (between the terminal points) would be required to operate service every 10 minutes in both directions. If service frequencies were improved to every 5 minutes, five passing tracks would be required. In addition, the terminal locations would need to be double-tracked to allow recovery time for two or more vehicles.

While development of a single track system in the Greenway could reduce costs, a number of other engineering challenges exist that could significantly increase costs. The number of historic bridges and available width between the existing pathway and the edge of the current level right of way present potential issues in some locations. Access issues which are not present in any other corridor are critical on the Greenway, where vertical circulation will be required. Access for disabled riders will require either extensive elevators, or ramp structures which may not be feasible in some locations.

More quantitative cost estimates (that assigns an estimated dollar amount) will be conducted in Phase III of the evaluation. Figure 6-1 provides a summary of the cost effectiveness criteria evaluation.

### **W Broadway Avenue**

Two areas were identified where capital costs would be significantly higher than a standard street:

- I-94 and W Broadway bridge, approximately 330 feet
- 4<sup>th</sup> Avenue bridge (on Washington Avenue), approximately 35 feet

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is rated as **LOW**.

### **Central Avenue NE**

Several areas were identified where capital costs would be significantly higher than a standard street:

- Broadway Street NE at Central Avenue NE, approximately 220 feet
- 9<sup>th</sup> Street SE and Central Avenue, approximately 150 feet
- 3<sup>rd</sup> Avenue S river bridge, approximately 1,900 feet

Based on this initial assessment, the capital cost differential associated with building streetcar service in this entire corridor is rated as **MODERATE**, primarily because of the long river bridge and several bridges along the corridor.

### **Chicago Avenue S**

Several areas were identified where capital costs would be significantly higher than a standard street:

- I-35W/I-94 bridge, approximately 400 feet
- Midtown Greenway bridge, approximately 90 feet

Based on initial assessment, the capital cost differential associated with building streetcar service in this corridor is relatively minor, thus rated as **LOW**.

### **Franklin Avenue**

Only one area was identified where capital costs would be significantly higher than a standard street:

- I-35W bridge, approximately 300 feet

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is relatively minor, even with the short span of the bridge at I-35W, thus rated as **LOW**.

### **Hennepin Avenue S**

Several areas were identified where capital costs would be significantly higher than a standard street:

- Lowry Hill tunnel (bottleneck, northbound only), approximately 1,400 feet
- Greenway bridge/Uptown Transit Center, approximately 100 feet
- LRT crossing (downtown)

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is rated as **MODERATE**, primarily due to the Lowry Hill tunnel (in the northbound direction). It should be noted that a possible alignment via Douglas Avenue and Colfax Avenue was identified as a way to avoid the bottleneck area. Although this would add some length to the line, it would avoid the capital costs associated with the Lowry Hill tunnel. This analysis will be explored further in Phase III of the analysis.

### **Midtown Greenway**

Midtown Greenway offers a unique opportunity for developing a streetcar service that can operate on a single track with passing sidings, rather than a double track operation. Double track operations are always required when streetcars share a lane with mixed traffic, as is proposed for much of the Minneapolis system. In the case of the Greenway, streetcars will operate in their own dedicated right of way, and can operate both directions on a single track, provided that streetcars traveling in opposite directions do not “meet” on the trackway. Even single track operations require occasional sidings or double track segments where streetcars headed in one direction can “pull off” the main line, and allow a car coming in the opposite direction to cross. These sections are often controlled by signals that alert drivers when a streetcar is coming in the opposite direction. More sidings, or double track segments are required for more frequent service.

To some extent, the lower cost of single track operation on the Greenway will be offset by the need for vertical circulation, including elevators, at key station locations, and the potential for widening the existing right of way in some locations, including the removal or rebuilding of bridges, to allow for necessary double track segments. Even with these additional costs, the fact that most of the Greenway can be developed as a single track corridor will keep costs relatively low on this corridor.

This is the only corridor with an existing cost estimate from a previous study. The initial cost estimate of \$53 million, in 2005 dollars<sup>3</sup>, will be verified by the project team in the next phase of study. It should be noted that these costs include the cost of seven rehabilitated streetcar vehicles, at approximately \$800,000 each.

Based on this previous cost estimate, and the assumption that single track operation with passing sidings can provide the needed frequency in this corridor, capital costs would be rated as **LOW**. If this entire corridor were double-track, costly bridge and excavation work would be required throughout the corridor in order to make streetcar operations both safe and feasible. In this case, the estimated cost differential over a standard street would likely be significant.

### Lake Street

Several areas were identified where capital costs would be significantly higher than a standard street:

- Kennilworth bridge, approximately 400 feet
- Calhoun Isles channel bridge, approximately 50 feet.
- I-35 W underpass, approximately 150 feet

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is relatively minor, even with several short bridges on the western edge of the corridor. It should be noted, however, that Lake Street has just gone through a major reconstruction and streetscaping project, which would likely add significant costs if streetcar were introduced in this corridor. Thus, this corridor is rated as **MODERATE**.

### Nicollet Avenue S

Several areas were identified where capital costs would be significantly higher than a standard street:

- I-94 bridge, approximately 240 feet
- Greenway bridge (Nicollet Avenue bridge unused), approximately 100 feet
- Minnehaha Parkway bridge, approximately 820 feet
- LRT crossing (downtown)
- Nicollet Mall paving and streetscape (downtown)

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor would be relatively minor, and thus rated as **LOW**. Although there are several short bridge crossings, and the Nicollet Mall would likely be

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<sup>3</sup> THE FEASIBILITY OF A SINGLE-TRACK VINTAGE TROLLEY IN THE MIDTOWN GREENWAY, ([www.midtowngreenway.org](http://www.midtowngreenway.org)). These costs have not yet been independently verified by the streetcar study team.

more costly than a standard street, this corridor is very long and most of the corridor is on standard street sections. Thus on cost per mile basis, this corridor has a relatively low cost differential.

### **University Avenue SE / 4<sup>th</sup> Street SE**

Several areas were identified where capital costs would be significantly higher than a standard street:

- Dinkytown bridge, approximately 220 feet
- I-35 W bridge, approximately 240 feet
- Hennepin Avenue river bridge, approximately 1,040 feet<sup>4</sup>

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is rated as **MODERATE**, primarily due to the long Hennepin Avenue bridge crossing and shorter bridges at I-35W and in Dinkytown.

### **Lyndale Avenue S**

Several areas were identified where capital costs would be significantly higher than a standard street:

- I-94 bridges (southbound), approximately 400 feet
- Lowry tunnel (northbound), approximately 1,400 feet
- Midtown Greenway bridge, approximately 95 feet

Based on this initial assessment, the capital cost differential associated with building streetcar service in this corridor is rated as **MODERATE**, primarily due to the bottleneck. In the northbound direction, a section of this corridor is over the Lowry Hill tunnel, and southbound a section of the corridor is an overpass. South of Franklin, there is a short bridge crossing at the Midtown Greenway.

## **Capital Costs – Summary and Conclusions**

Based on this initial assessment of items that would add to a standard capital cost per mile, several corridors were identified that would likely have greater impacts:

- **Central Avenue NE.** Due to a long bridge crossing (3<sup>rd</sup> Avenue bridge), this corridor could be moderately more expensive than a standard street.
- **Hennepin Avenue S.** The I-94 / Lowry Hill tunnel would introduce higher costs per mile than a standard street if the alignment were to travel over the tunnel. An

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<sup>4</sup> Although this bridge was constructed to handle light rail (or streetcar), additional costs would still be incurred to lay tracks in the bridge deck.

alternate route (that would need to be explored further) via Dupont Avenue and Douglas Avenue could significantly reduce this cost differential.

- **Lyndale Avenue S.** Unlike the Hennepin Avenue corridor, the Lyndale corridor would require travel across the I-94 / Lowry Hill tunnel, which would moderately increase the total capital costs in to this corridor.
- **University Avenue SE / 4<sup>th</sup> Street SE.** Capital costs are likely to be somewhat higher along this corridor due to the Hennepin Avenue bridge, several short bridges over I-35W and several bridges in Dinkytown.
- **Lake Street.** Several bridges on the west end of the corridor, as well as the fact that the corridor is currently undergoing a major reconstruction and streetscaping process, would likely add additional costs to the standard cost per mile in this corridor.

**Figure 7-2 Summary of Cost Effectiveness Criteria**

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
<b>From...</b>	<b>Robbinsdale Transit Center</b>	<b>29th Ave NE</b>	<b>Lake St</b>	<b>Nicollet Ave S</b>	<b>Lake St</b>	<b>SW LRT</b>	<b>SW LRT</b>	<b>66th St</b>	<b>Downtown via Hennepin</b>	<b>Lake St</b>
<b>To...</b>	<b>Downtown</b>	<b>Downtown</b>	<b>Downtown</b>	<b>Chicago Ave S</b>	<b>Downtown</b>	<b>Hiawatha LRT</b>	<b>Hiawatha LRT</b>	<b>Downtown</b>	<b>Stadium Village</b>	<b>Downtown</b>
<b>Utilities</b>	No major utilities in Minneapolis; need to examine Robbinsdale utilities.	24" water main between 12th Ave NE and Lowry; 30" water main north of Lowry Ave NE; 40" water main north of 31st Ave NE	No major utility issues	No major utility issues	No major utility issues	No major utility issues	12" water main along entire length of Lake Street corridor	16" water main between 3rd St S and 12th St S (Nicollet Mall)	24" water main between 18th Ave NE and Oak St SE ; 48" water main between Oak St SE and Ontario St SE	24" water main between Franklin and 27th St W
<b>On-Street Parking</b>	Minor impact on parking due to 90 degree turns in downtown Robbinsdale and for stops on Broadway between Fremont and Lyndale Ave N. Minor impact downtown for stops.	Some potential impact on parking at 29th Ave NE for turn and vehicle layover, and for stops between 27th Ave NE and 18th Ave NE, as well as East Hennepin area. Minor impact downtown for stops.	Minor impact on parking at 38th, relatively minimal impact north of Lake. Minor impact downtown for stops.	Minor impact on parking for stops at commercial nodes (Nicollet and Chicago).	Moderate impact on parking for stops and turns in Uptown. Minor impact downtown for stops.	Negligible impact on parking.	Minor impact on parking for stops along the entire corridor.	Some potential loss of parking for stops north of Lake. Minor impact downtown – no impact on Nicollet Mall.	Some potential loss of parking due to 90 degree turns at University/Hennepin, and for stops in East Hennepin area, Dinkytown and near the University. No major impact downtown.	Moderate impact on parking between Franklin and Lake and for turn and layover (possibly at 31st). Minor impact downtown for stops.
<b>Capital Costs</b>	LOW - only one short bridge crossing at I-94; 4 <sup>th</sup> Avenue N bridge.	MODERATE - long 3rd Ave river bridge, several shorter bridges.	LOW - short bridge at Midtown Greenway, I-94/I-35W bridge	LOW - only one short bridge at I-35W	MODERATE - Lowry Hill tunnel (NB only), bridge at Midtown Greenway	LOW - based on previous estimate of capital costs from Midtown Greenway trolley study	MODERATE - two short bridges on west end of corridor; corridor in process of major reconstruction and streetscape project.	LOW - several short bridge crossing, Nicollet Mall streetscaping, very long corridor	MODERATE - long Hennepin Ave bridge, several shorter bridges at I-35W and in Dinkytown.	MODERATE - Lowry Hill Tunnel (NB), overpass (SB), Midtown Greenway bridge



## Chapter 8. Summary and Recommended Long-Term Streetcar Network

All of the corridors that passed the Phase I screening completed earlier in this study are at least technically feasible for operation as a streetcar corridor. However, not all corridors are equally well suited for streetcar operations in the short term.

This chapter summarizes the results of the Phase II evaluation and identifies other unique conditions which may prioritize some corridors for streetcar service in the shorter term.

Figure 8-1 summarizes the results of the Phase II analysis and identifies those corridors that best meet each of the criteria used in this phase of the evaluation. The table identifies the opportunities and constraints presented by each corridor based on the broad criteria of Supportive Land Use, Economic Development Potential, Transit Operations, Demand Potential, and Cost Effectiveness. Other considerations are identified, where they are evident.

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Figure 8-1 Summary of Phase II Analysis

Principal Streets	Broadway	Central	Chicago	Franklin	Hennepin	Midtown Greenway	Lake	Nicollet	University / 4th	Lyndale
From...	Robbinsdale Transit Center	29th Ave NE	Lake St	Nicollet Ave S	Lake St	SW LRT	SW LRT	66th St	Downtown via Hennepin	Lake St
To...	Downtown	Downtown	Downtown	Chicago Ave S	Downtown	Hiawatha LRT	Hiawatha LRT	Downtown	Stadium Village	Downtown
<b>Transit-Supportive Land Use</b>	Serves only one special generator but has relatively strong anchors. Low transit supportive land use.	Does not serve any special generators and weak anchor on north end. Moderate to low transit supportive land use.	Serves a moderate number of special generators and has high transit-supportive land use.	Does not serve special generators and no anchors. Not scored for transit supportive land use, but serves dense neighborhood.	Serves many special generators, has strong anchors and has moderately high transit-supportive land use.	Serves several special use generators and has strong anchors. Moderate transit supportive land use.	Serves several special use generators and has strong anchors. Moderate transit supportive land use.	Serves moderate number of special generators, has moderately strong anchors and moderate transit supportive land use (higher north of Lake).	Serves several important special generators, has strong anchors and high transit supportive land use.	Serves moderate number of special generators, but weak anchor on south end. Moderately high transit supportive land use.
<b>Economic Development Potential</b>	Strong potential for high intensity development in North Loop area. Some potential for moderate to low intensity development along the rest of the corridor.	Some potential for moderate intensity development in East Hennepin area and along corridor near Lowry. Good potential downtown.	Strong potential for high-intensity development downtown and moderate intensity development at Midtown Greenway/Lake Street.	Relatively low redevelopment potential.	Strong potential for high-intensity infill development in Uptown, and in several locations in downtown (near Washington Avenue and near 10 <sup>th</sup> Street).	Good potential for moderate intensity development along Greenway – especially at major nodes.	Good potential for moderate intensity development at major nodes – Hennepin, Lyndale, Nicollet, Chicago and to a lesser degree, Bloomington.	Good potential for moderate intensity development at Greenway and Lake Street and between Lake and downtown.	Good potential for high intensity development along river (south of University) and moderate intensity development in East Hennepin area.	Some potential for moderate intensity development at Midtown Greenway/Lake Street, and in several locations downtown.
<b>Transit Operations</b>	Good potential to impact bus volumes; relatively good connections with other modes; minor duplication with Bottineau BRT.	Limited ability to impact bus volumes; relatively good connection with other modes; potential duplication with University/4 <sup>th</sup> corridor.	If extended to 38 <sup>th</sup> Street, good potential to impact bus volumes; good connections to other modes.	Limited utility as a connecting corridor.	Limited ability to impact bus volumes; relatively good connections to other modes.	Limited potential to impact bus volumes; strong ability to connect Southwest Corridor LRT to Hiawatha LRT. No connection to other modes downtown.	Strong potential to impact bus volumes; moderate ability to connect Southwest Corridor LRT to Hiawatha LRT; no connection to other modes downtown.	Strong potential to impact bus volumes; good connections to other modes.	Strong potential to impact bus volumes; good connections to other modes.	Limited ability to impact bus volumes; relatively good connections to other modes.
<b>Transit Demand</b>										
<b>Cost Effectiveness</b>	Limited utility conflicts; no major increase over standard capital costs/mile.	Strong potential for utility conflicts; potential for higher capital costs due to long bridge crossing.	Limited utility conflicts; no major increase over standard capital costs/mile.	Limited utility conflicts; no major increase over standard capital costs/mile.	Limited utility conflicts; moderate potential for higher capital costs due to Lowry Hill tunnel.	Limited utility conflicts; no major increase over standard capital costs/mile – potentially could be less costly if single-track.	Minor potential for utility conflicts; moderate potential for higher capital costs due to several bridges and reconstruction project	Potential for utility conflicts on Nicollet Mall; capital costs higher in some segments, but relatively low overall.	Strong potential for utility conflicts in University area; potential for moderately high capital costs due to bridge crossings.	Moderate potential for utility conflicts; potential for higher capital costs due to Lowry Hill tunnel.
<b>Other Issues (not included in evaluation criteria)</b>	No other major issues.	No other major issues.	No other major issues.	No other major issues.	No other major issues.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT; Major reconstruction and streetscaping project on Lake Street.	Service in this corridor is highly dependent on the outcome of Southwest Corridor LRT.	No other major issues.	No other major issues.

## **W Broadway Avenue**

Compared to other corridors, W Broadway has less potential for the kind of higher intensity mixed use development that is ideal for streetcar operations. Should this corridor be developed at some time, streetcar implementation in this corridor should be relatively cost effective both considering capital and operating costs. There are no major utilities or other conditions that would increase capital costs significantly, and the proposed operating plan has the potential to replace a significant amount of bus service, reducing net operating costs.

The segment of this corridor with the greatest potential in the short-term is the North Loop area, south of 10<sup>th</sup> Avenue N, where intensive residential development is occurring and is expected to continue assuming the housing market remains strong. Over the long term, it is assumed that significant support and financing would need to be generated north of the North Loop area before streetcar service could be extended.

In terms of connections through downtown, the Washington Avenue corridor to Chicago Avenue or the Nicollet Avenue to 9<sup>th</sup>/10<sup>th</sup> Streets to Chicago Avenue have the greatest potential. In the short term, it is probably more important to serve the inner core of downtown (via Nicollet Avenue), but from an economic development potential, the Washington Avenue to Chicago Avenue alignment could help catalyze development in the Downtown East area.

Based on this evaluation, this corridor was retained as a long-term streetcar corridor and will be evaluated further in Phase III of the evaluation.

## **Central Avenue NE**

Central Avenue exhibits mixed potential for streetcar service when compared to other corridors. On one hand, this corridor shows some economic development potential (primarily in the East Hennepin area and to a lesser degree at Lowry Avenue NE). On the other hand, this corridor does have some drawbacks. First, transit-supportive land use is relatively low compared to other corridors (similar to the W Broadway corridor). Second, the impact on the underlying bus network is minimal given an initial assessment of streetcar operations in this corridor. Finally, from a cost effectiveness standpoint, this corridor has one of the most significant potential conflicts with utilities.

Although there are some challenges with this corridor, it is retained as a part of the long-term streetcar network. In the short term, the segment of this corridor with the greatest potential is between the East Hennepin area and downtown. It should be cautioned, however, that some potential duplication exists from this area with the University Avenue SE/4<sup>th</sup> Street SE corridor. Over time, some of the challenges associated with the northern end of this corridor (such as low transit-supportive land use and limited redevelopment potential compared to other corridors) could improve allowing this corridor to be extended

to the business district around Lowry Avenue or as far as the Shorham Yards development (at approximately 29<sup>th</sup> Avenue NE) if development intensity in this area makes this a good anchor.

### **Chicago Avenue S**

Chicago Avenue S corridor shows strong potential for streetcar service compared to other corridors. Although the intensity of development varies along the corridor, Chicago Avenue S bisects one of Minneapolis' most dense residential neighborhoods, has very high transit supportive land use, and serves several major hospitals between Lake Street and downtown, as well as the new Midtown Exchange at Lake Street. South of Lake Street, the intensity of development is lower, but if this corridor is extended one mile to 38<sup>th</sup> Street, bus volumes in this corridor could be reduced significantly. Streetcars service could provide some redevelopment inertia in this area.

In downtown, Chicago Avenue bisects the Elliot Park neighborhood, which is has the most intense development along the corridor due to substantial residential development over the past decade. From the Elliot Park neighborhood, at least two potential alignments in downtown were identified – one via 9<sup>th</sup>/10<sup>th</sup> Street to Nicollet, and one via Chicago Avenue to Washington Avenue. While the 9<sup>th</sup>/10<sup>th</sup> Street corridor provides the best link to the inner core of downtown, the Chicago Avenue/Washington Avenue corridor shows relatively strong redevelopment potential.

Based on this assessment, it is recommended that Chicago Avenue S be included as part of the long-term streetcar network, and is recommended to extend as far south as 38<sup>th</sup> Avenue. The downtown segments show the greatest potential over the short term, at least as far as 14<sup>th</sup> Street to serve the Elliot Park neighborhood. Phase III of the analysis will explore the alternative routings for this corridor in greater detail to determine which segment best meet the goals of the long-term network.

### **Franklin Avenue**

This corridor performs well based on this evaluation, primarily because it traverses the most densely developed neighborhoods in the city. Likewise, from a cost effectiveness standpoint, streetcar service would have fewer cost barriers compared to other corridors. However, this corridor was only retained from Phase I of the evaluation as a potential connecting corridor between Chicago Avenue S and Nicollet Avenue S. Based on the initial operating plans, and an assessment of connections between corridors, Franklin Avenue did not prove to be a beneficial connection, and is not a recommended corridor for the long-term network.

### **Hennepin Avenue S**

Hennepin Avenue S shows relatively strong potential as a streetcar corridor. There are some obvious advantages to operating streetcar in this corridor, such as the ability to

connect downtown with Uptown (a strong anchor), and relatively high transit supportive land use along the corridor. In addition, there is continued opportunity for residential and commercial infill development in Uptown as well as in downtown near Washington Avenue and around 10<sup>th</sup> Street. There are also some challenges associated with this corridor. These include a relatively minor impact on the existing bus network (unless significant restructuring is proposed) and the potential for higher capital costs compared to other corridors due to access through the bottleneck (Lowry Hill tunnel).

Based on this evaluation, it is recommended that Hennepin Avenue S as far south as Uptown be included in the long-term streetcar network. This corridor also has a strong connection to the University Avenue SE/4<sup>th</sup> Street SE corridor via Hennepin Avenue in downtown.

### **Lake Street / Midtown Greenway**

Although Lake Street and the Midtown Greenway are different in many ways, the two alignments generally serve the same corridor. And while they did not perform as well as corridors that serve downtown, this corridor shows relatively good potential as a streetcar corridor. There are several reasons for this: (1) relatively strong economic development potential (at the major nodes – Hennepin, Lyndale, Nicollet and Chicago), (2) potential to provide an important connection between the Southwest Corridor LRT and Hiawatha LRT, and (3) ability to serve a significant number of people and jobs along the corridor. For these reasons, this *corridor* is recommended to be included in the long-term streetcar network.

However, streetcar service in this corridor only makes sense in one of the alignments – not both. In places, these corridors are between one and four blocks apart, too close to plan for streetcars in both locations. It should be noted that while the two alignments are very close together, streetcars would function differently depending on the alignment chosen. On the Greenway, the streetcar would serve primarily as a connector to the two Light Rail services – the existing Hiawatha line and the proposed Southwest line, serving passengers who would travel from those lines to destinations that are outside of comfortable walking distance. While there is potential for redevelopment along the Greenway and the streetcar service would serve some local trips, most of the streetcar ridership would come through transfers to and from the LRT lines. Stop spacing in the Greenway would be somewhat wider than are typical with streetcar service, because vertical circulation requirements would make it too expensive to place stops every block or two. Service on this alignment would be entirely new and would replace little, if any, of the existing bus service on Lake Street.

Along Lake Street, the streetcar would serve a more traditional function, attracting short neighborhood trips, as well as connecting with light rail. Streetcars would replace buses on an almost one for one basis. However, physical constraints on Lake Street would make streetcar operation relatively slow. Streetcar service on Lake Street would require

additional construction, just after much of the street has been rebuilt. Bus bulbouts which have been created for bus stops on Lake would need to be lengthened, reducing street parking in some locations.

There has been some consideration of operating a “one way loop” streetcar in this corridor, with one direction of travel on the Greenway and the other on Lake. This arrangement is not practical for several reasons. First, the corridors do not function as a “couplet” as they are as much as four blocks apart in some locations. The depressed Greenway operation is not visible from Lake Street, nor is Lake Street visible from the Greenway. In addition, the stop spacing on the two alignments would not be the same, increasing the distance between the two directions of service. Dividing the service into two different corridors that are not directly related would negatively impact both, rather than enhancing both corridors.

Although the two alignments have their merits for different reasons, based on this analysis, the Midtown Greenway was chosen as the preferred alignment. This recommendation is made for several reasons:

- **The outcome of the Southwest Corridor LRT is unclear.** Two Southwest Corridor LRT alignments are still being evaluated: via Kenilworth/Royalston or Uptown/Nicollet. If the Kenilworth/Royalston alignment is chosen, the Greenway is the most appropriate alignment because it can more effectively provide a regional connection between the Southwest Corridor and Hiawatha LRT lines (by offering faster travel speeds and stops only at major nodes). If the Uptown to Nicollet alignment is chosen, streetcar service in the corridor (Lake Street or Greenway) does not make sense west of Nicollet. However, for the same reasons noted above, the Greenway could be utilized as a connection between the Nicollet/28<sup>th</sup> Street station and Hiawatha LRT station.
- **Congestion and slow travel speeds on Lake Street.** Lake Street is a relatively congested corridor, with commercial uses along the entire corridor. As a result, transit operating speeds on Lake Street are relatively slow. As pointed out in the Phase I report, modern streetcars are no faster than buses in dense urban environments, and in some cases slower because they cannot maneuver around temporary obstructions. This not only results in a slower trip for passengers along this corridor, but also adds to transit operating costs.
- **Reconstruction and streetscaping of Lake Street.** Lake Street is currently in the process of a multi-year reconstruction and streetscaping project. This project is improving water main and sewer connections, enhancing the pedestrian network and improving access to businesses along the corridor. Although streetcars would not operate that differently than buses, they would require reconstruction of the street and the addition of overhead wires along the entire corridor.

- **Strong support for streetcar in the Midtown Greenway.** The Midtown Greenway currently has relatively strong support from stakeholders within the corridor.
- **Midtown Greenway complements the regional LRT network.** Because service in the Midtown Greenway would be similar to light rail (faster operating speeds, wider stop spacing, etc. but with lower capacity), service in this corridor could provide an important regional link between the Southwest Corridor and Hiawatha LRT lines. If streetcar service is implemented in this corridor, it should be timed to the Southwest Corridor LRT line.

It should be noted that streetcar service on Lake Street was identified as having the greatest impact on the existing bus network – effectively replacing local buses one-for-one in the corridor. Although this would be a significant advantage over the Midtown Greenway, which would not have a significant impact on bus volumes in the corridor, the other factors were viewed as more important in making this recommendation.

### **Nicollet Avenue S**

Overall, the Nicollet Avenue S corridor shows strong potential for streetcar service when compared to other corridors. This corridor not only has good economic development potential (especially at Lake Street/Midtown Greenway, in downtown and at key nodes along Eat Street), but also has the potential to serve the best transit supportive land uses compared to other corridors. In terms of transit operations, streetcar service on Nicollet Avenue could have a significant impact on the underlying bus network. The potential for streetcars in this corridor is the greatest north of 38<sup>th</sup> Street where the short-line buses could be replaced one-for-one and a connection to cross-town buses could be made. The only issues associated with this corridor are the potential for higher capital costs, especially along the Nicollet Mall, and the K-Mart at Lake Street.

Although the entire corridor has potential for streetcar service and is recommended for inclusion in the long-term streetcar network, it is recommended that this corridor be shortened to the segment north of 38<sup>th</sup> Street.

It should be noted that if the Uptown to downtown alignment is chosen for the Southwest Corridor LRT line, then streetcar service along Nicollet Ave S between downtown and Lake would no longer be an option.

### **University Avenue SE / 4th Street SE**

The University Avenue SE / 4<sup>th</sup> Street SE corridor shows strong potential for streetcar service when compared to all other corridors. The ability to connect downtown, the East Hennepin area, Dinkytown, and the University of Minnesota creates strong potential for a streetcar line in this corridor. The potential impact on the underlying bus network and the economic development potential in the East Hennepin area and along the river (south of University) makes this a strong corridor. The major issue with this corridor is the potential

for higher capital costs due to utility conflicts in the University area and a long bridge crossing along Hennepin Avenue.

Despite some potential drawbacks related to costs, it is recommended that this corridor be included in the long-term streetcar network. The only issue with this corridor is potential duplication with the Central Avenue corridor between downtown and the East Hennepin area.

### **Lyndale Avenue S**

Lyndale Avenue S has mixed potential as a streetcar corridor. This corridor is strong in some areas, such as a relatively high transit-supportive land use score and service to one of the highest density neighborhoods in Minneapolis. However, this corridor does not measure up when compared to other corridors, most notably in terms of cost effectiveness (utilities, on-street parking impacts, and moderate increase in capital costs associated with the bottleneck). In addition, the Lyndale Avenue S corridor did not have a significant impact on the underlying bus network and duplicates service (to some degree) with the Hennepin Avenue and Nicollet Avenue corridors. Finally, the potential for redevelopment along this corridor is relatively low compared to other corridors. For these reasons, it is recommended that this corridor not be included in the long-term streetcar network.

Figure 8-2 summarizes the recommendations developed as a result of this phase of the analysis and Figure 8-3 provides a map of the corridors recommended for the long-term streetcar network.

**Figure 8-2 Streetcar Corridors Carried Forward to Phase III Evaluation**

Candidate Corridor	Included in Long-Term Streetcar Network?	Comments / Explanation
<b>W Broadway Avenue</b>	<b>Yes</b>	Lacks high intensity land uses but shows long-term potential, especially east of Penn Avenue N.
<b>Central Avenue NE</b>	<b>Yes</b>	Lacks high intensity land uses but shows long-term potential, especially near Lowry Avenue NE and in East Hennepin area.
<b>Chicago Avenue S</b>	<b>Yes</b>	High intensity land uses along entire corridor with both short- and long-term potential. At least two potential alignments through downtown are included.
Franklin Avenue	<b>No</b>	Does not work well as a stand-alone corridor.
<b>Hennepin Avenue S</b>	<b>Yes</b>	High intensity land uses in Uptown and in downtown with short-and long-term potential.
Lake Street	<b>No</b>	Good potential to impact local bus network and more traditional streetcar corridor. However, has less potential as a regional connection between LRT lines compared to Midtown Greenway and corridor in process of major reconstruction and streetscaping project.
<b>Midtown Greenway</b>	<b>Yes</b>	Good redevelopment potential and ease of transit operations. Better than Lake Street at providing regional connection between Hiawatha and Southwest Corridor LRT lines. This connection could be made at the West Lake station or the Nicollet/28 <sup>th</sup> Street station, depending on the alignment selected for the SW LRT corridor.
<b>Nicollet Avenue S</b>	<b>Yes, only as far as 38<sup>th</sup> Street</b>	High intensity land uses (north of Lake Street) with strong potential to impact local transit services. <i>Note: would not be included if the Uptown/Nicollet alignment is chosen for the Southwest Corridor LRT line.</i>
<b>University Avenue SE / 4<sup>th</sup> Street SE</b>	<b>Yes</b>	High intensity land uses in downtown, East Hennepin area and around the University of Minnesota. Both short and long-term potential.
Lyndale Avenue S	<b>No</b>	Less redevelopment potential and minimal impact on transit operations. Higher capital costs than other corridors. Potential conflicts with other higher priority corridors.

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**Figure 8-3 Long-Term Streetcar Network Carried Forward to Phase III Analysis**



**Legend**

Transit Centers

- Existing (Red T in circle)
- Planned (White T in circle)

Phase III Corridors

- Hiawatha Corridor Light Rail Line Alignment & Stations (Blue line with circles)
- I-35 BRT and Stations (future) (Red dashed line with circles)
- Central Corridor Light Rail Line Alignment & Stations (future) (Red solid line with circles)
- Bottineau BRT Alignment & Stations (future) (Red dashed line with circles)
- Southwest Corridor Transitway Alignment (future - alignments still in planning stages) (Blue dashed line)

Other Features:

- Minneapolis City Boundary (Grey outline)
- Water Features (Blue)
- Park, Recreation/Preserve; Golf Course; Agricultural (Green)
- Undeveloped (Light Grey)
- Central Business Districts (CBD) (Dark Grey)

**Streetcar Corridors Carried Forward to Phase III**

- A** W Broadway Ave (Robbinsdale Transit Center to downtown) - via Washington
- B** Hennepin Ave S (downtown to Lake Street)
- C** Midtown Greenway (SW LRT to Hiawatha LRT)
- D** Nicollet Ave S (downtown to 38th St)
- E** University Ave SE/4th Street SE (downtown to Stadium Village) - via E Hennepin Ave
- F** Chicago Avenue S (downtown to 38th St) - downtown via 9th/10th St or Chicago Ave/Washington Ave
- G** Central Avenue NE (downtown to 29th Ave NE) - via 3rd Avenue

0 0.25 0.5 1 1.5 2 Miles

Source: MetroGIS, Met Council, and the City of Minneapolis



- Future transit corridor sources:**
1. Central Corridor LRT: Metropolitan Council
  2. I-35 BRT: MnDOT
  3. Southwest Transitway: Southwest Transitway.org
  4. Bottineau BRT: Metro Transit





## Downtown Corridors and Issues

Although this evaluation focused on downtown and the corridors outside of downtown, Phase III will take a much closer look at downtown and the issues that will arise if streetcar is introduced. Based on the recommendations above, the downtown corridors that will remain in the evaluation include:

- **Nicollet Avenue** – entire corridor.
- **Hennepin Avenue** – entire corridor.
- **Washington Avenue** – between Plymouth Avenue N and Chicago Avenue.
- **Chicago Avenue** – entire corridor.
- **9<sup>th</sup>/10<sup>th</sup> Streets** – between Chicago Avenue and Nicollet Avenue.

Streetcar also has the potential to serve some of the near-downtown neighborhoods, and/or act as a catalyst for redevelopment. Some of the major redevelopment initiatives that will be explored further in Phase III of the report include:

- **Downtown East / North Loop.** The Downtown East / North Loop Master Plan envisions the expansion of the core of downtown to the west (around the planned ballpark) and to the east to the area around the Metrodome. The study area of the plan is within ¼ mile of the existing Hiawatha LRT stations. Although the Plan includes land use maps for the area, it is not technically a redevelopment plan.
- **Twins Ballpark.** On August 29, 2006, the Hennepin County Board authorized the construction of a new Minnesota Twins ballpark in downtown Minneapolis. The preferred site of the new ballpark is just west of I-394 between 7<sup>th</sup> Street N and Royalston Avenue. The new 42,000-seat facility will likely improve the development potential in this area and generate significant special event demand for transit service.
- **Metrodome area.** Although it is likely that the Metrodome will remain for the foreseeable future, each of the major tenants of the Metrodome is currently seeking a new stadium on a different site. Because this is a large site in the Downtown East area, the Downtown East / North Loop Master Plan evaluated the possibility of redevelopment at this site. This could open up a significant number of possibilities in terms of redevelopment, of which streetcar could be used as possible catalyst.

## Chapter 9. Next Steps – Phase III Evaluation

Phase III of this evaluation will identify the shortest operable segment and develop operating and capital plans for the line. The following items will be developed in Phase III of the analysis:

- **Identify shortest operable segments.** Based on the long-term streetcar network, initial streetcar segments will be identified for each corridor.
- **Capital costs.** This will include a general capital cost for the line and more detailed costing for the segment
- **Ridership estimates.** This will include ridership estimates for the segment.
- **Operating plan.** This will include cost and net cost for the segment.
- **Physical issues.** This will include identification of physical issues that could impact the implementation of the segment.
- **Community interest.** Identification of community interest and support for the segment.
- **Development potential.** This will include an assessment of current and future development potential.
- **Financing opportunities.** This will identify local, state and federal funding sources, as well as private financing opportunities.



# **APPENDIX A**

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## INITIAL STREETCAR OPERATING PLANS – DRAFT



# Appendix: Initial Streetcar Operating Plans – *Draft*

## Summary

Corridor	Peak Streetcar Vehicle Requirement	Net Change in Ann Operating Hours (+)	Net Change in Daily Vehicle Volumes – NB/EB (+)	Net Change in Daily Vehicle Volumes – SB/WB (+)
<b>Broadway</b>	<b>4</b>	<b>12,000</b>	<b>33</b>	<b>27</b>
<b>Chicago</b>	<b>4</b>	<b>10,000</b>	<b>30</b>	<b>34</b>
<b>Central</b>	<b>3</b>	<b>12,500</b>	<b>72</b>	<b>72</b>
<b>Midtown Greenway (a)</b>	<b>3</b>	<b>18,000</b>	<b>72 (1)</b>	<b>72 (1)</b>
<b>Midtown Greenway (b)</b>	<b>5</b>	<b>27,000 (2)</b>	<b>72 (1)</b>	<b>72 (1)</b>
<b>Lake</b>	<b>10</b>	<b>13,000</b>	<b>4</b>	<b>7</b>
<b>University/4<sup>th</sup></b>	<b>4</b>	<b>8,000</b>	<b>28</b>	<b>28</b>
<b>Nicollet</b>	<b>12</b>	<b>20,000 (3)</b>	<b>28</b>	<b>33</b>
<b>Hennepin</b>	<b>4</b>	<b>16,000 (4)</b>	<b>67</b>	<b>68</b>
<b>Lyndale</b>	<b>4</b>	<b>18,000 (4)</b>	<b>72</b>	<b>72</b>

- (a) Two-way via Greenway.
- (b) One-way Greenway, one-way Lake.

- (1) Operates in exclusive ROW and is not adding or replacing an existing bus line.
- (2) No impact on bus routes has been determined yet. This figure will be lower if service on parallel corridors is replaced.
- (3) May be additional impacts on bus service if 18G is replaced by neighborhood circulator.
- (4) No impact on bus routes has been determined yet. May be potential to reduce operating hours and bus volumes if midday service transfers at Lake and peak service operates limited between Lake and downtown. See corridor summaries below for more detail.

**W. Broadway Ave**

**Streetcar**

*(Robbinsdale TC, R Hubbard, L 41<sup>st</sup>, R Broadway, R France, L Oakdale, R Broadway, R Washington to Nicollet Mall)*

Monday-Saturday, 15 min. frequency, 5:00 AM – 11:00 PM

Sunday, 15 min. frequency, 6:00 AM – 12:00 AM

**Southbound Buses:**

Route 14E and 14A via Broadway/Oakdale replaced by streetcar

Route 14E and 14A via Regent/39<sup>th</sup>/Noble/36<sup>th</sup> operates limited stop between Broadway/Lowry and downtown.

**Northbound Buses:**

Route 14R via Broadway/Oakdale replaced by streetcar.

Route 14N via 36<sup>th</sup>/Noble/39<sup>th</sup>/Regent operates limited stop between downtown and Broadway/Lowry.

**Peak Streetcar Vehicle Requirement: 4**

**Estimated Impact:**

Streetcar Operating Hours:	+	26,000 annual revenue hours
Reduction in bus operating hours:	-	14,000 annual revenue hours
Operating cost difference:	+	12,000 annual revenue hours

M-F daily streetcar trips (NB):	+	72
M-F daily bus trips (NB):	-	39
NB trip difference:	+	33

M-F daily streetcar trips (SB):	+	72
M-F daily bus trips (SB):	-	45
SB trip difference:	+	27

**Notes:**

- Assumes a 12.5 mph streetcar average operating speed peak and base, 15 mph evening.
- May be some additional costs b/c some 14 trips not interlined in downtown (not calculated at this point).

**Chicago Ave S**

**Streetcar**

*(38<sup>th</sup> St/Chicago, continue via Chicago, L 9<sup>th</sup>, R to Nicollet Mall)*

Monday-Saturday, 15 min. frequency, 5:00 AM – 11:00 PM

Sunday, 15 min. frequency, 6:00 AM – 11:00 PM

**Southbound Buses:**

Monday – Friday, all Route 5 buses operating only between downtown and 38<sup>th</sup> St replaced by streetcar.

Monday-Friday, all Route 5 buses operating only south of 38<sup>th</sup> run limited stop between 8<sup>th</sup> St S and Lake.

**Northbound Buses:**

Monday – Friday, all Route 5 buses operating only between 38<sup>th</sup> St and downtown replaced by streetcar.

Monday-Friday, all Route 5 buses operating only south of 38<sup>th</sup> run limited stop between Lake and 8<sup>th</sup> St S.

**Peak Streetcar Vehicle Requirement: 4**

**Estimated Impact:**

Streetcar Operating Hours:	+	21,000 annual revenue hours
Reduction in bus operating hours:	-	11,000 annual revenue hours
Operating cost difference:	+	10,000 annual revenue hours

M-F daily streetcar trips (NB):	+	72
M-F daily bus trips (NB):	-	42
NB trip difference:	+	30

M-F daily streetcar trips (SB):	+	72
M-F daily bus trips (SB):	-	38
SB trip difference:	+	34

**Notes:**

- Assumes a 1.5 times improvement in travel speed between Lake and 8th St downtown
- Assumes a 8 mph streetcar average operating speed peak, 10 mph base, 12 mph evening.
- Route extended to 38<sup>th</sup> St E to connect with Route 23 and to replace shortline buses to 38<sup>th</sup> (39 trips SB and 40 NB).

**Central Ave NE**

**Streetcar**

*(29<sup>th</sup> Ave NE / Central Ave NE, continue 3<sup>rd</sup> Ave Bridge, R Washington, L Nicollet Mall)*

Monday-Saturday, 15 min. frequency, 5:00 AM – 11:00 PM

Sunday, 15 min. frequency, 6:00 AM – 11:00 PM

**Southbound Buses:**

No bus routes replaced by streetcar.

Monday-Friday, Route 10 operates limited stop between Lowry and downtown.

**Northbound Buses:**

No bus routes replaced by streetcar.

Monday-Friday, Routes 10U, 10N, 10C, 10H operates limited stop between downtown and Lowry.

**Peak Streetcar Vehicle Requirement: 3**

**Estimated Impact:**

Streetcar Operating Hours:	+	18,000 annual revenue hours
Reduction in bus operating hours:	-	5,500 annual revenue hours
Operating cost difference:	+	12,500 annual revenue hours

M-F daily streetcar trips (NB):	+	72
M-F daily bus trips (NB):	-	0
NB trip difference:	+	72

M-F daily streetcar trips (SB):	+	72
M-F daily bus trips (SB):	-	0
SB trip difference:	+	72

**Notes:**

- Assumes a 1.5 times improvement in travel speed between Lowry and downtown
- Assumes a 10 mph streetcar average operating speed peak, 12 mph base and 15 mph evening.
- Route was not extended to Columbia Heights TC due to at grade RR crossing
- Connection to Columbia Heights TC makes much more sense in terms of operating plan.

**Midtown Greenway (Version 1)**

**Streetcar**

*(Via Greenway from SW LRT to Hiawatha LRT)*

Monday-Saturday, 15 min. frequency, 5:00 AM – 11:00 PM

Sunday, 15 min. frequency, 6:00 AM – 11:00 PM

**Eastbound Buses:**

No bus routes replaced by streetcar.

**Westbound Buses:**

No bus routes replaced by streetcar.

**Peak Streetcar Vehicle Requirement: 3**

**Estimated Impact:**

Streetcar Operating Hours:	+	18,000 annual revenue hours
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Reduction in bus operating hours:	-	0 annual revenue hours
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Operating cost difference:	+	18,000 annual revenue hours
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M-F daily streetcar trips (EB):	+	72
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M-F daily bus trips (EB):	-	0
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EB trip difference:	+	72
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M-F daily streetcar trips (WB):	+	72
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M-F daily bus trips (WB):	-	0
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WB trip difference:	+	72
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**Notes:**

- Assumes an 18 mph average operating speed throughout the day.
- If SW LRT alignment via Greenway/Nicollet is chosen, streetcar would not be feasible in Greenway.

**Midtown Greenway (Version 2)**

**Streetcar**

*(Via Greenway one-way from SW LRT to Hiawatha LRT and via Lake one-way from SW LRT to Hiawatha LRT)*

Monday-Saturday, 15 min. frequency, 5:00 AM – 11:00 PM

Sunday, 15 min. frequency, 6:00 AM – 11:00 PM

**Eastbound Buses:**

No bus routes replaced by streetcar.

**Westbound Buses:**

No bus routes replaced by streetcar.

**Peak Streetcar Vehicle Requirement: 5**

**Estimated Impact:**

Streetcar Operating Hours:	+	27,000 annual revenue hours
Reduction in bus operating hours:	-	0 annual revenue hours
Operating cost difference:	+	27,000 annual revenue hours

M-F daily streetcar trips (EB):	+	72
M-F daily bus trips (EB):	-	0
EB trip difference:	+	72

M-F daily streetcar trips (WB):	+	72
M-F daily bus trips (WB):	-	0
WB trip difference:	+	72

**Notes:**

- Assumes a 10 mph average operating speed throughout the day (accounts for 15 mph operating speed in Greenway and 8-10 mph operating speed on Lake).
- If SW LRT alignment via Greenway/Nicollet is chosen, streetcar would not be feasible in Greenway.

**Lake Street**

**Streetcar**

*(Via Lake Street from SW LRT to Hiawatha LRT)*

Monday-Friday, 8 min. frequency, 6:00-9:00 am and 3:30 – 6:00 pm; 10-30 min. frequency other times (total operation 4:00 am – 2:00 am)

Saturday, 10 min. frequency, 9:00 AM – 8:00 PM; 15-30 min frequency 4:00 am – 9 am and 8:00 pm to 2:00 am

Sunday, 10-15 min. frequency, 9:00 AM – 8:00 PM; 15-30 min frequency 4:00 am – 9 am and 8:00 pm to 1:00 am

**Peak Streetcar Vehicle Requirement: 10**

**Eastbound Buses:**

Replaces all Route 21 buses between Uptown Transit Center and Hiawatha LRT.

**Westbound Buses:**

Replaces all Route 21 buses between Hiawatha LRT and Uptown Transit Center.

**Estimated Impact:**

Streetcar Operating Hours:	+	46,000 annual revenue hours
Reduction in bus operating hours:	-	33,000 annual revenue hours
Operating cost difference:	+	13,000 annual revenue hours

M-F daily streetcar trips (EB):	+	111
M-F daily bus trips (EB):	-	115
EB trip difference:	-	4

M-F daily streetcar trips (WB):	+	111
M-F daily bus trips (WB):	-	118
WB trip difference:	-	7

**Notes:**

- Assumes an 8mph average operating speed peak, 10 mph average operating speed base and evening.
- Forces a transfer for through-travel between Lake west of Hiawatha (including St. Paul) to Uptown.
- If SW LRT alignment via Lake is chosen, streetcar may still be feasible for local circulation on Lake.
- Although streetcar replaces Route 21 almost 1-to-1, additional operating costs are assumed because streetcar corridor is from SW LRT (west station) to Hiawatha LRT.

- If SW LRT is implemented, Routes 21 and 53 will be extended to west Lake station, which will reduce the cost difference between streetcar/bus.

**University / 4th**

**Streetcar**

*(Via Hennepin, R University to Stadium Village)*

Monday-Friday, 10 min. frequency, 6:00-9:00 am and 3:30 – 6:00 pm; 15 min. frequency other times (total operation 6:00 am – 11:30 pm)

Saturday and Sunday, 15 min. frequency, 6:00 AM – 11:00 PM

**Northbound Buses:**

Route 6U operating between downtown and the University is replaced by streetcar.

**Southbound Buses:**

Routes 6F, 6K, 6B, 6D, 6E, 6A, 6C and 6X operating between the University and downtown are replaced by streetcar.

**Peak Streetcar Vehicle Requirement: 4**

**Estimated Impact:**

Streetcar Operating Hours:	+	19,000 annual revenue hours
Reduction in bus operating hours:	-	11,000 annual revenue hours
Operating cost difference:	+	8,000 annual revenue hours

M-F daily streetcar trips (NB):	+	84
M-F daily bus trips (NB):	-	56
NB trip difference:	+	28

M-F daily streetcar trips (SB):	+	84
M-F daily bus trips (SB):	-	57
SB trip difference:	+	27

**Notes:**

- Assumes a 10 mph streetcar average operating speed all day
- Central LRT connections to and from the university will also be available from downtown.
- Possible turn-around/layover (Beacon Street).
- University and 4<sup>th</sup> are one-way. This issue to be addressed later in the study.

**Nicollet**

**Streetcar**

Long Line (Via Nicollet from 66<sup>th</sup> Street/Nicollet to downtown): Monday-Friday, 15 min. frequency, 4:30 am – 10:00 PM), 30 min frequency 10:00 PM - 1:30 am; Saturday and Sunday, 15 min. frequency, 4:30 am – 10:00 pm; 30 min frequency 10:00 pm – 12:00 or 1:00 am

Short Line (Via Nicollet from 38<sup>th</sup> Street/Nicollet to downtown): Monday-Friday, 15 min. frequency, 4:30 am – 10:00 PM), 30 min frequency 10:00 PM - 1:30 am; Saturday and Sunday, 15 min. frequency, 4:30 am – 10:00 pm; 30 min frequency 10:00 pm – 12:00 or 1:00 am

**Northbound Buses:**

Replace all Route 18 buses between downtown and 66<sup>th</sup> Street except those operating on Grand Ave S. Connections would be made with buses that continue south of 66<sup>th</sup>.

**Southbound Buses:**

Replace all Route 18 buses between 66<sup>th</sup> Street and downtown except those operating on Grand Ave S. Connections would be made with buses that continue south of 66<sup>th</sup>.

**Peak Streetcar Vehicle Requirement (Long Line): 7**

**Peak Streetcar Vehicle Requirement (Short Line): 5**

**Estimated Impact:**

Streetcar Operating Hours:	+	71,000 annual revenue hours
Reduction in bus operating hours:	-	51,000 annual revenue hours
Operating cost difference:	+	20,000 annual revenue hours

M-F daily streetcar trips (NB):	+	152
M-F daily bus trips (NB):	-	124
NB trip difference:	+	28

M-F daily streetcar trips (SB):	+	152
M-F daily bus trips (SB):	-	119
SB trip difference:	+	33

**Notes:**

- Long Line: assumes a 10 mph streetcar average operating speed peak, 12 mph base, 15 mph evening.
- Short Line: assumes a 8 mph streetcar average operating speed peak, 10 mph base, 12 mph evening.

- 18G route (via Grand) could be severed at Lake/Nicollet and served with a neighborhood circulator. Would have an operating cost savings.

**Hennepin**

**Streetcar**

*(From Uptown TC via Hennepin to downtown)*

Monday-Friday, 15 min. frequency, 5:00 am – 1:30 am

Saturday and Sunday, 15 min. frequency, 5:30 am – 11:30 pm; 30 min frequency from 11:30 pm – 1:30 am

**Eastbound/Northbound Buses:**

Replace all Route 6 buses between 36<sup>th</sup>/Hennepin and the University.

**Westbound/Southbound Buses:**

Replace all Route 6A buses between the University and 36<sup>th</sup>/Hennepin.

**Peak Streetcar Vehicle Requirement: 4**

**Estimated Impact:**

Streetcar Operating Hours:	+	18,000 annual revenue hours
Reduction in bus operating hours:	-	2,000 annual revenue hours
Operating cost difference:	+	16,000 annual revenue hours

M-F daily streetcar trips (EB/NB):	+	72
M-F daily bus trips (EB/NB):	-	5
EB/NB trip difference:	+	67

M-F daily streetcar trips (WB/SB):	+	72
M-F daily bus trips (WB/SB):	-	4
WB/SB trip difference:	+	68

**Notes:**

- Assumes a 8 mph streetcar average operating speed peak, 10 mph base, 15 mph evening.
- No other changes were assumed for Route 6.
- Route 12 not affected. Might be able to eliminate evening trips on 12 (minimal impact)
- Could consider peak limited stop trips on Route 6 between Lake and downtown. Would reduce operating cost impacts.
- Could consider transferring all midday 6 trips to streetcar at Uptown TC. Would reduce operating cost impacts.

**Lyndale**

**Streetcar**

*(Via Lyndale to Hennepin to downtown)*

Monday-Sunday, 15 min. frequency, (total operation 6:00 am – 12:00 am)

**Northbound Buses:**

No impact on Route 4.

**Southbound Buses:**

No impact on Route 4.

**Peak Streetcar Vehicle Requirement: 4**

**Estimated Impact:**

Streetcar Operating Hours:	+	18,000 annual revenue hours
Reduction in bus operating hours:	-	0 annual revenue hours
Operating cost difference:	+	18,000 annual revenue hours

M-F daily streetcar trips (NB):	+	72
M-F daily bus trips (NB):	-	0
NB trip difference:	+	72

M-F daily streetcar trips (SB):	+	72
M-F daily bus trips (SB):	-	0
SB trip difference:	+	72

**Notes:**

- Assumes a 8 mph streetcar average operating speed peak, 12 mph base, 15 mph evening.
- Corridor ridership does not justify 15 minute service, 18 hours/day
- May want to consider peak limited stop trips on Route 4 between Lake and downtown. Would reduce operating cost impacts.
- May want to consider transferring all midday Route 4 trips to streetcar at Lyn/Lake. Would reduce operating cost impacts.

## **Washington**

### **Notes:**

- Should treat Washington as a downtown corridor - i.e. a connection between other corridors that could lead to an extension of the network in the future.
- Does not make sense to think of operating streetcar exclusively on Washington without serving the major generators in the core of downtown.
- Washington has a lot of economic development potential, but not enough transit generators to justify a line that doesn't serve the core of downtown.