Detailed Evaluation of Alternatives

Nicollet-Central Transit Alternatives

FINAL November 2013

Minneapolis
City of Lakes

Prepared for:

City of Minneapolis

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URS

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Executive Summary

The City of Minneapolis approved a long-range streetcar plan in 2007 that included seven corridors (see Figure S-1). Two of these corridors were combined to create what is now known as the Nicollet-Central Corridor. This corridor runs for 9.2 miles from 46th Street in south Minneapolis to 41st Avenue in Columbia Heights, just north of the City's northern boundary (see Figure S-2). The corridor runs through the heart of downtown along Nicollet Mall and serves several existing and emerging high-density urban neighborhoods.

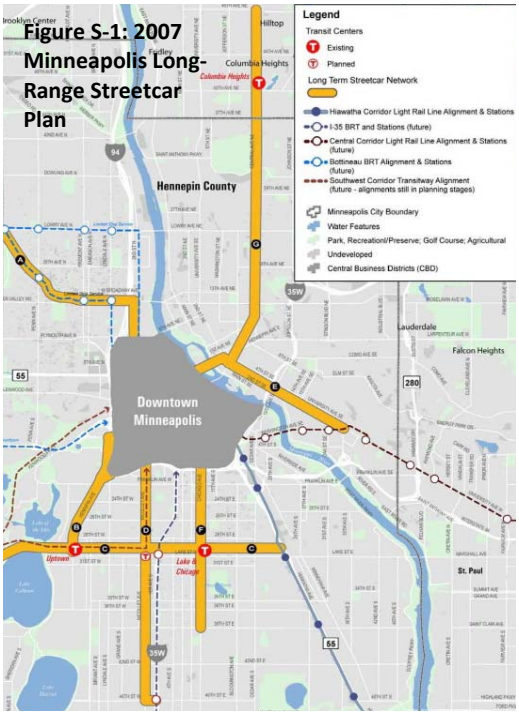


Figure S-1: 2007 Minneapolis Long-Range Streetcar Plan

In 2011, the City of Minneapolis was awarded a Federal Transit Administration (FTA) Section 5339 grant to complete a transit alternatives study and environmental review for the Nicollet-Central Corridor. This is an important first step in eventually qualifying for federal funding for construction of transit improvements in the corridor. The purpose of an alternatives study is to identify and evaluate a full range of potential transit improvement alternatives for service and facilities in the study corridor.

The Nicollet-Central Transit Alternatives Study has been guided by a Project Management Team (partner agencies of Minneapolis, Metropolitan Council/Metro Transit), a Technical/Citizens Advisory Committee (citizen representatives from neighborhoods along the corridor and technical representatives from public agencies), and a Policy Advisory Committee (policy maker representatives from along the corridor). The Policy Advisory Committee (PAC) will make a recommendation to the Minneapolis City Council on a locally preferred alternative (LPA) for the corridor. The City Council will recommend the locally preferred alternative to the Metropolitan Council. Following recommendation of the LPA, the City will work with the Metropolitan Council to modify the regional Transportation Policy Plan to include the recommended transit alternative for the Nicollet-Central corridor.

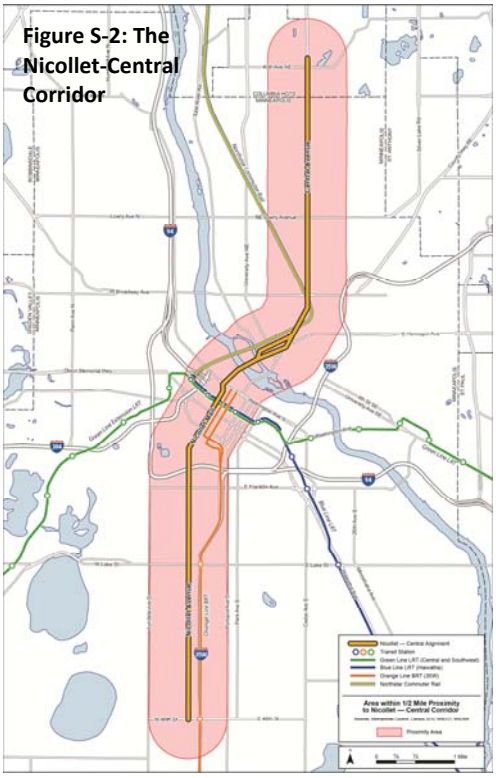


Figure S-2: The Nicollet-Central Corridor

Purpose

On October 25, 2012, the PAC approved the following statement of purpose for improving transit in the Nicollet-Central Corridor:

> *"The purpose of the Nicollet-Central Transit Alternatives Project is to improve transit connectivity, enhance the attractiveness of transit service, and catalyze development through an investment in transit infrastructure within the Nicollet-Central Corridor."*

Goals and Evaluation Measures

Six goals were identified, along with 28 evaluation measures related to those goals, for the purposes of evaluating how well transit alternatives addressed the above stated purpose of the project. Those goals are:

- Connect people and places (measured by the number of people, jobs and activity centers served, as well as the quality of transit, bicycle and pedestrian connections)
- Increase the attractiveness of transit (measured by projected transit ridership and potential for future growth in ridership)
- Catalyze and support economic development (measured by potential development capacity and potential to spur economic development)
- Integrate with the existing transportation system (measured by impacts on traffic, parking and freight railroads)
- Support healthy communities and environmental practices (measured by impacts to historic and natural resources, benefits to environmental justice communities and transit-reliant population, and environmental benefits)
- Develop an implementable project with community support (measured by capital costs, operating and maintenance cost, and public/business support)

Modal Alternatives

During the initial screening process (see *Initial Screening of Alternatives and Public Outreach Summary Report #2*), a large number of mode and alignment alternatives were identified and evaluated. This process resulted in the three alternatives for detailed evaluation: (1) No-Build, (2) Enhanced Bus, and (3) Streetcar. In addition, the detailed evaluation addresses alternatives for a "minimal operable segment" or "starter line."

The No Build alternative is a continuation of existing bus service using conventional 60-foot buses operating along Routes 10, 18 and 59 as they do today. This alternative includes growth in bus service to accommodate expected future growth in population and employment.

The "Enhanced Bus" alternative (see right photo) is designed to mimic streetcar service in the corridor. It includes stops approximately every 1/4 mile (about every two blocks), new hybrid articulated buses, off-board fare collection, improved transit stops/shelters, signal adjustments for improved transit speed, and other transit amenities. This alternative is not exactly the same as "Arterial Bus Rapid Transit (BRT)" which tends to have less frequent stops (usually every ½+ miles apart) and faster transit speeds, and are designed to serve longer trips.

The "Streetcar" alternative is a modern streetcar (see left photo) service that includes stops approximately every 1/4 mile (about every two blocks) and is designed to serve shorter trips in an urban area, and uses modern streetcar vehicles, off-board fare collection, improved transit stops/shelters, signal adjustments for improved transit speed, and other transit amenities.

Alignment Alternatives

Two alternatives for crossing the Mississippi River were evaluated in detail:

- Hennepin Avenue Bridge, using Hennepin Avenue and First Avenue on the northeast side of the river.
- Central/Third Avenue Bridge, using Central Avenue on the northeast side of the Mississippi River.

"Starter" Streetcar Line

The corridor was broken into segments to determine the best performing "starter" line for streetcar. The starter line needed to include service to downtown, to connect downtown to both the northeast (across Mississippi River) neighborhoods and the south (across I-94) neighborhoods, and have good outcomes related to the above referenced goals.

Evaluation of Modal Alternatives

- *Goal 1 - Connecting people and places*: There is no difference between the alternatives because both serve the same population, employment and activity centers and both provide the same transit, pedestrian and bicycle connections.
- *Goal 2 – Increase the attractiveness of transit*: Streetcar has higher projected ridership (20,100 riders per weekday on streetcar compared to 13,400 riders on enhanced bus) and streetcar has greater potential capacity per vehicle to accommodate future growth.
- *Goal 3 – Catalyze and support economic development*: Streetcar has greater potential to catalyze development based on a review of peer cities and discussion at a local developer forum.
- *Goal 4 – Integrate with existing transportation systems*: Both streetcar and enhanced bus operate in the same lanes as general traffic. Both are expected to have minimal and similar impacts on traffic, parking and freight rail operations.
- *Goal 5 – Support healthy communities and environmental practices*: Streetcar is expected to serve a higher number of transit-reliant riders (7,500 weekday riders compared to 4,800 weekday riders for enhanced bus) and, while not quantified, streetcar has the long-range potential to have fewer environmental impacts and a lower carbon footprint than enhanced bus.
- *Goal 6 – Develop an implementable project with community support*: Enhanced bus has a lower capital cost ($94 million compared to $393 million for streetcar) and a lower annual operating and maintenance cost ($13.6 million compared to $20.1 million for streetcar). However, the O&M cost per passenger boarding are approximately the same. Based on comments received during the public comment period, streetcar has significantly greater public/business support than enhanced bus.

Evaluation of River Crossing Alternatives

Two Mississippi River crossings were evaluated based on those detailed criteria that apply to this aspect of the detailed analysis. The results of this evaluation are:

- The Hennepin alignment has higher projected transit ridership and faster transit travel times although the Central alignment is the current route for Route 10 (Central Avenue service), resulting in increased walk distances of one to two blocks for some existing riders if the alignment were shifted to Hennepin.
- The Central/Third Avenue Bridge is listed in the National Register of Historic Places. Due to its age and historic status, it will be more expensive to modify for streetcar.

- There are better existing pedestrian and bicycle connections to the river from Hennepin Avenue and Hennepin Avenue provides a direct connection to Nicollet Island.
- Installing streetcar tracks on this section of Central Avenue and retaining the existing sharrows for bicycles would require the removal of on-street parking. On the other hand, the existing right-of-way width of Hennepin and First Avenues would accommodate streetcar tracks, bicycle lanes and on-street parking.

Evaluation of Streetcar Starter Line

This detailed evaluation of alternatives also examined a streetcar starter line that was generally defined in the *Detailed Definition of Alternatives Report* (April 2013) from Central Avenue at Eighth Street NE to Nicollet Avenue at Lake Street. Select information by segment of the corridor was developed including population, employment, cost estimates and economic development capacity. In summary, the streetcar starter line analysis *affirmed that the preliminary definition of the streetcar starter line best meets the goals and objectives of the study*:

- Serves the highest population and employment density
- Serves the highest number of transit-reliant population
- Serves the highest number of affordable housing
- Serve five of nine development opportunity sites and has the highest potential development capacity in terms of area and estimated dollar value
- Has the highest potential for the replacement of existing buses.

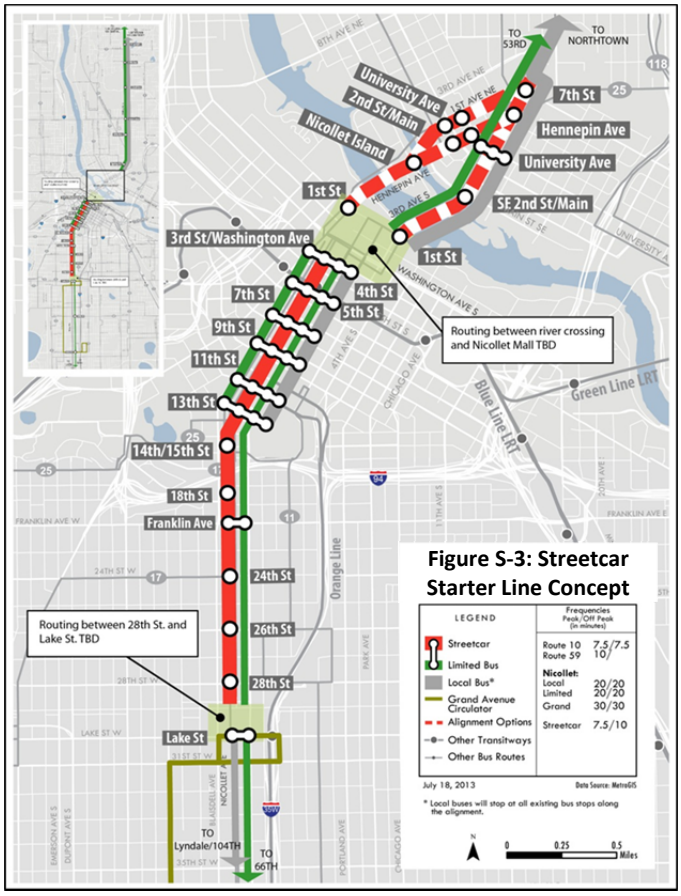


Figure S-3: Streetcar Starter Line Concept

Next Steps

Following public review of the detailed evaluation of alternatives, public comments will be summarized and presented to the Policy Advisory Committee (PAC) and the Minneapolis City Council. The PAC will make a recommendation of a locally preferred alternative (LPA) to the City Council. The City Council will select an LPA. Following the selection of an LPA, an environmental review will be completed, and the City will work with the Metropolitan Council to modify the regional Transportation Policy Plan to include the LPA for the Nicollet-Central Corridor. These actions are the next steps needed to continue to position the city and the region for potential federal funding of transit improvements in the Nicollet-Central Corridor.

1. Introduction

The City of Minneapolis approved a long-range streetcar plan in 2007 that included seven corridors (see Figure 1). Two of these corridors were combined to create what is now known as the Nicollet-Central Corridor. This corridor runs for 9.2 miles from 46th Street in south Minneapolis to 41st Avenue in Columbia Heights, just north of the city's northern boundary (see Figure 2). The corridor runs through the heart of downtown along Nicollet Mall and serves several existing and emerging high-density urban neighborhoods.

Figure 1: 2007 City of Minneapolis Long-Term Streetcar Study Map

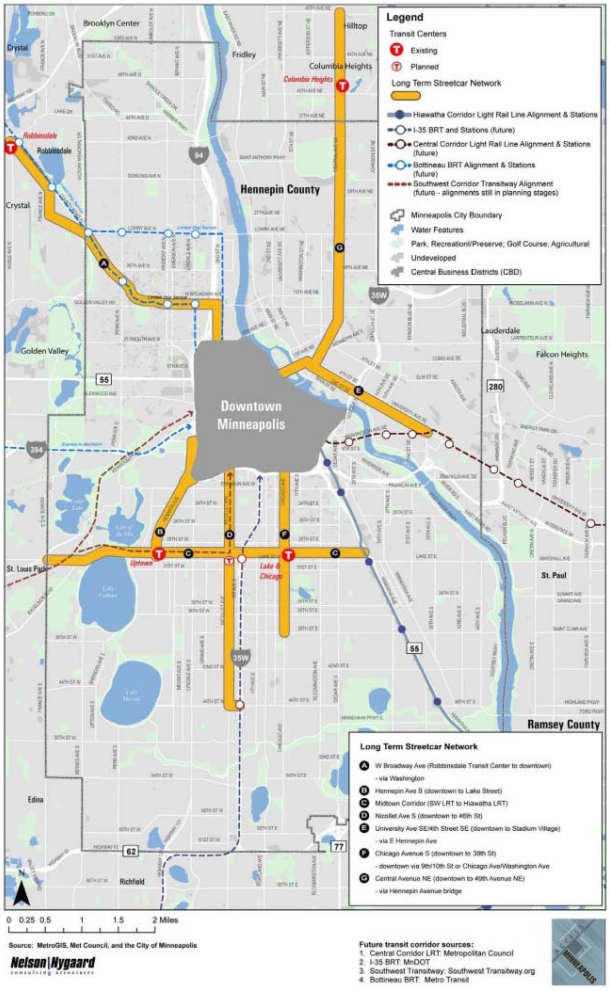
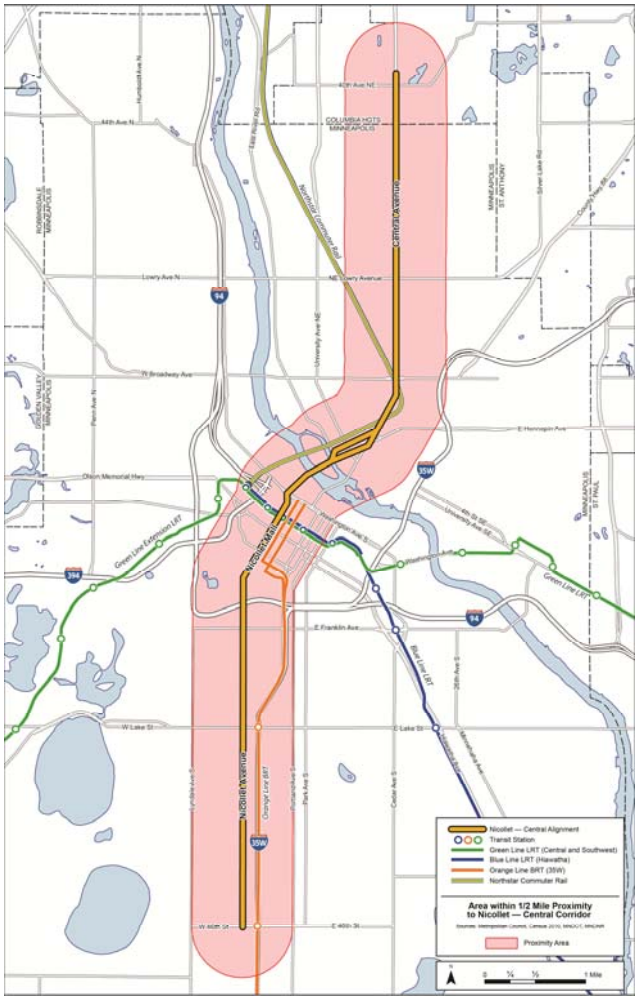


Figure 2: Nicollet-Central Transit Study Corridor



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The Nicollet-Central Transit Alternatives Study has been guided by a Project Management Team (partner agencies of Minneapolis, Metropolitan Council/Metro Transit), a Technical/Citizens Advisory Committee (citizen representatives from neighborhoods along the corridor and technical representatives from public agencies along the corridor), and a Policy Advisory Committee (policy maker representatives from along the corridor). The Policy Advisory Committee will make a recommendation to the Minneapolis City Council on a locally preferred alternative (LPA) for the corridor. The City Council will select the locally preferred alternative. Following selection of the LPA, the City will work with the Metropolitan Council to modify the regional Transportation Policy Plan to include the recommended transit alternative for the Nicollet-Central corridor. These steps are necessary prior to seeking federal funding for implementation.

On October 25, 2012, the Policy Advisory Committee approved the following purpose for improving transit in the Nicollet-Central Corridor:

> *"The purpose of the Nicollet-Central Transit Alternatives Project is to improve transit connectivity, enhance the attractiveness of transit service, and catalyze development through an investment in transit infrastructure within the Nicollet-Central Corridor."*

This report summarizes the methodology, assumptions and results of the detailed evaluation of the No-Build and three Build alternatives of the study two build alternatives and a minimal operable segment for a streetcar "starter line." The technical work that is summarized in this report is intended to facilitate the identification of an LPA.

1.1. Project Decision-Making Process

The study is being guided by a Policy Advisory Committee and supported by a Technical/Community Advisory Committee and a Project Management Team that is supported by a team of consultants. The overall decision making process for this project is outlined below in Figure 3.

Figure 3: Project Decision-Making Process

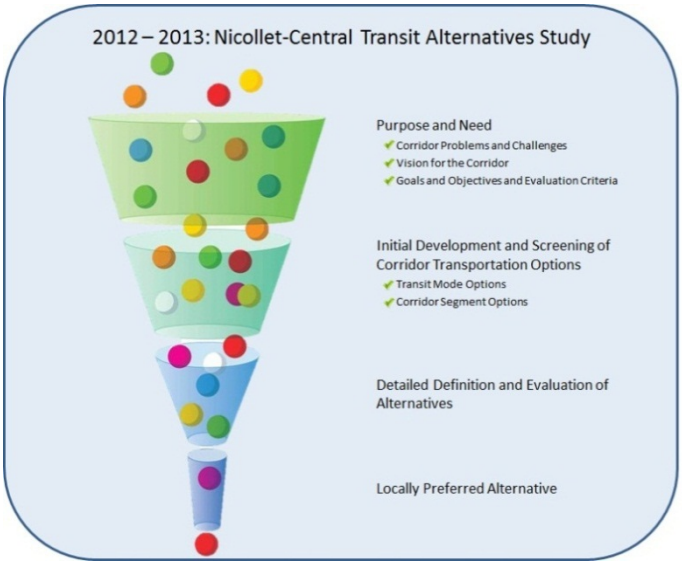
In addition to the Committees and Project Management Team shown in Figure 3, extensive public engagement activities have occurred, including ten public open houses, an online survey, an online comment card, key stakeholder interviews, and presentations at more than 75 standing community meetings and events.

1.2. Overview of Evaluation Process

The Nicollet-Central Transit Alternatives Study began in June 2012. It follows a multi-step evaluation process (Figure 4) that incorporates public input with technical analysis. The evaluation process began with an initial screening that analyzed a broad set of transit modes and alignments using high-level, qualitative measures. The alternatives that passed the initial screening were then defined in detail for subsequent detailed analysis that is the subject of this document.

The study's goals are the foundation of the evaluation criteria applied in both the initial screening and detailed evaluation of alternatives. These goals are:

Figure 4: Study Process



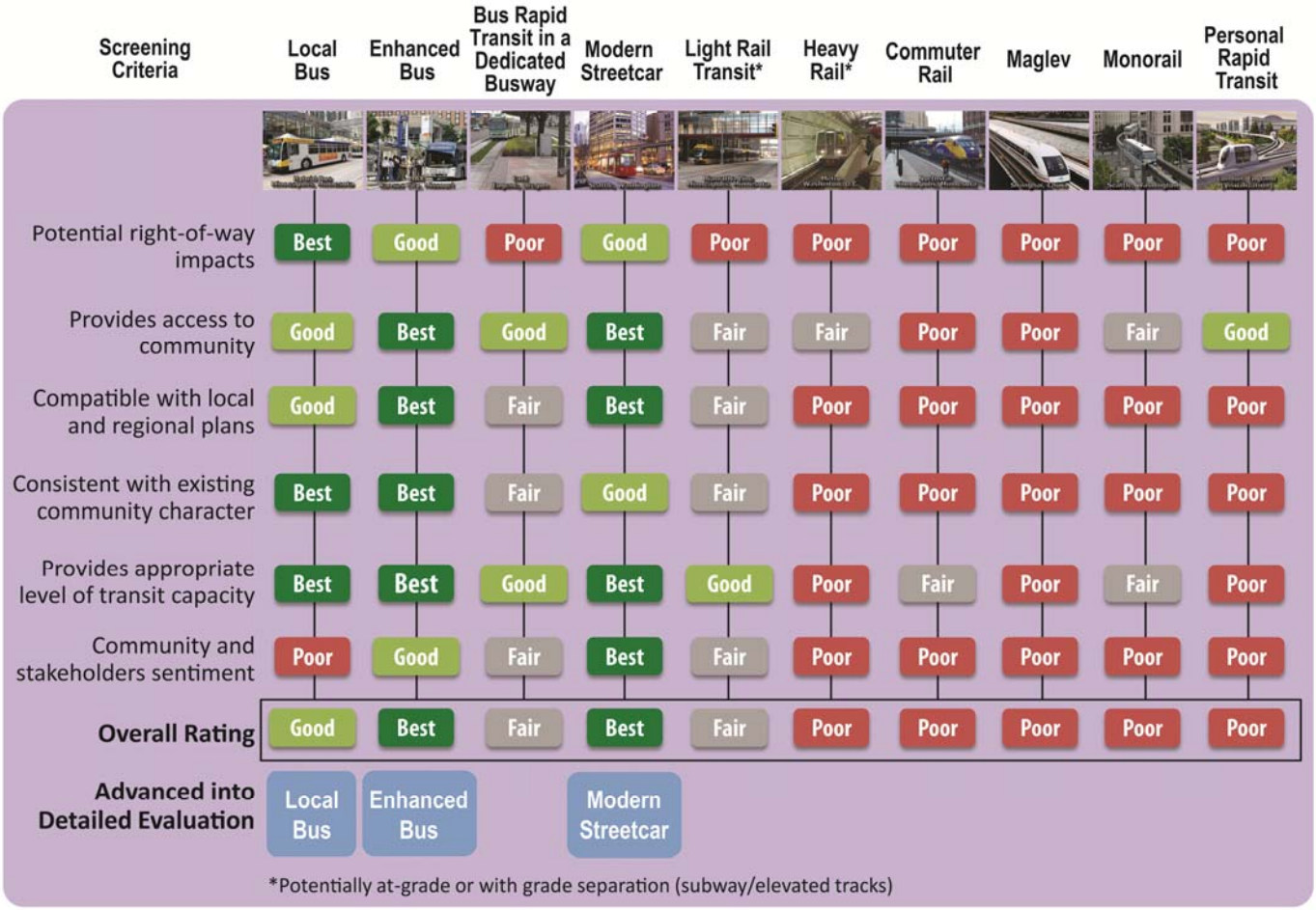
- Connect People and Places
  - Connect downtown with nearby neighborhoods
  - Enhance connections between corridor activity centers and destinations
  - Improve connections between the corridor and the regional transit system
- Increase the Attractiveness of Transit
  - Provide transit capacity for future growth
  - Maximize transit ridership
  - Improve visibility and identification of the transit system
  - Provide improved passenger amenities and infrastructure
  - Provide reliable, frequent service
  - Provide transit service and facilities that are easy to use for people who live in, work in and visit the corridor
  - Provide safe and comfortable transit service and facilities
  - Improve accessibility for people with mobility challenges
- Catalyze and Support Economic Development
  - Support the economic vitality of downtown
  - Support the economic vitality of small neighborhood businesses
  - Support local and regional goals to foster compact, mixed-used development along the corridor
- Integrate with the Transportation System
  - Integrate with the existing transit network
  - Provide acceptable traffic operations and reasonable parking options
  - Support walkable neighborhoods and multimodal transportation choices
- Support Healthy Communities and Environmental Practices
  - Minimize impacts to historical and cultural and natural resources
  - Minimize impacts to low-income and minority communities
  - Minimize neighborhood and property impacts
  - Support improved transportation, housing and economic opportunities for people of all income levels
- Develop an Implementable Project with Community Support
  - Define transit improvements with strong public, stakeholder and agency support
  - Identify transit improvements that are financially feasible and competitive
  - Develop transit improvements that allow for phased implementation

Both the initial screening and detailed evaluation of alternatives entailed development of numerous technical documents that are available under separate cover. This report references these detailed documents as appropriate.

1.3. Results of Initial Screening

In order to evaluate the different transit modes and alignment options and identify the appropriate mode-alignment pairings that defined the detailed alternatives, the study undertook a two-pronged approach within the initial screening. One approach identified a broad set of transit mode options while the other approach related to alignments. The initial screening applied generally broad, qualitative measures, including information from previous corridor studies. Figure 5 summarizes the results of the initial screening of modes along with the criteria. The alternatives were evaluated and ranked relative to one another. Details of this initial screening are documented under separate cover (*Initial Screening of Alternatives* and *Public Outreach Summary Report #2*). Figure 6 presents the alignment options considered in the initial screening and those recommended for detailed definition.

Figure 5: Summary of Initial Screening of Modes

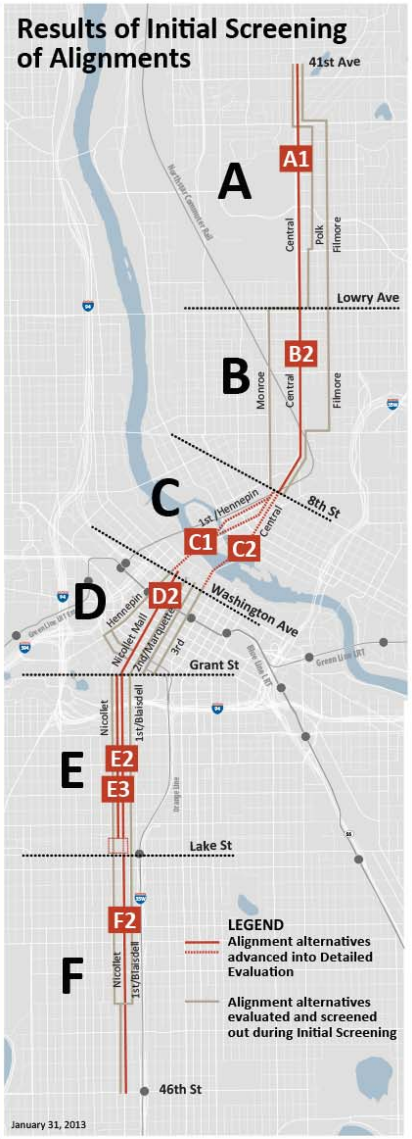


Screening Criteria	Local Bus	Enhanced Bus	Bus Rapid Transit in a Dedicated Busway	Modern Streetcar	Light Rail Transit*	Heavy Rail*	Commuter Rail	Maglev	Monorail	Personal Rapid Transit
Potential right-of-way impacts	Best	Good	Poor	Good	Poor	Poor	Poor	Poor	Poor	Poor
Provides access to community	Good	Best	Good	Best	Fair	Fair	Poor	Poor	Fair	Good
Compatible with local and regional plans	Good	Best	Fair	Best	Fair	Poor	Poor	Poor	Poor	Poor
Consistent with existing community character	Best	Best	Fair	Good	Fair	Poor	Poor	Poor	Poor	Poor
Provides appropriate level of transit capacity	Best	Best	Good	Best	Good	Poor	Fair	Poor	Fair	Poor
Community and stakeholders sentiment	Poor	Good	Fair	Best	Fair	Poor	Poor	Poor	Poor	Poor
Overall Rating	Good	Best	Fair	Best	Fair	Poor	Poor	Poor	Poor	Poor
Advanced into Detailed Evaluation	Local Bus	Enhanced Bus		Modern Streetcar						

*Potentially at-grade or with grade separation (subway/elevated tracks)

Figure 6: Summary of Initial Screening of Alignments

		Connects activity centers	Compatible with local and regional plans	Community and stakeholder sentiment	Effective alignment that provides for direct access	Consistent with existing community character	**Overall Rating**	**Advanced into Detailed Evaluation**
	41st Ave							
A1	Central	Good	Best	Best	Good	Best	Best	A1
A2	Polk	Good	Fair	Fair	Poor	Fair	Fair	
A3	Filmore	Best	Fair	Fair	Fair	Fair	Fair	
	Lowry Ave							
B1	Monroe	Best	Fair	Fair	Poor	Fair	Fair	
B2	Central	Good	Best	Best	Best	Best	Best	B2
B3	Filmore	Fair	Fair	Fair	Poor	Fair	Fair	
	8th St							
C1	1st/Hennepin	Good	Good	Good	Good	Good	Good	C1
C2	Central	Good	Good	Good	Good	Good	Good	C2
	Washington Ave							
D1	Hennepin	Good	Fair	Fair	Fair	Good	Fair	
D2	Nicollet Mall	Good	Best	Good	Best	Best	Best	D2
D3	2nd/ Marquette	Good	Fair	Fair	Fair	Fair	Fair	
D4	3rd	Good	Fair	Fair	Fair	Fair	Fair	
	Grant St							
E1	1st/Blaisdell	Good	Fair	Fair	Fair	Fair	Fair	
E2	Nicollet (reconnected at Lake)	Best	Best	Best	Best	Good	Best	E2
E3	Nicollet (assuming no reconnection of Nicollet)	Good	Good	Good	Good	Good	Good	E3
	Lake St							
F1	1st/Blaisdell	Good	Fair	Fair	Fair	Fair	Fair	
F2	Nicollet	Best	Best	Best	Best	Best	Best	F2
	46th St							



The results of the initial screening identified two options for crossing the Mississippi River (Hennepin/1st Avenue and Central/3rd Avenue) and three options for connecting Nicollet Avenue to Lake Street: Via First or Blaisdell Avenue or reopening Nicollet Avenue at Lake Street, as illustrated in Figure 6.

1.4. Alternatives for Detailed Definition

Modes

The three alternatives moved into the Detailed Definition and Evaluation of Alternatives phase were No-Build (local bus), Enhanced Bus (full length of the Nicollet-Central corridor, from 41st Avenue NE to 46th Street S), and Modern Streetcar (full length of the Nicollet-Central corridor, from 41st Avenue NE to 46th Street S).

River Crossing Alternatives

Two alternatives for crossing the Mississippi River were evaluated in detail, and are discussed in Chapter 4 of this report:

- Hennepin Avenue Bridge, using Hennepin Avenue and First Avenue on the northeast side of the River.
- Central/Third Avenue Bridge, using Central Avenue on the northeast side of the River.

Table 1 summarizes the features associated with each alternative for detailed definition and evaluation. A description of the existing transit features is provided for purposes of comparison. Detailed descriptions are in the *Detailed Definition of Alternatives Report*, (available on the project website (http://www.minneapolismn.gov/nicollet-central/index.htm). Figures 7 and 8 illustrate the conceptual service plans and stop locations for the two Build alternatives over the 9.2-mile corridor; Figure 9 illustrates the conceptual service plan and stop locations for the Modern Streetcar Starter line.

Streetcar Starter Line

Based on an analysis of the data generated through the *Detailed Definition of Alternatives*, the Modern Streetcar alignment was subdivided into a full alignment alternative (9.2 miles) and a Streetcar Starter Line alternative (3.4 miles); the Streetcar Starter Line alternative is further discussed in Chapter 4 of this report.

The original 9.2-mile alignment was initially identified as part of the Minneapolis Streetcar Feasibility Study because the existing bus service on routes 10 and 18 is comprised of sub-routes, the shortest of which, at the time, provided service to the Columbia Heights Transit Center and 46th Street, respectively. Based on this previous planning work within the corridor, this study's original 9.2-mile alignment was chosen to allow Metro Transit to replace the short line bus service with the streetcar, which would result in an operating savings for Metro Transit.

The PMT was also concerned, however, that a shortened alignment would require a substantially different background bus network because streetcar operating along a shortened alignment would not replace the subroutes of existing routes 10 and 18. Due to these concerns about potentially adverse impacts on the background bus network, the decision was made to develop a separate service plan, ridership estimates, capital and operating cost estimates for a shortened alignment to allow policy makers to make an informed decision not only about mode, but also about appropriate alignment length.

The PMT considered several factors when determining the alignment length of starter streetcar line, including:

- Population density,
- Employment density/employment served,
- Affordable housing density,

- Provides connections to near downtown neighborhoods,
- Connect key activity centers,
- Integration with the existing transit network.

Population density

The central segment of the corridor (from 8th Street NE to Lake Street S) contains neighborhoods with some of the highest population density in Minneapolis-St. Paul region, as well as the densest populated portion of the corridor. The starter streetcar line will serve 58 percent of the current population in the Nicollet-Central Corridor; because population in this portion of the corridor is expected to grow faster than the rest of the corridor, it is anticipated that the starter streetcar line will serve 66 percent of the 9.2-mile Nicollet-Central Corridor residents by 2030.

Employment density/employment served

Downtown Minneapolis has the highest concentration of employment in the Upper Midwest, with more than 120,000 employees. The highest density of employment within the full 9.2-mile study corridor is concentrated along the starter streetcar alignment: it will serve an area with more than twice the number of jobs per square mile than the full 9.2-mile corridor. The starter streetcar line will serve 94 percent of the jobs in the 9.2-mile Nicollet-Central Corridor.

Affordable housing

The highest concentration of affordable housing units in the full 9.2-mile corridor is located along the starter streetcar alignment. 13 percent of housing units served by starter streetcar line are legally binding affordable housing units, while nine percent of the housing units within the corridor are legally binding affordable housing units. Five percent of the housing units in the seven-county region are legally binding affordable units. The starter streetcar line will serve 91 percent of the legally affordable housing units in the 9.2-mile Nicollet-Central Corridor.

Provides connections to near downtown neighborhoods

A key objective of the Nicollet-Central Transit Alternatives Study was to provide improved transit connections between downtown and near-downtown neighborhoods. Although there are residential portions of downtown, the densely populated near-downtown neighborhoods located north of the Mississippi River and south of I-94 often feel “cut-off” from downtown due in large part the transportation/access barriers the river and interstate present. Extending the streetcar starter line over both the river and I-94 will bridge these gaps in the urban fabric and connect these neighborhoods with downtown.

Connect key activity centers

The central segment of the corridor (from 8th Street NE to Lake Street) connects downtown with existing and future activity centers just north of the river and along Nicollet Avenue north of Lake Street, including the Lake/Nicollet intersection.

Integrate with the existing transit network

The central segment of the corridor connects with the majority of transit in the study area, including transit in downtown, LRT on 5th Street, I-35W Highway BRT at Lake Street downtown, and major east-west bus connections outside downtown (Lake Street, Franklin Avenue, 4th/University).

Figure 7: Enhanced Bus Conceptual Service Plan

Figure 8: Modern Streetcar Conceptual Service Plan

Figure 9: Modern Streetcar Starter Line Conceptual Service Plan

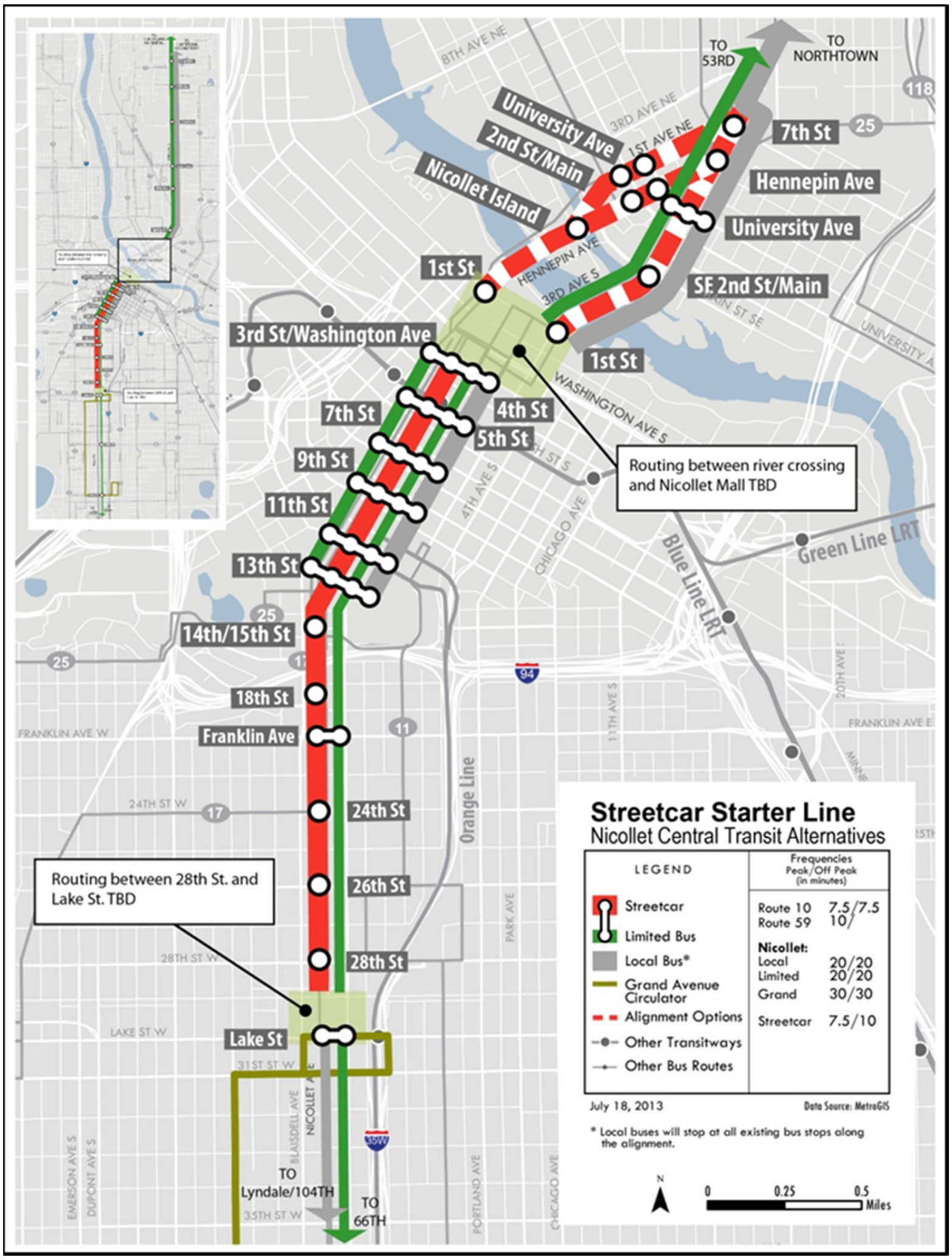


Table 1: Summary of Detailed Definition of Alternatives

ALTERNATIVE FEATURE	EXISTING	NO-BUILD	ENHANCED BUS (CENTRAL/41ST – NICOLLET/46TH)	MODERN STREETCAR (CENTRAL/41ST – NICOLLET/46TH)	MODERN STREETCAR STARTER LINE (HENNEPIN/CENTRAL – NICOLLET/LAKE)
Primary Transit Service within Study Area	*Routes 10, 18 and 59. Also serve areas north of Central/41st Ave NE and Nicollet/46th St S. Travel between northern and southern part of the corridor entails transfer downtown.*	*Same as Existing.*	*Enhanced Bus: Provides one-seat ride between 46th Street and 41st Avenue NE and continues as a local service to 53rd Avenue NE to the north and 66th Streetcar to the south.* *Limited Stop: Provides one-seat ride between 66th Street and downtown on Nicollet Avenue and between Northtown Mall and downtown on Central Avenue.* *Local Bus: Routes 10, 18 and 59 are replaced by enhanced bus and limited stop bus. Local bus service continues south of 46th Street and north of 41st Avenue NE. The Grand Avenue branch of Route 18 operates as a shuttle service.* *Other Local Bus: No other changes proposed to Route 11, 17, 25, and 568*	*Streetcar: Provides one-seat ride between 46th Street and 41st Avenue NE.* *Limited Stop Bus: Provides one-seat ride between 66th Street and downtown on Nicollet Avenue and between Northtown Mall and downtown on Central Avenue.* *Local Bus: Route 10, 18 and 59 are replaced by streetcar and limited stop bus. Local bus service continues south of 46th Street and north of 41st Avenue NE. The Grand Avenue branch of Route 18 operates as a shuttle service.* *Other Local Bus: No changes proposed to Routes 11, 17, 25 and 568*	*Streetcar: Provides one-seat ride between Lake Street and 8th Street NE.* *Limited Stop Bus: Provides one-seat ride between 66th Street and downtown on Nicollet Avenue.* *Local Bus: No change to Routes 10 and 59. Route 18 is replaced by streetcar and limited stop bus north of Lake Street, but local bus servcies continues south of Lake Street. The Grand Avenue branch of Route 18 operates as a shuttle service.* *Other Local Bus: No changes proposed to Routes 11, 17, 25, and 568*
Route Length	*Not applicable*	*Not applicable*	*9.2 miles*	*9.2 miles*	*3.4 miles*
Service Frequency – Primary Transit Routes (Peak/Midday)	*Route 10: 10 minutes* *Route 18: 7.5 minutes* *Route 59: 10 minutes*[1]	*Change Route 10 midday and peak frequency from every 10 minutes to 7.5 minutes*	*Enhanced Bus: 7.5/10 minutes* *Limited Stop: 15-30 minutes* *Shuttle: 30 minutes*	*Streetcar: 7.5/10 minutes* *Limited Stop: 10-30 minutes* *Shuttle: 30 minutes*	*Streetcar: 7.5/10 minutes* *Limited Stop: 20 minutes* *Local Bus: 20 minutes* *Shuttle: 30 minutes* *No changes needed to Routes 10/59*
Stop Spacing	*Every block*	*Same as today (every block – about 1/8 mile)*	*No changes to Nicollet Mall stops.* *Enhanced Bus: Every other block – about ¼ mile* *Limited Stop: Varies; one mile between Central/41st and Nicollet/46th; one-half mile outside* *Local and Shuttle: Same as Existing*	*No changes to Nicollet Mall stops.* *Streetcar: Every other block* *Limited Stop: Varies; one mile between Central/41st and Nicollet/46th; one-half mile outside.* *Local and Shuttle: Same as Existing*	*No changes to Nicollet Mall stops.* *Streetcar: Every other block* *Limited Stop: Varies; one mile between 8th Street NE and Nicollet/Lake Street; one-half mile outside* *Local and Shuttle: Same as Existing*

[1] Route 59 only operates in the peak periods.

ALTERNATIVE FEATURE	EXISTING	NO-BUILD	ENHANCED BUS (CENTRAL/41ST – NICOLLET/46TH)	MODERN STREETCAR (CENTRAL/41ST – NICOLLET/46TH)	MODERN STREETCAR STARTER LINE (HENNEPIN/CENTRAL – NICOLLET/LAKE)
Stop Facilities	*Varies; larger, more visible shelters on Nicollet Mall*	*Same as Existing.*	*Near-level/level boarding, curb extension, recognizable shelter, real-time signs*	*Near-level/level boarding, curb extension, recognizable shelter, real-time signs*	*Near-level/level boarding, curb extension, recognizable shelter, real-time signs*
Runningway	*Same as other local bus service in region, i.e. in right lane of existing roadways and with regular traffic*	*Same as Existing.*	*Same as Existing.*	*In mixed traffic. Entails track construction between Central/41st, Nicollet Mall and Nicollet/46th St*	*In mixed traffic. Entails track construction between Hennepin/Central, Nicollet Mall and Nicollet/Lake*
Transit Vehicles	*40′ hybrid bus*	*Same as Existing, although this could change, depending on ridership forecasts*	*Enhanced Bus: 60′ hybrid articulated bus. New to Twin Cities region.* *Limited Stop: 40′ hybrid* *Local and Shuttle: 40′ diesel*	*Streetcar: 67′ modern streetcar similar to Portland and Seattle. New to Twin Cities region.* *Limited Stop: 40′ hybrid* *Local and Shuttle: 40′ diesel*	*Streetcar: 67′ modern streetcar similar to Portland and Seattle. New to Twin Cities region.* *Limited Stop: 40′ hybrid* *Local and Shuttle: 40′ diesel*
Fare Collection	*On board, cash and electronic fare payment*	*Same as Existing.*	*Enhanced Bus: On-board and off-board system; passenger boarding using any door* *Limited Stop, Local and Shuttle: On-board*	*Streetcar: On-board and off-board; passenger boarding using any door* *Limited Stop, Local and Shuttle: On-board*	*Streetcar: On-board and off-board system; passenger boarding using any door* *Limited Stop, Local and Shuttle: On-board*
Technology and Customer Information	*Same as other local bus service in the region*	*Same as Existing.*	*Transit signal priority (TSP) and real-time signs*	*TSP and real-time signs*	*TSP and real-time signs*
Identity and Branding	*"Free Ride" service on Nicollet Mall*	*Same as Existing.*	*Enhanced Bus: Unique stops and vehicles*	*Streetcar: Unique stops and vehicles*	*Streetcar: Unique stops and vehicles*
Transit Vehicle Storage and Maintenance Facility	*Served by existing Metro Transit facilities such as Heywood and Nicollet.*	*Same as Existing.*	*Enhanced Bus fleet would be accommodated by existing or planned Metro Transit facility.*	*Streetcar requires new facility for storage, cleaning and washing.[2] Depending on many factors such as fleet size, facility could require a two- to five-acre site.*	*Streetcar requires new facility storage cleaning and washing.[2] Depending on many factors such as fleet size, facility could require a two- to three-acre site.*
Other Unique Features	*Not applicable*	*Not applicable*	*Not applicable*	*Special systems for streetcar vehicle propulsion including overhead contact wire and traction power substations*	*Special systems for streetcar vehicle propulsion including overhead contact wire and traction power substations*

[2] This study assumes that heavy maintenance functions such as wheel truing would be accommodated by existing, programmed or planned Metro Transit rail operations and facilities such as Franklin.

1.5. Evaluation Criteria

The following criteria were used to evaluate the modes and alignments that were considered for implementation with the Nicollet-Central study corridor; outcomes of these evaluations are discussed in subsequent sections of this report.

Table 2: List of Detailed Evaluation Criteria

GOAL	MEASURES
1. Connect People and Places	*1.1 2010 population within one-half mile* *1.2 2030 population within one-half mile* *1.3 2010 employment within one-half mile* *1.4 2030 employment within one-half mile* *1.5 Existing major activity centers served* *1.6 Transit connections* *1.7 Quality of pedestrian connections* *1.8 Quality of bicycle connections*
2 Increase the Attractiveness of Transit	*2.1 2030 ridership projections* *a. Project boardings* *b. New corridor transit trips* *2.2 Ability to accommodate growth in transit ridership*
3. Catalyze and Support Economic Development	*3.1 Estimate of development potential* *3.2 Potential value of development* *3.3 Potential for alternative to spur development*
4 Integrate with the Existing Transportation System	*4.1 Impact on existing corridor transportation operations* *4.2 Impact on existing on-street parking* *4.3 Impact on freight railroad operations*
5. Support Healthy Communities and Environmental Practices	*5.1 Potential impacts on historical, cultural and natural resources* *a. Number of archeology sites within one-quarter mile* *b. Number of architectural sites within one-quarter mile* *c. Natural resources within one-half mile* *5.2 Year 2030 transit-reliant ridership* *a. Project boardings by transit-reliant persons* *b. Percent of project boardings by transit-reliant persons* *5.3 Benefits to low-income and minority population within one-half mile* *a. Population living below poverty served* *b. Percent of population living below poverty* *c. Population without access to automobile* *d. Percent of population without access to automobile* *5.4 Affordable housing within one-half mile* *a. Number of affordable housing units mile* *b. Percent of housing units that are affordable* *5.5 Environmental benefits* *a. Regional air pollution*

GOAL	MEASURES
	b. Safety
6 Develop an Implementable Project with Community Support	*6.1 Cost-effectiveness* *a. 2030 passenger boardings per vehicle revenue hour* *b. O&M cost per passenger boarding** *c. Project annual O&M cost estimate** *d. Project capital cost estimate** *e. Cost-effectiveness* *6.2 Community support* *a. Public sentiment* *b. Business/developer community sentiment*

*Annual O&M (operating and maintenance) and capital cost estimates are in Year 2013 dollars.

2. Evaluation of Modal Alternatives

In the detailed evaluation, this study analyzed the two build alternatives and the No-Build alternative to assess how each would fare against the criteria listed in Table 2. Numerous technical studies were undertaken to produce the data needed to support the evaluation. These studies provide details of methodology and assumptions; are referenced in the appropriate sections of this report; and available on the project website (http://www.minneapolismn.gov/nicollet-central/index.htm).

This chapter of the report summarizes the methodology and assumptions of the detailed evaluation of modal alternatives by each goal of the study. The end of each section presents a table that summarizes results of the analysis.

2.1. Connect People and Places

The measures associated with this goal address population, employment, major activity centers and multimodal connections. These measures were used for this study because they are a surrogate for rider demand, which is a criterion that the FTA considers when evaluating project for federal funding.

2.1.1. Population and Employment

The number of people who would ride any transit service is strongly correlated with the number of people who live and work within close proximity to that service. The Nicollet-Central Corridor is a heavily populated corridor and contains the largest concentration of employment in the state of Minnesota, as presented in Table 3. In addition, the Nicollet-Central Corridor is expected to add 25,000 residents and 50,000 jobs by 2030. As shown in Table 3, each of the modes under consideration serves the same population and employment.

Table 3: Population and Employment*

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
1.1 2010 population	*93,900*		
1.2 2030 population	*120,000*		
1.3 2010 employment	*125,500*		
1.4 2030 employment	*177,900*		

*Within one-half mile of alignment.

2.1.2. Existing Major Activity Centers Served

A number of major activity centers were specifically identified in the Purpose and Need as places that should be served by the alternatives, presented in Table 4. The No-Build, Enhanced Bus, and Modern Streetcar alternatives serve all of these major activity centers.

Table 4: Major Activity Centers in the Nicollet-Central Corridor

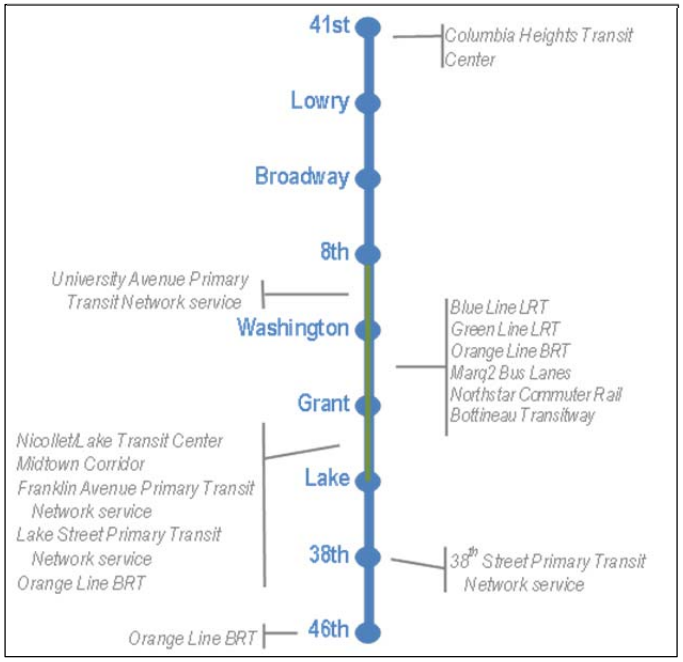
CULTURAL	INSTITUTIONAL/ EDUCATIONAL	RECREATIONAL/TOURISM	SHOPPING/DINING
Minneapolis Institute of Arts	*University of St. Thomas*	*Minneapolis Convention Center*	*Nicollet Mall shopping and restaurant district*
Childrens Theatre Company	*Minneapolis Community and Technical College*	*St. Anthony Main/Mississippi River*	*"Eat Street" restaurant district*
Hennepin Theatre Trust (Orpheum, State, Pantages, New Century Theatres)	*Minneapolis College of Art and Design*	*Target Center*	*Central Avenue NE commercial district*
The Cowles Center for Dance and the Performing Arts	*Minneapolis Central Library*	*Target Field*	*East Hennepin commercial district*
Orchestra Hall		*6,000 hotel rooms*	*Northeast Arts District*

2.1.3. Quality of Transit, Pedestrian and Bicycle Connections

Transit Connections

The corridor serves as the north-south spine of the transit network in Minneapolis, connecting many existing high-frequency and high-ridership bus routes, transitways and transit centers. It would also serve future transit centers and transitways.

Figure 10: Transit Connections



Pedestrian and Bicycle Connections

Both Minneapolis and Columbia Heights are fully developed and in most places have sidewalks on both sides of the streets. A continuous network of sidewalks encourages pedestrian trips and serves to extend the distance that people are willing to walk to access transit. However, there are locations along the corridor where there are barriers to pedestrian activity. These barriers are primarily the lack of connected street grid and/or sidewalks along streets, particularly at the northern and southern ends of the corridors. These connections contribute to pedestrian safety and comfort walking to/from transit stops (Figure 11).

Minneapolis is known nationally as a bicycle-friendly city. While Columbia Heights might not be as well-known for its bicycle friendliness, it is one of the many first and second ring suburbs that have also developed a strong bicycle network, contributing to Minneapolis' reputation as a bicycle-friendly city. As a result, the Nicollet-Central corridor provides many high quality bicycle connections (Figure 11). The Nicollet-Central corridor connects to the several premium bicycle routes, including the Midtown Greenway, West River Road trail, Heritage Trail, Grand Rounds, as well as bicycle boulevards that include RiverLake Greenway, Northeast Fifth Street and Northeast 22nd Street.

Each of the alternatives has the same benefits and obstacles related to walking and biking.

Figure 11: Inventory of Pedestrian and Bicycle Connections

Pedestrian Connections

41st

Continuous sidewalk network

Lowry

Incomplete street grid and lack of sidewalks between 18th and Broadway

Broadway

Largely continuous sidewalk network

8th

Two options to cross Mississippi River:

- *Hennepin/First – Access to Nicollet Island, St. Anthony Main and riverfront*
- *Central/Third – Access only to east side of River*

Washington

Continuous sidewalk network; Nicollet Mall

Grant

Continuous sidewalk network

Lake

I-35W creates a barrier to the east

38th

I-35W creates a barrier to the east

46th

Bicycle Connections

41st

Connection to the Grand Rounds and City loop bikeway

Lowry

Limited east-west connections due to railroads

Broadway

Limited east-west connections due to railroads

8th

Two options to cross Mississippi River:

- *Hennepin/First – Access to Heritage, East and West River trails; room for bike, parking and traffic with enhanced bus or streetcar*
- *Central/Third – No direct connection to trails served by Hennepin/First; limited room for bike, parking and traffic with streetcar.*

Washington

Bicycle lanes and designated bicycle routes throughout downtown

Grant

Connections to Midtown Greenway and other east-west bicycle facilities

Lake

Connection to on-street bicycle facilities on 31st , 35th, 36th and 38th St

38th

Connection to RiverLake Greenway

46th

2.1.4. Summary – Connect People and Places

Table 5 below presents the evaluation results for Goal 1, *Connect People and Places*.

Table 5: Goal 1 Results – Connect People and Places

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
1.1 2010 population within one-half mile	*93,900*		
1.2 2030 population within one-half mile	*120,000*		
1.3 2010 employment within one-half mile	*125,500*		
1.4 2030 employment within one-half mile	*177,900*		
1.5 Existing major activity centers served	*All alternatives serve all major activity centers. Most major activity centers clustered in/around downtown, Eighth-Washington and Grant-Lake. Outer-end service is beyond location of most major activity centers.*		
1.6 Transit connections	*All alternatives serve all of the transit connections within 9.2-mile study corridor including Columbia Heights Transit Center and 38th St primary transit network*		
1.7 Quality of pedestrian connections	*Connections diminish somewhat farther north and south; all alternatives have the same benefits and obstacles*		
1.8 Quality of bicycle connections	*Connections diminish somewhat farther north and south; all alternatives have the same benefits and obstacles*		

2.2. Increase the Attractiveness of Transit

The measures associated with the second goal of the study are related to 2030 ridership; this is one of the criterion that the FTA considers when evaluating projects for federal funding.

2.2.1. Year 2030 Ridership

Travel forecasting for the Nicollet-Central corridor was unusually complicated because it combines two heavily used transit corridors that currently are not interlined; it encompasses the downtown area which is served by most of the transit lines in the region; and a large share of existing trips are short trips that are not well represented in the zone-to-zone trip analysis reflected in the regional travel demand model. A two-step approach was used to address these complexities. First, the Metropolitan Council's regional travel demand model, which had been validated for the concurrent Midtown Corridor Alternatives Analysis, was used. This was combined with a "hybrid" incremental data-driven approach that used existing route boarding patterns to better capture "short trips" or "micro scale" travel movements and markets that the regional model is not designed to capture. The validation of these procedures is described in Appendix A, Travel Forecasting Results.

The 2030 transit ridership forecasts were developed using a combination of the results of the regional travel demand model and an incremental survey trip table that was "grown" from current data to 2030 data using

Metropolitan Council's demographic forecasts and a Fratar model process. New riders were generated using the regional travel demand model (as validated for the Midtown Corridor Alternatives Analysis).

The following adjustments were also made during the forecasting process:

- Bus to rail transfer penalties were based on the penalties used in the forecasts for the Bottineau Corridor.
- Rail preference factors were assumed for modern streetcar and were based on the rail preference factors used for Hiawatha and other LRT lines in the Twin Cities.
- The service plan for Enhanced Bus closely mirrors the service plan for modern streetcar; it does not have a service plan similar to the Arterial Transit Corridors Study (ATCS). The Enhanced Bus alternative was given a limited preference factor (a 10 percent faster running time) to reflect some of the service attributes such as BRT-like branding that are not included in the regional travel demand model.

The service plans and trips per hour by segment for the local bus, limited stop and "line haul" service for each Build alternative are detailed in Appendix B, Operating Plans. For the No-Build alternative, local bus service includes Routes 10 and 19 while the limited stop service is defined as the existing Route 59.

These forecast results assume that the modern streetcar alternatives would have the same rail preference as Hiawatha and the other LRT lines under construction or consideration in the Twin Cities. This preference means that in some cases travelers will see up to a 25 minute weighted travel time savings over a comparable bus trip. Even though modern streetcar is an untested transit system concept in the Twin Cities, this rail preference was considered to be similar to light rail.

Enhanced bus incorporates some infrastructure features studied in the Arterial Transit Corridor Study 2012, but the service design more closely mirrors the streetcar alternative for the purpose of this study. However, there is no comparable preference for it in the Met Council travel demand model. For this reason, it is coded with an In Vehicle Time (IVT) discount of 10 percent, or assumes that it would run 10 percent faster than scheduled in the travel demand model. This IVT discount provides for alternative-specific service attributes as defined in the Nicollet-Central Transit Alternatives Detailed Definition of Alternatives (prepared under separate cover) and includes features such as transit signal priority and BRT-like branding.

For the Build alternatives, the service patterns and trips per hour by segment for the local bus, limited stop, and "line haul" service for each alternative are summarized in the previous chapter and detailed in *Technical Memorandum: Service Plans* (under separate cover). For the No-Build, local bus service includes Routes 10 and 18 while the limited stop service is defined as the existing Route 59.

The ridership forecasts prepared for this study are not directly comparable to those from Metro Transit's 2012 *Arterial Transitway Corridors Study (ATCS).* This is because the ridership forecasting approach and service planning assumptions for this study *differ* from that employed in the ATCS. Some of the differences include:

- The ATCS uses a previous version of the Met Council travel forecasting model with different calibration assumptions, 2030 demographic forecasts, and 2030 background transit service assumptions.

- The ATCS assumed proposed rapid bus service on Nicollet and Central as separate corridors (with no through routing).

- In each corridor the rapid bus service for the ATCS is longer than in Nicollet-Central with the Nicollet service running from American Boulevard to 3rd Street and the Central service running from the Leamington Ramp to the Northtown Transit Center.

- The ATCS assumed different modifications to Routes 10, 17, 18, and 59.

- Stops are much more widely space - with BRT assumed to be a faster, limited stop service intended to provide faster service for longer trips.

Several measures of ridership are reported for each alternative and can be considered as part of the overall evaluation process:

- *Project Boardings* are defined as boardings on either the enhanced bus or modern streetcar alternative and is the same as FTA's Project Trips measure. Project Boardings by *Transit-Dependents* are defined as the subset of Project Boardings attributed to zero-car households.
- *Corridor Bus Boardings.* This model output includes Routes 10, 18, and 59 in the No-Build and local bus, and limited-stop bus in the Build.
- *Total Boardings* is the sum of Project Boardings, Corridor Bus Boardings, and Other Corridor Boardings for all of the segments. Other Corridor Boardings include the following routes: 17, 25, 11, and 568.
- *New Riders* reflect the difference in regional transit linked trips between each build alternative and the Project No build. This is a regional measure so a decrease in ridership due to a change in service in one part of the corridor may offset an increase in ridership from the streetcar or other proposed improvements.
- *VMT Savings* are an estimate of the difference in auto Vehicle Miles of Travel (VMT) between each build alternative and the Project No Build. This measure is expressed as a savings so that a positive number corresponds with a decrease in VMT while a negative number denotes an increase in VMT.

Table 6: Year 2030 Ridership

	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Project (Streetcar or Enhanced Bus) Boardings		*13,400*	*20,100*
Transit-Dependent		*4,800*	*7,500*
Non Transit-Dependent		*8,500*	*12,600*
Corridor Bus Boardings	*37,300*	*10,100*	*12,300*
Limited Stop Bus	*1,700*	*9,800*	*10,300*
Local Bus	*35,600*	*300*	*2,000*
Other Corridor Boardings (Routes 11, 17, 25, 568)	*28,900*	*29,400*	*33,100*
Total Boardings	***66,200***	***52,900***	***65,500***
New Riders		*-1,700*	*900*
VMT Savings		*-9,700*	*-2,900*

Conclusions

Some conclusions that can be drawn from both the alternative forecasts and the sensitivity tests are:

- New riders and VMT savings are higher when there are fewer changes to the background bus service (from the Project No Build). This is likely because existing riders are not "lost" when existing local (Route 10, 18) and limited stop (Route 59) service patterns are changed. The service planning changes causing these losses are combination of changes in combined headways and stopping patterns which result, in some cases, in riders having to transfer where they formerly had a "one seat" ride in the No Build alternative. Riders that find this new option unattractive are switching to the auto mode.

- Project Boardings are lower for some alternatives since riders are not, in some cases, forced to transfer to the "line haul" service (i.e. the streetcar or enhanced bus).

- Project Boardings for Enhanced Bus are different from the Streetcar alternatives because of service plan differences and the rail preference is more than the enhanced bus preference.

Further refinement to the alternative service plan could lead to an optimal combination of project boardings, VMT savings, and new riders.

2.2.2. Ability to Accommodate Growth in Transit Ridership

In addition to its connection to the core of downtown Minneapolis, the Nicollet-Central corridor is proximate to a large number of special trip generators that include the Minneapolis Convention Center, Target Field, Target Center, Hubert H. Humphrey Metropolitan Dome (Vikings Stadium), museums and theaters. As such, this study has placed importance on the ability of any transit improvement in the corridor to accommodate the demand (ridership) from special events at one or more of these venues would generate.

The increased capacity resulting from the use of either enhanced bus and modern streetcar vehicles will be sufficient to accommodate projected growth in ridership (either from special event or daily riders); the No Build option will not provide the additional capacity necessary to support the anticipated growth in ridership.

Additional capacity beyond projected demand could be provided through greater service frequency for enhanced bus and through either greater service frequency or larger vehicles for streetcar.

2.2.3. Summary – Increase the attractiveness of Transit

Table 7 summarizes the evaluation results of for *Goal 2, Increase the Attractiveness of Transit*.

Table 7: Goal 2 Results – Increase the Attractiveness of Transit

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
2.1 2030 ridership projections			
Project boardings	*Not applicable*	*13,400*	*20,100*
New corridor transit trips	*Not applicable*	*--*	*900*
2.2 Ability to accommodate growth in transit ridership	*Use of articulated buses and/or more frequent service*	*Would accommodate growth in demand*	

References: Metropolitan Council travel demand model; *Ridership* and *Service Plans* technical memoranda.

2.3. Catalyze and Support Economic Development

2.3.1. Estimate of "Potential Maximum Development Capacity"

This measure compared existing development patterns with the theoretical maximum build-out allowable under current zoning, based on the maximum allowable FAR (floor-to-area ratio) in each zoning district. The *difference between current built form and the potential maximum allowable limits* (build-out increment) *is the potential maximum development capacity*. This exercise was GIS-based, using the City's land use and zoning GIS database and mapping. Potential maximum development capacity for the study corridor by segment is presented in Table 8 below. No Build and both of the Build alternatives can accommodate both temporary and permanent growth in ridership by adding vehicles and/or increasing the frequency of service. It is important to note that existing single family residential neighborhoods were excluded from these calculations except where small area plans identified a future change in land use from single family residential to mixed use or other land uses.

Table 8: Estimated Potential Maximum Development Capacity*

SEGMENT	LAND AREA (SF)	CURRENT BUILT FORM (SF)	CURRENT FAR	ADDITIONAL CAPACITY (SF)	ADDITIONAL CAPACITY (FAR)
41st to Lowry	*6,383,170*	*1,309,781*	*0.21*	*15,611,140*	*2.45*
Lowry to Broadway	*10,517,436*	*9,736,310*	*0.93*	*5,313,975*	*0.51*
Broadway to 8th	*4,768,681*	*3,114,334*	*0.65*	*9,481,476*	*1.99*
8th to Washington	*9,694,086*	*10,304,215*	*1.06*	*19,691,232*	*2.03*
Washington to Grant	*16,197,418*	*101,384,062*	*6.26*	*38,927,145*	*2.40*
Grant to Lake	*15,622,895*	*10,675,862*	*0.68*	*23,545,846*	*1.51*
Lake to 38th	*3,563,725*	*2,056,552*	*0.58*	*4,384,673*	*1.23*
38th to 46th	*1,216,537*	*496,865*	*0.41*	*1,525,379*	*1.25*
Total	*67,963,949*	*139,077,981*	*2.05*	*118,480,865*	*1.74*

* Within one-half mile of alignment. References: Minneapolis zoning and land use GIS database and mapping; Columbia Heights zoning and land use data.

2.3.2. Estimate of Value of Potential Maximum Development Capacity

This measure estimated assessed value of the potential maximum development capacity derived as described above. The approach was a GIS-based arithmetic exercise to assign proxy submarket valuations (based on the Hennepin County Assessor data for parcels in the study area) to the build-out increment, or *potential maximum development capacity*. Market value was derived on a per-square-foot basis for each parcel included in the analysis, and weighted averages for each segment were used in the calculation of the value of potential maximum incremental development capacity. The estimated value of potential maximum development capacity for the study corridor by segment is presented in Table 9 below.

Table 9: Estimated Value of Potential Maximum Development Capacity*

SEGMENT	AVG VALUE (PSF)	VALUE OF ADDITIONAL CAPACITY
41st to Lowry	*$41.76, $67.18*	*$859,529,451*
Lowry to Broadway	*$32.07*	*$170,419,185*
Broadway to 8th	*$13.00*	*$123,259,188*
8th to Washington	*$35.51*	*$699,235,652*
Washington to Grant	*$35.32*	*$1,374,906,762*
Grant to Lake	*$51.06*	*$1,202,250,893*
Lake to 38th	*$66.99*	*$293,729,229*
38th to 46th	*$75.14*	*$114,616,945*
Total	*$40.83*	*$4,837,947,304*

* Within one-half mile of alignment.

2.3.3. Peer City Research

A peer review of streetcar and enhanced bus systems in various cities across the U.S. was conducted to provide additional context for assessing economic development potential for enhanced bus or streetcar in Minneapolis. The experience of other cities with streetcars and enhanced bus systems provides valuable lessons learned in the planning, design and construction phases of a new transit service in Minneapolis. There are not very many streetcar lines and even fewer enhanced bus or Bus Rapid Transit (BRT) that have been in place for a long time and evaluated for economic benefits. In addition, there are multiple factors that influence economic development ranging from economic cycles to local development policies. However, in general, cities that have implemented streetcar systems or are in the process of building streetcar have demonstrated (or expect to demonstrate) that streetcar catalyzes economic development and increases property values in close proximity to these lines. Enhanced bus service has generally brought less documented economic development than the streetcar systems profiled in the peer review, though they were able to deliver significant transit improvements at a much lower cost than streetcars or light rail.

Local Developer Forum

A local forum for developers was held in May 2013 to discuss the potential for streetcar and enhanced bus to catalyze economic development in the Nicollet-Central corridor. The general consensus of the participants was that streetcar had greater potential to spur economic development because it is viewed as a more permanent investment than bus improvements; it is a new or "cool" idea that will attract the "creative class" (both residents and employees); and it adds value to land and developments as evidenced by substantial increases in land values along University Avenue since the announcement of LRT (Central Corridor). Participants indicated that the K-Mart area near Lake Street and the East Hennepin area immediately northeast of the Mississippi River have the highest potential for development. They also acknowledged the value of supportive zoning and other development policies in realizing economic development potential.

2.3.4. Potential for Alternative to Spur Development

The evaluation of the corridor's potential for transit-supportive economic development also includes a qualitative criterion, namely the *potential for an alternative to spur development*. This analysis will not only help in the selection of an LPA but will also help align that alternative with FTA's Small Starts economic development criterion, which emphasizes transit-supportive plans and policies and their performance.

A detailed, primarily qualitative analysis of nine locations along the corridor identified by the City of Minneapolis as "Opportunity Areas" in which a major transit investment could reasonably be expected to spur transit-supportive economic development. This analysis considered the Minneapolis and Columbia Heights Comprehensive Plans, applicable Small Area Plans, adopted development policies and guidelines; and approved development plans.

The streetcar alternative was deemed to have the greatest potential to spur development in the study corridor; Enhanced Bus was assessed to have a moderate ability to spur and enhance development. This qualitative assessment is based on two analytic inputs:

- Feedback from the Minneapolis development community, obtained at a developer forum held on May 6, 2013, for this specific purpose (see Appendix D, Developer Forum Summary)
- Peer city research conducted by the consultant team (see Appendix P, Peer City Research)

- This analysis also reviewed location, conditions on the ground, unbuilt development capacity, suitability for transit-oriented development, transit-supportive plans and policies, and the interplay among zoning, current land use, and Future Land Use.
- Results of this qualitative evaluation are summarized in Table 10 below, and are useful to the evaluation process in two distinct ways:
    - Six specific evaluation criteria were developed to help differentiate among the proposed transit alternatives. These criteria reflect the Opportunity Area analysis, the feedback from the Developer Forum, and the development-related results of the Peer Cities research.
    - In addition, the Opportunity Area analysis is used to help differentiate among corridor segments, by showing the extent to which including a particular segment in the project would serve additional Opportunity Areas and thereby contribute to their development.

Table 10: Potential for Alternative to Spur Development

SOURCE/INPUT	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Developer forum feedback	*Low*	*Medium*	*High*
Peer city research	*Low*	*Medium*	*High*
Qualitative assessment of development potential	*Low*	*Medium*	*High*
Support economic vitality of downtown	*Low*	*Medium*	*High*
Support small and neighborhood businesses	*Low*	*Medium*	*High*
Foster compact, mixed use development:			
Support infill development and lively, mixed-use activity in Opportunity Areas (Lowry/Central, East Hennepin, Nicollet Mall, I-94/Franklin, Eat Street)	*Low*	*Medium*	*High*
Support long-term development in transformative Opportunity areas (Nicollet/Lake, Central Arts Wedge, Shoreham Yards)	*Low*	*Low*	*High*
Overall Assessment of Potential to Spur Development	***Low***	***Medium***	***High***

2.3.5. Summary – Catalyze and Support Economic Development

The summary of quantitative and qualitative evaluation criteria of alternatives to catalyze and support economic development in the study corridor by segment is presented in Table 11 below.

Table 11: Goal 3 Results – Catalyze and Support Economic Development

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
3.1 Estimate of development potential	*118,500,000 square feet*		
3.2 Potential value of development (Year 2013 $)	*$4.8 billion*		
3.3 Potential for alternative to spur development	*Lowest potential*	*Medium potential*	*Highest potential*

References: City of Minneapolis zoning and land use GIS database and mapping; City of Columbia Heights zoning and land use data; City of Minneapolis and Hennepin County Assessor GIS database; *Economic Development Recommendations* and *Streetcar and Enhanced Bus Peer Review Summary* (technical memoranda)*; May 2013 Developer Forum Summary.*

2.4. Integrate with Existing Transportation System

Each of the alternatives will operate within mixed traffic and interact with other elements on the transportation network. Discussion of interactions with bicyclists and pedestrians is included in Section 2.1.3; discussion of each alternative's interaction with motorized vehicles and freight rail infrastructure is included below. The Build alternatives will serve stations that are located on curb extensions.

2.4.1. Impact on Existing Traffic Operations

As detailed in *Technical Memorandum: Traffic and Parking* (Appendix F and available on the project website (http://www.minneapolismn.gov/nicollet-central/index.htm), a high-level analysis found that each of the alternatives under consideration would have minimal impacts on traffic within the corridor. This high-level assessment also examined key intersections in the corridor using existing data from the City of Minneapolis to determine any significant differences in traffic operational impacts between enhanced bus and streetcar.

Currently, Metro Transit Routes 10 and 18 operate at high frequencies on Central Avenue and Nicollet Avenue, respectively. Buses stop frequently (potentially at every block) and pull off in a parking lane. The typical impact to general traffic in the corridor is from buses merging back into the driving lane. Another typical impact is a bus at a stop that is blocking part of a traffic lane, e.g. on Nicollet Avenue in Eat Street where there is one lane in each direction, a two-way left-turn lane and parking.

Following is a summary of potential impacts of enhanced bus or streetcar on existing traffic operations.

- **Impact on general traffic:** Based on the conceptual service plans, the volume of transit vehicles on the corridor by alternative is not anticipated to change significantly, particularly relative to general traffic volumes. The potential impact of enhanced bus or streetcar on general traffic is not anticipated to be significant.

- **Impact on reliability of transit travel times:** Implementation of enhanced bus or streetcar would result in higher transit reliability due to the addition of TSP, decreased boarding times (near-level or level boarding and off-board fare collection), and fewer stops.

- **Impact on general traffic at transit stops:** Enhanced bus or modern streetcar stops assume curb extensions so that the transit vehicle would not need to pull out of and into traffic as buses do today. As such, when a transit vehicle is stopped, it would prevent general traffic behind it from moving forward. However, potential improvement in transit travel time due to TSP, near-level or level boarding and off-board fare collection are factors that will improve transit travel times and decrease dwell times, potentially also improving vehicle travel times. Both modern streetcar and enhanced bus are expected to have similar impacts on traffic. Thus, for purposes of the Alternatives Analysis, there are no significant differences in traffic impacts between the Build alternatives.

2.4.2. Impact on Corridor Parking

The purpose of this measure is to determine – at a very high level – the comparative on-street parking impacts associated with the enhanced bus and streetcar alternatives. Specifically, this measure attempts to address broadly any significant impacts resulting from enhanced bus or streetcar stops using curb extensions. As documented in *Technical Memorandum: Traffic and Parking* (Appendix F), the analysis determined that each of the alternatives under consideration would have similar impacts to on-street parking within the corridor. Both Build alternatives are expected to result in the loss of one to three parking spaces where new stops on curb extensions are provided. No parking loss is expected where there are existing bus stops or turn lanes. There is no significant difference in on-street parking impacts between the enhanced bus and modern streetcar alternatives.

Determining the exact impacts on on-street parking on Central and Nicollet Avenues entails advanced conceptual design. This level of analysis and design typically occur during environmental review and accounts for considerations including driveway locations and potential integration of transit stops, e.g. streetcar with bus stops.

2.4.3. Impact on Freight Railroads

Both the enhanced bus and streetcar alignment crosses existing freight railroad tracks at four locations. Three locations are currently grade-separated and one is an at-grade crossing, as presented in Table 12.

Table 12: Freight Railroad Crossings

Crossing	Railroad	POSITION
Central at Eighth Street SE	*BNSF*	*Roadway over*
Central at Broadway Avenue NE	*BNSF*	*Roadway over*
Central at 14th Avenue NE	*BNSF*	*Railroad over*
Central at Columbia Parkway NE	*CP RR*	*At-grade*

Based on a high-level analysis, following is a preliminary assessment of potential impacts of the enhanced bus and streetcar alternatives on freight railroads currently operating within the Nicollet-Central corridor:

- **Enhanced Bus:** Implementation of enhanced bus service will not differ significantly from bus service today. Therefore, there are no anticipated changes or impacts to freight railroads associated with this

alternative. However, buses would continue to encounter significant delays when freight trains are crossing the at-grade crossing near Columbia Pkwy.

- **Modern Streetcar alternative:** In the case of both the BNSF railroad overpass at Central Avenue and 14th Avenue NE and the CP at-grade freight crossing at Central Avenue near Columbia Parkway, there are feasible engineering solutions to address the operating requirements associated with each of the two locations. Several options are proposed for the BNSF overpass and a grade-separated crossing is assumed at the existing at-grade crossing near Columbia Parkway. Therefore, there are no anticipated impacts to freight operations associated with the modern streetcar alternatives. The impact of addressing the operational requirements of freight and streetcar are reflected in the capital cost estimates, identified and documented under separate cover (Appendix J).

2.4.4. Summary – Integrate with Existing Transportation System

Table 13 summarizes the evaluation results of for *Goal 4, Integrate with Existing Transportation System*.

Table 13: Goal 4 Results – Integrate with Existing Transportation System

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
4.1 Impact on existing transportation operations			
General traffic	*Same as existing*	*Minimal. Volume of transit vehicles is small relative to general traffic (except on Nicollet Mall).*	
Transit travel time reliability	*Same as existing*	*Improved due to TSP, enhanced stops and off-board fare collection*	
General traffic at transit stops	*Same as existing*	*Minimal. May have negative impacts, even though these impacts are likely to be small and/or mitigated by other factors.*	
4.2 Impact on on-street parking	*Not applicable*	*Minimal relative to No-Build.*	
4.3 Impact on freight railroad operations	*Likely no significant change from existing conditions*	*Likely no significant change from existing conditions*	*Likely no significant change from existing conditions, even with assumed grade-separation of streetcar from freight at Central/Columbia Parkway*

References: *Traffic and Parking Impacts* and *Potential Impacts to Freight Railroad Operations* (technical memoranda under separate cover).

2.5. Support Healthy Communities and Environmental Practices

Evaluation criteria associated with this fifth goal of the Nicollet-Central Transit Alternatives address those elements included during the FTA environmental review, also known as the NEPA (National Environmental Policy Act) process. These elements are cultural, historic and natural resources, parkland and environmental justice.

2.5.1. Cultural, Historic and Natural Resources

Potential Impact on Cultural and Historic Resources

A Minnesota State Historic Preservation Office (SHPO) file search was conducted to identify known architectural history properties and archaeological sites that have been previously listed or determined eligible for listing in the National Register of Historic Places (NRHP) located within the alternatives study areas. The methodology for the development of the study areas and detailed information on the locations of these known cultural resources can be found in the *Cultural Resources Literature Review and Visual Assessment* report (Appendix I). In summary:

- Number of previously listed and eligible archaeology sites within 500 feet of alignment: Up to three
- Number of previously listed and eligible historic architectural properties within one-quarter mile of alignment: Up to 310.

The potential for unknown cultural and historic resources is largely unknown. Therefore, a Section 106 review would be needed to determine the NRHP eligibility for resources that have not been identified or evaluated for NRHP eligibility to date. Additionally, at this level of analysis, it is determined that any of the Build alternatives has the potential to impact known cultural and historic resources. Therefore, an LPA other than No-Build would require further investigation.

Natural Resources

For purposes of this analysis, natural resources within one-half mile of either side of the alignment were identified using aerial photography and geographic information systems (GIS) data. Natural resources include features such as rivers, streams, lakes, wetlands, parks, and visual impacts. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) were also used to identify flood hazard areas. This assessment also included parklands, consistent with environmental review and Section 4f regulations.

Based on an assessment of potential impacts on natural resources, it is unlikely that any of the build alternatives would adversely impact environmental resources within the study corridor. If streetcar is selected as the LPA mode, construction of an Operations and Maintenance Facility – depending on its siting – may impact natural resources within the corridor. Infrastructure and design decisions that are made during refinement of the LPA will be evaluated in detail during environmental review.

2.5.2. Year 2030 Transit-Reliant Population

An important measure in both the local decision-making process and the FTA selection of candidate projects is how well a particular project serves transit-reliant (or "transit-dependent") populations. For purposes of this study, this criterion is defined as the number of persons living in households without an automobile.[3] As shown in Table 14, the modern streetcar would provide the most trips for transit-reliant persons.

[3] Transit-reliant population (transit dependent population) are persons with in a household without an automobile, it does not include any information regarding income or other demographics which might indicate why someone chooses to live without an automobile.

Table 14: Ridership by Transit-Reliant Population in 2030

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Project boardings by transit-reliant persons	*N/A*	*4,800*	*7,500*
Percent of project boardings by transit-reliant persons	*N/A*	*36%*	*38%*

2.5.3. Benefits to Low-Income and Minority Populations

Each of the proposed build alternatives would provide increased service and better meet the transportation needs of low-income and minority populations within one-half mile. As a result, the benefits to low-income and minority populations of each of the alternatives is primarily a function of the location of area served by each alternative, and as such, there is no difference between the No-Build, enhanced bus and modern streetcar alternatives. Table 15 presents the results of this analysis

Table 15: Benefits to Low-income, Minority, and Persons without Access to an Automobile

CRITERIA	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Population living below poverty served	*21,600*		
Percent of population living below poverty	*23%*		
Non-white population served	*26,100*		
Percent of non-white population	*28%*		
Population without access to automobile	*15,100*		
Percent of population without access to automobile	*16%*		

2.5.4. Affordable Housing

The affordable housing evaluation criteria seek to quantify the number of legally-binding affordable housing units currently in the corridor (as defined as the one-half mile buffer around the proposed alignments) relative to the greater metropolitan seven-county region. Affordable housing units are defined as those affordable to households earning 80 percent of Area Median Income (AMI) or less. Data on affordable housing units was sourced from HousingLink; data on total housing units for the study corridor, the City of Minneapolis, the City of Columbia Heights and the seven-county metropolitan region was sourced from 2010 Census data.

The number of affordable housing units in the study corridor by segment is presented in Table 16 below.

Table 16: Affordable Housing Units*

GOAL/CRITERIA	NO BUILD	ENHANCED BUS	MODERN STREETCAR
Goal 5: Support Healthy Communities and Environmental Practices			
5.4 Affordable Housing: Number of Units	*4,600*	*4,600*	*4,600*
Percent of Housing Units that are Affordable	*9%*	*9%*	*9%*

*Within one-half mile of alignment. References: HousingLink; City of Minneapolis; City of Columbia Heights; and 2010 Census.

2.5.5. Environmental Benefits

Each alternative was evaluated for the impact that it would have on regional air quality pollutants, energy use, greenhouse gas emissions and safety by applying the proposed FTA formulas for evaluating New Starts and Small Starts project on these elements.[4] This methodology incorporates the change in distance traveled using personal vehicles as well as transit vehicles. Transit vehicles take into account the differences between vehicle types, e.g. streetcar, diesel buses, hybrid buses. As shown in the following table, there would be no significant difference between the alternatives on any of the environmental benefits examined.

Table 17: Environmental Benefits

	NO-BUILD	ENHANCED BUS*	MODERN STREETCAR*
Regional air pollution	*N/A*	*Minimal impacts for all Build alternatives Alternatives are within +/- 0.5%*	
Air quality - CO	*N/A*	*0.012%*	*0.006%*
Air quality - NOx	*N/A*	*0.013%*	*0.005%*
Air quality - VOC	*N/A*	*0.012%*	*0.005%*
Air quality - PM2.5	*N/A*	*0.015%*	*0.151%*
Energy use	*N/A*	*0.017%*	*0.026%*
Greenhouse gas emissions	*N/A*	*0.017%*	*0.023%*
Safety	*N/A*	*No significant difference between alternatives*	

[4] Federal Transit Administration, "Proposed New Starts and Small Starts Policy Guidance", January 9, 2013. http://www.fta.dot.gov/documents/NewStartsPolicyGuidance.pdf. However, at the request of the PMT, this preliminary definition of has been modified to exclude the monetization of environment benefits. Instead, for purposes of this study, the Table X presents the changes associated with each criterion.

	NO-BUILD	ENHANCED BUS*	MODERN STREETCAR*
Change in disabling injury crashes	*N/A*	*Alternatives are within +/- 1.5 crashes/year*	
Change in fatal crashes	*N/A*	*Alternatives are within +/- 1 fatality/20 years*	

*Values are relative to the No-Build alternative.

Additional long-term benefits associated with reduction in the carbon footprint and the increased use of sustainable construction materials (including permeable pavement) that can be studied in future phases of the project.

2.5.6. Summary – Support Healthy Communities and Environmental Practices

Table 18 presents the results of all of the evaluation criteria associated with the study goal, *Support Healthy Communities and Environmental Practices*.

Table 18: Goal 5 Results – Support Healthy Communities and Environmental Practices

CRITERIA	NO BUILD	ENHANCED BUS	MODERN STREETCAR
5.1 Potential impacts on historical, cultural and natural resources			
Number of archeology sites within one-quarter mile	*3*		
Number of architectural site within one-quarter mile	*310*		
Natural resources within one-half mile	*Minimal impacts for all alternatives*		
5.2 Year 2030 transit-reliant ridership			
Project boardings by transit-reliant person	*N/A*	*4,800*	*7,500*
% of project boarding by transit-reliant persons	*N/A*	*36%*	*38%*
5.3 Benefits to low-income and minority population			
Population living below poverty served	*21,600*		
% of population living below poverty	*23%*		
Non-white population served	*26,100*		
% of population that is non-white	*28%*		
Population without access to automobile	*15,100*		
% of population without access to automobile	*16%*		
5.4 Affordable housing			
Number of affordable housing units	*4,600*		
% of housing units that are affordable	*9%*		
5.5 Environmental benefits	*N/A*	*Minimal impacts for all Build alternatives*	
Regional air pollution (Regional change, in kilograms)[3]	*N/A*	*No significal difference between alternatives. Alternatives are within +/- 0.5%*	
Safety	*N/A*	*No significant difference between alternatives*	

2.6. Develop an Implementable Project with Community Support

At the outset of the Nicollet-Central Transit Alternatives study, the community, stakeholders and decision-makers determined that any LPA resulting from the study must be cost-effective and supported by the community. The measure used to determine cost-effectiveness is based on FTA's preliminary definition under MAP-21 and has been modified for purposes of local decision-making. This study recognizes that implementation of an LPA such as

streetcar would seek funds from FTA's Capital Investment Program; one of the criteria of the program to justify a project is cost-effectiveness. In addition to cost-effectiveness, the degree to which the community supports each alternative is critical to developing and implementing a successful transit investment.

2.6.1. Cost-Effectiveness

The cost-effectiveness of each alternative is defined using various measures that are explained below.

Passenger Boardings per Vehicle Revenue Hour

This figure estimates the number of people boarding a transit vehicle divided by the number hours of transit service provided. For example, if there are six buses operating from 5:00 to 6:00 pm this would represent six vehicle revenue hours. As shown in Table 19, the modern streetcar alternative carries the most passengers per vehicle revenue hour. The enhanced bus alternative has lower passenger boarding per vehicle revenue than the modern streetcar alternative, although it is above Metro Transit's 2011 bus system-wide average passenger boarding per revenue hour of 36. Passenger boardings on the No-Build alternative reflect a change from standard 40-foot buses to 60-foot hybrid articulated buses in order to meet the project demand, as discussed in Chapter 2.2.2.

Table 19: Passenger Boardings per Revenue Hour

	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Project	*N/A*	*42*	*90*
*Other buses in corridor**	*64*	*34*	*37*
Corridor total	*64*	*38*	*58*

*No-Build: Routes 10, 18, and 59. Build alternatives: Local, limited stop and Grand Avenue circulator.

O&M Cost per Passenger Boarding

The operating and maintenance (O&M) cost per passenger boarding is an annual cost in Year 2013 dollars divided by the Year 2030 estimate of the number passenger boardings on that service. Table 20 provides the O&M cost per passenger boarding each of the build alternatives, as well as the supporting bus service in the corridor. For comparison, Metro Transit's 2011 National Transit Database report indicated that its system-wide average O&M cost is $3.58 per passenger ($3.48 for bus, $2.47 for light rail transit, and $22.69 for commuter rail).[5]

Table 20: Operating and Maintenance Cost per Passenger Boarding

	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
Project	*N/A*	*$3.17*	*$3.13*
Other buses in corridor	*$1.58*	*$3.00*	*$2.85*
Corridor total	*$1.58*	*$3.10*	*$3.02*

*No-Build: Routes 10, 18, and 59. Build alternatives: Local, limited stop and Grand Avenue circulator.

[5] National Transit Database, http://www.ntdprogram.gov/ntdprogram/pubs/profiles/2011/agency_profiles/5027.pdf.

Annual O&M Cost Estimate (Year 2013 Dollars)

This measure estimates annual operating and maintenance costs for the Build alternatives compared to the No Build. The O&M cost estimates are based on a fully allocated cost model developed by the *Robert Street Transitway Alternatives* project and applied to this project.

Table 21 below presents the estimated O&M costs for enhanced bus, and streetcar alternatives for the two different river crossing alignments (Central or Hennepin), in Year 2013 dollars. The table also provides a comparison of the costs for enhanced bus and streetcar service separately from the supporting bus service in each alternative. A more detailed description of the O&M cost methodology and results are provided in the *Operating and Maintenance Cost Estimation Methodology and Results* technical memorandum, Appendix O.

Project Capital Cost Estimate (Year 2013 Dollars)

Capital costs are the one-time expenditure required to build a transit system, including infrastructure costs and soft costs. Infrastructure costs typically include costs associated with the guideway, track, stops, structures, signalization and communications systems, support facilities, vehicles, and right-of-way acquisition. Soft costs for items such as engineering, construction services, project management, surveys, testing, insurance, legal, permits and owner's costs as also included as part of the overall capital cost. Contingencies are applied to the capital cost to account for uncertainty in both the estimating process and the scope of the project.

At this early and planning stage, there is not sufficient definition or detail to prepare true construction cost estimates for the detailed alternatives under consideration. Rather, the capital cost estimates reflect representative typical unit costs or allowances on a per unit basis that is consistent with the level of alternatives definition. Capital cost estimates will be refined as future studies on the corridor provide greater specificity about one of the alternatives under consideration, i.e. LPA.

The project capital cost estimate for each alternative accounts for infrastructure, fleet, systems and right-of-way elements identified in the *Detailed Definition of Alternatives* and *Service Plans* (both under separate cover) and summarized in Table 1 of this report. For purposes of comparison, Table 22 also presents the capital elements that are common between the alternatives as well as those that are unique. This information is organized using FTA's Standard Cost Categories (SCC). The summary of the capital cost estimates by SCC for the No-Build, enhanced bus, modern streetcar and modern streetcar starter line alternatives are in Year 2013 dollars; they are also presented in Year 2017 dollars using an annual inflation rate of 3 percent. Moreover, these estimates also assume crossing the Mississippi River via the Hennepin/First Avenue Bridge, the less costly routing of the two crossing options; see Section 4 of this report for addition discussion of river crossing options.

The primary elements contributing to the higher capital cost of the Central/Third Avenue Bridge for the Build alternatives are:

- Length: 1,400 LF longer
- Longer route increases fleet requirement by two enhanced bus or streetcar vehicles for the 9.2-mile alternatives

The incremental additional capital cost of the Central/Third Avenue Bridge by alternative is presented below and noted in Table 23.

- Enhanced bus: $5.5 million (Year 2013 dollars)
- Streetcar: $16 million (Year 2013 dollars)

Table 21: Summary of O&M Costs

SERVICE	NO-BUILD	ENHANCED BUS (VIA CENTRAL)	ENHANCED BUS (VIA HENNEPIN)	STREETCAR (VIA CENTRAL)	STREETCAR (VIA HENNEPIN)
Build Alternatives (Project O&M Cost)					
Streetcar Long				*$20,600,000*	*$20,100,000*
Starter Streetcar					
Enhanced Bus (53rd-66th)		*$8,100,000*	*$8,100,000*		
Enhanced Bus (53rd-46th)		*$5,800,000*	*$5,500,000*		
Supporting Bus Services					
Local Bus (Northtown to 41st)		*$1,400,000*	*$1,400,000*	*$1,400,000*	*$1,400,000*
Limited Stop (Northtown to 13th/Nic)		*$4,700,000*	*$4,700,000*	*$6,600,000*	*$6,600,000*
Grand Ave Circulator		*$600,000*	*$600,000*	*$600,000*	*$600,000*
Local Bus (Lyndale/104th to 46th/Nic)				*$1,900,000*	*$1,900,000*
Limited Stop (Nic/66th to 3rd/Nic)				*$700,000*	*$700,000*
Local Bus (Lyndale/104th to Lake/Nic)					
Local/Limited Bus (Lyndale/104th to 3rd/Nic)		*$3,000,000*	*$3,000,000*		
Route 10	*$9,600,000*				
Route 59	*$900,000*				
Route 18	*$8,400,000*				
Total	***$18,900,000***	***$23,600,000***	***$23,300,000***	***$31,800,000***	***$31,300,000***
Change over the No-Build	*$0*	*$4,700,000*	*$4,400,000*	*$12,900,000*	*$12,400,000*
% Change over the No-Build	*0%*	*25%*	*23%*	*68%*	*66%*
Build Alternative Supporting Bus Savings	*$0*	*$9,200,000*	*$9,200,000*	*$7,700,000*	*$7,700,000*

Table 22: Major Capital Cost Elements

SCC	Capital Cost Element	Enhanced Bus	Modern Streetcar
10	*Guideway*		• *Track for 9.2-mile alignment* • *Elevated streetcar track over CP railroad near Central Ave/Columbia Pkway*
20	*Stops*[a]	*39 branded stops in each direction of travel with unique shelters and heating and signage*	
30	*Support Facilities*	*Allowance for enhanced bus fleet of 24 hybrid articulated buses*	*New streetcar operations and maintenance facility (OMF) with light maintenance functions*[b] *for 18 streetcar vehicles*
40	*Sitework and Special Conditions Allowances*	*Street lighting modification* *Nicollet Ave reopening at Lake St* *Urban improvement (landscape/streetscape)* *Maintenance of traffic during construction*	*Enhanced bus elements plus:* • *Utility allowance* • *Site cleanup for OMF* • *Environmental mitigation* • *Bridge reconstruction for 5 existing structures*[c] • *Roadway construction*
50	*Systems Allowances*	• *Traffic signals modifications* • *TSP* • *Communications* • *Off-board fare collection*	*Enhanced bus elements plus:* • *Train control and signals* • *Streetcar-only signal phase* • *Traction power substation (TPSS) and distribution*
60	*Right-of-Way Allowance*	*Allowance for reopening of Nicollet Ave at Lake St*	*Enhanced bus elements plus:* • *OMF site – 4 acres* • *Traction power substations*
70	*Transit Vehicles*	*24 hybrid articulated buses*	*18 streetcar vehicles*
80	*Professional Services*[e]	*30 percent of sum of SCC 10-50*	
90	*Contingency*	• *SCC 10-50: 30 percent* • *SCC 60: 100 percent (Nicollet Ave reopening at Lake St)* • *SCC 70: 5 percent for enhanced bus fleet)*	*Larger costs since item is a function of capital elements unique to streetcar such as track, OMF, streetcar vehicle, TPSS, roadway construction and bridge reconstruction* • *SCC 10-50: 30 percent* • *SCC 60: 100 percent (Nicollet Ave reopening at Lake St and OMF on 4-acre site)* • *SCC 70: 5 percent for streetcar fleet*

[a] The number of enhanced bus and streetcar stops per direction of travel is generalized.
[b] Study assumes that heavy maintenance functions such as wheel truing would be accommodated at one of Metro Transit's light rail OMFs.
[c] Existing bridges included are: First/Blaisdell Ave over the Midtown Greenway; Nicollet Ave over I-94; Hennepin/First Ave or Central/Third Ave over the Mississippi River; Central Ave over the BNSF railroad north of Eighth St NE; Central Ave at Broadway over BNSF railroad.
[d] Existing bridges included are: First/Blaisdell Ave over the Midtown Greenway; Nicollet Ave over I-94; and Hennepin/First Ave or Central/Third Ave over the Mississippi River.
[e] Thirty percent for professional services is typical for a planning study.

Table 23: Summary of Capital Cost by Build Alternative (Year 2013 Dollars)[a,b]

STANDARD COST CATEGORY (SCC)	ENHANCED BUS	MODERN STREETCAR
10 Guideway	*$ -*	*$ 54,900,000*
20 Stations/Stops	*$ 9,300,000*	*$ 8,300,000*
30 Support Facilities	*$ 6,000,000*	*$ 12,800,000*
40 Sitework and Special Conditions	*$ 10,300,000*	*$ 67,900,000*
50 Systems	*$ 14,900,000*	*$ 46,100,000*
60 Right-of-Way	*$ 500,000*	*$ 6,700,000*
70 Vehicles	*$ 26,400,000*	*$ 72,000,000*
80 Professional Services	*$ 12,200,000*	*$ 57,000,000*
90 Contingency	*$ 14,000,000*	*$ 67,300,000*
100 Finance Charges	*$ -*	*$ -*
Total in Year 2013 Dollars	***$ 94,000,000***	***$ 393,000,000***
Total in Year 2017 Dollars[c]	***$ 106,000,000***	***$ 442,000,000***

[a] Cost estimates for enhanced bus and streetcar alternatives are based on Hennepin/First Avenue Bridge routing. The additional incremental of the Central/Third Avenue Bridge routing by alternatives is: Enhanced bus $5.5 million; modern streetcar $16 million; streetcar starter line $7 million. Estimates shown are in year 2013 dollars unless noted.
[b] There is a capital cost associated with the No-Build alternative, which would include the purchase of hybrid articulated bases..
[c] Year 2017 is assumed year of expense, based on an annual inflation rate of 3 percent.

For reference, the following technical memoranda that are available under separate cover form the basis of the capital cost estimate for the No-Build, enhanced bus, and streetcar alternatives:

- Capital Cost Methodology and Results (Appendix J)
- Operating Plans (Appendix B)
- Operating and Maintenance Cost Estimation Methodology and Results (Appendix O)
- Bridge Analysis (Appendix L)
- Feight Rail Impacts (Appendix G)

Cost-Effectiveness

Currently, the FTA is in the process of redefining how it will evaluate transit projects based on cost-effectiveness. For the purpose of the Nicollet-Central Transit Alternatives study, the formula used is intended to serve as proxy for the FTA's New Starts cost-effectiveness measure described in the Proposed New Starts and Small Starts Policy Guidance. In this study, cost-effectiveness is intended to assist with the local decision-making.

As shown in Table 24, all of the Build alternatives would likely receive a rating of medium or better based on the FTA's preliminary threshold for a medium rating. Specifically, a cost-effectiveness of $9.99 or less would achieve a medium rating. Based on the proposed guidance, a project must receive a medium or better rating for both project justification and local financial commitment in order to be recommended for funding.

Table 24: Cost-Effectiveness Measure

	NO-BUILD	ENHANCED BUS	MODERN STREETCAR
*Cost-Effectiveness**	*N/A*	*$1.79*	*$4.27*

*Estimated using incremental annualized capital cost and incremental annual O&M cost in Year 2013 dollars and 2030 project boardings. This information is subject to change, pending additional FTA guidance on its Capital Investment Program ratings under MAP-21.

It is anticipated that additional guidance and clarification from FTA regarding MAP-21 criteria is forthcoming.

2.6.2. Community Support

A formal comment period was held from August 1 to September 15, 2013, during which four public open houses were held in different parts of the corridor on August 6, 7, 14 and September 9th, 2013. More than 100 people attended these open houses. Members of the public had an opportunity to provide project input via comment forms following the September 2013 open houses: a paper comment form was distributed to open house attendees, and an electronic comment form was posted on the project website. More than 130 comment forms were received via the online surveys and the comment forms distributed at the open houses. Additional outreach activities included:

- Developers forum
- Over 30 meetings with neighborhood/business associations attended by over 500 people
- Website, Facebook, email distribution list
- News releases and media coverage

Following is a summary of the common themes that emerged from the public input:

- More than 70 percent supported modern streetcar over enhanced bus or conventional bus
- Concerns about traffic, parking, and construction impacts for businesses
    - Several individuals expressed concern that there would be traffic, parking and construction impacts associated with both modern streetcar and enhanced bus. The provision of curb extensions at transit stops would require the transit vehicle to stop in the mixed traffic lane; therefore, people had concerns that this would have a negative impact on traffic. There was also concern that these transit stops would eliminate on-street parking in front of businesses. Several individuals noted the business impacts of construction along University Avenue (for Central LRT) and expressed concern that there would be similar impacts during construction of modern streetcar.
- Concerns about bicycles and streetcars
    - Several individuals raised questions about how bicycles would operate on the same streets as modern streetcar, particularly along Nicollet Mall.
- Concerns about cost and funding
    - Several respondents indicated concern about the cost of modern streetcar, noting that the enhanced bus alternative would be much less expensive. Respondents expressed concerns about an increase in taxes to cover the additional cost and had questions regarding the funding sources that would be used to pay for construction, operation and maintenance.

Public input is summarized in further detail in *Public Outreach Summary Report for Phase III* or the project website.

2.6.3. Summary – Develop an Implementable Project with Community Support

Table 25 presents a summary of the evaluation measures associated with the sixth goal of the study.

Table 25: Goal 6 Results – Develop an Implementable Project with Community Support

Criteria	No-Build	Enhanced Bus	Modern Streetcar
A Cost Effectiveness			
Passenger boardings per vehicle revenue hour			
Project	*N/A*	*42*	*90*
Other buses in corridor	*64*	*34*	*37*
Corridor total	*64*	*38*	*58*
O&M cost per passenger boarding (2013 $)			
Project	*N/A*	*$3.17*	*$3.13*
Other buses in corridor	*$1.58*	*$3.00*	*$2.85*
Corridor total	*$1.58*	*$3.10*	*$3.02*
Annual O&M cost estimate (2013 $)			
Project	*N/A*	*$13.6 million*	*$20.1 million*
Other buses in corridor	*$18.9 million*	*$9.7 million*	*$11.2 million*
Incremental O&M cost vs. No-Build	*N/A*	*$4.4 million*	*$12.4 million*
Project capital cost estimate (2013 $)	*$89 million*	*$94 million*	*$393 million*
Preliminary cost-effectiveness (2013 $)	*N/A*	*$1.79*	*$4.27*
B Community Support			
Public sentiment	*Very limited support*	*Limited support*	*Support*
Business/developer community sentiment	*Very limited support*	*Limited support*	*Support*

3. Mississippi River Crossing Alternatives

As previously discussed, two alternatives for crossing the Mississippi River were evaluated in detail:

- Hennepin Avenue Bridge, using Hennepin Avenue and First Avenue on the northeast side of the river.
- Central/Third Avenue Bridge, using Central Avenue on the northeast side of the river.

Table 26 below presents a side-by-side comparison of the Hennepin/First Avenue Bridge and Central/Third Avenue Bridge.

Table 26: Comparison of Mississippi River Crossing Options

MEASURE/DESCRIPTION	HENNEPIN/FIRST	THIRD/CENTRAL
One-Way Distance (Eighth to Hennepin)	*6,200 feet*	*6,900 feet*
Other Streetcar Lines Served	*Hennepin, University/Fourth and Washington*	*Hennepin and University/Fourth*
Major Activity Centers Served	*Direct and indirect ways to access Riverfront , Nicollet Island, East Hennepin and St. Anthony Main*	*Mostly indirect ways to access Riverfront, Nicollet Island and St. Anthony Main*
Existing Pedestrian & Bicycle Connections	• *Direct and indirect access to Riverfront and Nicollet Island* • *North of River, could accommodate bike lane within existing right-of-way without affecting on-street parking*	• *Access to north/east Riverfront via stairs* • *Indirect to Nicollet Island and West Riverfront* • *North of River, could accommodate bike lane but would affect on-street parking*
Changes for Transit Patrons	• *For Route 10/59 patrons: Walk would be two to three blocks longer or shorter, if from the east or west* • *1,000 more passenger boardings per day in 2030*	*No change for existing patrons*
Traffic Considerations		
Transit Travel Time	*Additional travel time savings due to shorter alignment and only one crossing with Washington Ave*	*Improved travel time due to transit enhancements*
*AM Peak Hour Volume**	*500 vehicles/lane southbound*	*700 vehicles/lane southbound*
*PM Peak Hour Volume**	*600 vehicles/lane southbound*	*650 vehicles/lane southbound*
Hennepin/First Conversion to Two-Way Traffic	*Would not preclude*	*No impact*

MEASURE/DESCRIPTION	HENNEPIN/FIRST	THIRD/CENTRAL
Cultural and Historic Resources	• *St. Anthony Main Historic District*	• *St. Anthony Main Historic District* • *Bridge in National Register of Historic Places*
Annual Operating and Maintenance Cost of Build Alternative (Year 2013 $)		
Enhanced Bus	*$13.6 million*	*$13.9 million*
Modern Streetcar	*$20.1 million*	*$20.6 million*
Streetcar Starter Line	*$10.6 million*	*$11.4 million*
Capital Cost of Build Alternative (Year 2013 $)		
Enhanced Bus (9.2 miles)	*$94 million*	*$100 million*
Modern Streetcar (9.2 miles)	*$393 million*	*$409 million*
Streetcar Starter Line (3.4 miles)	*$182 million*	*$189 million*
Public and Stakeholder Input		
Public Input	*Strong support*	*Limited support*
Business/Stakeholder Input	*Strong support*	*Limited support*

* Source: City of Minneapolis 2010 hourly traffic counts.
** Based on input to be obtained from August 2013 outreach activities.

Evaluation of River Crossing Alternatives

Two Mississippi River crossings were evaluated based on those detailed criteria that apply to this aspect of the detailed analysis. The results of this evaluation are:

- The Hennepin Avenue Bridge has higher projected transit ridership and faster transit travel times, although the current Route 10 uses the Central Avenue Bridge. Shifting the Route 10 service to Hennepin Avenue would result in increased walk distances of one to three blocks for some existing riders.
- The Central/Third Avenue Bridge is listed in the National Register of Historic Places. Due to its age and historic status, it would be more expensive to modify for streetcar and likely to entail a more complex environmental review process.
- There are better existing pedestrian and bicycle connections to the river from Hennepin Avenue and Hennepin Avenue provides a direct connection to Nicollet Island.
- Installing streetcar tracks on this section of Central Avenue and retaining the existing sharrows for bicycles would require the removal of on-street parking. On the other hand, the existing right-of-way width of Hennepin and First Avenues would accommodate streetcar tracks, bicycle lanes and on-street parking.
- The Hennepin Avenue Bridge provides more pedestrian and bicycle connections to the Riverfront. It also provides a direct connection to Nicollet Island. Additionally, the Hennepin/First Avenue alignment could accommodate general traffic, streetcar, pedestrians, bicycle lanes, and on-street parking just northeast of

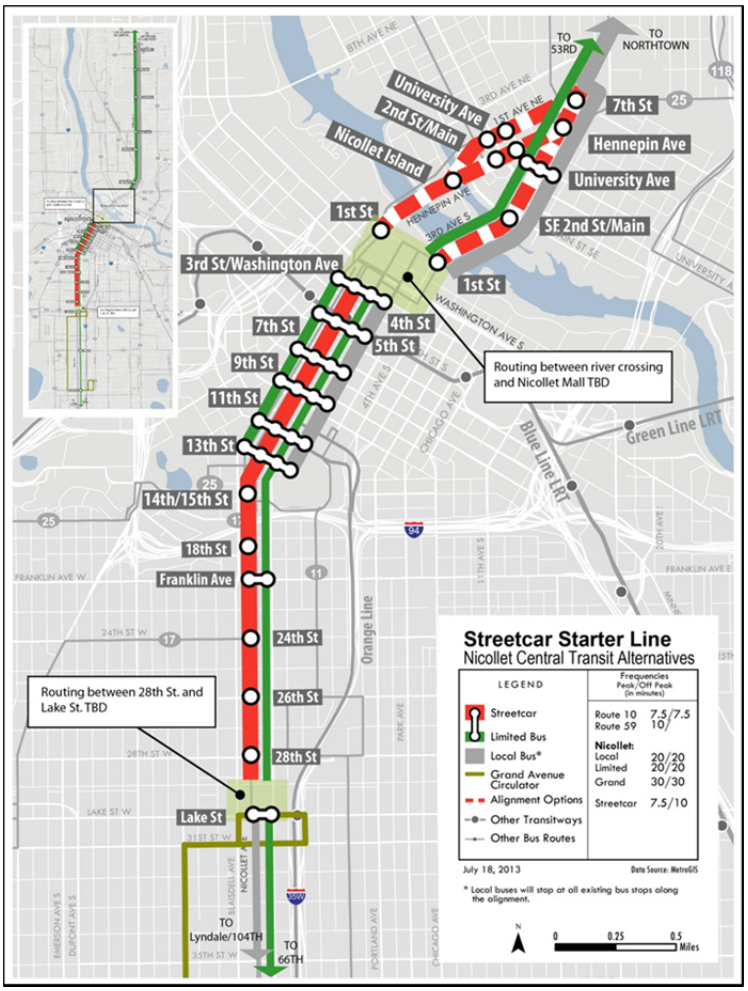
the River, without precluding the potential conversion of these two roadways to two-way traffic operations.

- More than 70 percent of respondents (input was received during the formal comment period (August 1 to September 15, 2013), four public houses in August/September 2013, and online surveys) supported crossing the Mississippi River via the Hennepin/1st Avenue bridges rather than the Central/3rd Avenue Bridge.

4. Modern Streetcar Starter Line

The Detailed Definition of Alternatives phase of the study determined that a streetcar starter line needed to be conceived because the background bus service plan associated with it would be significantly different than the 9.2-mile (entire length) streetcar or enhanced bus alternative. The results of the detailed evaluation are intended to identify any necessary modifications to (or affirm) the presumed starter line. They are also intended to compare the relative benefits of the starter line to a 9.2-mile alignment.

Figure 12: Streetcar Starter Line Concept



Based on the results of the detailed evaluation, a 3.4-mile streetcar starter line between Hennepin/Central Avenue and Nicollet/Lake Street has the following characteristics relative to a 9.2-mile streetcar line (also illustrated on the following pages and in 2):

- Would produce half the average weekday ridership in 2030 (9,200 vs. 20,100)
- Includes 69 percent of the development capacity in the corridor (Figure 13) (approximately one-third the length but over two-thirds the development capacity captured) and five of nine economic development opportunity sites (Figure 14)
- Would serve 96 percent of population growth in the 9.2-mile corridor *and* (see Figure 15):
    - 74 percent of corridor households without automobiles
    - 61 percent of corridor population living in poverty
    - 63 percent of corridor non-white population
    - 91 percent of corridor affordable housing units
- Would be cost-effective and, therefore, compete for federal funding.
    - Streetcar capital cost comparison: $182 million vs. $393 million in Year 2013 dollars
    - Streetcar annual O&M cost comparison: $10.6 million vs. $20.1 million in Year 2013 dollars

These results suggest that a 3.4-mile streetcar starter line between Central Avenue/Eighth Street NE and Nicollet Avenue/Lake Street would capture a majority of the benefits of a 9.2-mile streetcar investment.

Figure 13: Potential Maximum Development Capacity

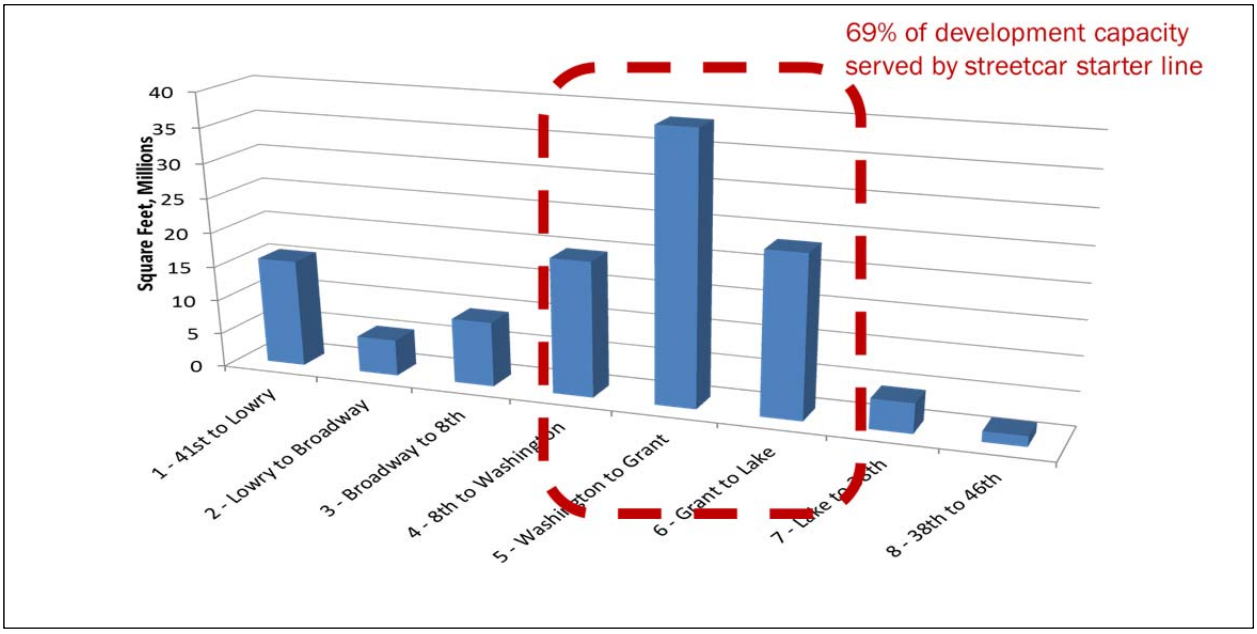
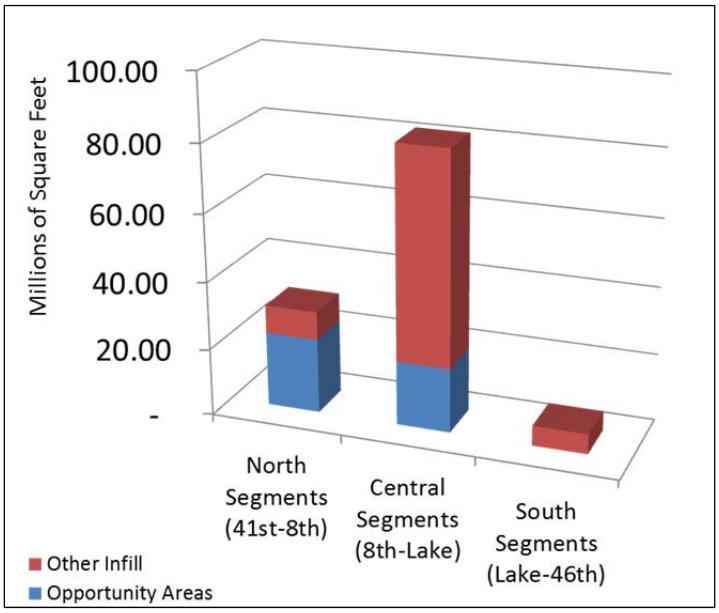


Figure 14: Five of Nine Opportunity Sites



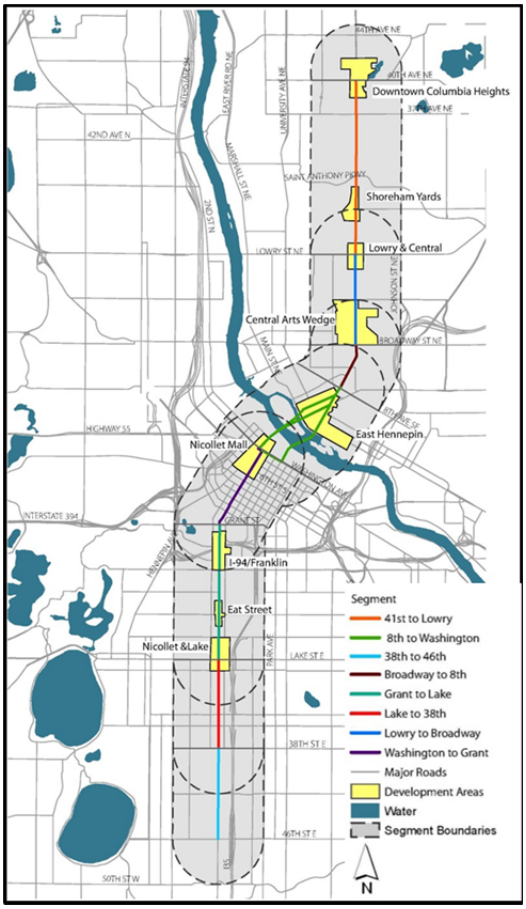
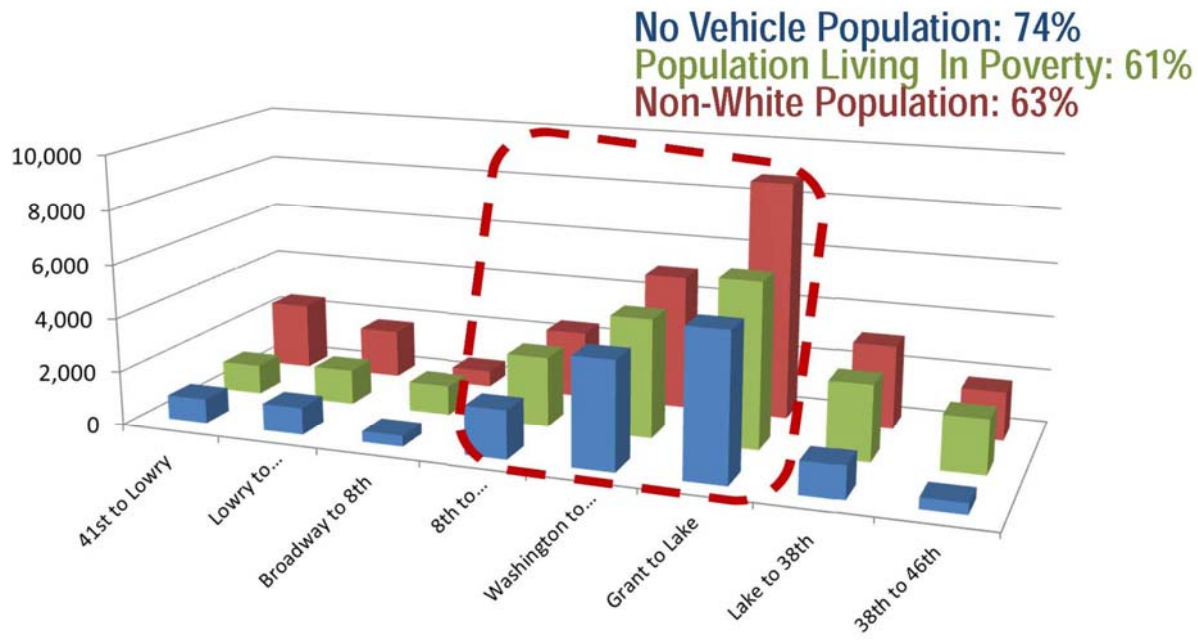


Figure 15: Streetcar Starter Line



The Modern Streetcar Starter Line alternative was subjected to the same evaluation criteria as the No-Build, Enhanced Bus, and Streetcar alternatives. The results of these analyses are presented below.

4.1. Connect People and Places

4.1.1. Population and Employment

Using the methodology described in Section 2.1.1, the population and employment within one-half mile of the Modern Streetcar Starter line are shown in Table 27. 95 percent of the increase in population and 93 percent of the increase in employment is expected to occur within the area which would be serviced by the 3.4-mile streetcar starter line.

Table 27: Population and Employment*

CRITERIA	MODERN STREETCAR STARTER LINE
1.1 2010 population	*54,800*
1.2 2030 population	*79,700*
1.3 2010 employment	*118,100*
1.4 2030 employment	*167,100*

*Within one-half mile of alignment.

4.1.2. Existing Major Activity Centers Served

The No-Build, enhanced bus, and modern streetcar alternatives serve all of these major activity centers, while the streetcar starter line provides access to all but two of the activity centers in the 9.2-mile corridor -- Central Avenue NE commercial district and the Northeast Arts District.

4.1.3. Quality of Transit, Pedestrian and Bicycle Connections

Transit Connections

As discussed in Section 2.1.1, the corridor serves as the north-south spine of the transit network in Minneapolis, connecting many existing high-frequency and high-ridership bus routes, transitways and transit centers. It would also serve future transit centers and transitways. As shown in Figure 16 the majority of transit connection served by the No-Build, enhanced bus, and modern streetcar alternatives (blue line) are served by the streetcar starter line alternative (green line).

4.1.4. Summary – Connect People and Places

Table 28 on the next page presents the evaluation results for Goal 1, *Connect People and Places*.

Figure 16: Transit Connections

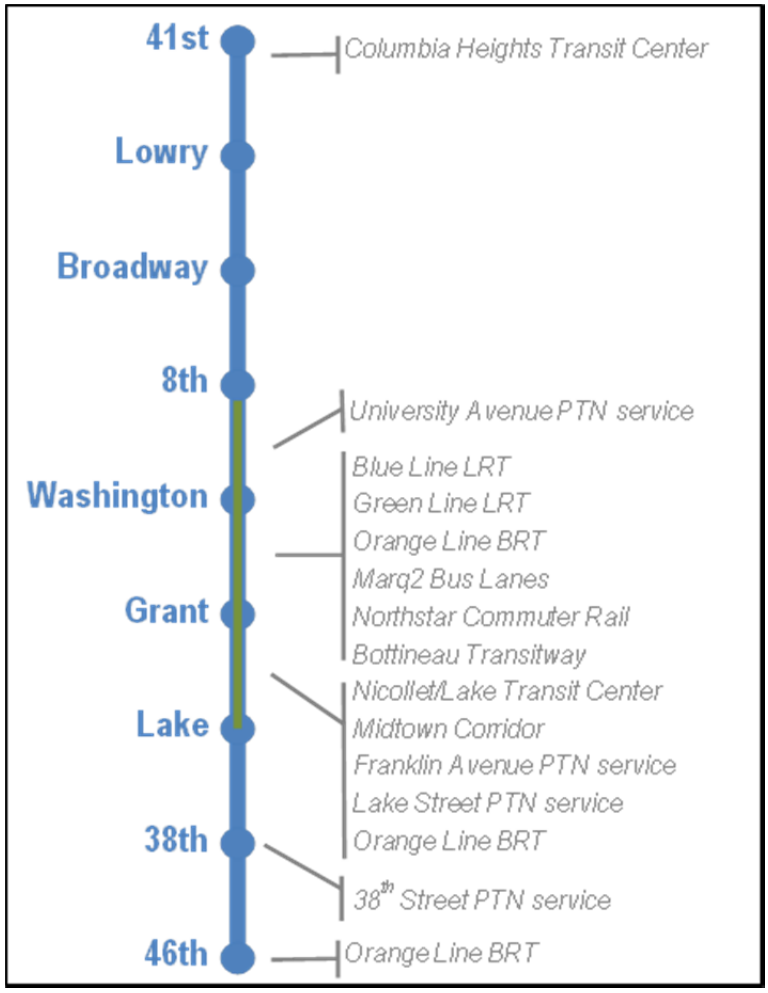


Table 28: Goal 1 Results – Connect People and Places

CRITERIA	MODERN STREETCAR STARTER LINE
1.1 2010 population within one-half mile	*54,800*
1.2 2030 population within one-half mile	*79,700*
1.3 2010 employment within one-half mile	*118,100*
1.4 2030 employment within one-half mile	*167,100*
1.5 Existing major activity centers served	*Serves all or nearly all major activity centers. Most major activity centers clustered in/around downtown, Eighth-Washington and Grant-Lake.*
1.6 Transit connections	*Serves most important connections (Downtown-Lake)*
1.7 Quality of pedestrian connections	*Consistent quality of connections throughout alignment*
1.8 Quality of bicycle connections	*Consistent quality of connections throughout alignment*

4.2. Increase the Attractiveness of Transit

The measures associated with the second goal of the study are related to 2030 ridership.

4.2.1. Year 2030 Ridership

The travel demand modeling approach for the Modern Streetcar alternative followed the same methodology as the travel demand modeling for the No-Build, Enhanced Bus, and Modern Streetcar alternatives, as outlined in Section 2.2.1 of this report.

Several measures are reported for each alternative forecast and can be considered as part of the overall evaluation process:

- Project boardings
- Corridor bus boardings
- Total boardings
- New riders
- VMT savings

Table 29: Year 2030 Ridership - Modern Streetcar

	MODERN STREETCAR	MODERN STREETCAR STARTER LINE
Project Boardings	*20,100*	*9,200*
Transit-Dependent	*7,500*	*4,200*
Non Transit-Dependent	*12,600*	*5,100*
Corridor Bus Boardings	*12,300*	*26,300*
Limited Stop Bus	*10,300*	*3,100*
Local Bus	*2,000*	*23,100*
Other Corridor Boardings (Routes 11, 17, 25,568)	*33,100*	*33,400*
Total Boardings	***65,500***	***68,900***
New Riders	*900*	*1,200*
VMT Savings	*-2,900*	*3,016*

Conclusions

Some conclusions that can be drawn from both the alternative forecasts and the sensitivity tests are:

- Despite operating along a shorter alignment than the 9.2-mile modern streetcar alignment, the Modern Streetcar Starter Line is forecasted to attract more new riders, more total boardings and reduce VMT at a higher rate than the full length alignment.

- The Modern Streetcar Starter line's operating plan includes less extensive changes to underlying bus service, which results in a higher number of corridor bus boardings.

4.2.2. Ability to Accommodate Growth in Transit Ridership

The same methodology described in Section 2.2.2 of this report was used to evaluate the Modern Streetcar Starter Line alternative's ability to accommodate the demand (ridership) from special events at one or more of these venues would generate. And similar to the enhanced bus and streetcar finding in the previous chapter, the streetcar starter line would accommodate growth in ridership.

4.2.3. Summary – Increase the attractiveness of Transit

Table 30 summarizes the evaluation results of for *Goal 2, Increase the Attractiveness of Transit*.

Table 30: Goal 2 Results – Increase the Attractiveness of Transit

CRITERIA	MODERN STREETCAR STARTER LINE
2.1 2030 ridership projections	
Project boardings	*9,200*
New corridor transit trips	*1,200*
2.2 Ability to accommodate growth in transit ridership	*Would accommodate*

References: Metropolitan Council travel demand model; *Ridership* and *Service Plans* (technical memoranda under separate cover).

4.3. Catalyze and Support Economic Development

4.3.1. Potential for Alternative to Spur Development

Table 31: Potential for Alternative to Spur Development

SOURCE/INPUT	MODERN STREETCAR STARTER LINE
Developer forum feedback	*High*
Peer city research	*High*
Qualitative assessment of development potential	*Medium*
Support economic vitality of downtown	*High*
Support small and neighborhood businesses	*Medium*
Foster compact, mixed use development:	
Support infill development and lively, mixed-use activity in Opportunity Areas (Lowry/Central, East Hennepin, Nicollet Mall, I-94/Franklin, Eat Street)	*High*
Support long-term development in transformative Opportunity areas (Nicollet/Lake, Central Arts Wedge, Shoreham Yards)	*Medium*
Overall Assessment of Potential to Spur Development	***High***

4.3.2. Summary – Catalyze and Support Economic Development

The summary of quantitative and qualitative evaluation criteria of alternatives to catalyze and support economic development in the study corridor by segment is presented in Table 32 below.

Table 32: Goal 3 Results – Catalyze and Support Economic Development

CRITERIA	MODERN STREETCAR STARTER LINE
3.1 Estimate of development potential	*82,200,000*
3.2 Potential value of development (Year 2013 $)	*$3.3 billion*
3.3 Potential for alternative to spur development	*Highest potential*

References: City of Minneapolis zoning and land use GIS database and mapping; City of Columbia Heights zoning and land use data; City of Minneapolis and Hennepin County Assessor GIS database; *Economic Development Recommendations* and *Streetcar and Enhanced Bus Peer Review Summary* (technical memoranda)*; May 2013 Developer Forum Summary.*

4.4. Integrate with Existing Transportation System

Given the multi-modal nature of the Nicollet-Central corridor, this third goal is quite relevant with regards to how a transit improvement could fit within the context of other transportation uses/users.

4.4.1. Impact on Existing Traffic Operations

The Modern Streetcar Starter Line alternative would have the same impacts on existing traffic operations as the No-Build and Build alternatives under consideration, as described in Section 2.4.1.

4.4.2. Impact on Corridor Parking

The Modern Streetcar Starter Line alternative would have the same impacts on corridor parking as the No-Build and Build alternatives under consideration, as described in Section 2.4.2.

4.4.3. Impact on Freight Railroads

The Modern Streetcar Starter Line alternative would have the same impacts on freight railroads as the No-Build and Build alternatives under consideration, as described in Section 2.4.3.

4.4.4. Summary – Integrate with Existing Transportation System

Table 33 summarizes the evaluation results of for *Goal 4, Integrate with Existing Transportation System*.

Table 33: Goal 4 Results – Integrate with Existing Transportation System

CRITERIA	MODERN STREETCAR STARTER LINE
4.1 Impact on existing transportation operations	
General traffic	*Minimal. Volume of transit vehicles is small relative to general traffic (except on Nicollet Mall).*
Transit travel time reliability	*Improved due to TSP, enhanced stops and off-board fare collection*
General traffic at transit stops	*Minimal. May have negative impacts, even though these impacts are likely to be small and/or mitigated by other factors.*
4.2 Impact on on-street parking	*Minimal relative to No-Build.*
4.3 Impact on freight railroad operations	*Likely no significant change from existing conditions*

References: *Traffic and Parking Impacts* and *Potential Impacts to Freight Railroad Operations* (technical memoranda under separate cover).

4.5. Support Healthy Communities and Environmental Practices

Evaluation criteria associated with this fifth goal of the Nicollet-Central Transit Alternatives address those elements included during the FTA environmental review, also known as the NEPA (National Environmental Protection Act) process. These elements are cultural, historic and natural resources, parkland and environmental justice.

4.5.1. Cultural, Historic and Natural Resources

Potential Impact on Cultural and Historic Resources

The Modern Streetcar Starter alternative would have similar potential impact on cultural and historic resources as the No-Build and Build alternatives under consideration, as described in Section 2.5.1; due to its shorter length, it is anticipated that this alternative would have fewer impacts on cultural and historic resources.

Natural Resources

Based on an assessment of potential impacts on natural resources, it is unlikely that any of the build alternatives would adversely impact environmental resources within the study corridor. If streetcar is selected as the LPA mode, construction of an Operations and Maintenance Facility – depending on its siting – may impact natural resources within the corridor. Infrastructure and design decisions that are made during refinement of the LPA will be evaluated in detail during environmental review.

4.5.2. Year 2030 Transit-Reliant Population

As shown in Table 34, the largest percentage of the trips on the Modern Streetcar Starter Line would be taken by transit-reliant persons.

Table 34: Ridership by Transit-Reliant Population in 2030

CRITERIA	MODERN STREETCAR STARTER LINE
Project boardings by transit-reliant persons	*4,200*
Percent of project boardings by transit-reliant persons	*46%*

4.5.3. Benefits to Low-Income and Minority Populations

Table 35 presents the results of the analysis to quantify Modern Streetcar Starter Line service to population living below the poverty line and/or persons without access to automobiles.

Table 35: Benefits to Low-income, Minority, and Persons without Access to an Automobile

CRITERIA	MODERN STREETCAR STARTER LINE
Population living below poverty served	*13,100*
Percent of population living below poverty	*24%*
Non-white population served	*16,300*
Percent of non-white population	*30%*
Population without access to automobile	*11,200*
Percent of population without access to automobile	*20%*

4.5.4. Affordable Housing

Using the same methodology described in Section 2.5.4, the number of affordable housing units in the study corridor by segment is presented in Table 36 below.

Table 36: Affordable Housing Units*

GOAL/CRITERIA	MODERN STREETCAR STARTER LINE
Goal 5: Support Healthy Communities and Environmental Practices	
5.4 Affordable Housing: Number of Units	*4,200*
% of Housing Units that are Affordable	*13%*

*Within one-half mile of alignment. References: HousingLink; City of Minneapolis; City of Columbia Heights; and 2010 Census.

4.5.5. Environmental Benefits

Using the same methodology described in Section 2.5.5, it was determined that there would be no significant difference between the alternatives on any of the environmental benefits examined, as shown in Table 37.

Table 37: Environmental Benefits*

	MODERN STREETCAR STARTER LINE
Regional air pollution	*Minimal impacts for all Build alternatives* *Alternatives are within +/- 0.5%*
Air quality - CO	*-0.003%*
Air quality - NOx	*-0.003%*
Air quality - VOC	*-0.003%*
Air quality - PM2.5	*0.056%*
Energy use	*0.006%*
Greenhouse gas emissions	*0.005%*
Safety	*No significant difference between alternatives*
Change in disabling injury crashes	*Alternatives are within +/- 1.5 crashes/year*
Change in fatal crashes	*Alternatives are within +/- 1 fatality/20 years*

*All figures are relative to the No-Build alternative.

4.5.6. Summary – Support Healthy Communities and Environmental Practices

Table 38 presents the results of all of the evaluation criteria associated with the study goal, *Support Healthy Communities and Environmental Practices*.

Table 38: Goal 5 Results – Support Healthy Communities and Environmental Practices

CRITERIA	MODERN STREETCAR STARTER LINE
5.1 Potential impacts on historical, cultural and natural resources	
Number of archeology sites within one-quarter mile	*3*
Number of architectural site within one-quarter mile	*290*
Natural resources within one-half mile	*Minimal impacts for all alternatives*
5.2 Year 2030 transit-reliant ridership	
Project boardings by transit-reliant person	*4,200*
% of project boarding by transit-reliant persons	*46%*
5.3 Benefits to low-income and minority population	
Population living below poverty served	*13,100*
% of population living below poverty	*24%*
Non-white population served	*16,300*
% of population that is non-white	*30%*
Population without access to automobile	*11,200*
% of population without access to automobile	*20%*
5.4 Affordable housing	
Number of affordable housing units	*4,200*
% of housing units that are affordable	*13%*
5.5 Environmental benefits	*Minimal impacts for all Build alternatives*
Regional air pollution (Regional change, in kilograms)[3]	*No significal difference between alternatives. Alternatives are within +/- 0.5%*
Safety	*No significant difference between alternatives*

4.6. Develop an Implementable Project with Community Support

As previously discussed, at the outset of the Nicollet-Central Transit Alternatives study, the community, stakeholders and decision-makers determined that any LPA resulting from the study must be cost-effective and supported by the community. The measure used to determine cost-effectiveness is based on FTA's preliminary definition under MAP-21 and has been modified for purposes of local decision-making. This study recognizes that implementation of an LPA such as streetcar would seek funds from FTA's Capital Investment Program; one of the criteria of the program to justify a project is cost-effectiveness. In addition to cost-effectiveness, the degree to which the community supports each alternative is critical to developing and implementing a successful transit investment.

4.6.1. Cost-Effectiveness

Passenger Boardings per Vehicle Revenue Hour

Using the methodology described in Section 2.6.1, the passenger boardings per hour for the Modern Streetcar Starter line are shown in Table 39.

Table 39: Passenger Boardings per Revenue Hour

	MODERN STREETCAR STARTER LINE
Project	*75*
*Other buses in corridor**	*52*
Corridor total	*56*

*No-Build: Routes 10, 18, and 59. Build alternatives: Local, limited stop and Grand Avenue circulator.

O&M Cost per Passenger Boarding

Using the methodology described in Section 2.6.1, the O&M cost per passenger boarding for the Modern Streetcar Starter line is shown in Table 40.

Table 40: Operating and Maintenance Cost per Passenger Boarding

	MODERN STREETCAR STARTER LINE
Project	*$3.60*
Other buses in corridor	*$1.97*
Corridor total	*$2.39*

*No-Build: Routes 10, 18, and 59. Build alternatives: Local, limited stop and Grand Avenue circulator.

Annual O&M Cost Estimate (Year 2013 Dollars)

Using the methodology described in Section 2.6.1, the annual O&M cost estimate for the Modern Streetcar Starter line are shown in Table 41.

Table 41: Summary of O&M Costs

SERVICE	MODERN STREETCAR STARTER (VIA CENTRAL)	MODERN STREETCAR STARTER (VIA HENNEPIN)
Build Alternatives (Project O&M Cost)		
Streetcar Long		
Starter Streetcar	*$11,400,000*	*$10,600,000*
Enhanced Bus (53rd-66th)		
Enhanced Bus (53rd-46th)		
Supporting Bus Services		
Local Bus (Northtown to 41st)		
Limited Stop (Northtown to 13th/Nic)		

SERVICE	MODERN STREETCAR STARTER (VIA CENTRAL)	MODERN STREETCAR STARTER (VIA HENNEPIN)
Grand Ave Circulator	*$600,000*	*$600,000*
Local Bus (Lyndale/104th to 46th/Nic)		
Limited Stop (Nic/66th to 3rd/Nic)	*$2,400,000*	*$2,400,000*
Local Bus (Lyndale/104th to Lake/Nic)	*$3,100,000*	*$3,100,000*
Local/Limited Bus (Lyndale/104th to 3rd/Nic)		
Route 10	*$9,600,000*	*$9,600,000*
Route 59	*$900,000*	*$900,000*
Route 18		
Total	***$28,000,000***	***$27,200,000***
Change over the No-Build	*$9,100,000*	*$8,300,000*
% Change over the No-Build	*48%*	*44%*
Build Alternative Supporting Bus Savings	*$2,300,000*	*$2,300,000*

Project Capital Cost Estimate (Year 2013 Dollars)

Using the methodology described in Section 2.6.1, the project capital cost estimate for the Modern Streetcar Starter line is shown in Table 42 and 43. Note that the capital cost estimate does not include reopening Nicollet Mall, unlike the capital cost estimates for the Modern Streetcar and Enhanced Bus alternatives.

Table 42: Major Capital Cost Elements

SCC	CAPITAL COST ELEMENT	MODERN STREETCAR STARTER LINE
10	*Guideway*	*Track for 3.4-mile alignment*
20	*Stops*[a]	*19 branded stops/direction of travel*
30	*Support Facilities*	*New streetcar OMF with light maintenance functions*[b] *for 12 streetcar vehicles*
40	*Sitework and Special Conditions Allowances*	*Same as modern streetcar except:* • *Shorter alignment (3.4 miles)* • *Bridge reconstruction for 3 existing structures*[d]
50	*Systems Allowances*	*Enhanced bus elements plus:* • *Train control and signals* • *Streetcar-only signal phase* • *Traction power substation (TPSS) and distribution*
60	*Right-of-Way Allowance*	*Sames as 9.2-mile streetcar except:* • *Shorter alignment* • *OMF site –3 acres* • *Fewer TPSS*
70	*Transit Vehicles*	*12 streetcar vehicles*
80	*Professional Services*[e]	*30 percent of sum of SCC 10-50*

SCC	CAPITAL COST ELEMENT	MODERN STREETCAR STARTER LINE
90	*Contingency*	*Same percentages as 9.2-mile streetcar alternative except:* • *Shorter alignment* • *SCC 60: OMF on 3-acre site*

[a] The number of enhanced bus and streetcar stops per direction of travel is generalized.
[b] Study assumes that heavy maintenance functions such as wheel truing would be accommodated at one of Metro Transit's light rail OMFs.
[c] Existing bridges included are: First/Blaisdell Ave over the Midtown Greenway; Nicollet Ave over I-94; Hennepin/First Ave or Central/Third Ave over the Mississippi River; Central Ave over the BNSF railroad north of Eighth St NE; Central Ave at Broadway over BNSF railroad.
[d] Existing bridges included are: First/Blaisdell Ave over the Midtown Greenway; Nicollet Ave over I-94; and Hennepin/First Ave or Central/Third Ave over the Mississippi River.
[e] Thirty percent for professional services is typical for a planning study.

Table 43: Summary of Capital Cost by Alternative (Year 2013 Dollars)[a]

STANDARD COST CATEGORY (SCC)	MODERN STREETCAR STARTER LINE
10 Guideway	*$ 19,400,000*
20 Stations/Stops	*$ 4,600,000*
30 Support Facilities	*$ 10,800,000*
40 Sitework and Special Conditions	*$ 24,500,000*
50 Systems	*$ 18,200,000*
60 Right-of-Way	*$ 3,700,000*
70 Vehicles	*$ 48,000,000*
80 Professional Services	*$ 23,200,000*
90 Contingency	*$ 29,300,000*
100 Finance Charges	*$ -*
Total in Year 2013 Dollars	***$ 182,000,000***
Total in Year 2017 Dollars[b]	***$ 204,000,000***

[a] Cost estimates for enhanced bus and streetcar alternatives are based on Hennepin/First Avenue Bridge routing. The additional incremental of the Central/Third Avenue Bridge routing by alternatives is: Enhanced bus $5.5 million; modern streetcar $16 million; streetcar starter line $7 million. Estimates shown are in year 2013 dollars unless noted.
[b] Year 2017 is assumed year of expense, based on an annual inflation rate of 3 percent.

Cost-Effectiveness

Using the methodology described in Section 2.6.1, the cost-effectiveness of the Modern Streetcar Starter line is shown in Table 44.

Table 44: Cost-Effectiveness

	MODERN STREETCAR STARTER LINE
*Cost-Effectiveness**	*$4.76*

*Estimated using incremental annualized capital cost and incremental annual O&M cost in Year 2013 dollars and 2030 project boardings. This information is subject to change, pending additional FTA guidance on its Capital Investment Program ratings under MAP-21.

4.6.2. Community Support

As discussed in Section 2.6.2, extensive public outreach was undertaken during this phase of the project, including open houses, online surveys, and comment cards. As previously discussed, more than 70 percent supported modern streetcar over enhanced bus or conventional bus. More than 60 percent, however, supported a streetcar starter line from Lake Street to 8th Street NE, and many respondents expressed desire for an extension further north along Central Avenue to a terminus near Broadway, 14th or Lowry.

4.6.3. Summary – Develop an Implementable Project with Community Support

Table 45 presents a summary of the evaluation measures associated with the sixth goal of the study.

Table 45: Goal 6 Results – Develop an Implementable Project with Community Support

CRITERIA	MODERN STREETCAR STARTER LINE
A Cost Effectiveness	
Passenger boardings per vehicle revenue hour	
Project	*75*
Other buses in corridor	*52*
Corridor total	*56*
O&M cost per passenger boarding (2013 $)	
Project	*$3.60*
Other buses in corridor	*$1.97*
Corridor total	*$2.39*
Annual O&M cost estimate (2013 $)	
Project	*$10.6 million*
Other buses in corridor	*$16.6 million*
Incremental O&M cost vs. No-Build	*$8.3 million*
Project capital cost estimate (2013 $)	*$182 million*
Preliminary cost-effectiveness (2013 $)	*$4.76*
B Community Support	
Public sentiment	*Strong support*
Business/developer community sentiment	*Strong support*

5. Findings and Next Steps

Table 46 presents the results of the detailed evaluation of the No-Build, enhanced bus, streetcar and streetcar starter line alternatives using the criteria developed for each of the six goals of the study. The preliminary findings based on the detailed technical evaluation are summarized below.

5.1. Preliminary Findings

5.1.1. Evaluation of Modal Alternatives

- *Goal 1 - Connecting people and places*: There is no difference between the alternatives because both serve the same population, employment and activity centers and both provide the same transit, pedestrian and bicycle connections.
- *Goal 2 – Increase the attractiveness of transit*: Streetcar has higher projected ridership (20,100 riders per weekday on streetcar compared to 13,400 riders on enhanced bus) and streetcar has greater potential capacity per vehicle to accommodate future growth.
- *Goal 3 – Catalyze and support economic development*: Streetcar has greater potential to catalyze development based on a review of peer cities and discussion at a local developer forum.
- *Goal 4 – Integrate with existing transportation systems*: Both streetcar and enhanced bus operate in the same lanes as general traffic. Both are expected to have minimal and similar impacts on traffic, parking and freight rail operations.
- *Goal 5 – Support healthy communities and environmental practices*: Streetcar is expected to serve a higher number of transit-reliant riders (7,500 weekday riders compared to 4,800 weekday riders for enhanced bus) and, while not quantified, streetcar has the long-range potential to have fewer environmental impacts and a lower carbon footprint than enhanced bus.
- *Goal 6 – Develop an implementable project with community support*: Enhanced bus has a lower capital cost ($94 million compared to $393 million for streetcar) and a lower annual operating and maintenance cost ($13.6 million compared to $20.1 million for streetcar). However, the O&M cost per passenger boarding are approximately the same. Modern streetcar has significantly greater support from the public and business community than enhanced bus.

5.1.2. Evaluation of River Crossing Alternatives

Two Mississippi River crossings were evaluated based on those detailed criteria that apply to this aspect of the detailed analysis. The results of this evaluation are:

- The Hennepin alignment has higher projected transit ridership and faster transit travel times although the Central alignment is the current route for Route 10 (Central Avenue service), resulting in increased walk distances of one to two blocks for some existing riders if the alignment were shifted to Hennepin.
- The Central/Third Avenue Bridge is listed in the National Register of Historic Places. Due to its age and historic status, it will be more expensive to modify for streetcar.
- There are better existing pedestrian and bicycle connections to the river from Hennepin Avenue and Hennepin Avenue provides a direct connection to Nicollet Island.
- Installing streetcar tracks on this section of Central Avenue and retaining the existing sharrows for bicycles would require the removal of on-street parking. On the other hand, the existing right-of-way width of Hennepin and First Avenues would accommodate streetcar tracks, bicycle lanes and on-street parking.

5.1.3. Evaluation of Streetcar Starter Line

This detailed evaluation of alternatives also examined a streetcar starter line that was generally defined in the *Detailed Definition of Alternatives Report* (April 2013) from Central Avenue at Eighth Street NE to Nicollet Avenue at Lake Street. Select information by segment of the corridor was developed including population, employment, cost estimates and economic development capacity. In summary, the streetcar starter line analysis *affirmed that the preliminary definition of the streetcar starter line best meets the goals and objectives of the study*:

- Serves the highest population and employment density
- Serves the highest number of transit-reliant population
- Serves the highest number of affordable housing
- Serve five of nine development opportunity sites and has the highest potential development capacity in terms of area and estimated dollar value
- Has the highest potential for the replacement of existing buses.

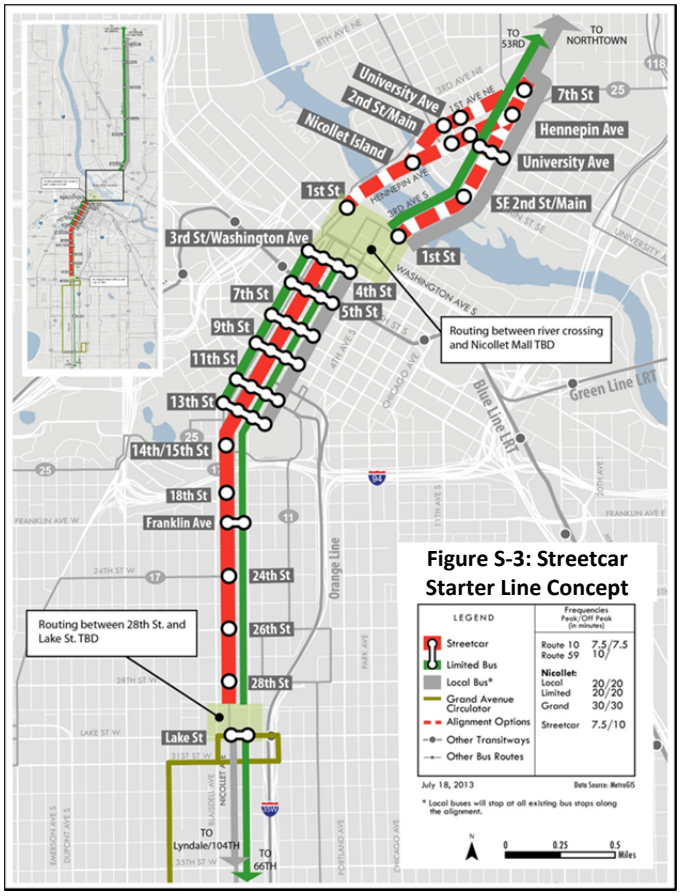


Figure S-3: Streetcar Starter Line Concept

5.2. Next Steps

Following public review of the detailed evaluation of alternatives, public comments will be summarized and presented to the Policy Advisory Committee (PAC) and the Minneapolis City Council. The PAC will make a recommendation of a locally preferred alternative (LPA) to the City Council. The City Council will select an LPA. Following the section of an LPA, an environmental review will be completed, and the City will work with the Metropolitan Council to modify the regional Transportation Policy Plan to include the LPA for the Nicollet-Central Corridor. These actions are the next steps needed to continue to position the city and the region for potential federal funding of transit improvements in the Nicollet-Central Corridor.

Table 46: Results of Detailed Evaluation

Criteria	No-Build	Enhanced Bus *(9.2 mi)*	Modern Streetcar *(9.2 mi)*	Modern Streetcar Starter Line *(3.4 mi)*
Goal 1: Connect People and Places				
1.1 2010 population within one-half mile	93,900			54,800
1.2 2030 population within one-half mile	120,000			79,700
1.3 2010 employment within one-half mile	125,500			118,100
1.4 2030 employment within one-half mile	177,900			167,000
1.5 Existing major activity centers	All alternatives serve all or nearly all major activity centers Most major activity centers are clustered in/around downtown; Eighth-Washington; and Grant-Lake.			
1.6 Transit connections	Serves all of the transit connections within the 9.2-mile study corridor including the Columbia Heights Transit Center and 38th St primary transit network			Serves most important connections (Downtown - Lake)
1.7 Quality of pedestrian connections	Connections diminish somewhat farther north and south			Consistent quality of connections throughout alignment
1.8 Quality of bicycle connections	Connections diminish somewhat farther north and south			Consistent quality of connections throughout alignment
Goal 2: Increase the Attractiveness of Transit				
2.1 2030 ridership projections				
Project boardings	N/A	13,400	20,100	9,200
New corridor transit trips	N/A	--	900	1,200
2.2 Ability to accommodate growth in transit ridership[1]	Would require use of hybrid articulated buses to do so	Would accommodate	Could require more frequent service during special events	Would accommodate
Goal 3: Catalyze and Support Economic Development				
3.1 Estimate of development potential (SF)[2]	118,500,000			82,200,000
3.2 Potential value of development (2013 $)	$ 4.84 billion			$3.28 billion
3.3 Potential for alternative to spur development *(Based on May 2013 Developer Forum, Peer Review, and review of local plans, policies and guidelines)*	Lowest potential of four alternatives	Medium potential of four alternatives	Highest potential of four alternatives	Highest potential of four alternatives
Goal 4: Integrate with the Existing Transportation System				
4.1 Impact on corridor traffic	Minimal impacts for all alternatives			
4.2 Impact on parking	Minimal impacts for all alternatives			
4.3 Impact on freight railroad operations	Minimal impacts for all alternatives			
Goal 5: Support Healthy Communities and Environmental Practices				
5.1 Potential impacts on historical, cultural and natural resources				
Number of archeology sites within one-quarter mile	3			3
Number of architectural sites within one-quarter mile	310			290
Natural resources within one-half mile	Minimal impacts for all alternatives			
5.2 Year 2030 transit-reliant ridership				
Project boardings by transit-reliant persons	N/A	4,800	7,500	4,200
% of project boardings by transit-reliant persons	N/A	36%	37%	46%
5.3 Benefits to low-income and minority population				
Population living below poverty served	21,600			13,100
% of population living below poverty	23%			24%
Non-white population served	26,100			16,300
% of population that is non-white	28%			30%
Population without access to automobile	15,100			11,200
% of population without access to automobile	16%			20%
5.4 Affordable housing				
Number of affordable housing units	4,600			4,200
% of housing units that are affordable	9%			13%
5.5 Environmental benefits *(Relative to No-Build)*	N/A	Minimal impacts for all Build alternatives		
Regional air pollution *(Regional change, in kilograms)*[3]	N/A	No significant difference between alternatives. Alternatives are within +/- 0.5%		
Safety	N/A	No significant difference between alternatives		
Goal 6: Develop an Implementable Project with Community Support				
6.1 Cost Effectiveness				
Passenger boardings per vehicle revenue hour				
Project	N/A	42	90	75
Other buses in corridor[4]	64	34	37	52
Corridor total	64	38	58	56
O&M cost per passenger boarding				
Project	N/A	$3.17	$3.13	$3.60
Other buses in corridor[4]	$1.58	$3.00	$2.85	$1.97
Corridor total	$1.58	$3.10	$3.02	$2.39
Annual O&M cost estimate				
Project	N/A	$13,600,000	$20,100,000	$10,600,000
Other buses in corridor[4]	$18,900,000	$9,700,000	$11,200,000	$16,600,000
System-wide change vs. No-Build	N/A	$4,400,000	$12,400,000	$8,300,000
Project capital cost estimate (2013 $)	Would require use of hybrid articulated buses	$94,000,000	$393,000,000	$182,000,000
Cost-effectiveness (2013 $)[5]	N/A	$1.79	$4.27	$4.76
6.2 Community Support				
Public sentiment	*very limited support*	*limited support*	*support*	*strong support*
Business/developer community sentiment	*very limited support*	*limited support*	*support*	*strong support*

[1] *Based on estimated additional passenger capacity at peak load based on 2030 ridership forecasts*

[2] *Based on existing zoning*

[3] *Relative to 2030 change in VMT, vs. No-Build alterantive*

[4] *Other buses in corridor defined as follows:*

No-Build -- Routes 10, 18, and 59

Build alternatives -- Local, limited stop and Grand Avenue circulator

[5] *Project incremental annualized capital costs + project incremental annual O&M cost divided by 2030 project boardings relative to No-Build alternative*

2030 project boardings annualized using Route 18 factor (320)

Build Alternatives presented in this table assume the Hennepin Avenue River Crossing

Table 47: Mississippi River Crossing Alternatives

CONSIDERATIONS	HENNEPIN/FIRST AVENUE BRIDGE	CENTRAL/THIRD AVENUE BRIDGE
One-Way Distance [a]	*6,200 feet*	*6,900 feet*
Other Future Streetcar Lines Served	*Hennepin*	*Hennepin*
	University/Fourth	*University/Fourth*
	Washington	
Major Activity Centers Served	*Direct and indirect ways to access the Riverfront, Nicollet Island, East Hennepin and St. Anthony Main*	*Mostly indirect ways to access Riverfront, Nicollet Island and St. Anthony Main*
Existing Pedestrian and Bicycle Connections	*Direct and indirect access to the Riverfront and Nicollet Island*	*Access to north/east Riverfront via stairs*
	North of the River, Hennepin/First could accommodate bike lane within the existing roadway right-of-way	*Indirect to Nicollet Island and West Riverfront*
Walk Time for Existing Transit Riders	*For Route 10/59 patrons: Walk would be two to three blocks longer or shorter, if from the east or west*	*No change for existing patrons*
2030 Weekday Boardings [b]	*20,100*	*19,400*
Transit Travel Time		
Enhanced Bus (41st Ave NE-46th St S)	*47 minutes*	*48.5 minutes*
Streetcar (41st Ave NE-46th St S)	*45.9 minutes*	*47.5 minutes*
Streetcar Starter Line (Eighth St NE-Lake St)	*25.2 minutes*	*26.8 minutes*
2010 Traffic Volumes [c]		
AM Peak (Southbound)	*500 vehicles/lane*	*700 vehicles/lane*
PM Peak (Northbound)	*600 vehicles/lane*	*650 vehicles/lane*
Hennepin/First Avenue Conversion to Two-Way Traffic	*Would not preclude*	*No impact*
Cultural and Historic Resources		*Bridge on National Register of Historic Places*
Estimated Annual Operating and Maintenance Cost of Build Alternative [d]		
Enhanced Bus (41st Ave NE-46th St S)	*$13.6 million*	*$13.9 million*
Streetcar (41st Ave NE-46th St S)	*$20.1 million*	*$20.6 million*
Streetcar Starter Line (Eighth St NE-Lake St)	*$10.6 million*	*$11.4 million*
Estimated Capital Cost of Build Alternative [d]		
Enhanced Bus (41st Ave NE-46th St S)	*$94 million*	*$100 million*
Streetcar (41st Ave NE-46th St S)	*$393 million*	*$409 million*
Streetcar Starter Line (Eighth St NE-Lake St)	*$182 million*	*$189 million*

[a] Distance along alignment between Eighth Avenue NE and Washington Avenue.

[b] Based on 2030 boardings for streetcar alternative between 41st Avenue NE and 46th Street S.

[c] Source: City of Minneapolis.

Table 48: Key Results Available by Segment

	2010					2030	
	Population	Population - No Vehicle Households	Percent of Population Living Below Poverty	Non-White Population	Employment	Population	Employment
41st to Lowry	10,000	900	11%	2,500	1,900	10,700	3,100
Lowry to Broadway	6,200	1,000	20%	1,800	1,900	7,000	2,900
Broadway to 8th	3,700	400	31%	600	1,400	4,200	2,100
8th to Washington - Hennepin	12,400	1,800	21%	2,500	6,700	17,800	9,200
Washington to Grant	17,800	4,000	25%	5,000	103,200	31,500	145,900
Grant to Lake	24,600	5,400	25%	8,800	8,200	30,400	11,900
Lake to 38th	11,300	1,200	25%	3,100	1,100	11,000	1,600
38th to 46th	7,900	400	25%	1,800	1,100	7,400	1,200
Total: 41st to 46th	93,900	15,100	23%	26,100	125,500	120,000	177,900
Total: 8th to Lake - Hennepin	54,800	11,200	24%	16,300	118,100	79,700	167,000
Minneapolis Average			22%				
Columbia Heights Average			13%				
Seven County Region Average			11%				
8th to Washington - Central	12,400	1900	24%	2,900	11,500	18,000	15,800

Represents population and employment within 1/2 mile of proposed alignment.

Numbers may not sum due to rounding.

Source:

2010 Population, US Census Bureau 2010 Decennial Census, TAZ 2000 level geography

Population in Households with No Vehicle Available, American Community Survey: 5-year sample 2006-2011 at the Census tract geography.

2010 Employment, Minnesota Department of Employment and Economic Securities, TAZ 2000 level geography

2030 Population and Employment, Metropolitan Council forecasts developed based on city forecasts, TAZ 2000 level geography

Non-white population, persons without access to an automobile, and persons living poverty were based on the American Community Survey (ACS) 5-year sample 2007-2011 at the Census tract level geography

	Affordable Housing		Estimated Potential Maximum Development Capacity	
	Affordable Housing Units	Total Housing Units	Size (million sq ft)	Value ($ million)
41st to Lowry	51	4,633	16	$860
Lowry to Broadway	242	4,336	5	$170
Broadway to 8th	0	1,002	9	$123
8th to Washington	1,514	6,220	20	$699
Washington to Grant	1,832	14,528	39	$1,375
Grant to Lake	862	11,984	24	$1,202
Lake to 38th	109	4,575	4	$294
38th to 46th	36	3,375	2	$115
Total: 41st to 46th	4,646	50,653	118	$4,838
Total: 8th to Lake	4,208	32,732	82	$3,276
Minneapolis Total	21,734	178,287		
Columbia Heights Total	307	8,584		
Seven County Region Total	59,948	1,186,986		

Represents affordable housing and development capacity within 1/2 mile of proposed alignment.

Source:

Affordable Housing Units, HousingLink data on legally-binding housing units available and affordable to households earning 80 percent of Area Median Income (AMI) or less.

Total Housing Units, US Census Bureau 2010 Decennial Census

Estimated Potential Maximum Development Capacity, Appendix N Economic Development Recommendations. Defined as the theoretical maximum build-out alowable under current zoning, based on the maximum allowable FAR (floor-to-area ratio) in each zoning district. The difference between current built form and the potential maximum allowable limits (build-out increment) is the estimated potential maximum development capacity.