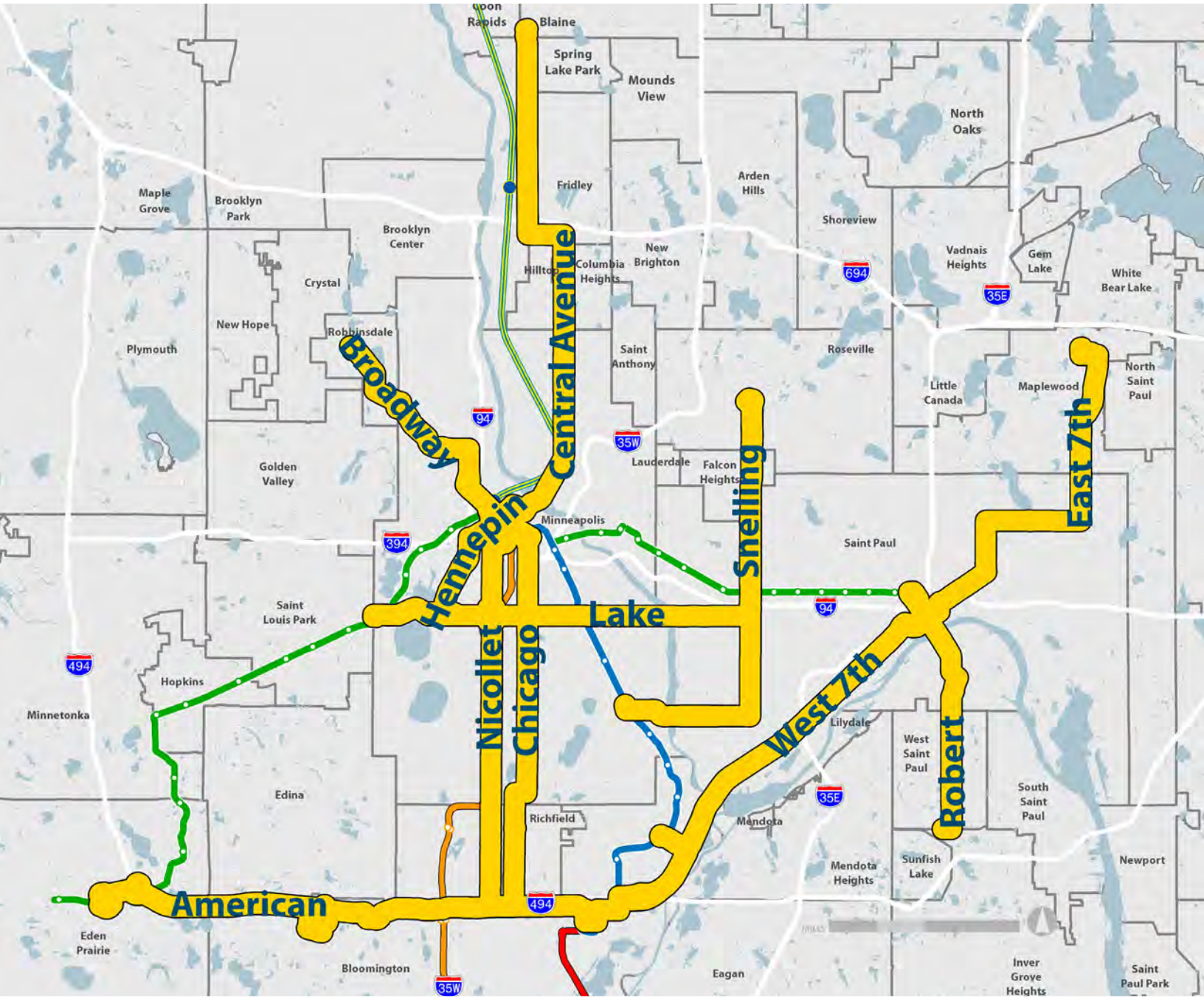
Arterial Transitway Corridors Study



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Metro Transit

Prepared by **SRF Consulting Group, Inc.**
with Kimley-Horn and Associates, Inc.
Connetics Transportation Group
Luken Architecture
CR Planning

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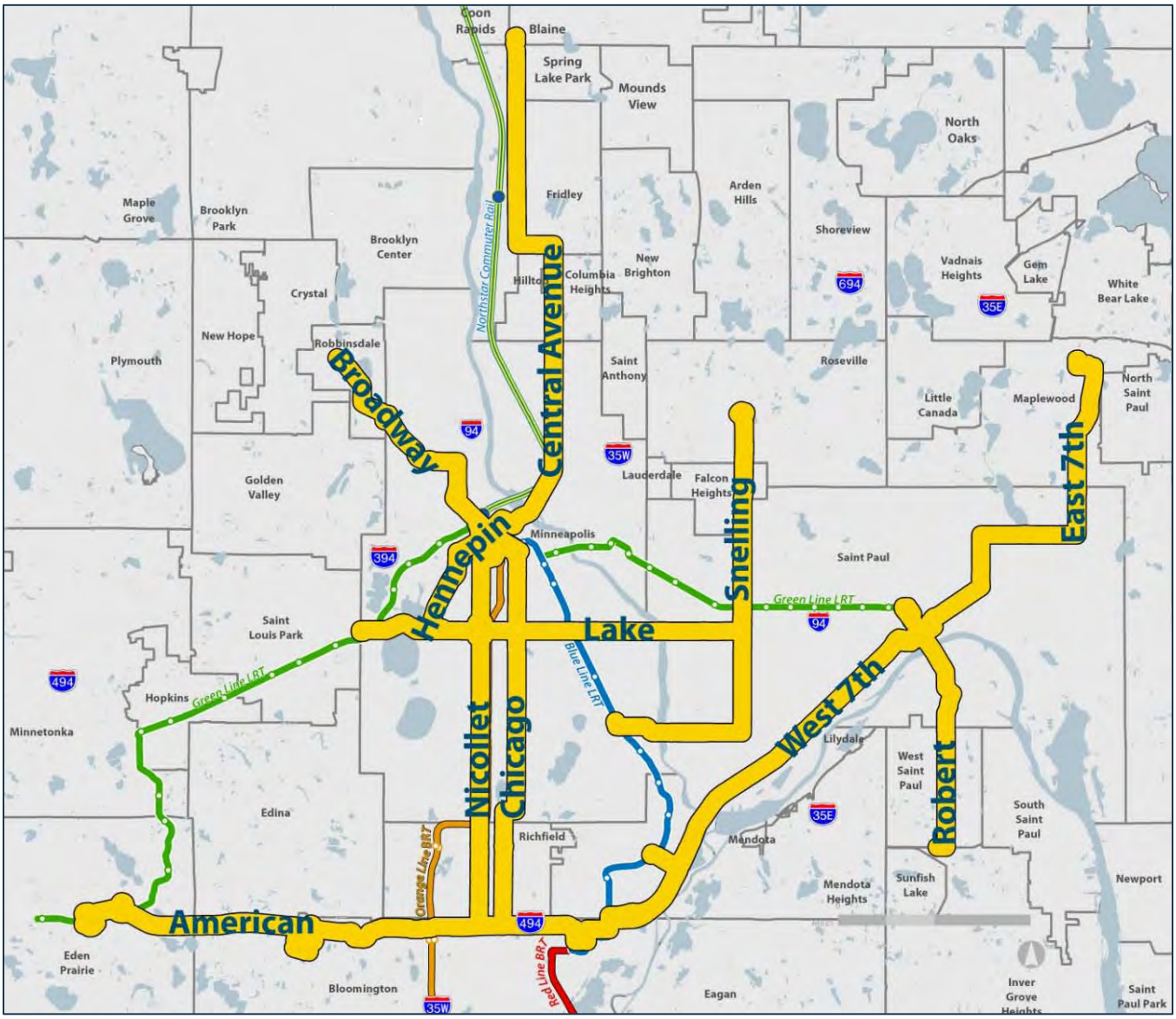
Introduction to the Arterial Transitway Corridors Study

In 2011, Metro Transit embarked on the *Arterial Transitway Corridors Study*, a year-long study of improvements along some of the Twin Cities' most heavily traveled transit corridors. The purpose of the ATCS was to develop a facility and service plan to enhance efficiency, speed, reliability, customer experience, and transit market competitiveness on 11 high-demand urban transitway corridors, shown in the map below.



INTRODUCTION

Why were these corridors selected for study?

In the *Transportation Policy Plan* (TPP) adopted in 2004, the Metropolitan Council set a goal of doubling transit ridership—to about 147 million annual rides by 2030. Since the goal was set, transit ridership has grown steadily. Ridership is an important measurement of the system's performance; steadily increasing ridership reflects a transit system that enhances regional mobility, offers an alternative to congestion, and provides environmental benefits. Metropolitan Council policy focuses on two broad approaches to increasing transit ridership and meeting mobility needs: maintain and grow bus ridership, and develop a network of bus and rail transitways.

The *2030 Transit Master Study*, completed by the Metropolitan Council in 2008, evaluated more than two dozen Twin Cities corridors for potential transitway investments. The study screened high-ridership arterial corridors for their potential for light rail transit (LRT) or dedicated busways. Although some of the corridors showed promising ridership results, narrow rights-of-way and significant community impacts meant that constructing LRT or dedicated busways would not be feasible. The study showed that substantial ridership growth could still be achieved through faster transit speeds and higher service frequency in these corridors.

Building on the findings of the *2030 Transit Master Study,* the 2009 update to the TPP established arterial bus rapid transit as a concept for future study in the Twin Cities region, and recommended implementation in nine corridors: Central Avenue, Snelling Avenue/Ford Parkway, West Broadway Avenue, Nicollet Avenue, Chicago Avenue, East 7th Street, Robert Street, West 7th Street, and American Boulevard. The ATCS will evaluate and recommend improvements to the nine corridors identified in the TPP, as well as the Lake Street and Hennepin Avenue corridors. Lake Street was added to prepare for a broader Alternatives Analysis of the Lake Street-Midtown corridor, and Hennepin Avenue was added due to high existing demand and enhanced connections to future Southwest LRT.

Planning directions for the ATCS were also informed by studies completed by partner agencies:

- Robert Street Transit Feasibility Study (Dakota County Regional Railroad Authority, 2007-2008)
- Minneapolis Streetcar Study and related efforts (City of Minneapolis, 2007-2010)

The ATCS builds on the work completed through these studies. In turn, findings from the ATCS can be used to inform future studies of corridors for other potential types of transit investments.

What problems does the study address? (Purpose and Need)

The corridors studied and evaluated for improvements all have unique attributes; however, they share many common characteristics. They are generally located in highly developed urban areas and have robust existing bus service. In each of the corridors, future growth in population, households, and employment is expected. While forecasted growth is relatively minor in some corridors, other corridors are forecasted to grow faster than the seven-county Twin Cities metropolitan area.

Because the corridors are all unique, but similar in certain regards, the purpose and need for this project is made up of eleven elements that apply to each corridor in various ways.

Corridor transit service is a critical element of the regional transportation system

- **Corridor forms important connection to regional fixed guideway transit system.** This element applies equally across all corridors, as each makes at least one connection to the regional fixed guideway system.
- **High existing corridor transit demand offers opportunity for service improvement.** Routes in nearly all of the corridors carry more than 3,000 passengers each weekday.
- **High demand challenges existing transit capacity.** Moreover, routes in several of the corridors exhibit more than 6,000 passenger boardings each day, and passenger loads that regularly exceed regional standards.
- **Corridor serves large proportion of people who depend on transit.** In nearly all of the corridors, more than 10 percent of households do not have a vehicle.
- **Corridor serves an area with rapidly growing population and/or employment.** Between 2000 and 2030, nine of the eleven corridors will experience population and/or job growth of more than 20 percent.
- **Existing passenger waiting facilities offer opportunities for improvement.** This criterion applies to all corridors.

Speed and reliability improvements are required to decrease costs and improve ridership

- **Slow transit travel speeds lead to high operating cost and lower service attractiveness.** Routes in many corridors travel at an average in-service speed of less than 15 miles per hour.
- **Customer boarding time and fare collection cause delay.** In each of the corridors, slow transit speeds are caused by delay from the time it takes customers to board. On some routes, boarding and fare payment delay accounts for up to 33 percent of transit travel time.
- **Roadway configuration and intersection controls challenge speed and reliability**. Transit services in each corridor are subject to delay and reliability issues from roadway conditions. Many routes experience chronic on-time performance issues.
- **Roadway configuration presents opportunities for travel time savings**. Roadway and intersection conditions in each of the corridors present opportunities for improvements through transit signal priority, curb extensions, or other treatments.
- **Planned roadway improvements offer potential for construction coordination**. Improvements are planned on portions of several of the corridors.

INTRODUCTION

The chart below summarizes which Purpose and Need elements apply to each corridor, providing a framework for why each corridor is included in this study.

	Snelling	Lake	American	Central	Broadway	Hennepin	Nicollet	Chicago	West 7th	East 7th	Robert
Corridor transit service is a critical element of the regional transportation system											
Corridor forms important connection to regional fixed guideway transit system	•	•	•	•	•	•	•	•	•	•	•
High existing corridor transit demand offers opportunity for service improvement	•	•		•	•	•	•	•	•	•	•
High demand challenges existing transit capacity		•		•		•	•	•			
Corridor serves large proportion of people who depend on transit	•	•		•	•	•	•	•	•	•	•
Corridor serves an area with rapidly growing population and/or employment			•	•	•	•	•	•	•	•	•
Existing passenger waiting facilities offer opportunities for improvement	•	•	•	•	•	•	•	•	•	•	•
Speed and reliability improvements are required to decrease costs and improve ridership											
Slow transit travel speeds lead to high operating cost/lower service attractiveness		•		•	•	•	•	•		•	
Customer boarding time and fare collection cause delay	•	•	•	•	•	•	•	•	•	•	•
Roadway configuration and intersection controls challenge speed and reliability	•	•	•	•	•	•	•	•	•	•	•
Roadway configuration presents opportunities for travel time savings	•	•	•	•	•	•	•	•	•	•	•
Planned roadway improvements offer potential for construction coordination	•	•	•	•			•		•		•

What is Arterial Bus Rapid Transit?

Arterial bus rapid transit (arterial BRT) is high-frequency, limited-stop service offering an improved customer experience on urban arterial streets. Arterial BRT provides improved speed, frequency, passenger experience, and reliability by upgrading vehicle, runningway, and station quality without the higher capital costs, construction impacts, and right-of-way requirements of an LRT or dedicated busway corridor. These improvements lead to lower operating costs and improved ridership. Lower costs also allow for faster implementation of transit improvements

Arterial bus rapid transit concepts have been used to increase transit speeds and provide a better customer experience in several places throughout the U.S., including Kansas City, Las Vegas, Oakland, Boston, New York City, Cleveland, Seattle, and Los Angeles. After implementing arterial BRT, communities have seen travel time decrease and ridership increase, for a fraction of what it would cost to implement LRT or a dedicated busway.

Component	Typical Results
Travel Time	15–25% faster travel
Ridership	20–40+% increase
Capital Costs	$1 million–$3 million per mile

Rapid Bus

The arterial BRT concept developed in this study for the Twin Cities metro area uses a working title of **Rapid Bus**. The actual name will be determined through a future project implementation phase. Eight specific system features make up the Rapid Bus concept studied in the ATCS.

System Features Common to All Corridors

Station Design

Bus stops would be upgraded to premium transitway stations with enhanced amenities and information

Fare Collection

Off-board fare payment speeds boarding and increases convenience, police enforcement enhances security

Vehicle Design

Rapid Bus vehicles would have a unique look distinct from regular local and express service

Identity/Brand

A system brand will be developed to differentiate Rapid Bus transitways from other transit services

Features Tailored to Individual Corridors

Station Size

Stations and boarding platforms would be sized to projected passenger demand and available space

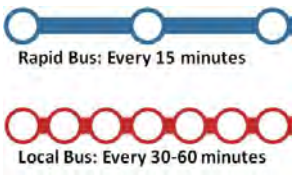
Runningway

Current road lanes would not change but spot improvements would allow buses to move more quickly in traffic

Signal Priority

Signal priority would allow buses additional green time to minimize delay and increase speed

Service Plans



Service plans respond to corridor demand. Rapid buses run every 15 minutes or better, 7 days per week

Study Goals and Objectives

Part of this study focuses on prioritizing corridors for implementation. To do this, the project team developed an evaluation framework.

The Rapid Bus concepts developed for the 11 corridors focus on developing new ridership to work toward achieving *Transportation Policy Plan* ridership targets by meeting the following goals:

1. **Mobility:** Provide mobility benefits by connecting major destinations along the study corridors more quickly with more frequent transit service.
2. **Affordability:** Implement affordable transit improvements.
3. **Integration:** Seamlessly integrate with existing and planned transit systems.
4. **Customer Experience:** Provide an enhanced customer experience by developing passenger infrastructure and information commensurate with existing and planned levels of transit service.
5. **Growth:** Support anticipated corridor growth and redevelopment.

What was studied in the ATCS?

The ATCS included four distinct project phases, each of which contributed to developing the Rapid Bus concept and determining where the concept was best suited for near-term implementation.

1. **Existing Conditions.** The first phase of the ATCS included a detailed look at existing transit, roadway, population, and land use conditions in each of the eleven corridors. A full technical memorandum documenting existing conditions is available on the study website.
2. **Review of Arterial Transit Modes.** During the second phase, a review of local bus, streetcar, and arterial BRT was conducted to better inform the concept development stage. This phase included interviews of peer transit agencies with experience in implementing arterial BRT. A full technical memorandum documenting this review is available on the study website.
3. **Concept Development.** The third phase of the study focused on developing the Rapid Bus concept to estimate benefits and costs. Activities during this phase included developing system-level attributes for all Rapid Bus corridors, then applying these attributes to develop corridor-specific concept plans and operating plans. Corridor plans were used to estimate operating and capital costs and forecast future ridership. A full technical memorandum documenting concept development is available on the study website.
4. **Evaluation and Prioritization.** During the fourth and final phase of the ATCS, the results of concept development were evaluated and prioritized on a corridor-by-corridor basis to identify where Rapid Bus is best suited for near-term implementation. A full technical memorandum documenting concept development is available on the study website.

Complete Study Materials *are available online at www.metrotransit.org*

The Concept Development phase of the study involved the most intensive work to define Rapid Bus. This phase involved further defining how Rapid Bus would look and operate (through **physical concept plans** and **operating plans**), and measuring its outcomes (through **cost estimates** and **ridership forecasting**). The methods for each of these activities are further explained in this section.

Physical Concept Plans

Physical concept plans were developed during the ATCS to define how the various characteristics of arterial BRT would be applied to the Rapid Bus concept. The physical concept plans include the following:

- Mixed-traffic runningways
- Transit signal priority
- Roughly half-mile station spacing
- Stations located at farside of intersections where possible
- Curb extensions on road segments with on-street parking; curbside stations where no parking is present today
- Nine-inch raised curbs for “near-level” boarding
- Premium vehicles with all-door boarding
- Stations sized to match demand and fit site conditions
- Modular station shelter design with a distinctive Rapid Bus brand
- Off-board fare collection using ticket vending machines
- Foundational transitway components at stations

WHAT WAS STUDIED?

Runningway treatments

For the ATCS, it was assumed that Rapid Bus will travel in mixed traffic using existing street configurations, but station curb extensions will allow buses to move more quickly in traffic. This study assumed that Rapid Bus will operate in mixed-use traffic lanes, sharing space with all types of road users.

Other runningway improvements may be considered as spot improvements in future project design phases. For example, queue jumpers are short lanes at intersections that allow transit vehicles to move to the front of traffic queued at a traffic signal. Though not included in this study, the assumptions made for the Rapid Bus concept do not preclude the use of queue jumpers in the future.

Signals

This study assumed that transit signal priority (TSP) would be implemented at some intersections to reduce delay for transit customers and lower transit operating costs. TSP reduces delay for buses at traffic signals and minimizes negative impacts on overall traffic operations. Reduced delay benefits transit customers by providing faster travel times, and benefits transit operations by reducing operating costs. TSP can be designed flexibly to respond to traffic and transit needs. TSP is not signal preemption, which interrupts signal cycles and can cause greater disruption to traffic. Instead, priority may be expressed through an "early green" for a bus approaching an intersection, or an "extended green" phase for a bus about to be stopped at a signal.

Some signalized intersections may not allow for TSP. For the purpose of estimating cost and running time in this study, a portion of intersections were assumed to have TSP benefits. These TSP cases were fed into the transit travel time estimates to gauge how long buses would be delayed at intersections.

Vehicles

Rapid Bus vehicles would have a unique look distinct from regular local and express service, and would be designed to allow for faster boarding and alighting. Detailed vehicle design was not included in this study, but it was assumed that low-floor premium vehicles would be purchased and used for this service. Vehicles would have two or three doors based on the length to allow all-door boarding. Future phases may determine added features on these buses, such as enhanced customer information or other features.

Based on operating service levels defined in the ATCS, corridors were assigned either standard 40-foot vehicles (Snelling Avenue, Robert Street, American Boulevard, Hennepin Avenue) or articulated 60-foot vehicles (Lake Street, Central Avenue, West Broadway Avenue, Chicago Avenue, East 7th Street, West 7th Street). In addition, hybrid buses were assumed for Nicollet Avenue and Central Avenue corridors to meet the goal of providing hybrid-only bus service on Nicollet Mall in downtown Minneapolis. Future project development may consider a common vehicle for all corridors.

Off-Board Fare Collection

Rapid Bus would feature off-board fare collection and all-door boarding. Passengers would purchase a ticket at a ticket vending machine (TVM) on the station platform rather than pay a farebox on the bus. Passengers with Go-To Cards could also pay using an on-board validator affixed inside each vehicle door. To accommodate off-board fare collection, one TVM is provided at each station. At locations where extra-small stations are provided in both directions at a particular intersection, it was assumed that a TVM is only provided in the peak boarding direction. A smartcard validator is included on each vehicle door to allow passengers to board and alight through all doors at once.

Station Spacing and Siting

Rapid Bus would stop less often than local routes and would serve stations at key activity centers. Rapid Bus would serve stations spaced roughly every one-half mile and sited at key activity centers in each corridor. This station spacing and siting improves transit travel times by reducing the number of stops a bus makes by nearly 75 percent, and maintains high levels of service for nearly 98 percent of the population currently served by existing routes in the corridor. Proposed station locations for each corridor were defined based on connections to intersecting bus routes, existing ridership patterns, surrounding land uses and trip generators, and major development plans. A target of two to three stops per mile was used to space the stations, with narrower station spacing closer to downtown core areas and wider spacing further away from the downtowns. These station locations may be refined as corridors progress through further phases of project development.

Once the generalized station locations were identified, specific locations relative to intersections were defined and site conditions were determined. The starting point—or ideal operational condition—for each station in the Rapid Bus conceptual design was:

- Farside siting at intersections
- Bump-outs (curb extensions)
- Raised (nine-inch) curbs

Farside Stations

A farside stop is located just after an intersection with another roadway. Transitway operations benefit from farside stations over nearside stations because they eliminate conflicts between right-turning vehicles and stopped transit vehicles at the nearside of the intersection. Farside stops also maximize TSP effectiveness by allowing a transit vehicle to activate the priority call prior to arriving at the intersection, progress through the intersection, and then stop at the farside platform. Although TSP operations minimize the amount of delay from a traffic signal cycle, buses may be required to stop twice at an intersection with a nearside stop: once for a red traffic signal, and again at the station to load and unload riders. Farside station locations also afford the ability to add queue jump lanes that use the right-turn lane on the nearside of the intersection to bypass traffic.

A nearside station is located just before an intersection with another roadway. Nearside stations have been identified in the concept design where existing site conditions do not accommodate a farside station location. Nearside stations are less desirable from a transit operations perspective than farside stations because they minimize TSP effectiveness and do not address conflicting right-turn movements.

Bump-Outs/Curb Extensions

A bump-out platform is a section of the sidewalk that is extended from the existing roadway curb to the edge of the through lane for the length of the proposed platform. Once the bump-out platform ends, the sidewalk transitions back to the typical sidewalk width. Bump-out platforms were identified for the concepts where existing on-street parking is provided. Existing on-street parking is eliminated at the bump-out platform locations.

Bump-out platforms speed and improve bus operations by:

- Eliminating the need for buses to merge in and out of traffic to access the transit stations, thus minimizing bus delay
- Potential reduction in overall bus stop length, which may allow added parking stalls in space previously used for bus movement
- Providing additional space for station shelters and amenities
- Minimizing conflicts between waiting bus passengers and pedestrians using the sidewalk

WHAT WAS STUDIED?

At locations where bump-out platforms are not feasible due to existing site constraints, standard curbside platforms are assumed adjacent to the travel lane. Curbside platforms are located adjacent to the roadway curb of a street and are typically integrated into the surrounding sidewalk. In the curbside condition assumed in this study, buses also stop in the lane of traffic, eliminating the need for buses to merge into traffic when leaving the stations.

One of the disadvantages of both bump-out and curbside traffic lane platforms is traffic queuing may occur behind stopped buses. This may cause drivers to change lanes to avoid a stopped bus. In corridors with a single traffic lane, autos would not be able to pass stopped buses. While this configuration is common in streetcar operations, few bus routes currently operate this way in the Twin Cities region. As on streetcar routes, a stop in traffic requires careful traffic analysis and minimal station dwell time. Rapid Bus vehicles could alternate between curbside and curb extension stations based on ridership and traffic considerations to minimize traffic impact while providing a faster travel speed.

Raised Curbs

In a "level-boarding" environment, station platforms are placed on the same level as the floor of a transit vehicle. An example of level boarding can be found at light rail stations in the Twin Cities. This eliminates the need to use steps on a bus, which can be difficult for passengers with limited mobility, and add boarding time for all passengers. Often, level boarding is implemented using a combination of low-floor vehicles and raised platforms, as well as sophisticated guidance equipment. Platform ramps for level boarding can add significant length to the station area, affecting parking or other uses. To improve travel speeds with lower cost and fewer impacts, the Rapid Bus concept assumes that "near-level" boarding would be applied where site conditions allow through construction of nine-inch platforms. Although "near-level" boarding does not eliminate the need for ramps to be deployed for passengers who use mobility devices, it does narrow the gap for ramp deployment, ease vehicle access for other passengers with low mobility, and enable faster boarding and alighting of all passengers.

Station Design and Modular Sizing

Rapid Bus stations would have the premium components included at other transitway stations in the region, including enhanced customer information. At the same time, stations and boarding platforms will be sized to fit anticipated passenger demand and available space at the station location. For the purpose of cost estimation and to configure station features in a narrow footprint, a conceptual Rapid Bus station prototype was developed for this study. Station shelters vary in size based on existing and forecast passenger demand at each station location. The shelter design concept assumed the use of modular components with the flexibility to be used in multiple configurations or as standalone structures based on demand and site-specific conditions at each Rapid Bus station. Modular elements also help reduce station maintenance costs, as components could be readily replaced across the entire system. Four different shelter sizes were developed based on approximate ridership levels: extra-small (fewer than 40 daily boardings), small (40-100 boardings), medium (100-500 boardings), and large (more than 500 daily boardings). In all station shelter concepts, a vertical pylon common to each shelter size serves as both an identification element and functional kiosk for passenger ticketing and information.

A fifth station designation (station marker only) is included for stations with extremely tight site constraints. These small-footprint stations will feature a common corridor identifier with static information and the Rapid Bus brand, but no additional amenities. This designation was created to fit within very constrained locations to avoid right-of-way encroachments. In future project phases, the right-of-way assumptions will be refined based upon additional information and design development work that occurs.

WHAT WAS STUDIED?

Extra Small Prototype

Small Prototypes

Medium Prototypes

Large Prototypes

WHAT WAS STUDIED?

The conceptual station shelter layout allows free pedestrian movement for boarding and waiting. A roof and windscreen panels provide shelter from the elements. An optional back windscreen provides additional enclosure where space allows. Windscreens were included at bump-out station locations only. Station concept designs have flexibility to fit the range of sidewalk conditions that exist along each corridor. Sidewalk width is the primary factor in determining the configuration; the shelter can be as narrow as four feet wide without a back windscreen, and up to eight feet with one. In addition, the design provides the flexibility to easily add on additional shelter modules to increase the length should the ridership warrant it and site conditions allow expansion.

Station areas will incorporate other functional elements and amenities to accommodate passenger needs and establish a safe, comfortable, and convenient transit experience. These elements include:

- Bike racks
- Litter receptacles
- Static signage for stop/route/system and wayfinding information
- Real-time vehicle arrival and departure information signage
- Security cameras
- Emergency telephones
- Station lighting
- Push-button radiant heating

Operating Plans

Unique operating plans were developed for each corridor based on existing and future levels of transit demand. Operating plan development consisted of three steps:

- Estimating travel times for Rapid Bus routes
- Developing operating plans for Rapid Bus service
- Adjusting background bus networks to account for added Rapid Bus service

The assumptions described in the physical concept plans section drove the development of operating plans.

Travel Time Estimates

To gauge how much time could be saved by implementing a Rapid Bus concept, travel time estimates were developed for each corridor. Estimates of station-to-station travel times are based on a combination of existing roadway characteristics within the corridor, bus acceleration/deceleration rates, anticipated station dwell times (based on potential average boarding/alighting activity and time savings from off-vehicle fare collection), and traffic signal delays with and without TSP. Assumptions about each of these components were validated by developing travel time estimates for selected existing Metro Transit routes and comparing those calculated estimates to actual schedules.

Rapid Bus Operating Plans

Rapid Bus operating plans were defined to outline how frequently and during which times of day Rapid Bus would operate. Plans were based on the *Regional Transitway Guidelines*-established minimum operating standards for Rapid Bus. Specifically, the *Guidelines* state that Rapid Bus routes should operate daily with a minimum **16-hour span of service**. On weekdays, buses should operate **every 15 minutes or better** during the daytime and early evening hours. Weekday late evening service may be relaxed to 30- or 60-minute frequency if applicable. Weekend service frequency requirements are less stringent. While 15-minute frequency is preferred, 30- or 60-minute frequency may be applied where demand dictates.

For the ATCS, the following service spans were assumed to define each Rapid Bus service plan:

- A.M. peak – 5:30 a.m. to 8:30 a.m. (3 hours)
- Midday – 8:30 a.m. to 3:00 p.m. (6.5 hours)
- P.M. peak – 3:00 p.m. to 6:00 p.m. (3 hours)
- Early evening – 6:00 p.m. to 9:30 p.m. (3.5 hours)
- Late evening (by corridor, if applicable) – 9:30 p.m. to 1:00 a.m. (3.5 hours)

Time periods are for planning purposes and do not reflect current fare policy time span definition.

Background Bus Network

Rapid Bus will become the principal route in each corridor, with local bus service generally continuing to operate at reduced frequencies. An effective background bus network is critical to the successful implementation of Rapid Bus service. The reason for this is twofold. First, comparable or improved levels of service must be implemented throughout the corridor—service generally should not be decreased on branches or other areas outside the direct Rapid Bus corridor, and transfers should be kept to a minimum. Second, there is still a need to provide service to passengers at stops between proposed Rapid Bus-designated stops. Although roughly 98 percent of current passengers are within one stop of proposed stations, wider stop spacing may not meet the needs of all users. The background bus network fulfills the need for a high-access alternative; service plans adjust frequency to demand.

Capital and Operating Cost Estimates

After concept corridor and operating plans were developed for each alternative, costs of these improvements were estimated. Two types of cost estimates were completed during the ATCS: capital costs (the one-time cost of building the Rapid Bus infrastructure) and operating costs (the ongoing cost of providing bus service and maintaining the infrastructure).

Capital Costs

Capital costs include the one-time expenditures to build a system. Typically, capital costs include corridor improvements, stations, structures, signalization and communications systems, operations and maintenance facilities, vehicles, and right-of-way acquisition. Also included are “soft costs” for items such as engineering, construction services, insurance, and owner’s costs, as well as contingencies for uncertainty in both the estimating process and the scope of the project.

At this early study stage, there is not sufficient definition or detail to prepare detailed construction cost estimates for the various alternatives under consideration. Rather, the capital cost estimates were developed using representative typical unit costs or allowances on a per-unit basis that are consistent with this level of review. The capital cost estimation methods are consistent for each corridor, which allows for a relative comparison of the 11 corridors. Capital cost estimates developed for this study will undergo refinement based on additional design development work in future project phases.

Operating and Maintenance (O&M) Costs

O&M cost estimates incorporate costs that are anticipated for general bus operations and maintenance, and additional costs related to Rapid Bus-specific service and facility features.

A spreadsheet cost model reflecting actual 2010 Metro Transit expenditures was developed to estimate operating costs for bus operations. Service variables driving the cost model include revenue bus-hours, revenue bus-miles, and maximum number of buses in service during the peak period (peak buses). Operating statistics (revenue bus-hours, revenue bus-miles, and peak buses) were determined for each proposed Rapid Bus route, and for proposed background bus service changes within each Rapid Bus corridor. The unit costs were applied to these statistics to determine O&M costs for each corridor.

WHAT WAS STUDIED?

Several Rapid Bus-specific features are not specifically captured in the standard cost model, but would require investment beyond standard hour and mile allowances. These Rapid Bus features include:

- Fare collection O&M
- Rapid Bus station maintenance and snow removal
- Police/fare enforcement
- ITS/TSP equipment maintenance

Fare Collection

Fare collection O&M costs include maintenance of TVMs at Rapid Bus stations and maintenance of Go-To Card (contactless fare payment) validators on Rapid Bus vehicles. Metro Transit experience suggests a typical annual O&M cost of $10,000 per TVM for maintenance and cash handling. Annual maintenance of on-board Go-To Card validators is estimated at $200 per validator. A validator is needed on each vehicle door (two validators per 40-foot vehicle and three validators per 60-foot vehicle).

This concept assumes that Rapid Bus vehicles will no longer require fareboxes or peripheral units due to the use of off-board fare collection. Metro Transit experience suggests an annual O&M cost savings of $2,000 per bus through the removal of fareboxes.

Station Maintenance & Snow Removal

Rapid Bus station maintenance will require additional Metro Transit staff for periodic cleaning and maintenance of each station. Metro Transit experience suggests one full-time employee for every 40 directional Rapid Bus stations, at an annual cost of $80,000 per employee (including fringe benefit costs). This estimate was derived from current estimates of one full-time maintenance employee per 100 standard shelters, and assumes a higher level of maintenance and cleaning than standard shelters.

Enhanced snow removal is also assumed at each directional Rapid Bus station. An annual cost of $3,500 per station stop has been assumed for snow removal, based on contract rates for enhanced snow removal on the Marquette-2nd Avenue bus lanes in downtown Minneapolis. Transit centers and downtown stops already receive this level of snow removal, which includes clearing the full platform area and removing the snow bank/windrow after snow events.

Police and Fare Enforcement

Additional police/fare enforcement is also proposed for Rapid Bus stations. Cost data from Blue Line (Hiawatha) LRT has been used to estimate additional police/fare enforcement levels and costs. Metro Transit staff estimates a need for 0.1914 police officer hours for every in-service bus hour. In-service hours were calculated for each Rapid Bus route. An annual cost of $100,000 has been assumed for each police officer (including fringe benefit costs), with 1,800 annual hours of enforcement time per police officer.

ITS/TSP

ITS/TSP equipment maintenance is the last element considered as additional Rapid Bus-specific O&M costs. Real-time information signage is assumed at each directional stop, with an annual maintenance cost of $2,600 per directional stop. Travel time estimates developed for the ATCS reflect a specific number of intersections assumed to have TSP; an annual O&M cost of $2,800 has been assumed for each of these intersections with TSP. Cost estimates are based upon local experience with technology projects.

Ridership Forecasts

Rapid Bus corridor ridership for the horizon year of 2030 was estimated using the Twin Cities Regional Travel Demand Forecast Model. The Regional Travel Demand Forecast Model includes a transit network representing September 2010 transit service levels. The Metropolitan Council is in the process of developing its long-term service improvement plans, which remained in draft form when this analysis was completed. To the extent possible, all major planned or programmed changes to the regional transit system were assumed in the forecasts. In addition, other year 2030 assumptions identified in the *Transportation Policy Plan* were added to the transit network, including Blue Line (Hiawatha) and Green Line (Central and Southwest) LRT, and Red Line (Cedar Avenue) and Orange Line (I-35W) BRT.

Route patterns for affected routes in each Rapid Bus corridor were adjusted to represent changes to frequency and travel time identified in the concept operating plans. First, the travel demand model was used to determine the expected change in transit ridership due to background service improvements or residential and employment changes in the corridor outside of Rapid Bus improvements—a "baseline" condition for 2030 that accounts for growth without building Rapid Bus. Then, the model was used to measure the increase in transit riders due to Rapid Bus improvements. Ridership was modeled on a corridor-by-corridor basis, not a system forecast of multiple lines. A network of corridors may offer additional ridership benefits not captured in this study, or small potential reductions on overlapping segments in a few study corridors.

What does Rapid Bus mean for each corridor?

Profiles of existing conditions and proposed Rapid Bus concepts are presented on the following pages for each of the 11 corridors:

- Snelling Avenue
- Lake Street
- American Boulevard
- Central Avenue
- West Broadway
- Hennepin Avenue
- Nicollet Avenue
- Chicago Avenue
- West 7th Street
- East 7th Street
- Robert Street

Each existing conditions profile includes:

- A description of the corridor and major destinations
- Current and forecast population and employment along the corridor
- Future land use changes
- General roadway conditions
- Existing transit service characteristics and demand

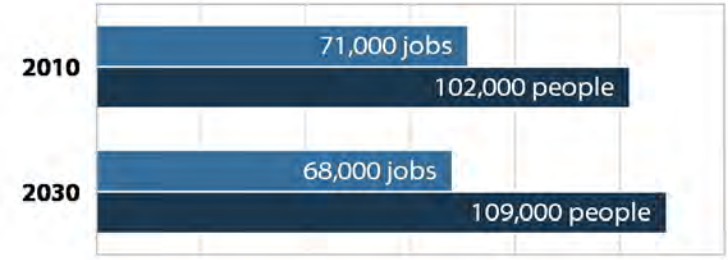
The Rapid Bus concept profile for each corridor includes:

- Corridor map with conceptual station locations
- Summary of station spacing and potential travel time improvement
- Conceptual renderings of stations
- Concept operating plan and service frequencies
- Key information on cost to build, ongoing cost of operation, and forecasted ridership

SNELLING AVENUE EXISTING CONDITIONS

The proposed Snelling Avenue corridor follows Snelling Avenue from Rosedale Transit Center to Ford Parkway, and then continues west along Ford Parkway and 46th Street to the 46th Street Blue Line (Hiawatha) LRT Station. Major destinations along the corridor include Rosedale Mall, Har Mar Mall, the University of Minnesota's St. Paul Campus, HHH Job Corps, the Minnesota State Fairgrounds, Hamline University, Midway Shopping Center, Macalester College, Sibley Plaza, Highland Village, and the recently-closed Ford Plant.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

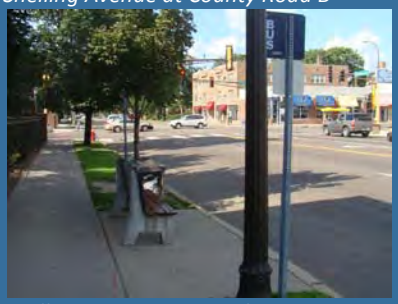
Future Land Use Changes

- Redevelopment opportunity at Snelling and University, with potential for St. Paul's highest density development outside of downtown.
- Stable demand for gradual increases in housing density from St. Catherine University, Macalester College, Hamline University, and St. Thomas University.
- Potential for enormous change in land use and density/intensity at the Ford Plant.
- Substantial ongoing, planned, and anticipated growth at 46th Street LRT Station.

General Roadway Conditions

Snelling Avenue is generally a four-lane roadway with no parking allowed. On Ford Parkway and 46th Street, there are one or two lanes per direction, and parking is allowed in some sections. Signalized intersections are located approximately every 3-4 blocks in St. Paul; signal spacing is wider in Roseville and in Minneapolis.

Snelling Avenue at County Road B



Snelling Avenue at Grand Avenue

Existing Transit Service

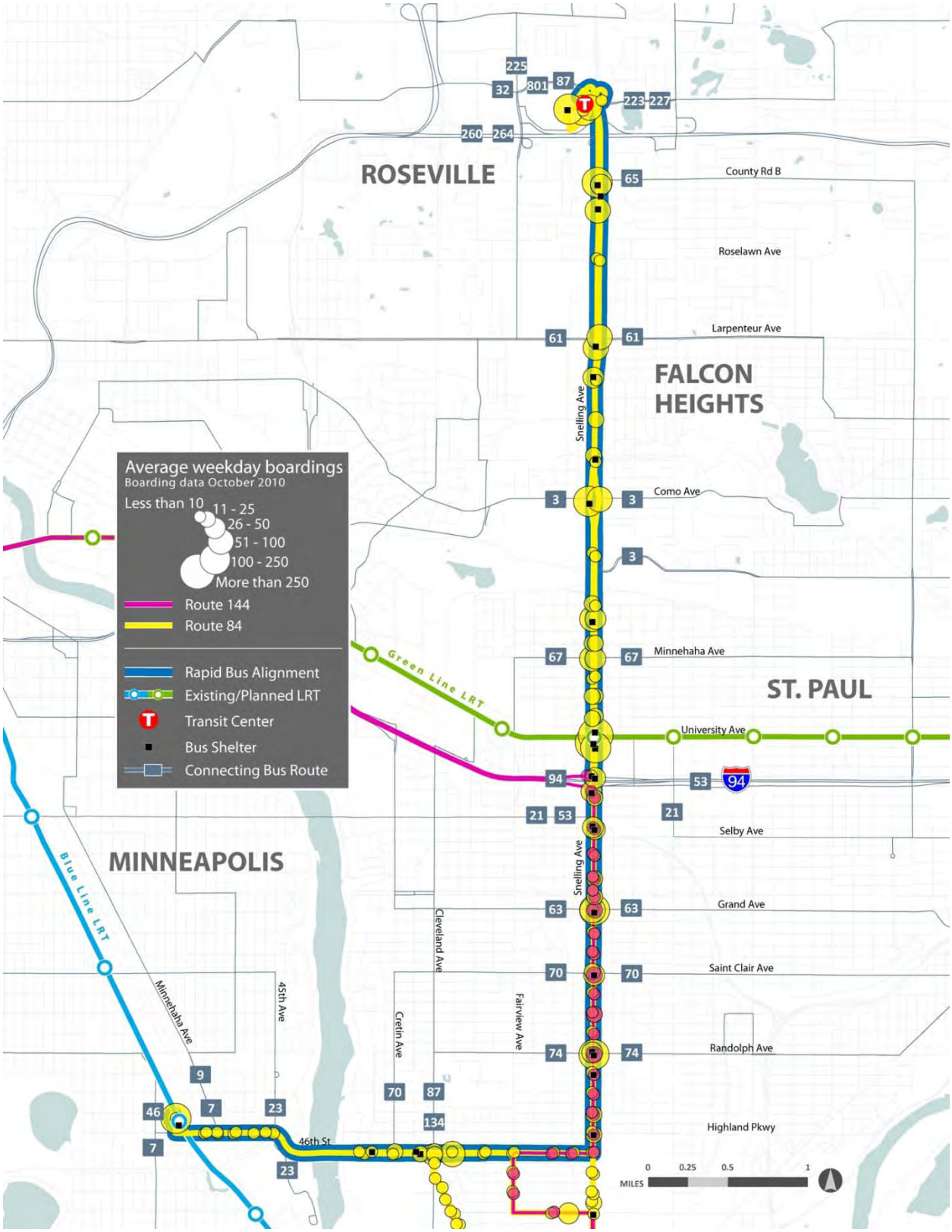
Route 84 is the primary route serving the Snelling Avenue corridor. Route 84 operates daily with two primary patterns—one between Rosedale Transit Center and 46th Street Station and the other between Rosedale Transit Center and Davern Street. The route generally operates every 15 minutes on weekdays and Saturdays, with 30-minute service during evenings and on Sundays. The portion of Route 84 north of Ford Parkway is part of Metro Transit's Hi-Frequency Network.

The pattern serving 46th Street was identified as the Rapid Bus alignment due to higher ridership demand and increased service levels, as well as faster travel compared to the St. Paul Avenue-West 7th-Davern routing.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed	16.2 mph
Average Weekday Corridor Riders (All Routes)	3,800
On-Time Performance	90.7%

In addition to Route 84, peak-only **Route 144** provides express service to downtown Minneapolis for the segment of the corridor south of I-94. **Routes 21** and **53** operate on portions of Snelling Avenue between University Avenue and Marshall Avenue, and several additional routes operate on Ford Parkway between Cleveland Avenue and 46th Street Station.

EXISTING TRANSIT SYSTEM



SNELLING AVENUE RAPID BUS CONCEPT

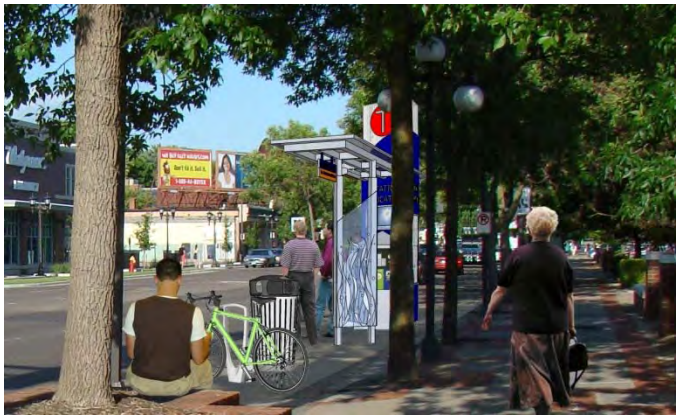
By the Numbers

- **9.7** miles long
- **21** proposed station locations
- **0.5 mile** on average between stations
- **27%** faster trip between Rosedale and 46th Street Station versus current Route 84
- **97%** of existing customers within one stop of a station
- **2** transitway connections (Green Line LRT and Blue Line LRT)
- **9 buses** needed to provide service

Concept Operating Plan

Upon implementation of Snelling Avenue Rapid Bus, the 46th Street pattern of Route 84 is replaced, and the Davern Street pattern is modified to serve Highland Park High School on select trips. Sunday service frequencies on Route 84 are improved to 30 minutes. Route 144 is replaced by Rapid Bus and Route 94 express or Green Line (Central) LRT service.

Conceptual Station Designs



Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 84	15	15	15	30
Route 144	20	-	-	-

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**10**	**10**	**15**	**30**
Route 84	30	30	30	30
Route 144		*Replaced*		

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$26,800,000**
Cost per Mile	$2,800,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$4,870,000
Reductions to Existing Bus Service	-$2,190,000
Net Change in Service Costs	$2,680,000
Additional Rapid Bus Costs	$1,070,000
Total Change in Costs	**$3,750,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	3,500
2030 Corridor Ridership ("Baseline" without Rapid Bus)	5,700
Additional Ridership From Adding Rapid Bus	+ 3,000
2030 Corridor Ridership (Rapid Bus + Background Service)	**8,700**

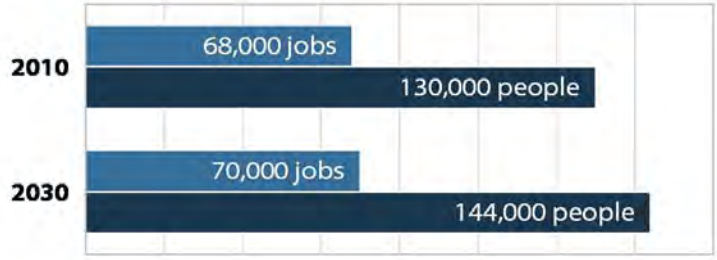
SNELLING AVENUE

RAPID BUS CONCEPT

LAKE STREET EXISTING CONDITIONS

The proposed Lake Street corridor begins west of Excelsior Boulevard at the West Lake Station on the planned Green Line (Southwest) LRT extension. The corridor follows Lake Street and Marshall Avenue to Snelling Avenue, and then follows Snelling to University Avenue. Major destinations along the corridor include the Uptown commercial district, the Chicago-Lake Transit Center and Midtown Exchange, South High School, Hi-Lake Shopping Center, the Lake Street/Midtown Station on the Blue Line (Hiawatha) LRT, and the Midway Shopping Center in St. Paul.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

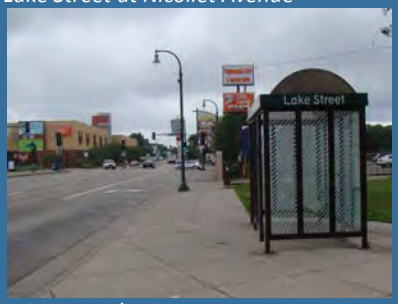
Future Land Use Changes

- Significant increases in housing density likely at West Lake and Midtown LRT stations.
- Several fairly large-scale housing development projects in planning or implementation phases along Midtown Greenway.
- Stable and successful Uptown Activity Center at Lake/Hennepin.
- Stable residential corridor on St. Paul side of river, with University of St. Thomas contributing to transit market and long-term housing densification potential.
- Redevelopment opportunity at Snelling and University, with potential for St. Paul's highest density development outside of downtown.

General Roadway Conditions

The majority of Lake Street has two travel lanes per direction. On Marshall Avenue, the roadway consists of one lane per direction with striped bike lanes. Parking is allowed in much of the corridor on both sides of the river. Signalized intersections are spaced every 2-3 blocks.

Lake Street at Nicollet Avenue



Lake Street/Midtown LRT Station

Existing Transit Service

Route 21 is the primary route serving the Lake Street corridor. The route begins at the Uptown Transit Station at Lake and Hennepin and follows Lake Street/Marshall Avenue to Snelling Avenue. The route turns north to the Midway Shopping Center at Snelling and University, and then follows Selby Avenue into downtown St. Paul. Two primary route patterns operate on weekdays—one traveling the full alignment to downtown St. Paul, and one shortline ending at the University of St. Thomas.

Combined weekday frequencies are generally 6 to 10 minutes; frequencies east of Summit and Finn are generally 15 to 20 minutes. Route 21 is part of Metro Transit's Hi-Frequency Network between the Uptown Transit Station and Cretin Avenue. Saturday frequencies along the trunk portion of Route 21 are generally 6 to 10 minutes. Sunday frequencies are 6 to 15 minutes.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed	10.0 mph
Average Weekday Corridor Riders (All Routes)	10,000
On-Time Performance	86.1%

In addition to Route 21, peak-only **Route 53** provides limited stop service between the Lake Street corridor and downtown St. Paul via I-94 east of Snelling Avenue. **Route 17** operates on Lake Street west of Hennepin Avenue, along with Routes 12 and 114.

EXISTING TRANSIT SYSTEM

LAKE STREET RAPID BUS CONCEPT

By the Numbers

- **8.5** miles long
- **24** proposed station locations
- **0.4 mile** on average between stations
- **31%** faster trip between Uptown and Snelling/University compared to current Route 21
- **98%** of existing customers within one stop of a station
- **4** transitway connections (Green Line LRT [2], Orange Line BRT, Blue Line LRT)
- **14 buses** needed to provide service

Concept Operating Plan

Upon implementation of Lake Street Rapid Bus, the University of St. Thomas pattern of Route 21 is replaced. Route 53 is also replaced by Rapid Bus and Green Line (Central) LRT. Route 17 is unchanged.

Conceptual Station Designs

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 21	10	7	10	15
Route 53	20-30	--	--	--

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**7.5**	**10**	**10**	**30**
Route 21	15-20	20	20	30
Route 53		*Replaced*		

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$42,500,000**
Cost per Mile	$5,000,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$6,970,000
Reductions to Existing Bus Service	-$3,630,000
Net Change in Service Costs	$3,340,000
Additional Rapid Bus Costs	$1,470,000
Total Change in Costs	**$4,810,000**

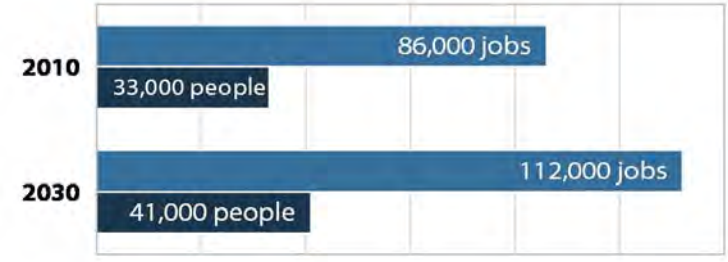
WEEKDAY RIDERSHIP	
2010 Corridor Ridership	10,700
2030 Corridor Ridership ("Baseline" without Rapid Bus)	14,300
Additional Ridership From Adding Rapid Bus	+ 3,800
2030 Corridor Ridership (Rapid Bus + Background Service)	**18,100**

RAPID BUS CONCEPT

AMERICAN BOULEVARD EXISTING CONDITIONS

The proposed American Boulevard corridor follows American Boulevard and I-494. This corridor begins at the Mall of America (MOA) and follows American Boulevard to the Normandale Lakes office park. The alignment then follows I-494, operating nonstop to Eden Prairie (Prairie Center Drive). An LRT station is planned for this location as part of the Green Line (Southwest) LRT. High-rise office buildings are located at France Avenue, and the Normandale Lakes office park anchors the route on the western end.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

Future Land Use Changes

- Bloomington has designated three major growth nodes, all of them in the I-494/American Boulevard corridor: Penn-American, South Loop, and Normandale Lakes.
- The city has adopted the Normandale Lakes District Plan for high-density mixed use development.
- Bloomington is currently preparing District Plans to guide transit-supportive growth in the Penn-American and South Loop areas.
- A variety of development and redevelopment sites are available throughout the corridor that would significantly increase employment and households in the corridor.

General Roadway Conditions

The majority of American Boulevard has two travel lanes per direction with short stretches with of three lanes per direction. Approximately half of the alignment travels along I-494 to Eden Prairie. There is no parking or bike lane on this corridor. Signalized intersections are spaced every 3-4 blocks along American Boulevard.

American Boulevard at Portland Avenue

American Boulevard at 12th Avenue

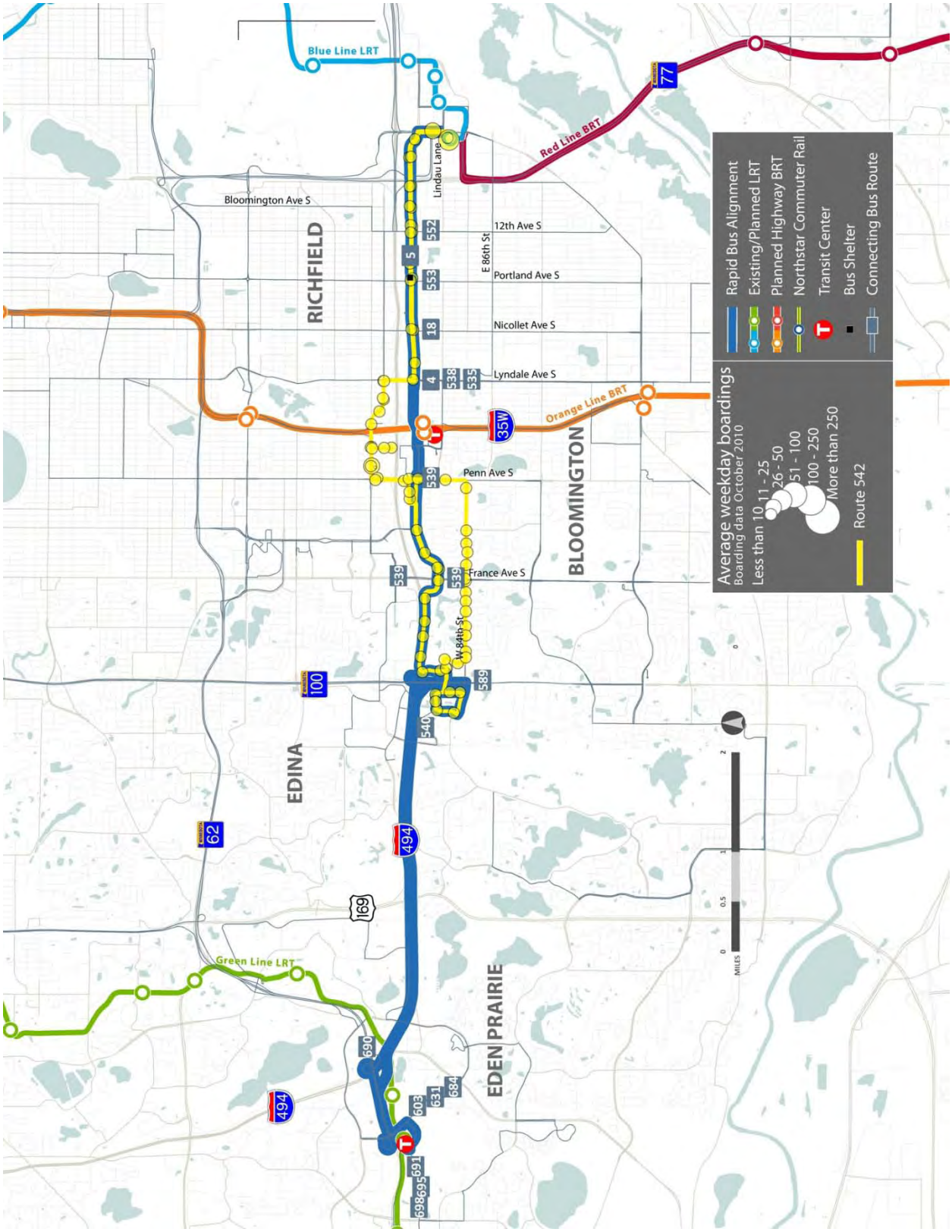
Existing Transit Service

Route 542 is the primary route serving the American Boulevard corridor, serving the eastern portion between Normandale Lakes and MOA. There is currently no east-west transit service in the western portion of the corridor between Normandale Lakes and Prairie Center Drive. Route 542 operates during weekday peak periods only at 30-minute frequencies.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed	16.8 mph
Average Weekday Corridor Riders	200
On-Time Performance	96.0%

AMERICAN BOULEVARD

EXISTING TRANSIT SYSTEM



AMERICAN BOULEVARD RAPID BUS CONCEPT

By the Numbers

- **14.3** miles long
- **19** proposed station locations
- **0.8 mile** on average between stations
- **22%** faster trip between MOA and Normandale Lakes versus Route 542
- **90%** of existing customers within one stop of a station
- **4** transitway connections (Green Line LRT, Blue Line LRT, Orange Line BRT, Red Line BRT)
- **6 buses** needed to provide service

Conceptual Station Design

Concept Operating Plan

Upon implementation of American Boulevard Rapid Bus, Route 542 is completely replaced by the Rapid Bus service, with expanded hours of service and improved service frequency.

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 542	30	--	--	--

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**15**	**15**	**15**	**--**
Route 542		*Replaced*		

Cost and Ridership

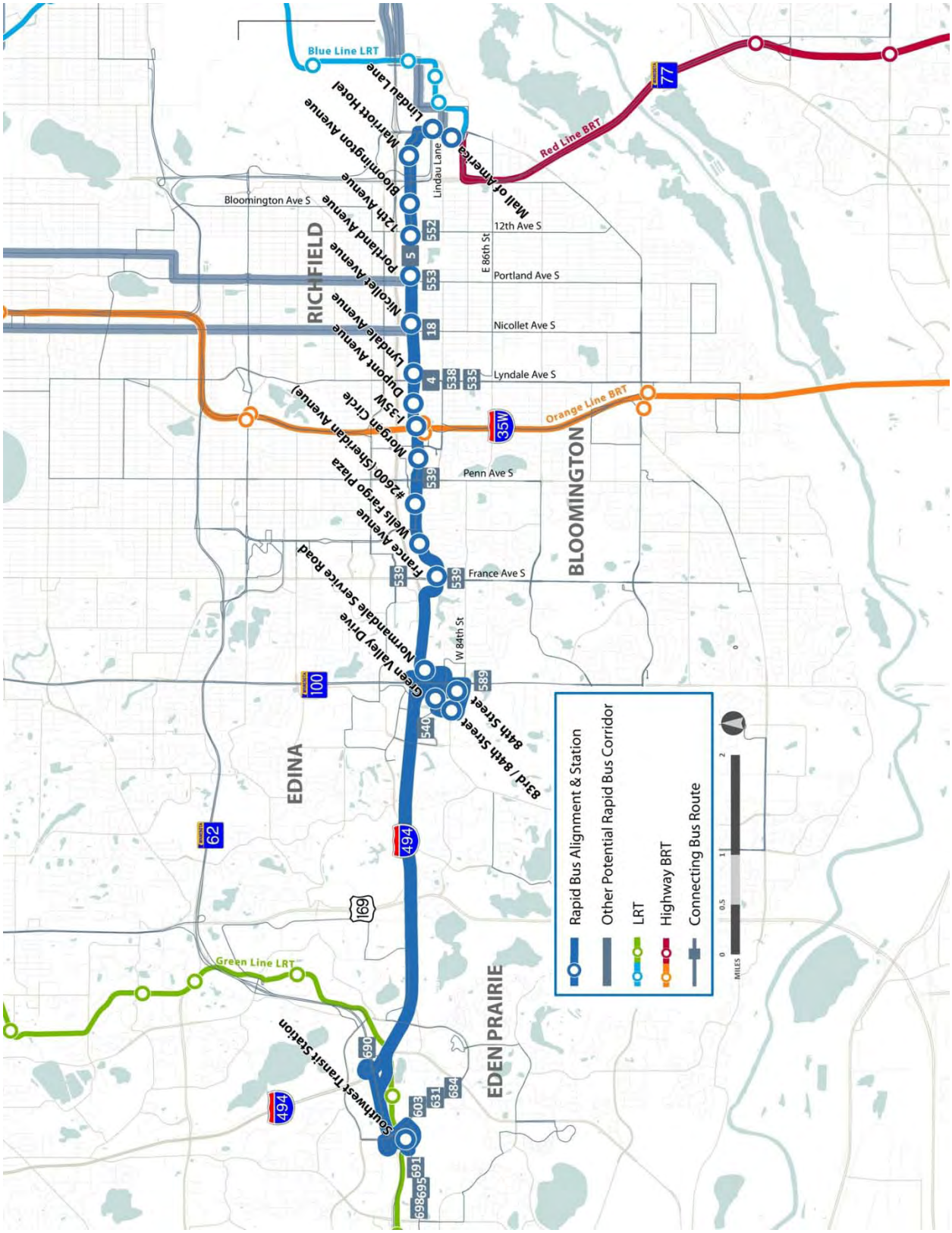
CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$18,000,000**
Cost per Mile	$1,200,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$3,220,000
Reductions to Existing Bus Service	-$670,000
Net Change in Service Costs	$2,550,000
Additional Rapid Bus Costs	$780,000
Total Change in Costs	**$3,330,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	200
2030 Corridor Ridership ("Baseline" without Rapid Bus)	400
Additional Ridership From Adding Rapid Bus	+ 3,700
2030 Corridor Ridership (Rapid Bus + Background Service)	**4,100**

AMERICAN BOULEVARD

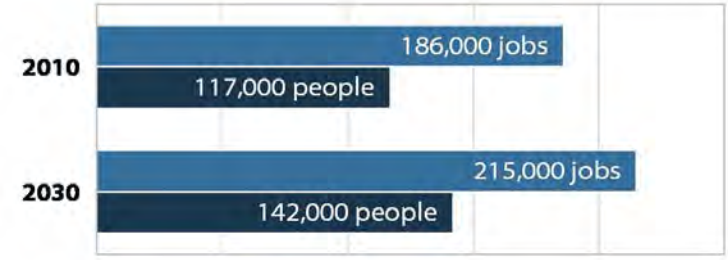
RAPID BUS CONCEPT



CENTRAL AVENUE EXISTING CONDITIONS

The proposed Central Avenue corridor follows Central Avenue from downtown Minneapolis to 53rd Street in Columbia Heights, turning west on 53rd, and following University Avenue north to the Northtown Transit Center. The alignment serves downtown Minneapolis, a mixed-use commercial corridor in northeast Minneapolis north of the Mississippi River, Columbia Heights Transit Center at 41st Avenue, and downtown Columbia Heights. The corridor transitions to a more suburban setting north of downtown Columbia Heights and in Fridley.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

Future Land Use Changes

- Strong East Hennepin Activity Center which will continue to grow.
- Redevelopment opportunity at the A-Mill site which could create hundreds of new housing units
- Continued housing densification and job creation at the Lowry Activity Center
- Redevelopment opportunity just off Central and Broadway in the Minneapolis Public Schools old headquarters
- Stable Commercial Corridor north of Broadway.

General Roadway Conditions

Central Avenue has two travel lanes per direction . Parking is allowed on northbound Central Avenue between 37th and 27th Avenue; and on both sides of Central between 27th and 13th Avenue. Currently, there are no bike lanes on Central Avenue. Signalized intersection are spaced every 2-3 blocks.

Central Avenue at Spring Street

Central Avenue at 40th Avenue

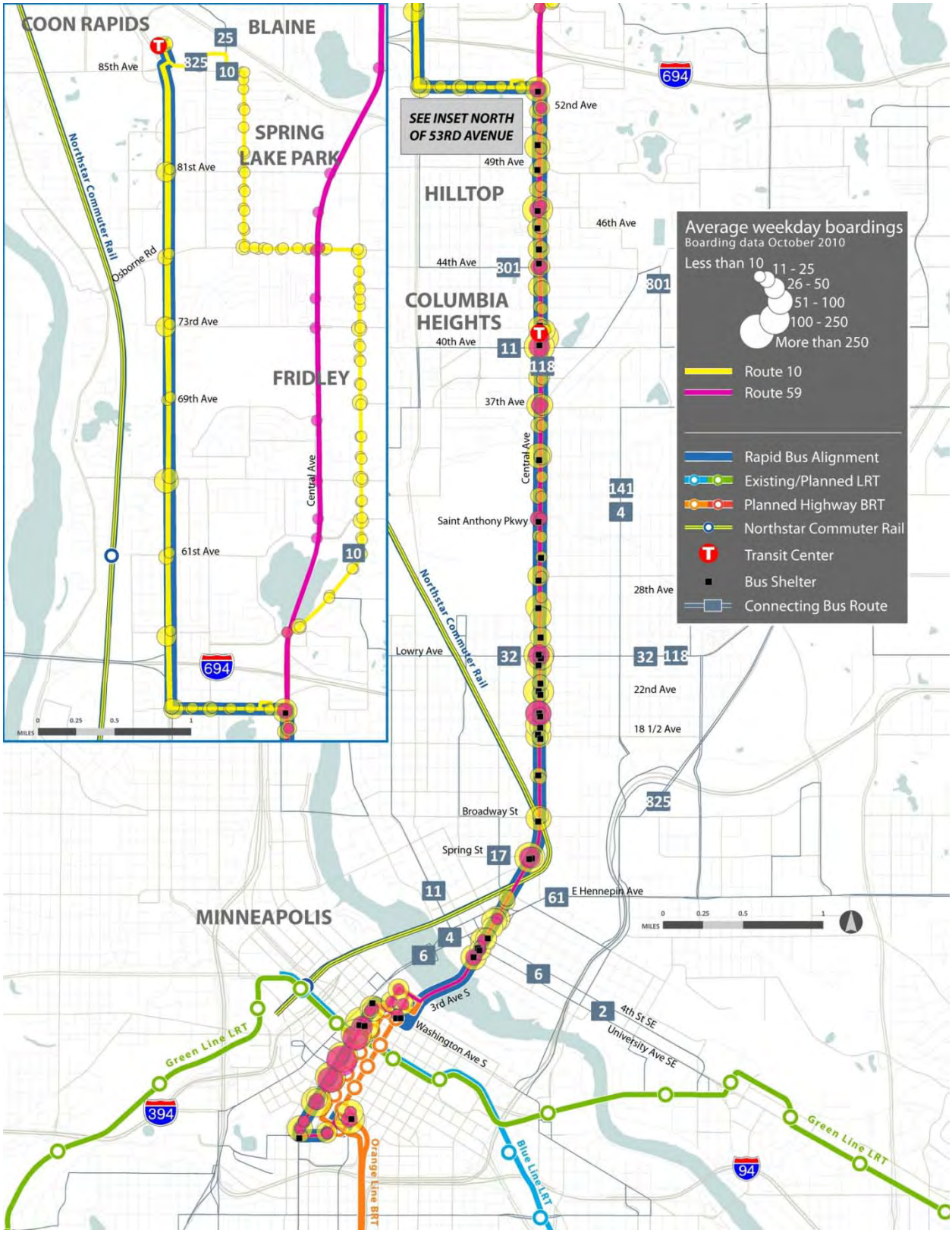
Existing Transit Service

Route 10 is the primary route serving the Central Avenue corridor. The route has three patterns—10N, which follows Central Avenue from downtown to Northtown; 10U, which follows Central/University to Northtown; and 10C, which turns back at the Columbia Heights Transit Center. During weekdays, every third trip generally does one of the above-noted patterns, each at about 30-minute frequencies, resulting in a combined 10-minute or better frequency. On Saturdays, the 10N and 10U operate at 60-minute frequencies each and the 10C operates at 30-minute frequencies, resulting in a combined 15-minute average frequency. On Sundays, the 10N, 10U, and 10C all operate at 60-minute frequencies, resulting in a combined 20-minute frequency. Route 10 is part of Metro Transit's Hi-Frequency Network between downtown Minneapolis and the Columbia Heights Transit Center.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 10)	13.1 mph
Average Weekday Corridor Riders (All Routes)	7,000
On-Time Performance (Route 10)	81.9%

Route 59 also serves this corridor, providing peak-only limited stop service between Central Avenue/53rd Street and downtown Minneapolis. A few Route 59 trips also provide service north of 53rd Street. Route 118 also operates on Central Avenue from Lowry Avenue to the Columbia Heights Transit Center, directly connecting a portion of the corridor to the University of Minnesota.

EXISTING TRANSIT SYSTEM



CENTRAL AVENUE RAPID BUS CONCEPT

By the Numbers

- **13.5** miles long
- **28** proposed station locations
- **0.5 mile** on average between stations
- **16%** faster trip between downtown Minneapolis and Northtown versus current Route 10
- **98%** of existing customers within one stop of a station
- **2** transitway connections (Green Line LRT and Blue Line LRT)
- **16 buses** needed to provide service

Concept Operating Plan

Two Rapid Bus patterns are introduced—one to Northtown Transit Center and a shortline running to 53rd Avenue. Upon implementation of Rapid Bus, the 53rd Avenue and University Avenue patterns of Route 10 are replaced with Rapid Bus. Service frequencies on the remaining Route 10 pattern (via Central Avenue) are adjusted. Route 59 is also replaced by Rapid Bus service.

Conceptual Station Designs

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 10	10	10	20	30
Route 59	10	--	--	--

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus to Northtown	**15**	**15**	**15**	**30**
Rapid Bus to 53rd	**15**	**30**	**--**	**--**
Route 10	30	30	60	60
Route 59	*Replaced*			

Cost and Ridership

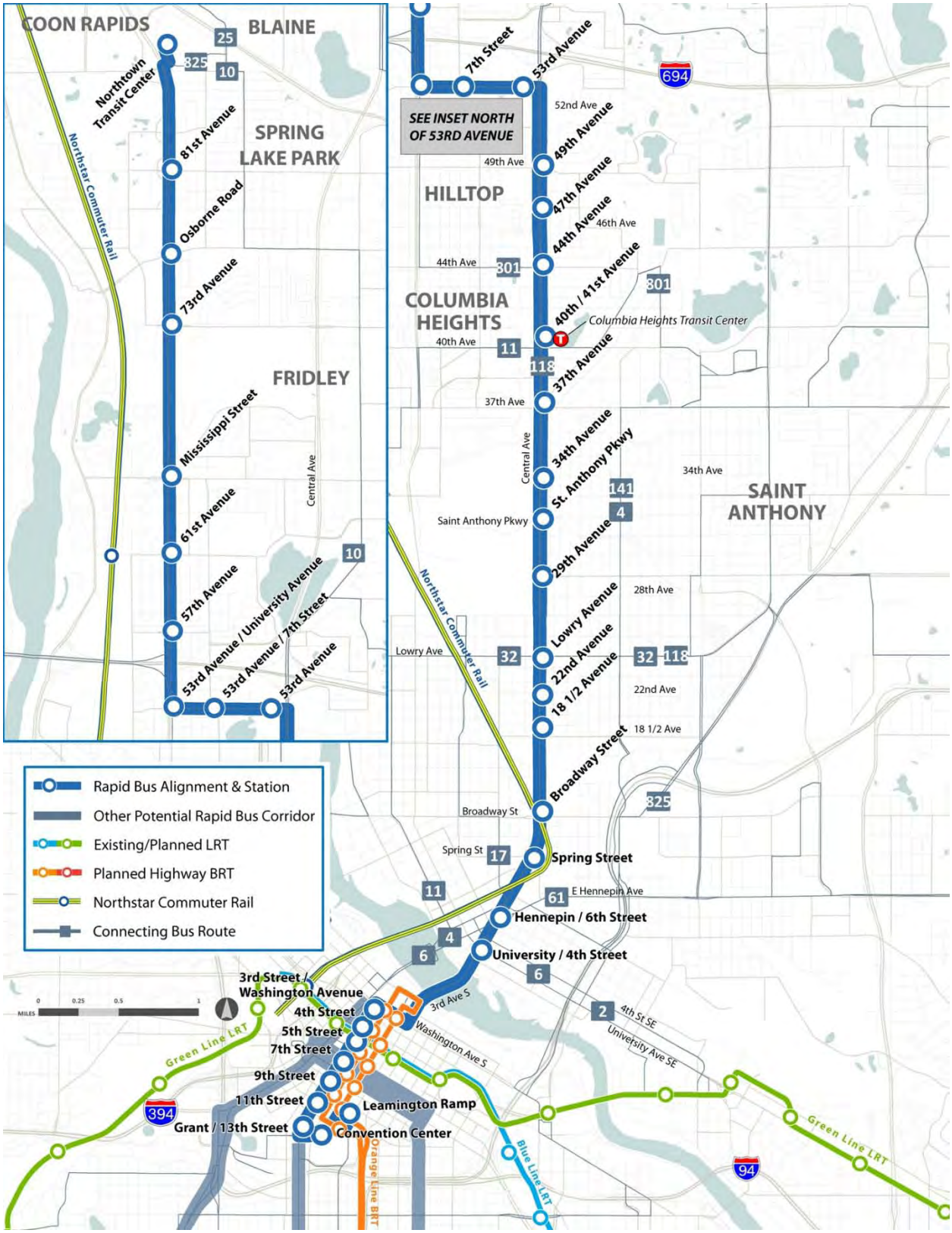
CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$58,000,000**
Cost per Mile	$4,200,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$7,380,000
Reductions to Existing Bus Service	-$4,480,000
Net Change in Service Costs	$2,900,000
Additional Rapid Bus Costs	$1,780,000
Total Change in Costs	**$4,680,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	7,500
2030 Corridor Ridership ("Baseline" without Rapid Bus)	10,700
Additional Ridership From Adding Rapid Bus	+ 3,700
2030 Corridor Ridership (Rapid Bus + Background Service)	**14,400**

CENTRAL AVENUE

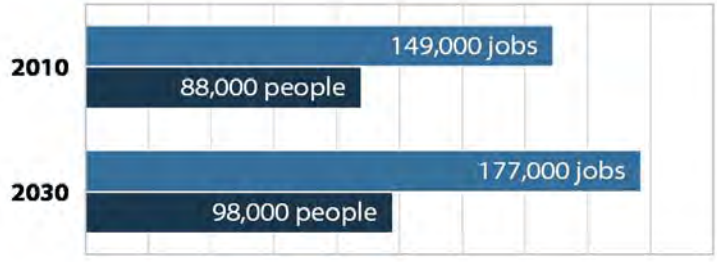
RAPID BUS CONCEPT



WEST BROADWAY AVENUE EXISTING CONDITIONS

The proposed West Broadway corridor begins in downtown Robbinsdale and follows West Broadway Avenue, France Avenue, Oakdale Avenue, West Broadway Avenue, Lyndale Avenue and 7th Street into downtown Minneapolis. The alignment serves destinations including downtown Robbinsdale, the Terrace Mall, North Memorial Medical Center, medium-density residential neighborhoods, North High School, Cub Foods at West Broadway and Aldrich, and Broadway Center at West Broadway and Lyndale.

***Population and Employment** within 1/2 mile of corridor*



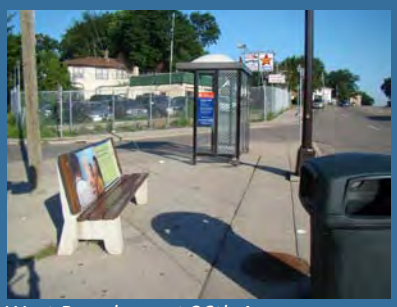
(2030 forecasts based on approved local plans)

Future Land Use Changes

- Construction of the new Minneapolis Public Schools headquarters and a new Hennepin County service Center at West Broadway and Girard will increase the density of jobs in the corridor
- Above the Falls is an area of major recent and future industrial development. Several opportunities exist to redevelop existing sites.
- Stable commercial corridor in Robbinsdale.

General Roadway Conditions

Outside of downtown, most of the West Broadway corridor has two travel lanes per direction. Parking is allowed in some of the corridor. There is a bike lane on 7th Street in downtown. Signalized intersections are spaced every 3-4 blocks with closer spacing in downtown.



West Broadway at 26th Avenue

Lyndale Avenue at West Broadway

Existing Transit Service

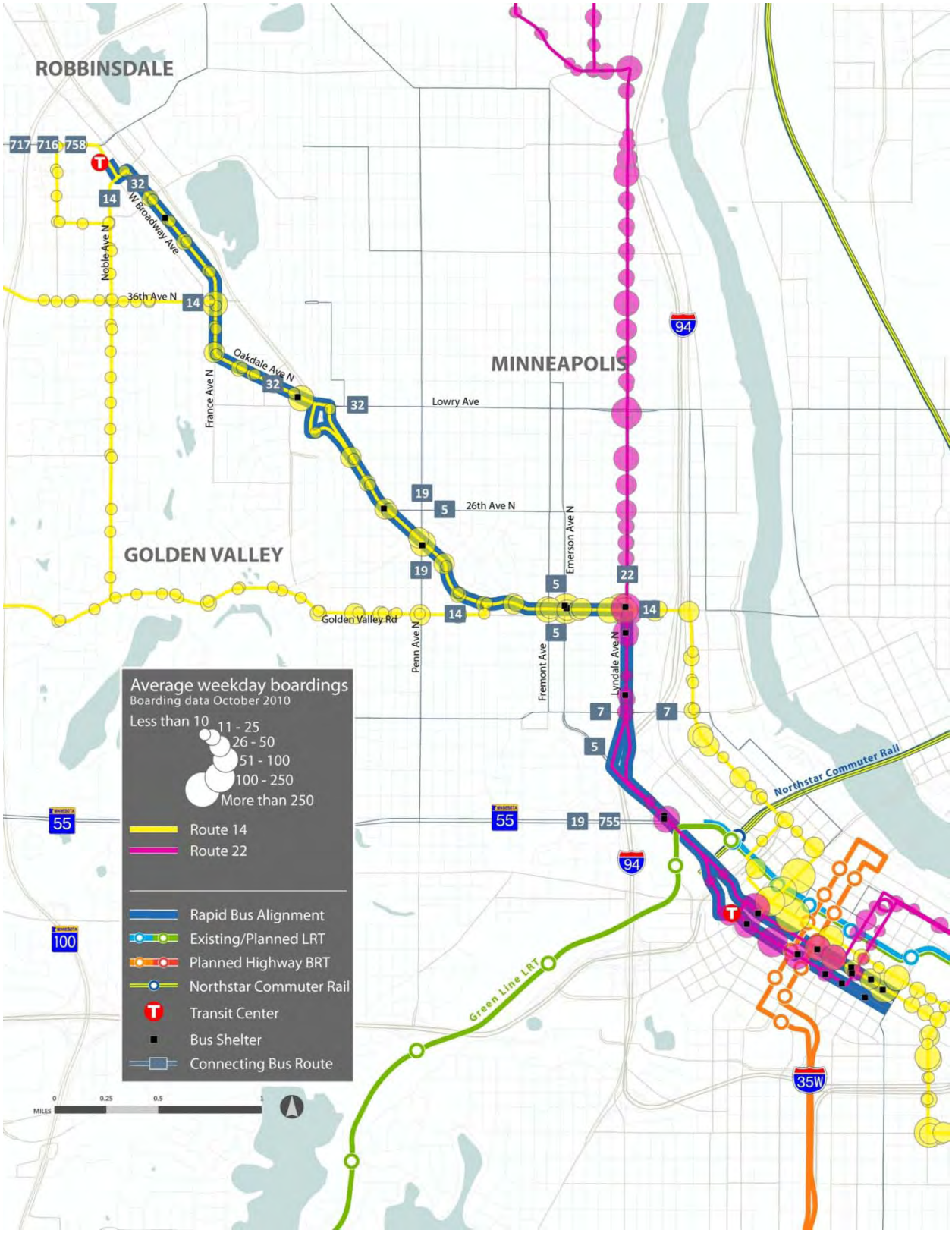
Route 14 is the primary route serving the West Broadway Avenue corridor. Route 14 begins northwest of downtown Minneapolis at the Robbinsdale Transit Center and travels through downtown Minneapolis and south on Bloomington Avenue, ending at Cedar Avenue and 66th Street. There are several different route patterns, but most trips begin at the Robbinsdale Transit Center. Some trips follow Broadway Avenue. Other trips follow Noble and 36th Avenue to Broadway. Other trips begin at Douglas and follow Golden Valley Road to Broadway. Route patterns consolidate at Broadway and Golden Valley Road and all patterns travel along West Broadway and Washington Avenue through Minneapolis. Weekday service frequencies from this location into downtown Minneapolis are generally 15 minutes in the peak periods, 20 minutes in the midday period and 30 minutes in the evening. Saturday and Sunday frequencies are generally 20 minutes during the day and 30 minutes in the evening.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 14)	12.8 mph
Average Weekday Corridor Riders (All Routes)	3,100
On-Time Performance (Route 14)	87.4%

In addition to Route 14, **Route 22** operates along the alignment from Broadway/Lyndale south into downtown Minneapolis, and **Route 32** operates on West Broadway Avenue between Lowry Avenue and the Robbinsdale Transit Center.

WEST BROADWAY AVENUE

EXISTING TRANSIT SYSTEM



WEST BROADWAY AVENUE RAPID BUS CONCEPT

By the Numbers

- **5.6** miles long
- **15** proposed station locations
- **0.4 mile** on average between stations
- **25%** faster trip between downtown Minneapolis and Robbinsdale Transit Center versus current Route 14
- **100%** of existing customers within one stop of a station
- **3** transitway connections (Green Line LRT, Blue Line LRT, Orange Line BRT)
- **5 buses** needed to provide service

Concept Operating Plan

Upon implementation of West Broadway Avenue Rapid Bus, the West Broadway pattern of Route 14 is replaced by Rapid Bus west of Knox Avenue. The downtown movements of Routes 14 and 22 are also exchanged, with Route 14 aligned through downtown via 7th and 8th Streets (similar to the Rapid Bus) and Route 22 realigned to travel on Washington Avenue.

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 14	15	20	20	30
Route 22	15	20	30	30

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**15**	**15**	**20**	**30**
Route 14	30	60	60	60
Route 22	15	20	30	30

Conceptual Station Designs

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$18,000,000**
Cost per Mile	$3,300,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$3,380,000
Reductions to Existing Bus Service	-$1,590,000
Net Change in Service Costs	$1,790,000
Additional Rapid Bus Costs	$670,000
Total Change in Costs	**$2,460,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	4,200
2030 Corridor Ridership ("Baseline" without Rapid Bus)	5,200
Additional Ridership From Adding Rapid Bus	+ 800
2030 Corridor Ridership (Rapid Bus + Background Service)	**6,000**

WEST BROADWAY AVENUE

RAPID BUS CONCEPT

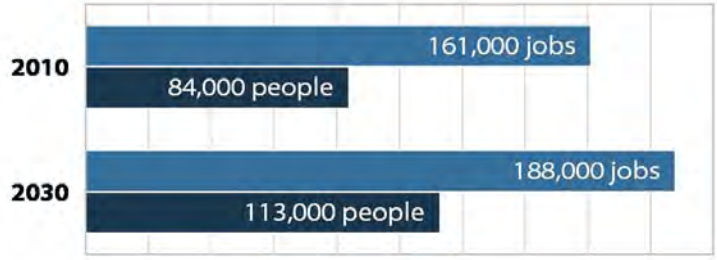
HENNEPIN AVENUE EXISTING CONDITIONS

The proposed Hennepin Avenue corridor follows Hennepin Avenue from downtown Minneapolis to Lake Street, and then continues west on Lagoon/Lake Street to the future West Lake Station on the Green Line (Southwest) LRT, west of Excelsior Boulevard. The corridor serves commercial and medium- to high-density residential land uses along Hennepin Avenue. Several high-density condominium and apartment complexes are located along Lake Street, and the Calhoun Village shopping area is located in the general vicinity of Lake Street and Excelsior Boulevard.

Future Land Use Changes

- The Hennepin Avenue corridor currently has a high housing density that is unlikely to be redeveloped.
- Stable and successful Uptown Activity Center at Lake/Hennepin.
- Stable Commercial Corridor between Dunwoody Boulevard and Lake Street.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

General Roadway Conditions

The majority of Hennepin Avenue has two travel lanes per direction. In downtown, Hennepin Avenue has a shared bus/bike/right turn lane. Parking is allowed in segments of the corridor. Signalized intersections are spaced every 3-4 blocks with closer spacing in downtown.

Hennepin Avenue at 26th Street

Hennepin Avenue at Groveland Avenue

Existing Transit Service

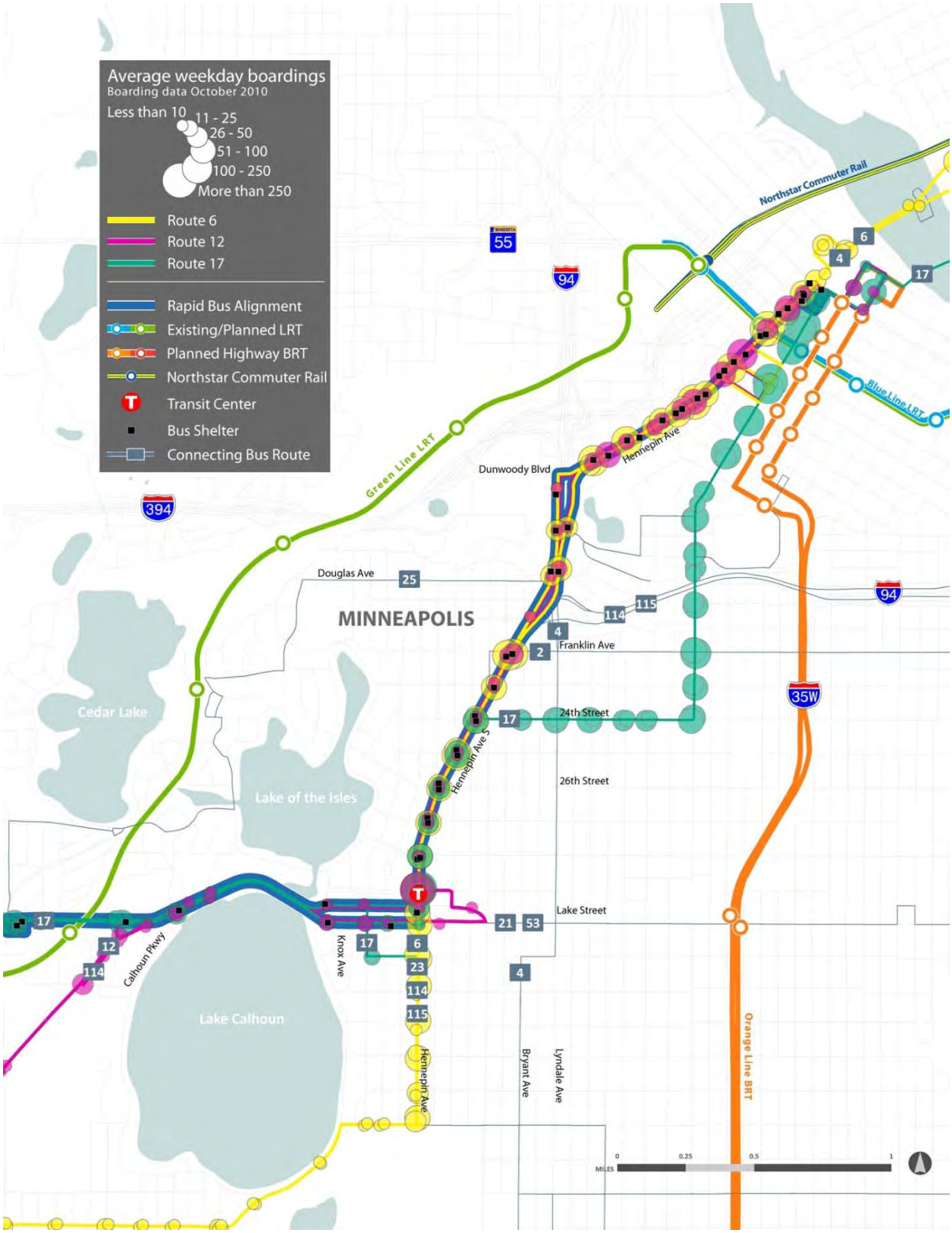
Route 6 is the primary route serving the Hennepin Avenue corridor. The route begins at the U of M or in downtown Minneapolis and follows Hennepin Avenue to 36th Street. South of Lake Calhoun, the alignment splits into various route patterns, with service to Edina and Bloomington. Weekday service frequencies in the corridor generally range from 6 to 10 minutes, with 15-minute service in the evenings. Saturday frequencies range from 10 to 15 minutes. Sunday frequencies are 15 minutes. The portion of Route 6 between 36th Street and downtown is part of Metro Transit's Hi-Frequency Network.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 6)	12.3 mph
Average Weekday Corridor Riders (All Routes)	8,300
On-Time Performance (Route 6)	85.9%

Route 12 also provides service in the Hennepin Avenue corridor. The route begins in downtown Minneapolis during peak periods and follows Hennepin Avenue to Lake Street, then turns west and follows Lake Street and Excelsior Boulevard to Minnetonka. Midday, evening, and weekend service operates between Uptown Transit Station and Minnetonka and does not travel through downtown. Peak period, peak direction trips on Route 12 operate non-stop between the Uptown Transit Station and Franklin Avenue. **Route 17** and **Route 114** also operate in portions of the corridor.

HENNEPIN AVENUE

EXISTING TRANSIT SYSTEM



HENNEPIN AVENUE RAPID BUS CONCEPT

By the Numbers

- **4.1** miles long
- **15** proposed station locations
- **0.3 mile** on average between stations
- **17%** faster trip between downtown Minneapolis and Uptown Transit Station versus current Route 6
- **99%** of existing customers within one stop of a station
- **3** transitway connections (Green Line LRT [2] and Blue Line LRT)
- **8 buses** needed to provide service

Concept Operating Plan

Upon implementation of Hennepin Avenue Rapid Bus, the weekday peak frequency on the France Avenue pattern of Route 6 is reduced. Those trips are replaced with a new France Avenue weekday peak route that operates between Southdale and the West Lake Station, as proposed in feeder bus plans for Green Line (Southwest) LRT. There are no changes to routes 12 and 17.

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 6	7.5	10	15	15
Route 12	20	30	30	60
Route 17	10	15	20	30

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**7.5**	**10**	**10**	**15**
Route 6	10	10	15	15
Route 12	20	30	30	60
Route 17	10	15	20	30
France Ave Route	30	--	--	--

Conceptual Station Designs

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$20,700,000**
Cost per Mile	$5,000,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$5,000,000
Reductions to Existing Bus Service	-$430,000
Net Change in Service Costs	$4,570,000
Additional Rapid Bus Costs	$800,000
Total Change in Costs	**$5,370,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	10,900
2030 Corridor Ridership ("Baseline" without Rapid Bus)	17,100
Additional Ridership From Adding Rapid Bus	+ 6,000
2030 Corridor Ridership (Rapid Bus + Background Service)	**23,100**

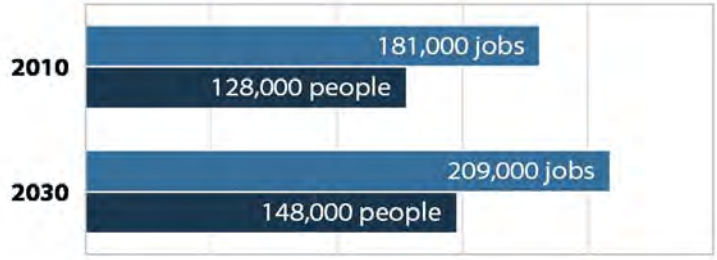
HENNEPIN AVENUE

RAPID BUS CONCEPT

NICOLLET AVENUE EXISTING CONDITIONS

The proposed Nicollet Avenue corridor begins in downtown Minneapolis and follows Nicollet Avenue to American Boulevard, south of I-494. South of downtown, Nicollet Avenue is primarily commercial, with a Kmart-anchored shopping center at Lake Street (where Nicollet Avenue terminates between 29th Street and Lake Street). In south Minneapolis and Richfield, adjacent land uses transition to medium-density residential, with commercial activity at major cross streets. Commercial and office land uses are located near the Nicollet/I-494 interchange.

***Population and Employment** within 1/2 mile of corridor*



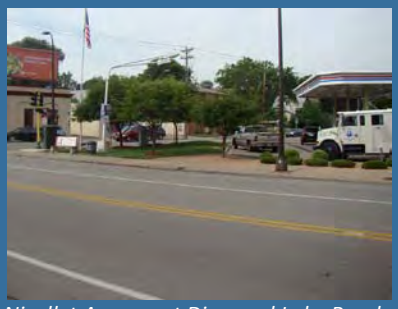
(2030 forecasts based on approved local plans)

Future Land Use Changes

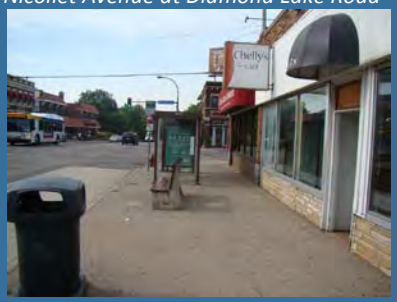
- The Nicollet Avenue corridor is a "Community Corridor," meaning that the preferred and planned mix of land uses is small scale commercial and residential.
- Redevelopment opportunity in the commercial area at the southern end of Nicollet between 60th and 62nd Street. This area could see a significant growth in housing or job growth in the future.
- Redevelopment opportunity in the Activity Center at Nicollet and Lake in the future, especially if Nicollet Avenue is reconnected.

General Roadway Conditions

Most of Nicollet Avenue has a center turn lane and one travel lane per direction. Parking is allowed between Grant and 29th Street, and also between 52nd and 62nd Street. No bike lanes are currently on Nicollet, but there are bike lanes on Blaisdell Avenue and 31st Street. Signalized intersections are spaced every 1-3 blocks.



Nicollet Avenue at Diamond Lake Road



Nicollet Avenue at 38th Street

Existing Transit Service

Route 18 is the primary route serving the Nicollet Avenue corridor. The route begins in downtown Minneapolis, and travels south on Nicollet Avenue to Bloomington. At Lake Street, the route leaves Nicollet Avenue where the street grid is interrupted. Between 31st Street and 29th Street, southbound Route 18 buses deviate to Blaisdell Avenue and northbound buses deviate to 1st Avenue.

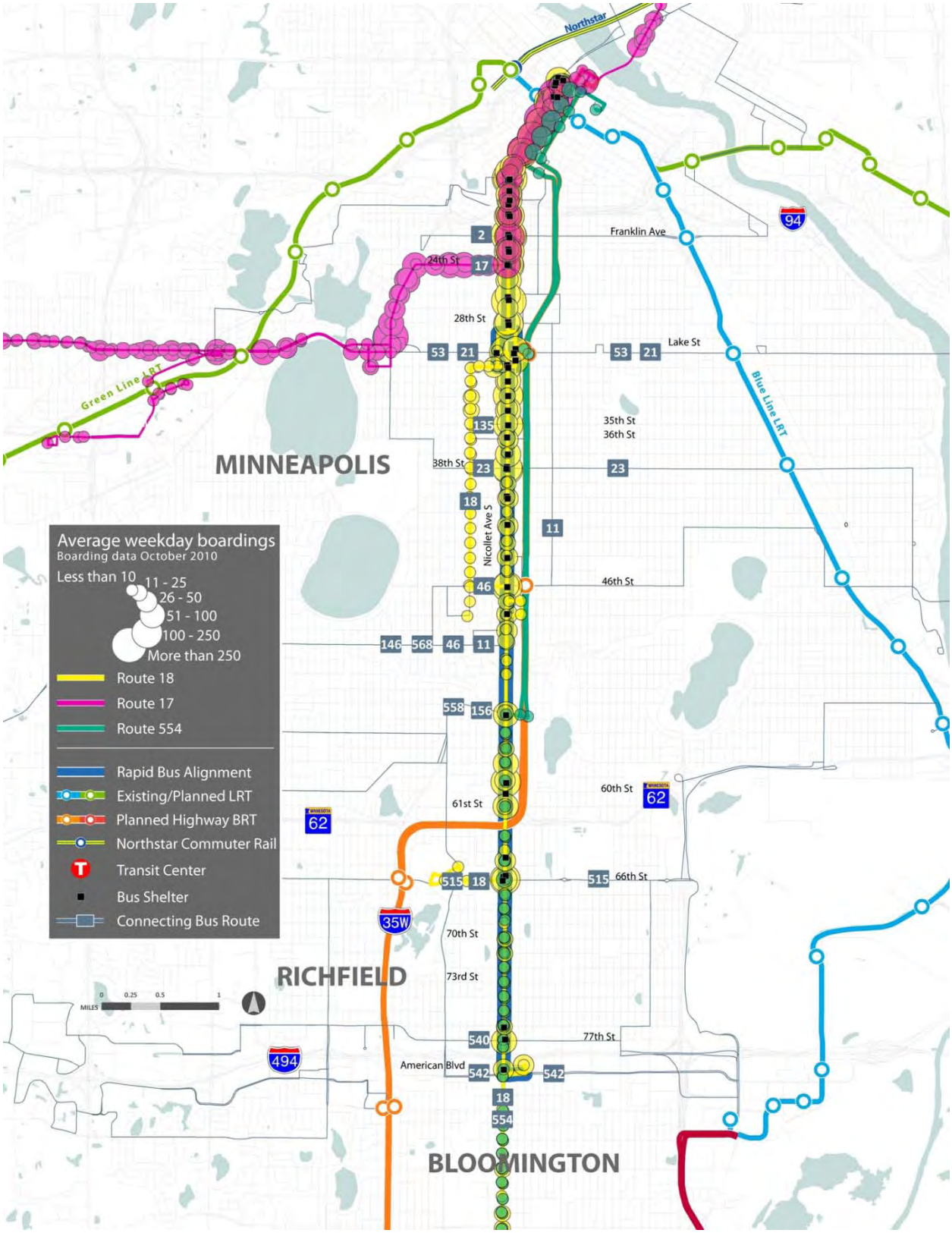
Route 18 includes a number of shortline service patterns; as a result, service frequencies diminish on Route 18 as the alignment travels south. In general, average weekday service frequencies are 8 minutes north of 46th Street, 15 minutes between 46th Street and American Boulevard, and 30 minutes between American Boulevard and south Bloomington. Saturday frequencies are generally 8 to 12 minutes and Sunday frequencies are generally 10 to 20 minutes. North of 66th Street, Route 18 is part of Metro Transit's Hi-Frequency Network.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 18)	10.9 mph
Average Weekday Corridor Riders (All Routes)	13,600
On-Time Performance (Route 18)	90.4%

In addition to Route 18, peak-only **Route 554** provides express service between the southern portion of the Nicollet Avenue corridor and downtown Minneapolis via I-35W north of Diamond Lake Road. Route 17 operates on Nicollet Avenue north of 24th Street.

NICOLLET AVENUE

EXISTING TRANSIT SYSTEM



NICOLLET AVENUE RAPID BUS CONCEPT

By the Numbers

- **8.8** miles long
- **28** proposed station locations
- **0.3 mile** on average between stations
- **20%** faster trip between downtown Minneapolis and American Boulevard versus current Route 18
- **99%** of existing customers within one stop of a station
- **2** transitway connections (Green Line LRT and Blue Line LRT)
- **13 buses** needed to provide service

Concept Operating Plan

Two Rapid Bus patterns are introduced—one to American Boulevard and a shortline running to 66th Street. Upon implementation of Nicollet Avenue Rapid Bus, the number of patterns on Route 18 is reduced to two—one operating to 46th Street via Grand Avenue and the other operating the full length of the route to south Bloomington. Route 554 remains unchanged.

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 18	7.5	7.5	10	20
Route 554	30	--	--	--

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus (to 66th)	**15**	**15**	**15**	**30**
Rapid Bus (to American)	**15**	**15**	**30**	**--**
Route 18	15	30	60	60
Route 554	30	--	--	--

Conceptual Station Designs

Cost and Ridership

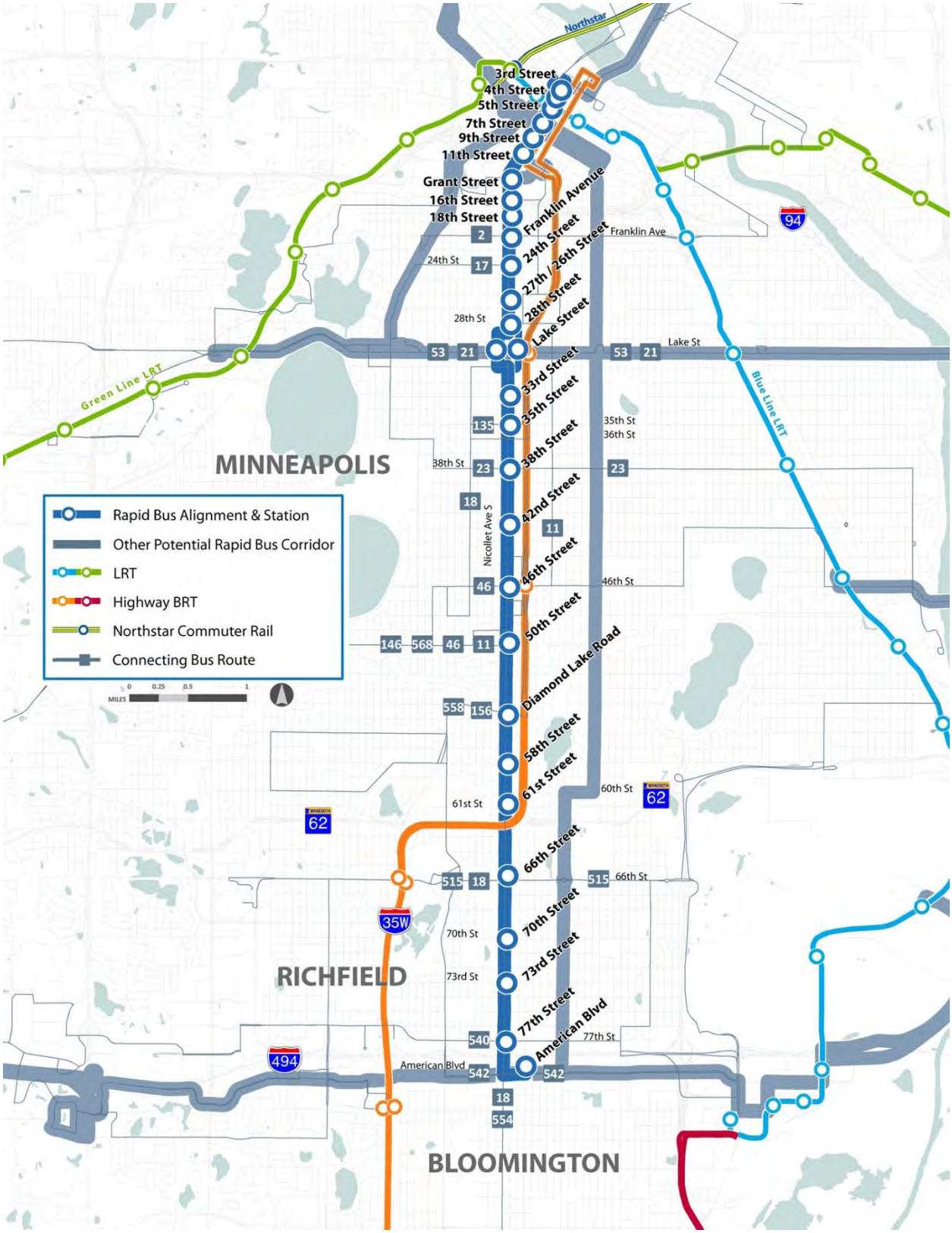
CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$52,700,000**
Cost per Mile	$6,000,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$7,870,000
Reductions to Existing Bus Service	-$5,130,000
Net Change in Service Costs	$2,740,000
Additional Rapid Bus Costs	$1,640,000
Total Change in Costs	**$4,380,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	13,800
2030 Corridor Ridership ("Baseline" without Rapid Bus)	17,300
Additional Ridership From Adding Rapid Bus	+ 3,000
2030 Corridor Ridership (Rapid Bus + Background Service)	**20,300**

NICOLLET AVENUE

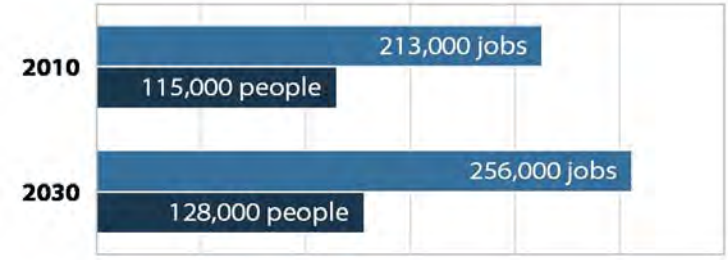
RAPID BUS CONCEPT



CHICAGO AVENUE EXISTING CONDITIONS

The proposed Chicago Avenue corridor follows Chicago Avenue and Portland Avenue to American Boulevard, ending at the Mall of America. The alignment serves downtown Minneapolis, the Midtown area medical facilities, and the Chicago-Lake Transit Center. South of Lake Street, the land uses are generally single-family residential, with some commercial nodes at major cross streets. The alignment crosses into Richfield south of Highway 62, then turns east on American Boulevard, serving commercial uses before ending at the MOA.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

Future Land Use Changes

- The Chicago Avenue corridor is a "Community Corridor," meaning that the preferred and planned mix of land uses is small scale commercial and residential.
- Recent redevelopment at the Activity Center at Chicago and Lake has intensified the number of housing units and employment.
- The City of Minneapolis is in the process of completing a new small area plan for the Growth Center area north of Lake Street that includes the hospitals. This area will be filled by hospital consolidation services which will result in modest job growth.

General Roadway Conditions

The Chicago Avenue corridor has one travel lane per direction except on 7th and 8th Streets in downtown Minneapolis, which both have three travel lanes (one way streets). Parking is allowed on most of the corridor. Currently, no bike lanes exist on Chicago Avenue. Signalized intersections are spaced every 1-3 blocks.

Chicago Avenue at Franklin Avenue

Chicago Avenue at 38th Street

Existing Transit Service

Route 5 begins north of downtown at the Brooklyn Center Transit Center (BCTC). There are two primary weekday route patterns—one that runs between BCTC and 38th Street, and one that runs between north Minneapolis and the Mall of America. Each route pattern operates at about 15-minute frequencies on weekdays, resulting in a combined frequency of 7-8 minutes. On Saturdays, combined frequency is roughly 10 minutes. On Sundays, frequencies on each route pattern are typically 30 minutes, with all trips going to/from the Mall of America in the early afternoon. Route 5 operates 24 hours a day and is part of the Hi-Frequency Network north of 56th Street.

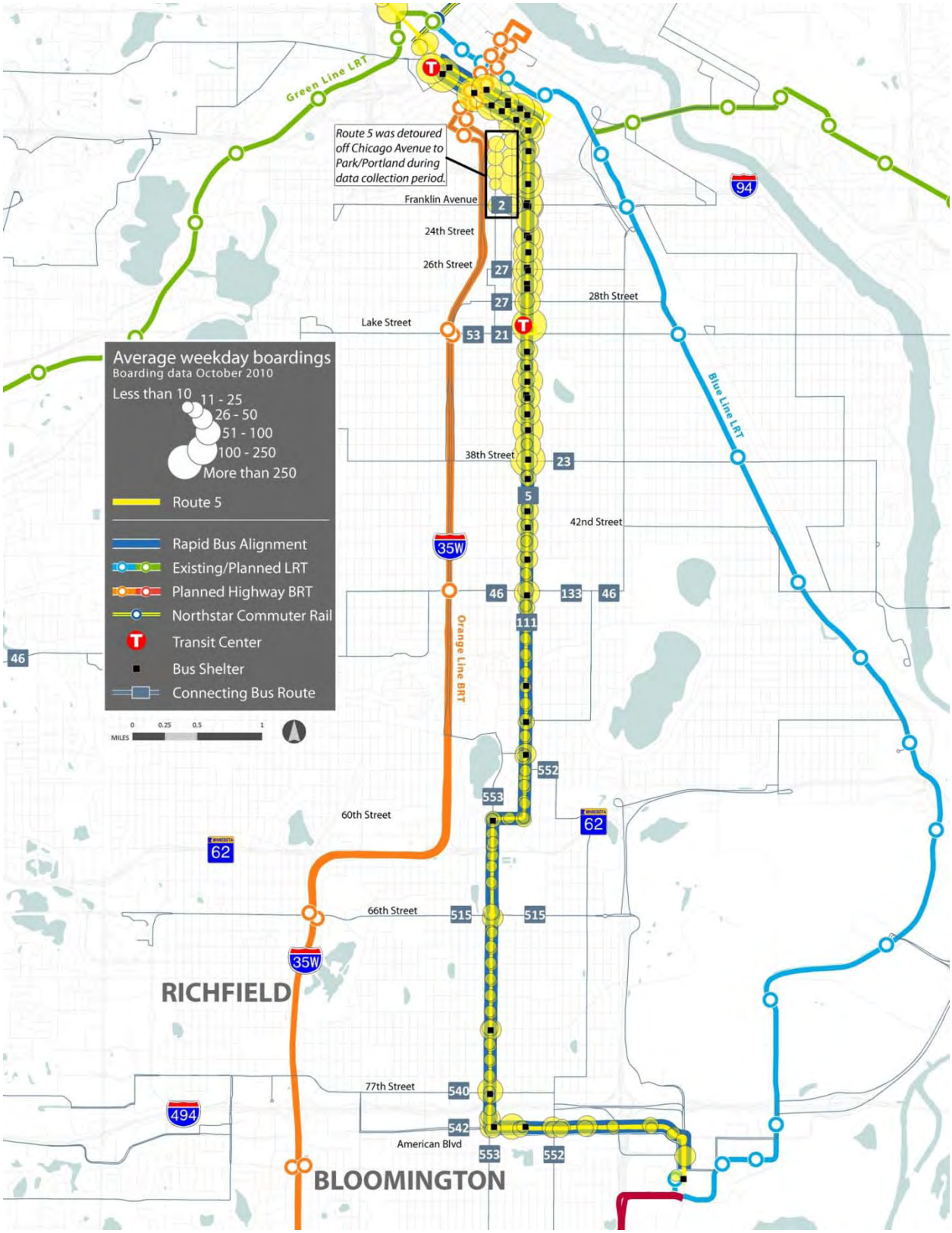
Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 5)	11.8 mph
Average Weekday Corridor Riders (All Routes)	8,000
On-Time Performance (Route 5)	85.2%

Four other routes operate on portions of the Chicago Avenue corridor:

- Local **Route 39** operates on Chicago Avenue from 26th Street to Lake Street
- Limited stop U of M **Route 111** operates along Portland and Chicago Avenues, from American Boulevard to 46th Street
- Express **Route 133** operates on a portion of Chicago Avenue, from 54th to 38th Street, then runs to downtown via I-35W
- Express **Route 553** operates on Portland Avenue from American Boulevard to 60th Street, then runs to downtown via I-35W

CHICAGO AVENUE

EXISTING TRANSIT SYSTEM



CHICAGO AVENUE RAPID BUS CONCEPT

By the Numbers

- **10.4** miles long
- **28** proposed station locations
- **0.4 mile** on average between stations
- **10%** faster trip between downtown and MOA versus current Route 5
- **100%** of existing customers within one stop of a station
- **4** transitway connections (Green Line LRT, Blue Line LRT, Orange Line BRT, and Red Line BRT)
- **12 buses** needed to provide service

Concept Operating Plan

Two Rapid Bus patterns are introduced to respond to current demand and trip lengths—one to Mall of America and a shortline running to 38th Avenue. Upon implementation of Chicago Avenue Rapid Bus, Route 5 is consolidated into one pattern operating through downtown Minneapolis to the Mall of America.

Conceptual Station Designs

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 5	7.5	7.5	15	15

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus to MOA	**15**	**15**	**20**	**--**
Rapid Bus to 38th	**15**	**15**	**20**	**30**
Route 5	30	30	30	30

Cost and Ridership

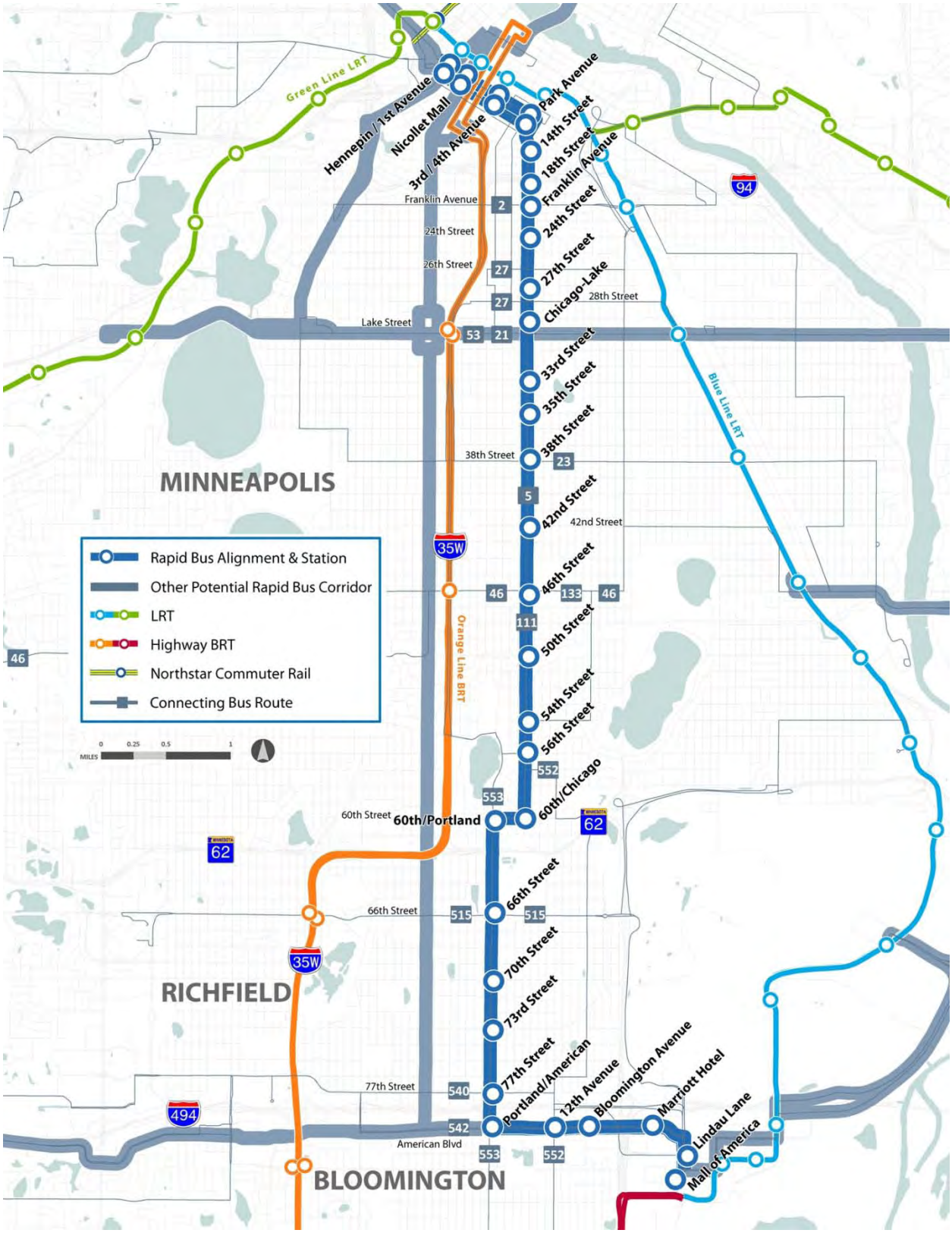
CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$43,000,000**
Cost per Mile	$4,100,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$6,620,000
Reductions to Existing Bus Service	-$3,820,000
Net Change in Service Costs	$2,800,000
Additional Rapid Bus Costs	$1,440,000
Total Change in Costs	**$4,240,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	10,800
2030 Corridor Ridership ("Baseline" without Rapid Bus)	13,100
Additional Ridership From Adding Rapid Bus	+ 2,300
2030 Corridor Ridership (Rapid Bus + Background Service)	**15,400**

CHICAGO AVENUE

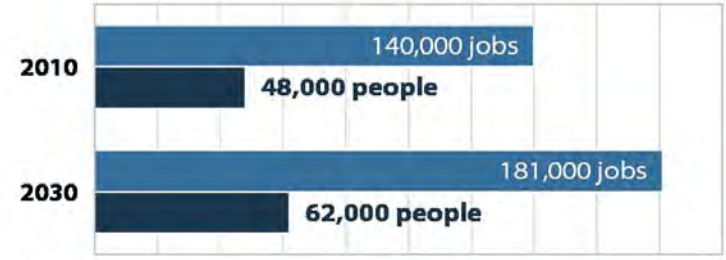
RAPID BUS CONCEPT



WEST 7TH STREET EXISTING CONDITIONS

The proposed West 7th Street corridor follows West 7th Street/TH 5 and I-494 between downtown St. Paul and the Mall of America. Outside of downtown St. Paul, the alignment serves a mix of medium to high density residential and commercial land uses to Montreal Avenue. Beginning at this point, all development is on the east side of the road until St. Paul Avenue. The corridor serves the MSP airport, and then continues south along TH 5 and I-494 to 34th Avenue, where it serves several office complexes and the Mall of America.

***Population and Employment** within 1/2 mile of corridor*



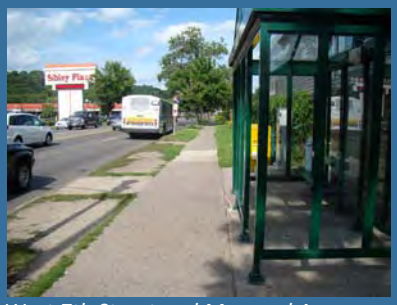
(2030 forecasts based on approved local plans)

Future Land Use Changes

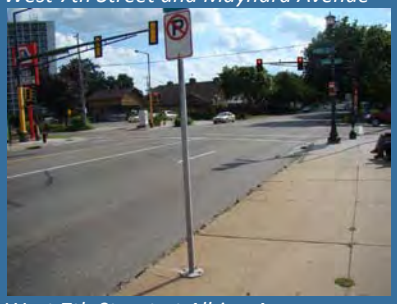
- Recently, a prominent growth node was the Gateway housing development at West 7th and Davern Street. A redevelopment opportunity exists adjacent to the Gateway housing development at the US Bank site.
- Significant growth node at the intersection with Montreal extending across I-35E to Otto Avenue. A number of residential and commercial intensification opportunities exist.
- Significant redevelopment opportunity at the Schmidt Brewery site with increased density in housing and retail.
- Opportunities for increased employment at the MSP airport.

General Roadway Conditions

Most of the West 7th Street corridor has two travel lanes in each direction. Parking is allowed east of I-35E. Currently, no bike lanes are on West 7th Street. Signalized intersections are spaced every 4-5 blocks with closer spacing in downtown St. Paul.



West 7th Street and Maynard Avenue



West 7th Street at Albion Avenue

Existing Transit Service

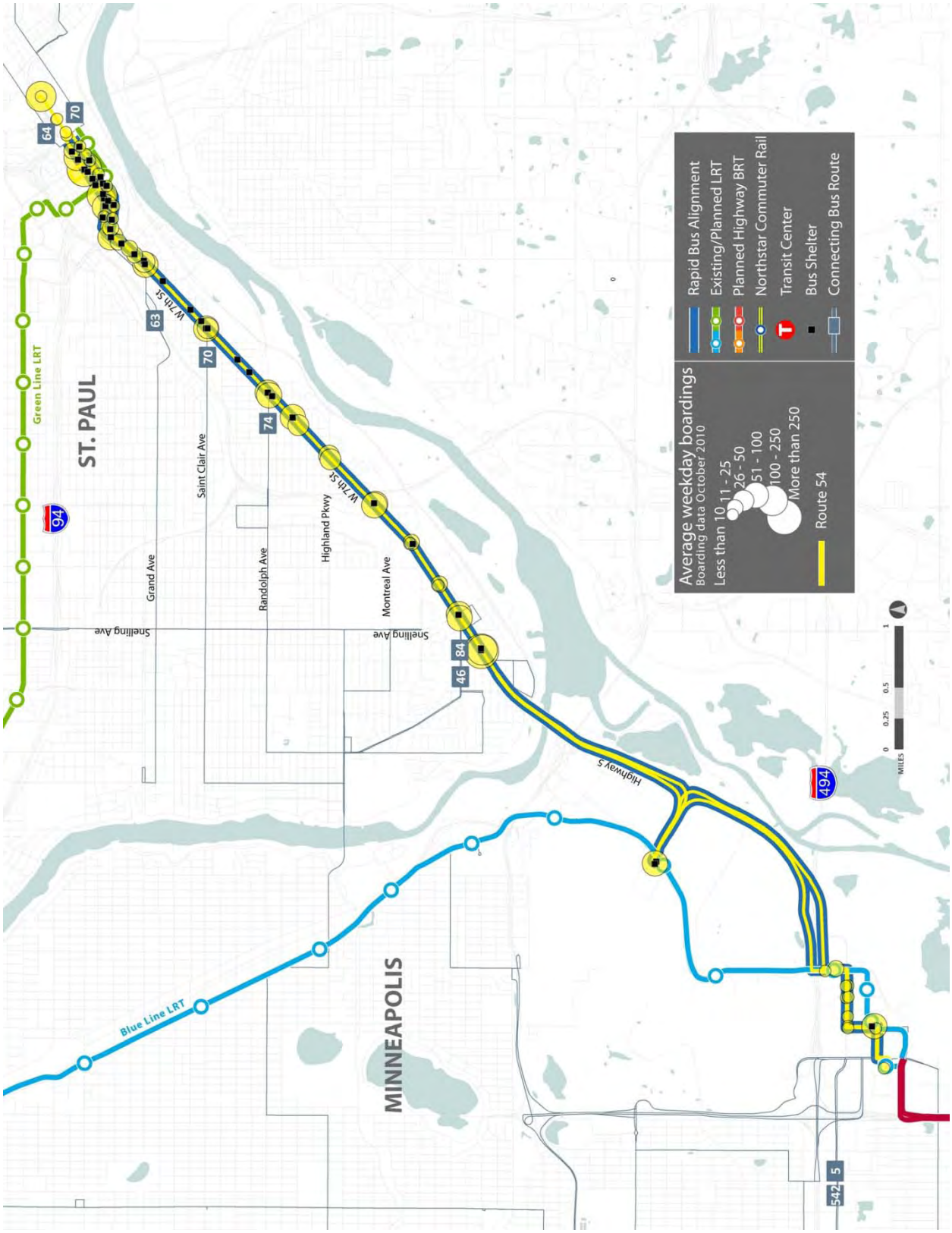
Route 54 is the primary route serving the West 7th Street corridor. The route begins in downtown St. Paul and travels along West 7th Street. After crossing the Mississippi River, the route deviates to the Lindbergh Terminal Station at the Minneapolis/St. Paul International Airport, and then continues along TH 5 and I-494 to 34th Avenue and ends at the Mall of America. This route operates a consistent service pattern all day. Weekday service frequencies are 15 minutes all day, including in the evenings. Saturday service frequencies begin at 30 minutes but transition to 15 minutes by mid-morning. Sunday service frequencies are 30 minutes all day. All of Route 54 is included in Metro Transit's Hi-Frequency Network.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 54)	19.1 mph
Average Weekday Corridor Riders (All Routes)	4,200
On-Time Performance (Route 54)	91.7%

In addition to Route 54, **Route 70** and **Route 74** both operate on portions of West 7th Street in St. Paul.

WEST 7TH STREET

EXISTING TRANSIT SYSTEM



WEST 7TH STREET RAPID BUS CONCEPT

By the Numbers

- **12** miles long
- **17** proposed station locations
- **0.7 mile** on average between stations
- **5%** faster trip between MOA and St. Paul versus current route 54
- **100%** of existing customers within one stop of a station
- **3** transitway connections (Green Line LRT, Blue Line LRT, and Red Line BRT)
- **8 buses** needed to provide service

Concept Operating Plan

Upon implementation of West 7th Street Rapid Bus, Route 54 is replaced by Rapid Bus service, with improved frequency during peak periods, late evenings, and on weekends.

Conceptual Station Designs

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 54	15	15	15	30

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**10**	**15**	**15**	**15**
Route 54		*Replaced*		

Cost and Ridership

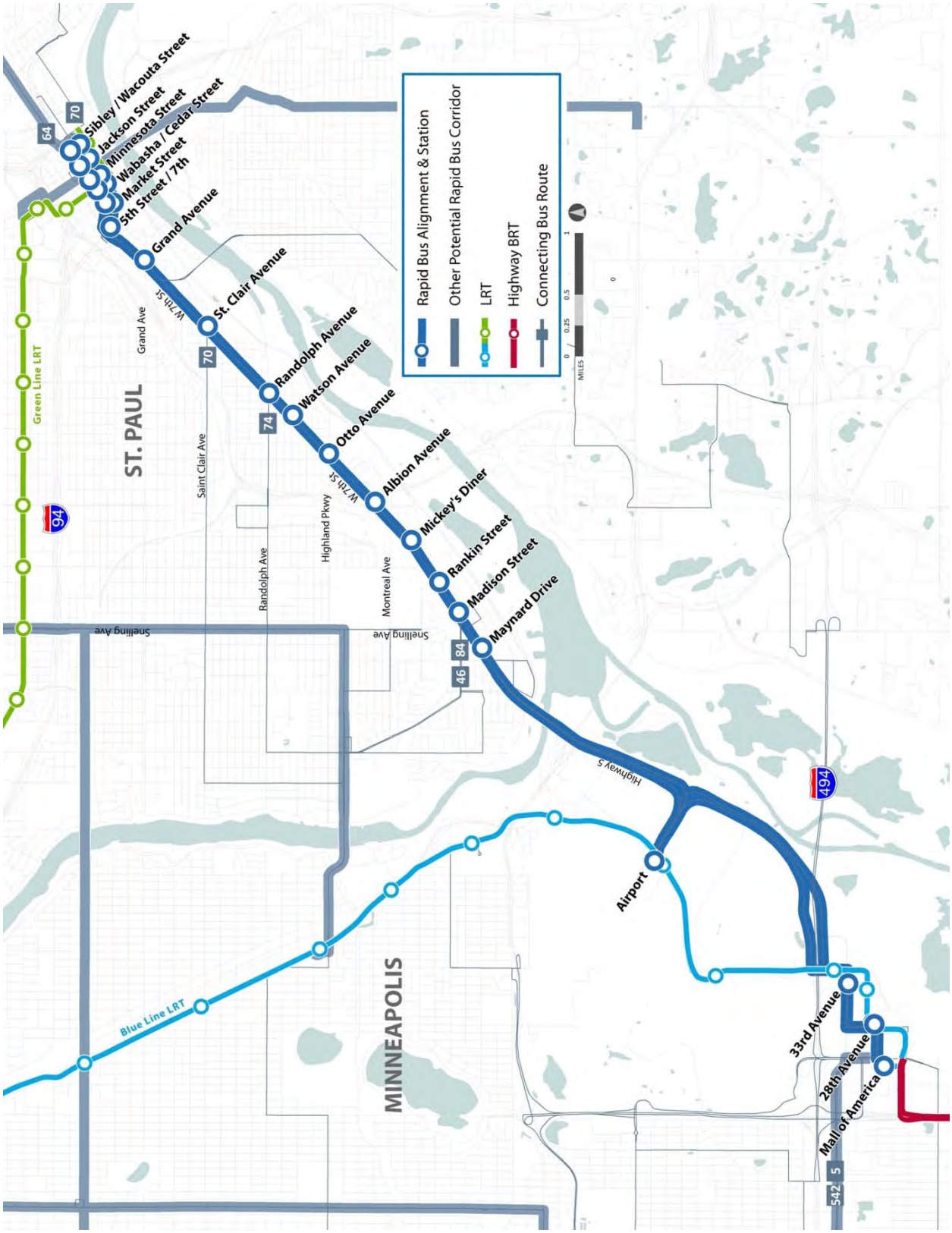
CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$25,400,000**
Cost per Mile	$2,100,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$4,790,000
Reductions to Existing Bus Service	-$4,730,000
Net Change in Service Costs	$60,000
Additional Rapid Bus Costs	$890,000
Total Change in Costs	**$950,000**

WEEKDAY RIDERSHIP	
2010 Corridor Ridership	3,900
2030 Corridor Ridership ("Baseline" without Rapid Bus)	6,000
Additional Ridership From Adding Rapid Bus	1,100
2030 Corridor Ridership (Rapid Bus + Background Service)	**7,100**

WEST 7TH STREET

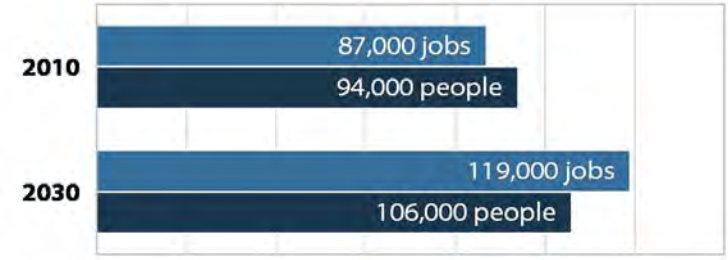
RAPID BUS CONCEPT



EAST 7TH STREET EXISTING CONDITIONS

The proposed East 7th Street corridor begins in downtown St. Paul and follows East 7th Street to Arcade Street, Maryland Avenue, and White Bear Avenue to the Maplewood Mall Transit Center. The corridor serves a mix of residential and light industrial along East 7th Street and Arcade, with commercial and residential along Maryland Avenue. Land uses along White Bear Avenue become more commercial at Larpenteur with the Hillcrest Shopping Center. Other major trip attractors along White Bear Avenue include the Maplewood Community Center and the Maplewood Mall.

***Population and Employment** within 1/2 mile of corridor*



(2030 forecasts based on approved local plans)

Future Land Use Changes

- The Port Authority site will be a job center with an estimated 1,200 to 1,700 jobs. The surrounding area will likely accommodate new housing in redevelopment and infill of currently vacant sites.
- Redevelopment opportunities exist at the Globe site, the Hamms Brewery site, and the Hospital Linen site.
- Potential for intensification at the Phalen Village redevelopment site.

General Roadway Conditions

Most of the East 7th Street corridor has two travel lanes per direction. Parking is not allowed in the corridor except in downtown St. Paul on 5th and 6th Streets. There is a bike lane on Arcade Street. Signalized intersections are spaced every 2-3 blocks.

White Bear Avenue at Hoyt Avenue

East 7th Street at Hope Avenue

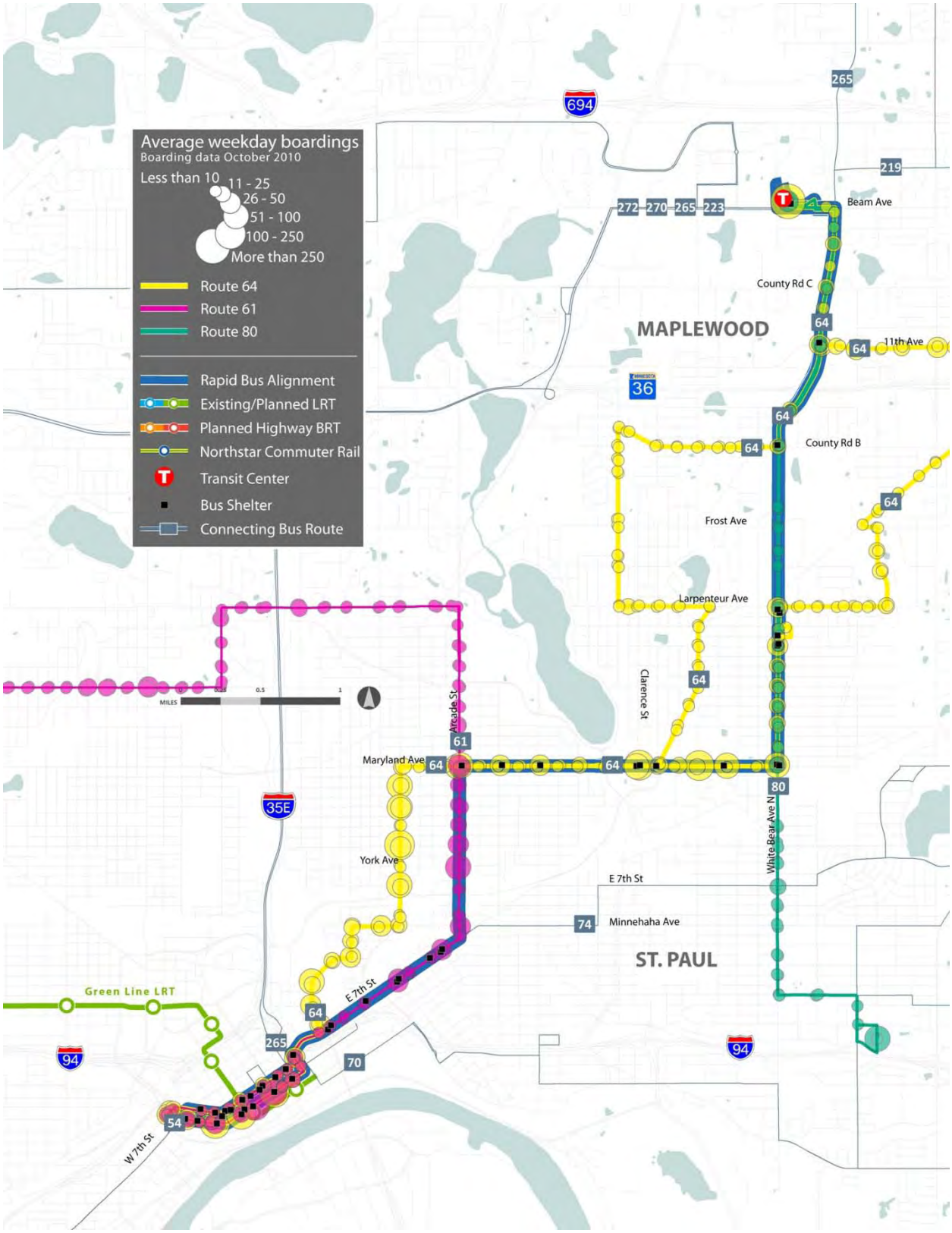
Existing Transit Service

Route 64 is the primary route serving the East 7th Street corridor. Generally, all Route 64 trips operate between downtown St. Paul and the Maplewood Mall Transit Center, with two major route patterns. The western alignment follows Maryland, Prosperity, Larpenteur, English, County Road B, and White Bear Avenue to Maplewood Mall. The eastern alignment follows Maryland and White Bear to Larpenteur, serves North St. Paul, then rejoins White Bear Avenue to Maplewood Mall. Select trips are added in the peak periods to Hillcrest Shopping Center. Weekday service frequencies are generally 15 minutes, with every other trip following one of the two route patterns described above. Saturday frequencies are generally 15 minutes and Sunday frequencies are 30 minutes. The portion of Route 64 between downtown St. Paul and the branch split at Prosperity/Maryland is included in Metro Transit's Hi-Frequency Network.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 64)	14.3 mph
Average Weekday Corridor Riders (All Routes)	1,800
On-Time Performance (Route 64)	89.7%

In addition to Route 64, **Route 61** serves the Arcade and East 7th Street segments of the corridor. **Route 74** operates on East 7th Street between downtown St. Paul and Minnehaha Avenue. **Route 80** operates along White Bear Avenue between Sun Ray Transit Center and Maplewood Mall Transit Center.

EXISTING TRANSIT SYSTEM



EAST 7TH STREET RAPID BUS CONCEPT

By the Numbers

- **8.9** miles long
- **23** proposed station locations
- **0.4 mile** on average between stations
- **11%** faster trip between downtown St. Paul and Maplewood Mall versus current Route 64
- **96%** of existing customers within one stop of a station
- **1** connection to a transitway (Green Line LRT)
- **9 buses** needed to provide service

Concept Operating Plan

Upon implementation of the East 7th Street Rapid Bus, Route 61 is proposed to be terminated at Maryland Avenue and Arcade Street. There are no other adjustments proposed to the three routes shown below or to Route 74.

Conceptual Station Designs

Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 61	15	30	60	--
Route 64	10-15	15	20	30
Route 80	30	60	--	--

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**10**	**15**	**15**	**--**
Route 61	15	30	60	--
Route 64	10-15	15	20	30
Route 80	30	60	--	--

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$28,800,000**
Cost per Mile	$3,200,000

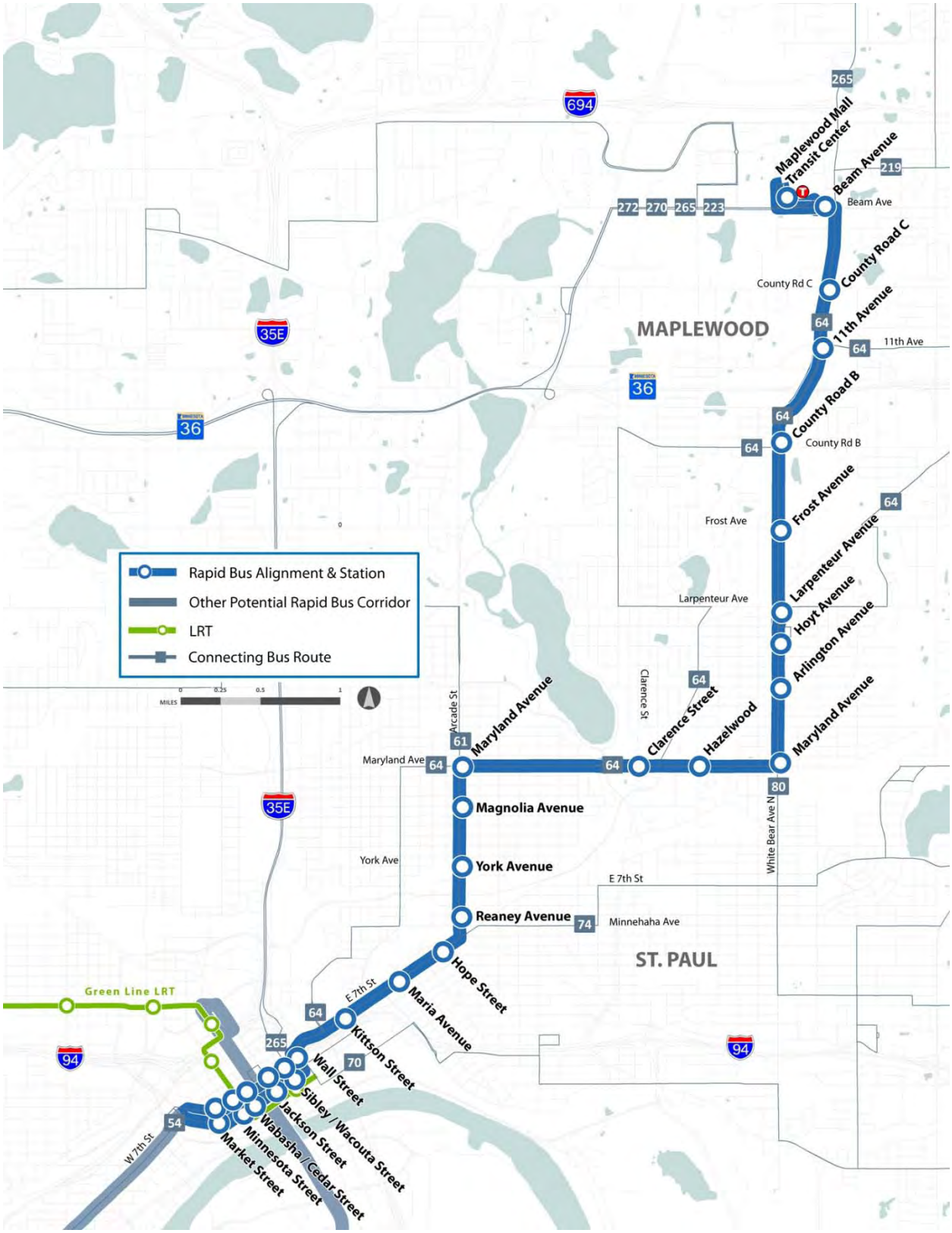
ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$4,210,000
Reductions to Existing Bus Service	-$750,000
Net Change in Service Costs	$3,460,000
Additional Rapid Bus Costs	$1,010,000
Total Change in Costs	**$4,470,000**

WEEKDAY RIDERSHIP[1]	
2010 Corridor Ridership	4,700
2030 Corridor Ridership ("Baseline")	11,100
Additional Ridership From Adding Rapid Bus	+ 2,200
2030 Corridor Ridership (Rapid Bus + Background Service)	**13,300**

[1] East 7th corridor ridership estimates include West 7th Rapid Bus ridership and assume a through-routed service pattern.

EAST 7TH STREET

RAPID BUS CONCEPT



ROBERT STREET EXISTING CONDITIONS

The proposed Robert Street corridor begins near the State Capitol on the north end of downtown St. Paul, and follows Robert Street, Cesar Chavez and State Street, and Robert Street again south to Mendota Road. After crossing the Mississippi River, the corridor serves lower density commercial/light industrial, and serves the District Del Sol at Cesar Chavez/State Street. South of Cesar Chavez, land use characteristics change to medium density residential. Commercial uses become more predominant south of Butler Avenue, with big box retail at the south end of the corridor.

***Population and Employment** within 1/2 mile of corridor*

(2030 forecasts based on approved local plans)

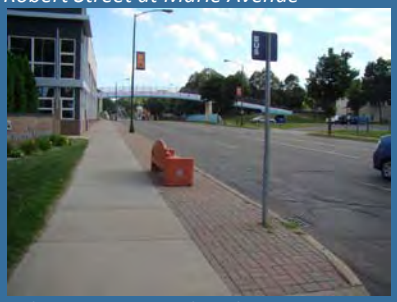
Future Land Use Changes

- Significant growth planned for the West Side Flats area immediately across the river from downtown.
- Strong commercial node at Robert Street and Cesar Chavez. This node is planned to be significantly denser in both housing and commercial activity.
- Redevelopment opportunity north of Butler Avenue and Signal Hills Shopping Center.
- Current commercial redevelopment at the Robert Street Marketplace will result in additional retail and employment.

General Roadway Conditions

Robert Street varies between 1 to 2 travel lanes per direction throughout the corridor. Parking is allowed in downtown St. Paul and some segment south of the Mississippi River. There are no bike lanes in the corridor. Signalized intersections are spaced every 3-4 blocks with closer spacing in downtown.

Robert Street at Marie Avenue



Robert Street at Colorado Avenue

Existing Transit Service

Route 68 is the primary route serving the Robert Street corridor. The route begins north of downtown St. Paul, and generally follows Jackson into downtown St. Paul. The route crosses the Mississippi River on Robert Street, and continues south to Thompson Avenue. There is a mid-route split at this point, with select trips following Thompson and 12th Avenue to Southview Boulevard, and other trips continuing south on Robert Street to Marie, Oakdale and Southview. Route 68 service patterns join together at Southview and 12th Avenue, and then continue on Southview and 5th Avenue through South St. Paul and Inver Grove Heights.

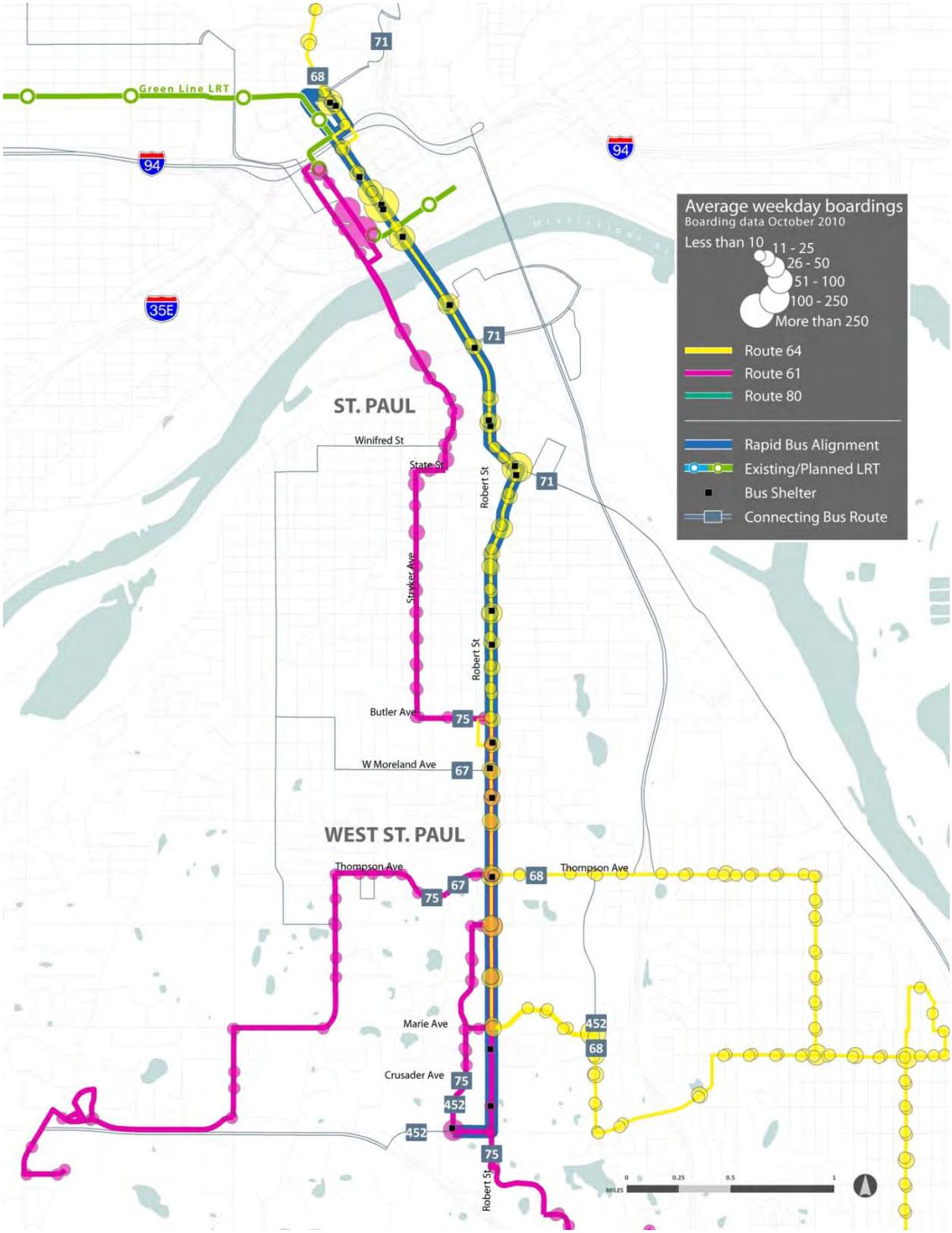
Weekday service frequencies on the common trunk (to Robert Street and Thompson) are generally 10 to 15 minutes in the peak periods and 20 to 30 minutes in the midday. Saturday and Sunday frequencies are generally 30 minutes.

Key Performance Indicators (2010)	
Average Weekday In-Service Speed (Route 68)	15.2 mph
Average Weekday Corridor Riders (All Routes)	2,800
On-Time Performance (Route 68)	92.8%

In addition to Route 68, **Route 75** operates on the defined Robert Street corridor between Butler Avenue and Marie Avenue. **Route 67** also serves Robert Street between Butler Avenue and Thompson Avenue.

ROBERT STREET

EXISTING TRANSIT SYSTEM



ROBERT STREET EXISTING CONDITIONS

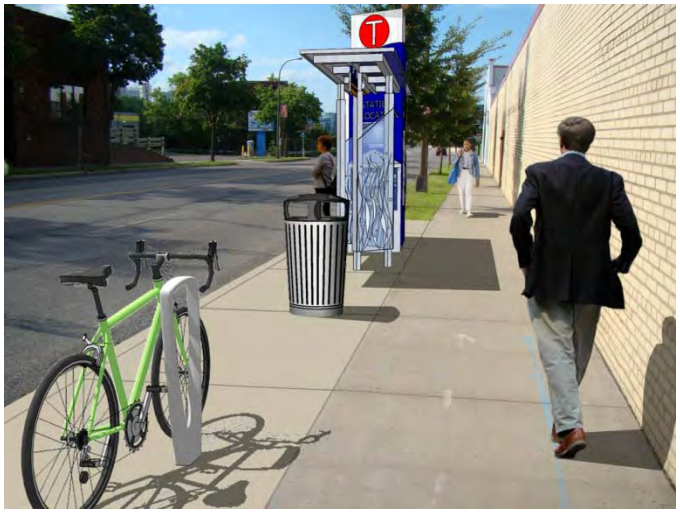
By the Numbers

- **5.6** miles long
- **17** proposed station locations
- **0.3 mile** on average between stations
- **21%** faster trip between downtown St. Paul and Marie/Oakdale versus current Route 68
- **99%** of existing customers within one stop of a station
- **1** connection to a transitway (Green Line LRT)
- **4 buses** needed to provide service

Concept Operating Plan

Upon implementation of Robert Street Rapid Bus, Routes 68 and 75 are proposed to be reconfigured. Route 68 will maintain its alignment along Robert Street; however, the route will branch at Marie Street. Route 75's alignment is split into two primary branch patterns at Thompson Avenue. New weekend service is added to Route 75.

Conceptual Station Designs



Weekday Frequency

EXISTING SERVICE	Rush Hours	Midday	Evening	Late Night
Route 68	15	30	60	60
Route 75	20-30	30	60	60

SERVICE CONCEPT	Rush Hours	Midday	Evening	Late Night
Rapid Bus	**15**	**15**	**15**	**--**
Route 68	30	30	60	60
Route 75	30	30	60	60

Cost and Ridership

CONSTRUCTION COST (2011$)	
Total Estimated Cost to Build (Includes Vehicles)	**$17,900,000**
Cost per Mile	$3,200,000

ANNUAL OPERATING COST (2011$)	
Rapid Bus Base Service	$2,690,000
Local Bus Service Enhancement	$660,000
Net Change in Service Costs	$3,350,000
Additional Rapid Bus Costs	$760,000
Total Change in Costs	**$4,110,000**

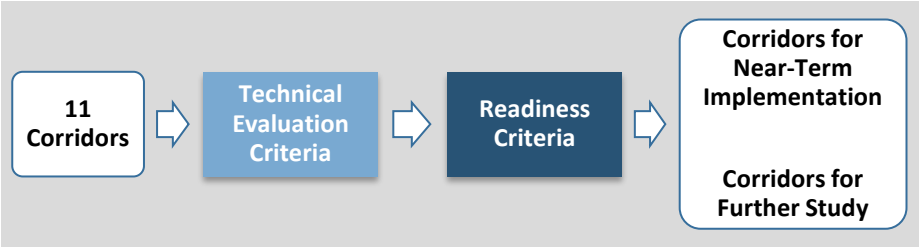
WEEKDAY RIDERSHIP	
2010 Corridor Ridership	2,800
2030 Corridor Ridership ("Baseline" without Rapid Bus)	6,000
Additional Ridership From Adding Rapid Bus	+ 1,000
2030 Corridor Ridership (Rapid Bus + Background Service)	**7,000**

ROBERT STREET

RAPID BUS CONCEPT

How do the corridors compare?

The 11 corridors studied for Rapid Bus were evaluated and prioritized for near-term implementation using a two-part approach that considered both **technical evaluation criteria** and **readiness criteria**.



First Component: Technical Evaluation

As outlined in the introduction to this report, the Rapid Bus concepts developed in this study focus on meeting the following goals:

1. **Mobility:** Provide mobility benefits by connecting major destinations along the study corridors more quickly with more frequent transit service.
2. **Affordability:** Implement affordable transit improvements.
3. **Integration:** Seamlessly integrate with existing and planned transit systems.
4. **Customer Experience:** Provide an enhanced customer experience by developing passenger infrastructure and information commensurate with existing and planned levels of transit service.
5. **Growth:** Support anticipated corridor growth and redevelopment.

To compare the corridors, technical evaluation measures were developed for each of the five identified goals.

Weight	Goal	Evaluation Measure
5%	Goal 1: Mobility (Transit Market Indicators)	• Jobs within ½ mile of corridor (2008)
		• Population within ½ mile of corridor (2010)
		• Transit-dependent persons[2] within ½ mile of corridor
35%	Goal 1: Mobility (Rapid Bus Outcomes)	• Percent decrease in end-to-end travel time
		• 2030 corridor ridership (weekday)
		• 2030 ridership over 2030 baseline
		• User benefits (annual)
20%	Goal 2: Affordability	• O&M cost per annual Rapid Bus passenger
		• 2030 Rapid Bus passengers per in-service hour (annual average)
		• Capital cost per corridor mile
		• Capital cost per annual Rapid Bus passenger
15%	Goal 3: Integration	• Percent of Rapid Bus hours paid for by existing service hours
		• Percent of existing local bus boardings within 1 stop of stations
		• Number of connections to fixed guideway transitways
5%	Goal 4: Experience	• Percent of stations where concept required modification to fit
10%	Goal 5: Growth	• Forecasted change in jobs within 1/2 mile of stations
		• Forecasted change in population within 1/2 mile of stations

[2] Population over 16 minus available autos

HOW DO THE CORRIDORS COMPARE?

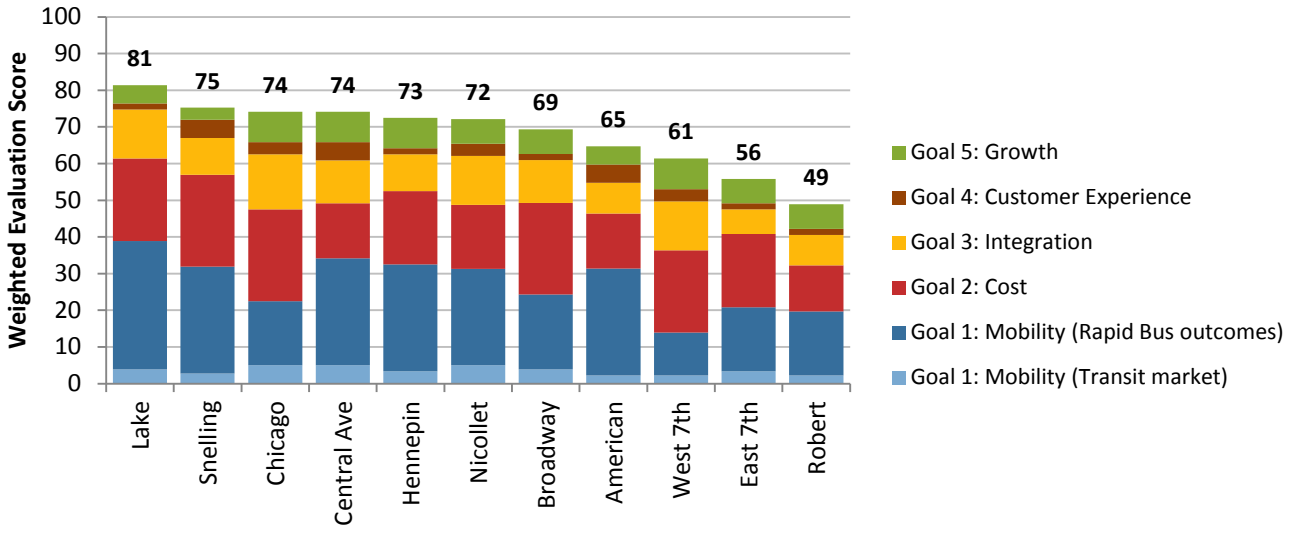
The measures were scored using a three-point scale (a minimum of one point and a maximum score of three points per evaluation measure). The chart below shows the scores for each of the evaluation measures in the first tier of the evaluation process. For each measure, the three-point scores were distributed using the natural breaks between the raw values in a corridor-blind analysis.

Key to Symbols
● Highest performance (3 points)
O Medium performance (2 points)
○ Lowest performance (1 point)

		Snelling	Lake	American	Central	Broadway	Hennepin	Nicollet	Chicago	West 7th	East 7th	Robert
Goal 1: Provide mobility benefits by connecting major destinations												
Transit market indicators (5% of total score)												
1-A	Jobs within ½ mile of corridor (2008)	○	○	O	●	●	●	●	●	O	O	O
1-B	Population within ½ mile of corridor (2010)	O	●	○	●	O	○	●	●	○	O	○
1-C	Transit-dependent persons within ½ mile of corridor	O	●	○	●	O	O	●	●	○	O	○
Rapid Bus outcomes (35% of total score)												
1-D	Percent decrease in end-to-end travel time	●	●	●	O	●	O	O	○	○	○	O
1-E	2030 corridor ridership (weekday)	O	●	○	O	○	●	●	O	○	O	○
1-F	2030 ridership over 2030 baseline	O	●	●	●	○	●	O	○	○	O	○
1-G	User benefits (annual)	●	●	●	●	O	O	O	O	○	○	O
Goal 2: Implement affordable transit improvements (30% of total score)												
2-A	O&M cost per annual Rapid Bus passenger	O	●	○	O	O	O	O	●	O	O	○
2-B	2030 Rapid Bus passengers per in-service hour (annual average)	O	O	○	○	●	O	O	●	O	O	○
2-C	Capital cost per corridor mile	●	○	●	O	O	○	○	O	●	O	O
2-D	Capital cost per annual Rapid Bus passenger	●	●	○	○	●	●	O	O	O	O	○
Goal 3: Seamlessly integrate with existing and planned transit systems (15% of total score)												
3-A	Percent of Rapid Bus revenue hours paid for by existing service hours	O	O	○	O	O	○	●	●	●	○	○
3-B	Percent of existing local bus corridor boardings proximate to proposed stations	O	●	○	●	●	●	●	●	●	O	●
3-C	Number of connections to fixed guideway transitways	O	●	●	O	O	O	O	●	O	○	○
Goal 4: Provide an enhanced customer experience (5% of total score)												
4-A	Percent of stations where concept required modification to fit	●	○	●	●	○	○	O	O	O	○	○
Goal 5: Support anticipated corridor growth and redevelopment (10% of total score)												
5-A	Forecasted change in jobs within 1/2 mile of proposed stations	○	○	O	O	O	O	O	●	●	O	O
5-B	Forecasted change in population within 1/2 mile of proposed stations	○	O	○	●	O	●	O	O	O	O	O

Technical Evaluation Weighting

After scoring the corridors on the three-point scale, measures were weighted based on the relative importance of each goal to the Rapid Bus concept. The weightings, noted in the evaluation chart on the previous page, place a large emphasis on mobility improvements and affordability, with less weight assigned to system integration, customer experience, and area growth. The figure below graphically represents the results of the first component of evaluation based on the quantitative measures.



Second Component: Readiness

The first component of the evaluation process identified the corridors that best met the goals and objectives of the ATCS using quantitative measures. Near-term decisions to implement Rapid Bus will not be based solely on technical merit, but will also take into consideration other factors that may influence the ability to quickly implement the Rapid Bus concept in a corridor. In the second component of evaluation, three qualitative readiness criteria are applied.

Will the corridor be studied in the near future in more detail for other modes?

The 11 corridors examined in this study are among the strongest transit corridors in the Twin Cities. Some of these corridors have been studied previously for other kinds of transit improvements by partner agencies. Alternative Analysis (AA) studies will be initiated in 2012 on some of these corridors. For corridors where additional in-depth study will be conducted in the near future, Rapid Bus is not recommended for near-term implementation, but remains a worthy mode for consideration in the upcoming AA studies.

The corridor information compiled and evaluated in the ATCS will serve as an input to the AA studies, which will include a comparison of transit modes in greater detail than in any previous studies, including the ATCS. Results of these upcoming AA studies will aid decision makers in selecting the appropriate level of transit investment for the corridors. For this reason, the **Lake Street**, **Nicollet Avenue**, **Central Avenue**, and **Robert Street** corridors are not recommended for Rapid Bus implementation at this time. Corridors may be reprioritized as plans are developed in the AA processes for each corridor.

Does the corridor's success depend on forecast growth or connections to an unfunded fixed guideway investment?

The Rapid Bus corridors represent a variety of different markets and locations within the Twin Cities region, with service oriented toward downtown Minneapolis, downtown St. Paul, and crosstown corridors. Connections to existing and future transitways and future forecast growth are also vital components in the analysis, which evaluated each corridor for its ridership potential in the forecast year of 2030. For corridors whose success depends on forecast growth or connections to an unfunded fixed guideway investment, Rapid Bus implementation is not recommended in the near term. Once these transitway investments are further along in project development and funding commitments, Rapid Bus implementation in these corridors could be considered.

The **American Boulevard** corridor benefits from connections to the Green Line (Southwest) LRT and Orange Line (I-35W South) BRT. The corridor has potential to form a vital east-west link between these transitways, along with the Blue Line (Hiawatha) LRT and the Red Line (Cedar Avenue) BRT. The success of Rapid Bus on American Boulevard also

HOW DO THE CORRIDORS COMPARE?

depends on substantial planned job and housing growth at three key districts along the corridor, where the City of Bloomington is targeting its development efforts. Interim steps toward Rapid Bus implementation will focus on building the transit market as these areas develop. Although the American Boulevard corridor is not recommended for Rapid Bus implementation in the near term, future study will continue to examine ways to maximize benefit to the area through Rapid Bus. This may include consideration of a 78th Street alignment west of the Normandale Lakes district, with a potential offline connection to north-south express service on Highway 169.

The **Hennepin Avenue** corridor also benefits to a connection to the Green Line (Southwest) LRT at West Lake Station. Unlike American Boulevard, Hennepin Avenue is currently a strong transit corridor whose successful implementation—in terms of ridership—is less dependent on the transitway connection. However, adding Hennepin Avenue Rapid Bus as an overlay on existing bus service would be duplicative under current conditions, as route branches outside the corridor limits would necessitate retaining a large amount of local bus service. In advance of Green Line (Southwest) LRT implementation, a broader restructuring of routes 6, 12, and 17 would be studied. This restructuring study may present a better opportunity for implementing Rapid Bus.

Is additional planning needed at this time to better develop Rapid Bus and other bus service in the corridor?
In addition to the aforementioned Alternatives Analyses, other studies are currently underway for the Bottineau Transitway (which may travel in the same area as the West Broadway Avenue corridor) and the Gateway Corridor (which may share a segment with the East 7th Street corridor). While not directly studying the same alignments reviewed in the ATCS, these corridor studies may influence the implementation of Rapid Bus in the West Broadway Avenue and East 7th Street corridors, respectively. Identifying a preferred transitway alternative on Bottineau and Gateway may help determine and/or refine the alignment and service configuration of Rapid Bus in the corridors. Once these studies have selected a preferred alignment and mode, more informed decisions could be made about how and when to implement Rapid Bus in these corridors as part of a greater discussion of transit network connections to the transitways.

As mentioned in the previous section, Hennepin Avenue Rapid Bus should be studied in the context of broader service restructuring in advance of Green Line (Southwest) LRT implementation.

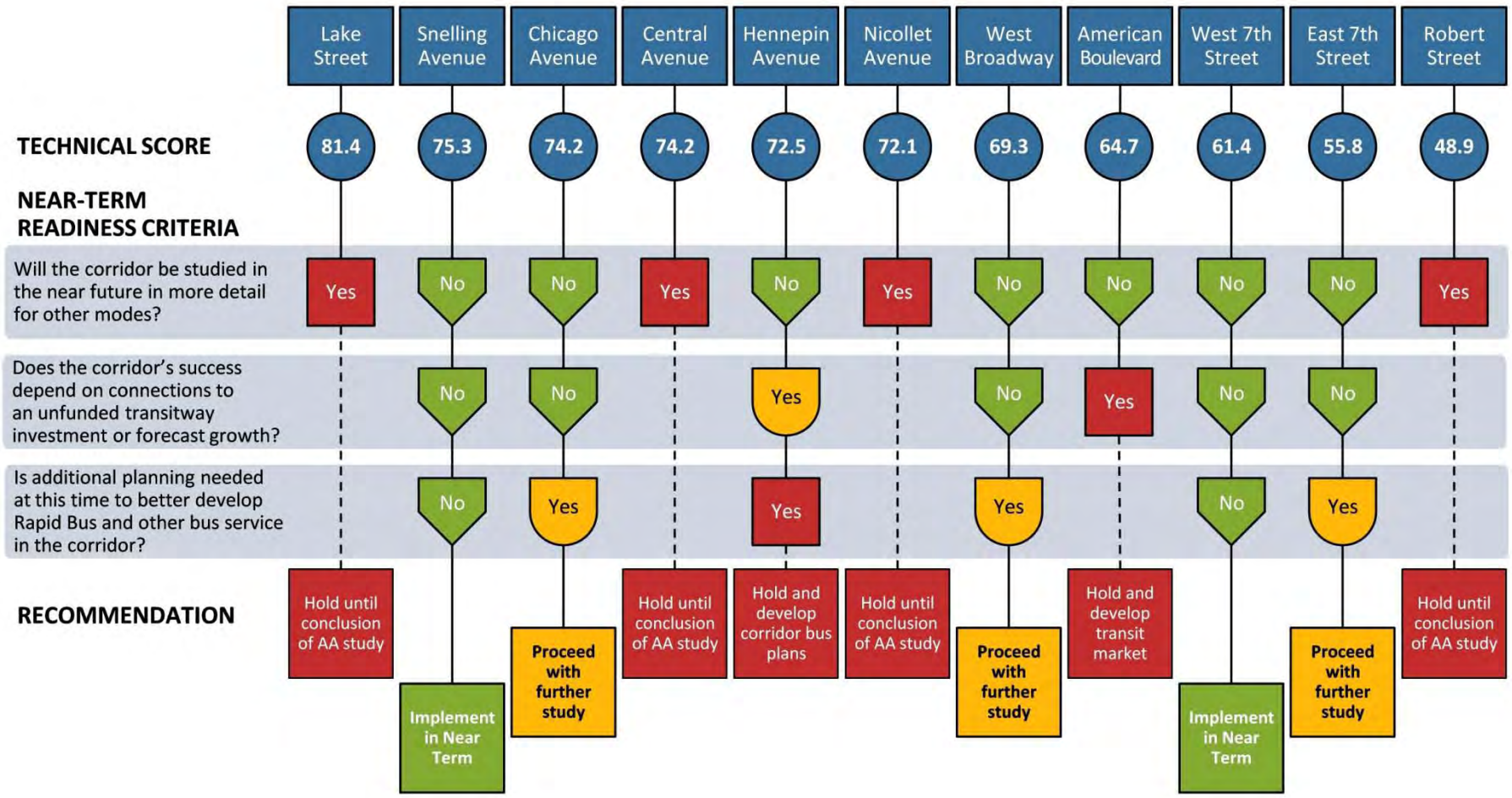
Discussions are also ongoing regarding the future location of east-west transit operations in downtown Minneapolis. Both the West Broadway Avenue and Chicago Avenue corridors would travel through downtown on an east-west alignment. The outcome of these discussions may shift the alignment of these routes and their complementary local service from 7th/8th streets to one or more other streets. For this reason, engineering of these corridors should not begin until a downtown alignment is solidified.

In addition, implementing Rapid Bus in the Chicago Avenue corridor would allow for significant reductions in Route 5 service levels south of downtown. However, Route 5 also provides high service levels northwest of downtown; retaining this service without a paired southern segment would greatly increase operating costs. This may be avoided through extending the Rapid Bus corridor through downtown to the northwest. Future study of this corridor may examine the potential to extend Chicago Avenue Rapid Bus to duplicate the Route 5, traveling on Emerson-Fremont through north Minneapolis.

For these reasons, it is recommended that Rapid Bus not be implemented on **West Broadway Avenue**, **Chicago Avenue, Hennepin Avenue** or **East 7th Street** in the near term, but that service and concept plans continue to be studied to refine the Rapid Bus concepts in these corridors as they relate to ongoing study efforts.

The figure on the following page summarizes the evaluation scores and screening process used to apply readiness criteria to the corridors.

HOW DO THE CORRIDORS COMPARE?



WHAT'S NEXT FOR RAPID BUS?

What do the results mean for implementing Rapid Bus?

Of the 11 corridors studied in the ATCS, six are screened from immediate near-term implementation due to additional upcoming studies or performance dependent on unfunded fixed guideway transitways. The remaining five corridors are either recommended for near-term implementation or further study and concept refinement.

Promising Corridors for Near-Term Implementation

Based on the evaluation and readiness criteria, it is recommended that Metro Transit work with its city, county, and MnDOT partners to implement Rapid Bus in the near term on Snelling Avenue and West 7th Street.

Snelling Avenue

The Snelling Avenue corridor has the highest evaluation score of the remaining corridors following the readiness screening process. Service changes related to implementation of Rapid Bus on the Snelling Avenue corridor could be coordinated with Green Line (Central) LRT service restructuring activities. In addition, a roadway construction project on Snelling Avenue beginning in 2012 may present opportunities for coordination in building Rapid Bus facilities on the corridor.

West 7th Street

Recent changes in bus service design in the West 7th Street corridor have proven to be effective in testing strategies incorporated in the Rapid Bus concept. Although the West 7th Street corridor was not among the top scoring corridors in the technical evaluation, it is important to note that partial implementation of the Rapid Bus concept in advance of the ATCS resulted in a lower technical score than could have been expected prior to consolidation of stops. Many of the mobility benefits of a Rapid Bus concept have already been partially achieved through stop consolidation and high-frequency service on Route 54.

Limited-stop Route 54 currently makes stops at approximately the same spacing in the corridor as a Rapid Bus line would, providing a fast trip for passengers. The route's high-frequency service and limited stops have proven effective in attracting passengers. Since stops have already been consolidated in the corridor, additional steps of adding transit signal priority, off-board fare collection, and upgraded passenger amenities would be relatively quick and effective to implement. The high-frequency service operating in the corridor could be replaced by Rapid Bus on a near one-to-one ratio, minimizing the amount of new operating funding commitment that would be needed to fund the service.

Similar to Snelling Avenue, service changes related to implementation of Rapid Bus on the West 7th Street corridor could be coordinated with Green Line (Central) LRT service restructuring activities, as well as buses serving the Union Depot. In addition, road and infrastructure construction in the Bloomington South Loop District is scheduled for 2012 through 2014, presenting coordination opportunities for building Rapid Bus infrastructure. In particular, a new transit street will be constructed as an extension of Lindau Lane. It is recommended that Rapid Bus on West 7th Street be implemented in the near term, and that construction activities be coordinated in the Bloomington South Loop district to maximize cost efficiency. Pending available funding, Rapid Bus service could begin as other construction activities are completed.

Corridors for Further Study

While not recommended for implementation in the near term, three corridors are identified for further planning with potential for subsequent implementation: Chicago Avenue, West Broadway Avenue, and East 7th Street.

Chicago Avenue

Existing travel patterns present opportunities to connect the Chicago Avenue corridor with north Minneapolis through an interlined Rapid Bus service. Stakeholders have also expressed interest in interlining Chicago Avenue Rapid Bus with Rapid Bus service on Fremont-Emerson in north Minneapolis, a corridor not studied in the ATCS. This interlining combination would present additional opportunities for local bus replacement on Route 5, which travels on Chicago Avenue in south Minneapolis and Fremont-Emerson in north Minneapolis.

Chicago Avenue scored highly in the evaluation process documented earlier in this memorandum, suggesting that Rapid Bus would perform well in this corridor. This concept requires further study to be implemented in the near term. Interlining concepts and alternative alignments and termini should continue to be investigated for the Chicago Avenue corridor. The potential for an interlined Rapid Bus line will also help to inform the discussion of east-west transit alignments through downtown Minneapolis.

West Broadway Avenue

As noted in the previous section, plans for the Bottineau Transitway include some transitway alternatives that travel on West Broadway Avenue on the alignment studied in the ATCS. West Broadway Avenue should continue to be studied for Rapid Bus implementation, along with the Fremont-Emerson corridor.

East 7th Street

Several preliminary concepts for the Gateway Corridor include transitway alternatives on a portion of the corridor studied in the ATCS. The Rush Line corridor is considering a number of potential routes and alignments that are parallel to portions of the East 7th corridor. While neither of these considerations precludes the operation of Rapid Bus in this corridor, the ATCS decision-making process will benefit from more fully developed Gateway and Rush Line Corridor concepts.

In addition, other service planning efforts and project partner feedback completed during the ATCS process indicate that a portion of the East 7th corridor may be served with an extension of West 7th Street Rapid Bus. The portion of the corridor on East 7th, Arcade, and Maryland Avenues has high existing transit demand and could support rapid bus investment in the near term if implemented as an extension of the West 7th Street corridor. These segments also have the least overlap with other transitway study alignments.

Further study of this concept as well as alternative service plans and coordination with a potential Gateway and Rush Line Corridor transitways should continue to be studied. If implemented on Arcade and Maryland as a first phase, a northerly extension of Rapid Bus service to Maplewood Mall may follow.

Next Steps

After completing this study, Metro Transit will continue its Rapid Bus project development efforts, working toward corridor implementation on Snelling Avenue and establishing a system of future Rapid Bus deployments. Key steps in project development include the following:

- **Developing system-level characteristics**. A number of system-level decisions must be made within the next 6-9 months for project plans to proceed, regarding fare collection and policy, technology features, branding, station design, and vehicle specifications.
- **Refining corridor-specific designs**. Concept-level service plans will be developed with public input to identify service frequency, bus requirements, remaining local bus service, and routing. Station platform location and design efforts will engage the public and stakeholders to determine final station locations. Corridor-wide technology, signal timing, and transit signal priority design will be completed, working with multiple jurisdictions.
- **Securing project funding.** Securing funding for construction and operation of Rapid Bus will enable project implementation. Potential funding sources include formula and competitive federal funds, state bonds, and regional transit funding sources.
- **Continuing to engage stakeholders throughout the process.** Successfully integrating local, agency, and project interests is critical to the success of Rapid Bus implementation. Through its guiding principle of community orientation, Metro Transit is committed to working with the project partners to identify the appropriate transit investments in the study corridors. As system- and corridor-specific plans progress, Metro Transit will work closely with its project partners to refine the Rapid Bus concept to fit within the context of each Rapid Bus corridor.