ACCESS MINNEAPOLIS:

DOWNTOWN EAST-WEST TRANSIT SPINE PLAN

Prepared by
Minneapolis Department of Public Works
and
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DRAFT FINAL REPORT

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Executive Summary

The Minneapolis City Council adopted *Access Minneapolis: Downtown Ten-Year Transportation Action Plan* in June 2007. At that time, the Council directed additional study on an east-west transit spine. This report documents that additional study.

Purpose of East-West Transit Spine

The purpose of an east-west transit spine is to improve transit service and to improve the quality of transit facilities for those passengers traveling east-west through downtown. Consolidating transit service into "spines" concentrates financial resources, simplifies the transit system for users, and is an efficient way to provide a very high frequency of service and a high level of transit facilities in selected downtown corridors. This helps provide better internal downtown transit circulation service for visitors and consumers who don't use the transit system on a regular basis and encourages transit use for a variety of trips. The objectives of an east-west spine are to:

- Provide an improved level of transit service that is fast, reliable and direct.
- Provide a high quality waiting environment for transit passengers.
- Provide a transit corridor with the capacity to grow
- Provide a high quality environment for all pedestrians.

At the same time, it will be important to provide reasonable options for curbside uses, maintain reasonable traffic flow through the downtown core, and avoid impacts on existing bike lanes.

Need for Transit Improvements

A detailed transit study completed as part of the *Downtown Action Plan* identified the following transit problems in downtown:

- Insufficient downtown street capacity to handle growth in transit demand
- Slow and unreliable transit service, due in part to downtown street configurations
- Need for transit services that stimulate economic development
- Need to reduce conflicts between transit and other modes
- Need for better intra-downtown circulation service
- Need for better service to edge-of-downtown neighborhoods

There was general agreement during the preparation of the *Downtown Action Plan* that the concept of an east-west transit spine was desirable, but an agreement was never reached on the best location for the spine or the best configuration for transit service. The transit routes that would use an east-west transit spine provide service primarily to the northwest and southeast quadrants of Minneapolis as well as the suburban communities of Brooklyn Center, Robbinsdale, Golden Valley, Minnetonka, St. Louis Park, Richfield and Bloomington. A number of major employers are served by these routes including the Hennepin County Medical Center, the Allina medical complex, the Wells Fargo campus, the North Memorial Medical Center, Honeywell, Mn/DOT(Golden Valley), and Target Financial Services. Over half of the employees in downtown Minneapolis work within less than three blocks of the existing east-west local transit service.

The local routes that would be served by an east-west transit spine are some of the highest performing routes in the regional transit system and several of their downtown stops have daily boardings that are higher than most LRT stations. The existing stop at 7th Street and Nicollet Mall has the highest boardings of any bus stop in the region and is only exceeded in boarding volumes by the LRT stop at Nicollet. These routes are part of the city's Primary Transit Network and have service at least every 15 minutes all day. These local bus routes have a combined daily ridership of over 36,000 daily boardings.

Unlike the north-south transit spine (Nicollet Mall, Marquette and 2nd Avenues) and the southwest transit spine (Hennepin Avenue), there have been very few transit service or facility improvements for east-west transit routes. Some of the highest volume stops do not have shelters, even though the number of boardings dramatically exceeds Metro Transit's installation guidelines. In addition, most of the east-west streets in the downtown core between the LRT line on 5th Street S and 10th Street S have very little landscaping and few pedestrian amenities.

Alternative Alignments for an East-West Transit Spine

Ten alternatives were evaluated for a potential east-west transit spine including:

- 6th and 7th Street one-way pair
- 7th and 8th Street one-way pair
- 8th and 9th Street one-way pair
- 9th and 10th Street one-way pair
- 4th Street contraflow lane
- 6th Street contraflow lane
- 7th Street contraflow lane
- 8th Street contraflow lane
- 9th Street contraflow lane
- Two-way operation on 8th Street

These alignment alternatives were evaluated using a three-tiered screening process:

- *Screen 1*: Impacts to transit service (geometric constraints, circuitous routing, travel times, walk time/distance)
- *Screen 2*: Impacts to traffic (traffic operations, level of service)
- *Screen 3*: Impacts to curbside uses (parking, taxi stands, valet parking, deliveries, etc.), existing bike lanes, and pedestrian zones

Screen 1 resulted in the elimination of alignments along 4th, 6th, 9th and 10th Streets due to increases in transit travel times, increases in walk times and distances, physical problems making connections to 7th Street and Hwy 55 on the northwest side of downtown, and poor service to the HCMC complex. Screen 2 resulted in the elimination of the 7th Street contraflow lane and the 8th Street two-way alternatives due to negative traffic impacts. Finally, the 7th and 8th Street one-way pair was recommended as the preferred alignment for the east-west transit spine based on fewer curbside use impacts and greater sidewalk space for pedestrians and transit passengers.

Proposed Facility and Service Improvements

The following facility and service improvements are recommended for the 7th and 8th streets east-west transit spine (see Figure ES-1):

- To accommodate the high volume of boarding passengers, the westbound bus stop on 7th Street at Nicollet Mall should be split into two bus stops – one at the existing far-side corner and a new stop at the nearside corner.

- To provide sufficient space for passenger facilities and pedestrian movement, curb extensions should be provided at the five bus stops on 7th and 8th streets between Marquette Avenue South and 1st Avenue North (nearside 7th/Nicollet, far-side 7th/Nicollet, far-side 7th/Hennepin, nearside 8th/Hennepin, and nearside 8th/Nicollet). To maintain acceptable traffic operations, parking and curbside uses should be restricted during peak periods in the left lane of these blocks; this maintains the existing three travel lanes in addition to the right lane where buses stop, as shown in Figure ES-2.

- Transit shelters that are heated and lighted should be provided at all fourteen transit stops on the downtown east-west transit spine. Existing shelters should be removed and upgraded to provide a uniform look and level of service to the corridor. Shelters should be sized for the anticipated volume of boarding passengers.

- Real time display (RTD) transit information signs should be provided at the busiest transit stops, including the seven bus stops between 3rd Avenue S and 1st Avenue N and two other bus stops at 7th St/Park Ave (HCMC) and at 7th St/3rd Avenue, as shown in Figure ES-1.

- Streetscape improvements should be provided along both sides of 7th and 8th streets, at least between 2nd Avenue S and 1st Avenue N. Ideally, these improvements should be provided along the entire corridor between Chicago Avenue S (HCMC) and 1st Avenue N.

- Dwell and hold time on 7th Street at the Nicollet Mall will impact through traffic. Route 5 hold needs to be accommodated differently than is done today, either through operating the route without a scheduled hold, holding at a different location, or providing for the hold in a parking bay outside the traffic lane.

- Improvements in boarding time will help speed the flow of buses through downtown. On-going efforts to increase market penetration for Metro Transit's contactless Go-To card in traditionally underserved areas is an important factor in meeting this goal.

The estimated capital cost to provide the recommended improvements on 7th and 8th streets between 1st Avenue N and Chicago Avenue is approximately $8 million. This cost estimate assumes that both streets can be retrofitted to include the needed pedestrian and transit improvements. If the streets have to be completely reconstructed, then the costs will be substantially higher. It would be most cost-effective to coordinate these improvements with planned mill and overlay projects on 7th and 8th streets. It may be possible to implement improvements in the short-term at the west end of the corridor where transit and pedestrian needs are greatest and phase in improvements to the west over the longer term.

Next Steps

The next steps that need to be taken to move forward on implementation of the proposed east-west transit spine improvements in downtown are to:

1. Prepare conceptual layouts for five bus stops with curb extensions.

2. Meet with downtown stakeholders to discuss the evaluation of alternatives, the preferred alignment alternative, and the proposed improvements along 7th and 8th streets.

3. Make modifications to recommendations and associated cost estimates based on input from downtown stakeholders.

4. Obtain approval of the preferred alignment alternative and proposed improvements and authorization to proceed from City Council.

5. Determine if any improvements, particularly operations changes, can be implemented immediately. If so, implement those changes prior to construction.

6. Identify funding sources for implementation and seek funding as needed.

7. Prepare final design plans and detailed cost estimates for proposed improvements, working with property owners and downtown stakeholders regarding streetscape and transit facility improvements.

8. Construct proposed improvements and implement proposed transit service changes.

Figure ES-1 Proposed East-West Spine Improvements

Real Time Sign
Improved Shelter
Curb Extension

Real Time Sign
Improved Shelter
Curb Extension

Real Time Sign
Improved Shelter
Curb Extension

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STREETSCAPE
TREES, LIGHTING & PLANTERS

PRIMARY STREETSCAPE
SECONDARY STREETSCAPE

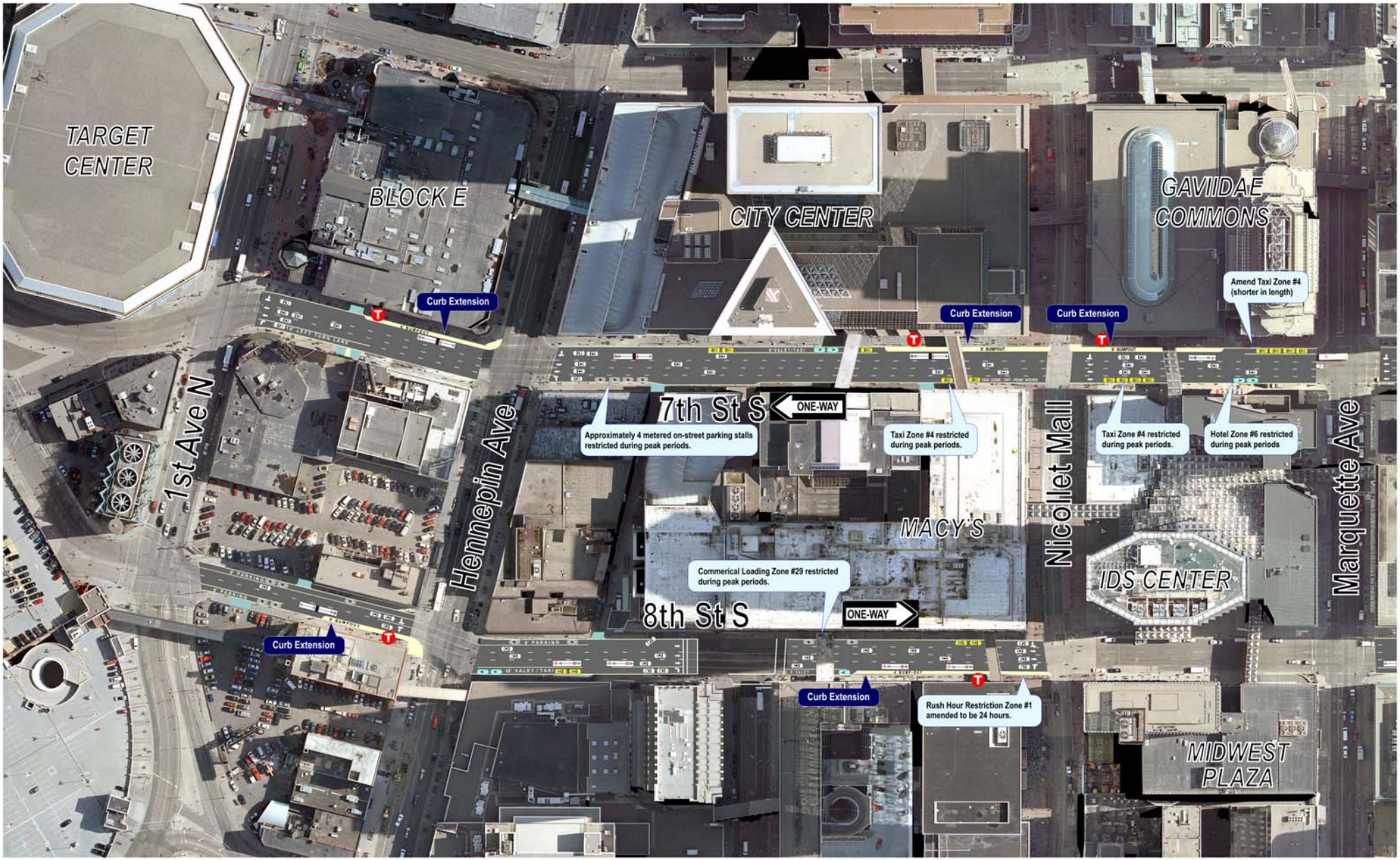
NEW SPLIT STOP AT 7TH & NICOLLET

REAL-TIME DISPLAY SIGNS AT 9 LOCATIONS

IMPROVED SHELTERS WITH HEAT & LIGHTING SIZED TO PASSENGER DEMAND AT 12 LOCATIONS

CURB EXTENSIONS AT 5 LOCATIONS

Figure ES-2: Proposed E-W Transit Spine Traffic Changes



Introduction/Background

The Minneapolis City Council adopted the *Access Minneapolis: Downtown Ten-Year Transportation Action Plan*[1] in June 2007. At that time, the Council directed additional study on an east-west transit spine through downtown. This report documents that additional study.

Downtown Transit Spine Planning and Implementation

The recommendations in the *Downtown Ten-Year Transportation Action Plan* are intended to meet long-term transit needs in downtown and to strongly encourage walking, bicycling and transit use within and to/from downtown. As part of the Downtown Action Plan, a detailed transit study for downtown was completed[2] and the following transit problems in downtown were identified:

- Insufficient downtown street capacity to handle growth in transit demand
- Slow and unreliable transit service, due in part to downtown street configurations
- Need for transit services that stimulate economic development
- Need to reduce conflicts between transit and other modes
- Need for better intra-downtown circulation services
- Need for better service to edge-of-downtown neighborhoods

The study recommended addressing these problems by consolidating transit service into high-visibility transit "spines" where transit is given modal priority. Consolidating transit service into spines has the following advantages:

- It simplifies the transit system for users, particularly for individuals who are not familiar with the system, similar to the advantage that a rail system provides.
- It concentrates financial resources, allowing better transit passenger facilities, passenger information services, security and other services to be provided.
- It often brings enough buses into a single corridor to justify transit lanes, thus improving overall transit operation and speed.
- Just as with the Primary Transit Network corridors outside downtown, it is an efficient way to provide a very high frequency of service in selected downtown corridors. This is beneficial for shorter trips and helps provide better internal downtown transit circulation

[1] City of Minneapolis, *Access Minneapolis: Downtown Ten-Year Transportation Action Plan,* adopted June 29, 2007.
[2] Meyer Mohaddes Associates, Nelson/Nygaard Consulting Associates, et al., *Downtown Transit Circulation Concept,* August 2006.

service and it allows people to use transit without needing to know a great deal about routes and schedules.

- It removes buses from other streets, providing overall improvements in the operation of the general transportation system.

In addition to light rail transit (LRT) on 5th Street, the Downtown Action Plan identified three primary bus transit spines in downtown Minneapolis, as shown in Table 1: a North-South Spine (Nicollet Mall, Marquette Avenue, and 2nd Avenue S), a Southwest Spine (Hennepin Avenue), and an East-West Spine (4th Street and 6th through 9th Streets). To date, the following Downtown Action Plan recommendations on the North-South and Southwest spines have been completed or are underway:

- *North-South Express Bus Spine:* Reconstruction of Marquette and 2nd avenues to provide dual-width contraflow transit lanes is complete, and express bus service returned in December 2009. The reconstruction project also included wider sidewalks, new bus shelters, real-time transit information signs, trees, street lights, and other streetscape elements.

- *North-South Local Bus Spine:* Removal of express buses on Nicollet Mall and the introduction of free bus service on the Nicollet Mall occurred in March 2010. Replacement of Nicollet Mall buses with hybrid electric vehicles is underway, and Metro Transit currently expects to reach the goal of 100% hybrid buses on Nicollet Mall by the end of 2010, two years ahead of schedule.

- *Southwest Spine:* The conversion of Hennepin Avenue and 1st Avenue North to two-way traffic operation was completed in October 2009; buses operate in hybrid lanes that are shared with bicycles and right-turning vehicles.

Table 1 – Characteristics of Downtown Transit Spines

	Downtown Transit Spines					
	South-West	North-South		East-West		
	Hennepin	Nicollet	Marquette/2nd	LRT	4th St	6th-9th Sts
Transit Routes Served by Downtown Spines						
LRT	--	--	--	55 LRT	--	--
Local Bus	4,6,12,61	10,11,17,18,25	--	--	3,7,16	5,9,14,19,22
Express/Limited-Stop Bus	1 route	1 route	78 routes	--	2 routes	16 routes
Transit Utilization						
Weekday Transit Trips	499	782	1,377	282	944	1,071
PM Peak Hour Transit Trips	43	64	268	16	50	105
Daily Downtown Boardings*	6,500	11,500	22,500	11,000	6,000	15,500
Daily Boardings at Highest Volume Stop*	1,000	1,200	1,300	4,800	2,200	3,800
Downtown Transit Facilities						
Exclusive Transit Lanes	bus/bike/turn	2-way	2-way	2-way	1-way	--
Shelters	yes	yes	yes	yes	--	some
Real-time Transit Info Signs	--	--	yes	--	--	--

* Source: Metro Transit, March-May 2009 APC data

As a result of these actions and previous investments in transit facilities on Nicollet Mall, 4th Street, Hennepin Avenue, and 5th Street LRT, all of the transit spines in downtown except the E-W bus spine have had some level of investment in transit service and passenger facilities, as shown in Table 1 and Figure 1.

Previous East-West Transit Spine Planning

There was general agreement during the preparation of the *Downtown Action Plan* that the concept of an east-west transit spine was desirable, but an agreement was never reached on the best location for the spine and the best configuration for transit service.

The detailed transit study conducted for downtown as part of the Downtown Action Plan[3] found that average existing bus speeds on 6th, 7th and 8th streets were 5.6 to 6.6 mph. These low bus speeds, coupled with the expected growth in bus volumes, led the consultants to initially recommend that a westbound contraflow lane be provided on 8th Street with eastbound buses operating in mixed traffic, although they acknowledged that mixed flow operation in the eastbound direction was not desirable.

After further traffic study, staff and consultants recommended that 8th Street be converted to two-way traffic operation and local bus service on 6th, 7th, 8th, and 9th streets be consolidated onto 8th Street in mixed traffic with I-94 express buses operating in mixed traffic on 6th and 7th streets.[4] This proposal for a two-way 8th Street was opposed by the downtown business community. Metro Transit also had concerns about the impacts of two-way 8th Street traffic operation on bus speeds through downtown.

As a result, the City Council directed that the question of an east-west spine be revisited and alternatives for its location and associated improvements be further evaluated.[5] The final *Downtown Transportation Action Plan* recommended the following:

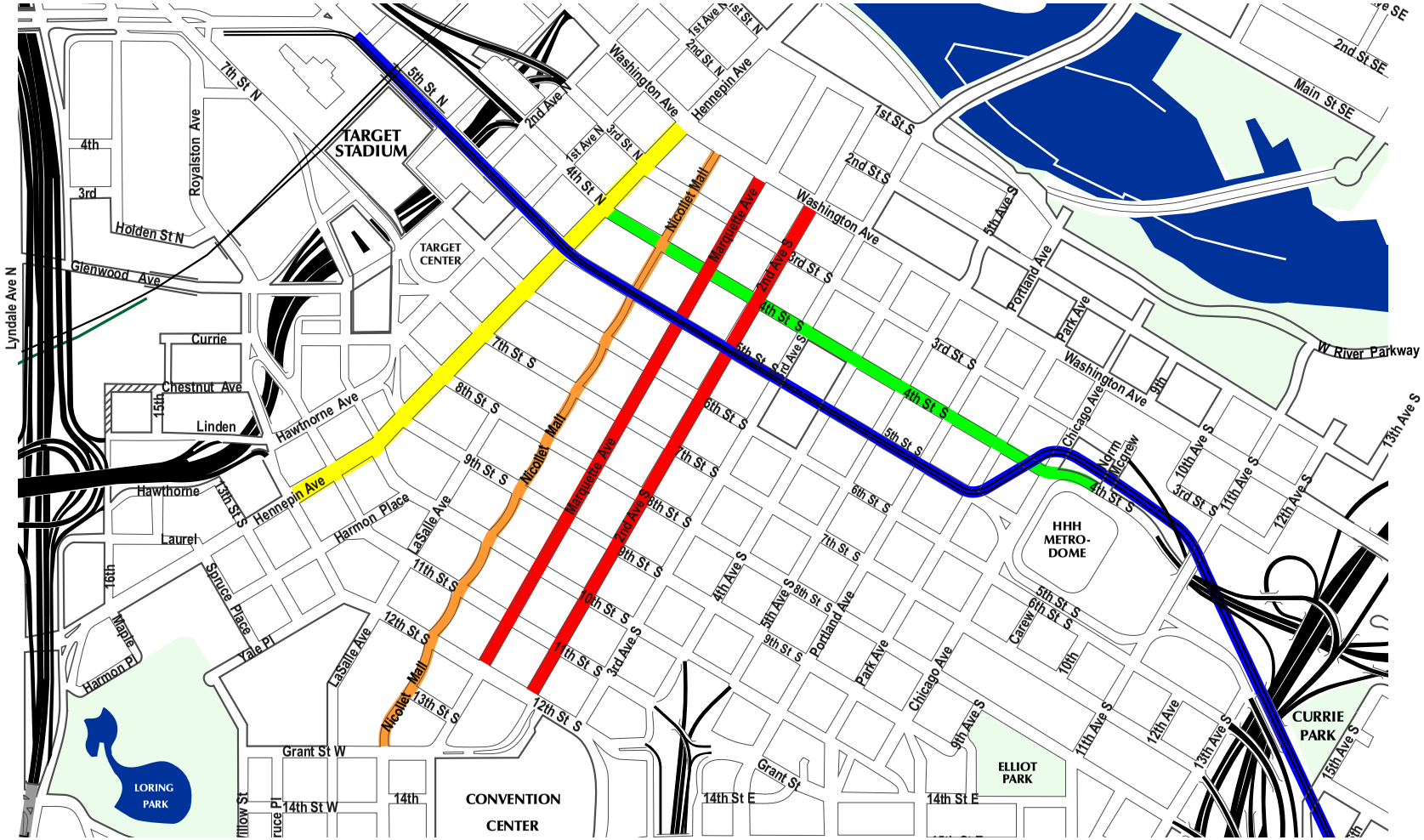
- Continue to use 4th Street for University Avenue buses until Central Corridor LRT is constructed – many of these buses will be replaced by the LRT service.

- Continue to operate peak period I-94 express buses on 6th St. (outbound in the afternoon) and 7th St (inbound in the morning) because these streets provide direct access to/from I-94 East.

- Continue to explore multiple options or combinations of sub-options, including 4th Street, to serve and improve the East-West transit spine.

[3] Meyer Mohaddes Associates et al, *Downtown Transit Circulation Concept,* August 2006.
[4] Meyer Mohaddes Associates et al, *Downtown Streets Strategy,* October 2006.
[5] City of Minneapolis, *Access Minneapolis: Downtown Ten-Year Transportation Action Plan,* adopted June 29, 2007.

Figure 1 - Existing Transit Spine Facilities



	Marquette / 2nd	Dual, 2-way bus lanes, enhanced shelters, real-time transit information, streetscape
	Nicollet	Transit/pedestrian mall, enhanced shelters, streetscape
	Hennepin	Shared bus/bike/turn lanes, enhanced shelters, streetscape
	4th St	1-way contraflow bus lane
	5th St	Exclusive LRT tracks, enhanced shelters

Purpose of East-West Transit Spine

The objectives for a downtown east-west transit spine are to:

- *Provide an improved level of transit service that is fast, reliable and direct.* Transit customers should have service that is consistently on-time, have travel speeds that are competitive with the automobile, and have a short walking distance to reach their destinations.

- *Provide a high quality waiting environment for transit passengers.* High volume transit corridors should have transit facilities that are appropriately sized and include light, heat and next bus arrival information.

- *Provide a transit corridor with capacity to grow.* As transit demand grows, the selected spine should have the capacity to serve future growth in transit ridership and service.

- *Provide a high quality environment for all pedestrians.* The sidewalks along the east-west spine should provide comfortable space for pedestrian circulation as well as space for waiting transit passengers.

- *Provide reasonable options and alternative locations for curbside uses.* Curbside uses (taxi stands, valet parking, deliveries, drop-off/pick-up, etc.) are an essential function of downtown streets. While these uses do not need to be provided on every street, they do need to be provided in close proximity to the properties they serve and impacts on curbside uses should be considered in making decisions about an east-west transit spine.

- *Maintain reasonable traffic flow through the downtown core.* Traffic flow in the downtown core does not need to be fast but it does need to be efficiently managed. The impacts on traffic flow should be considered in making decisions about an east-west transit spine.

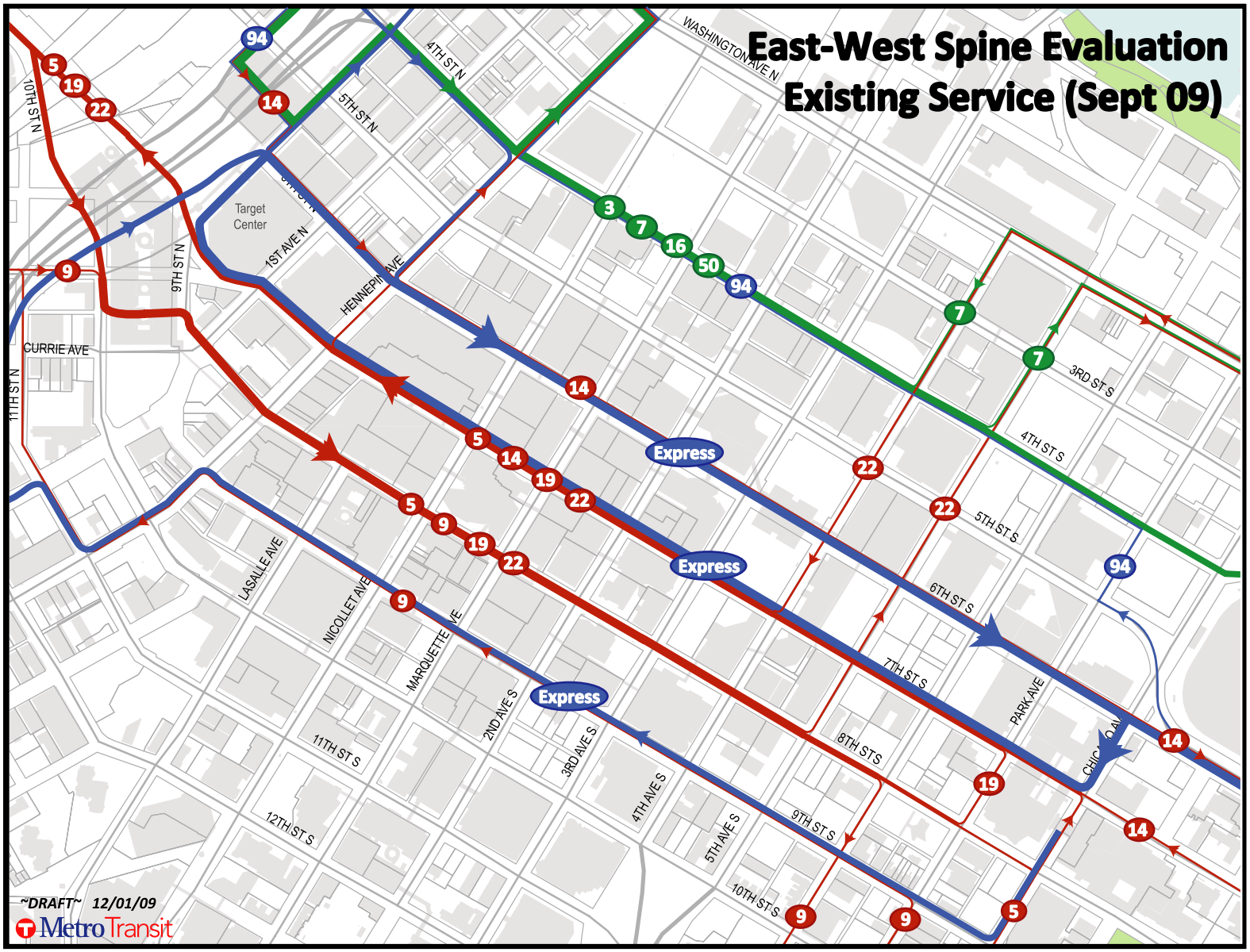
- *Consider impacts on existing bike lanes.* Bicycle use is rapidly growing in downtown Minneapolis and the *Downtown Action Plan* supports a multi-modal approach to transportation services in the downtown area. The impacts on existing bike lanes should be considered in making decisions about an east-west transit spine.

Existing East-West Transit Service and Facilities

East-west bus service through downtown is currently provided as follows (see Figure 2):

- *Local Bus Service on 6th, 7th, 8th, 9th Streets S:* Most east-west local buses (routes 5, 9, 14, 19, and 22) currently operate in mixed traffic on 6th, 7th, 8th and 9th streets. As shown in Table 2, these routes provide nearly 780 daily local bus trips and serve 11,000 daily passengers boarding at downtown bus stops on these streets. These local bus routes are the focus of concern for an east-west transit spine.

Figure 2 - Existing East-West Service in Downtown



- *Local Bus Service on 4th Street S:* East-west local buses traveling between downtown and the U of M (local routes 3, 7, and16, and limited stop Route 50) currently operate on 4th Street (westbound in a contraflow lane and eastbound in mixed traffic). As shown in Table 2, these streets carry over 690 daily local bus trips and serve almost 6,000 daily passengers boarding at 4th Street bus stops. However, some of this service will be eliminated (Route 50) or reduced (Routes 16 & 94) when the Central Corridor LRT line is constructed.

- *Express Bus Service on 6th, 7th, 8th, and 9th Streets S:* Most I-94 East express buses operate on 6th and 7th Streets through downtown (except for route 94, which uses the 4th Street contraflow lane in the westbound direction). In addition, some express routes connecting with I-394 and I-94 to the west of downtown operate on *6th, 7th, 8th, and 9th Streets S.* As shown in Table 2, these streets carry over 290 daily express bus trips and serve 4,300 daily passengers boarding at downtown bus stops on these streets.

Table 2 – Existing Local Bus Service on East-West Streets

Street	Service Type	Direction of Travel	Bus Routes	Daily Buses	Daily Downtown Boardings*
4th Street Local/Limited-Stop Total				**692**	**5,800**
4th Street	Local	Eastbound	3, 7, 16, 50	346	5,500
4th Street	Local	Westbound contraflow lane	3, 7, 16, 50	346	300
6th-10th Street Local Total				**779**	**11,000**
6th Street	Local	Eastbound	14	75	800
7th Street	Local	Westbound	5, 14, 19, 22	344	6,500
8th Street	Local	Eastbound	5, 9, 19, 22	315	3,200
9th Street	Local	Westbound	9	45	500
10th Street	Local	Eastbound	-	-	-
4th Street Express Total				**252**	**100**
4th Street	Express	Eastbound	760, 761, 763, 765, 766, 767, 780, 781, 782, 783, 784, 789, 850, 851, 852, 854	175	50
4th Street	Express	Westbound contraflow lane	94	77	50
6th-10th Street Express Total				**292**	**4,300**
6th Street	Express	Eastbound	94, 134, 144, 353, 355, 365, 375, 452, 643, 649, 663, 721, 724, 758, 764	173	3,100
7th Street	Express	Westbound	39, 353, 355, 365, 375, 452, 721, 724, 758, 764	84	700
8th Street	Express	Eastbound	39, 755	12	200
9th Street	Express	Westbound	643, 649, 663	23	300
10th Street	Express	Eastbound	-	-	-

* Source: Metro Transit, March-May 2009 APC data

In addition, 3rd, 4th, 11th, and 12th Streets S also carry express buses travelling east-west between the Marquette and 2nd Avenues S dual bus lanes and the freeways:

- I-94 West express buses operate on 3rd Street and the 4th Street contraflow lane, connecting to the Marquette and 2nd Avenue S. dual bus lanes. I-94 West express buses are expected to continue this routing because 3rd and 4th Streets provide direct access to/from I-94 West.

- I-394 express buses operate on 11th and 12th Streets and connect to the north-south spine on Marquette and 2nd avenues. I-35W South express buses also operate on 11th and 12th Streets for a short distance to connect to the Marquette/2nd Ave bus lanes. Both I-394 and I-35W express buses are expected to continue to operate on 11th and 12th streets in the future although I-394 expresses could be moved to an east-west route if bus capacity on 2nd and Marquette is exceeded in the future.

The local bus routes on 6th, 7th, 8th, and 9th Streets, which are the focus of concern for the east-west spine, are among the highest frequency routes in the region. Routes 5 and 19 are part of Metro Transit's High Frequency Network, with portions of each route providing service at least every 15 minutes on weekdays from 6am to 7pm and Saturdays from 9am to 6pm. Together the five local bus routes studied for the east-west spine (routes 5, 9, 14, 19, and 22) have a combined ridership of over 36,000 daily boardings, as shown in Table 3.

As shown in Figure 3, these routes serve several major employers outside the downtown area including the Hennepin County Medical Center, the Allina medical complex, the Wells Fargo campus, the North Memorial Medical Center, Honeywell, Mn/DOT (Golden Valley), and Target Financial Services. They also serve large portions of Minneapolis neighborhoods in the northwest and southeast quadrants of the City, as well as the suburban communities of Brooklyn Center, Robbinsdale, Golden Valley, Minnetonka, St. Louis Park, Richfield and Bloomington. Within the downtown area, at least 70,000 employees work within three blocks of existing east-west transit service on 7th and 8th streets. This represents over 54% of downtown employees.[6]

Over 50% of downtown employees work within two blocks of existing east-west service

Hennepin County Medical Center is a major employer served by the east-west spine

[6] Metropolitan Council, Local Planning Handbook Section 4. Transportation.

Table 3 - Local E-W Spine Routes on 6th , 7th, 8th, and 9th Streets

Route	Location	Midday Frequency	Average Daily Total Boardings*
5	Brooklyn Center - Emerson/Fremont – Chicago Ave S – Mall of America LRT	7-8 min	16,000
9	Cedar Lk Rd – 46th St LRT	30 min	2,700
14	Robbinsdale-West Broadway Av – Bloomington Av S	15-20 min	6,500
19	Brooklyn Center – Penn Av N – Olson Memorial Hwy	15 min	5,500
22	Brooklyn Center – Lyndale Av N – Cedar Ave S – VA Medical Center LRT	20 min	5.800
Total			**36,500**

* Source: Metro Transit, October 2009 Route Profile

7th Street Bus Stop West of Nicollet Mall

Unlike the north-south and southwest transit spines, transit boardings on east-west streets are highly concentrated at a few bus stops intersecting Hennepin Avenue and Nicollet Mall. The bus stops on 4th, 7th, and 8th streets at Nicollet Mall are among the top 10 highest volume bus stops in the region (including transit centers) and rival the volume of boarding passengers at the busiest LRT stations, as shown in Figure 4 and Figure 5. However, the quality of passenger facilities at most bus stops on the east-west spine is inadequate for the volume of passengers. Based on Metro Transit's shelter installation guidelines (which require a minimum of 40 daily boardings for a shelter), all of these stops should have shelters. The busiest bus stop on 7th Street at Hennepin, which at 3,800 daily boardings is the highest volume bus stop in the region, has no passenger shelter at all. In addition, most of the east-west streets in the downtown core between the LRT line on 5th Street and 10th Street have very little landscaping and few pedestrian amenities.

Figure 3 - Geographic Service Areas for East-West Transit Routes

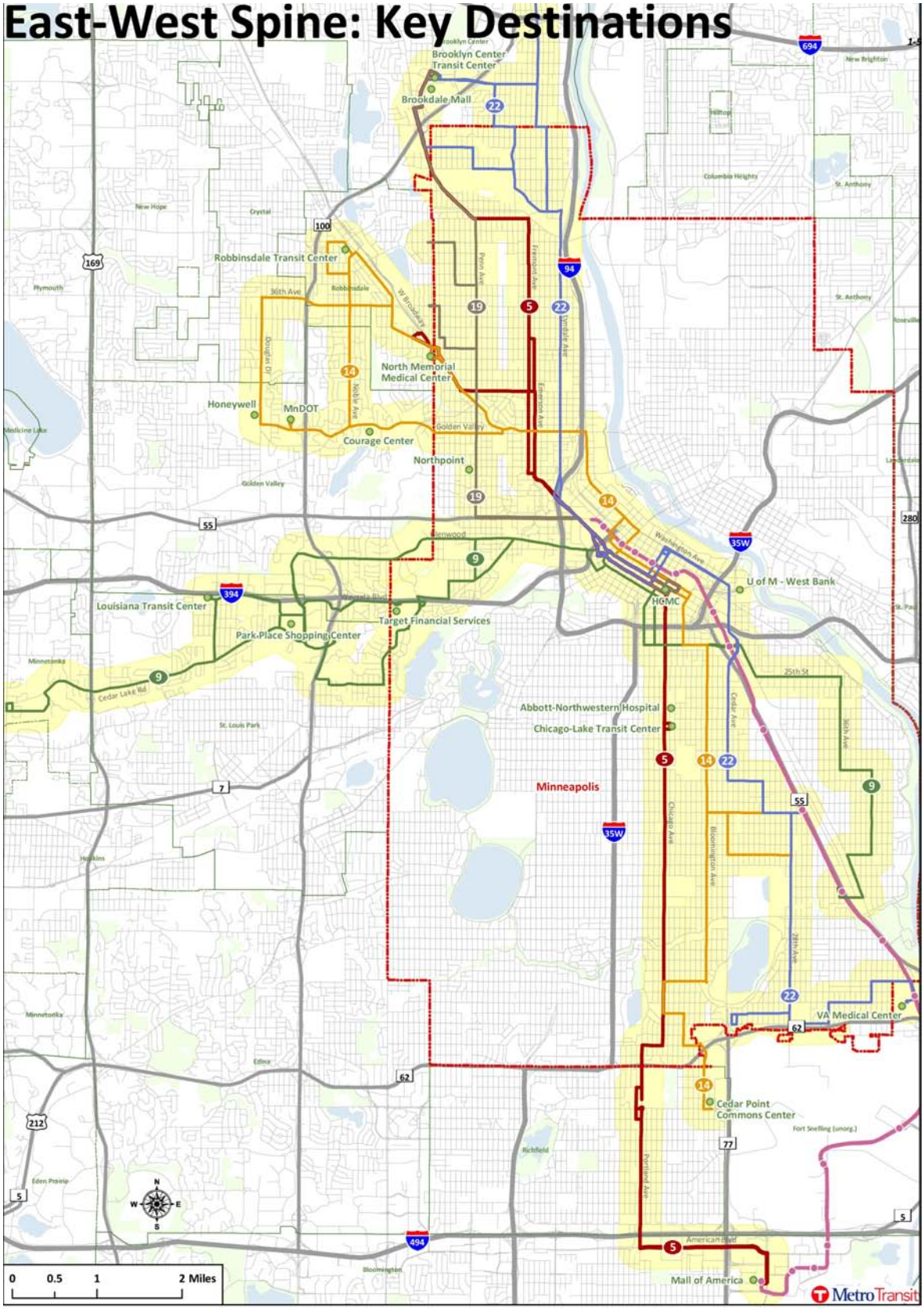
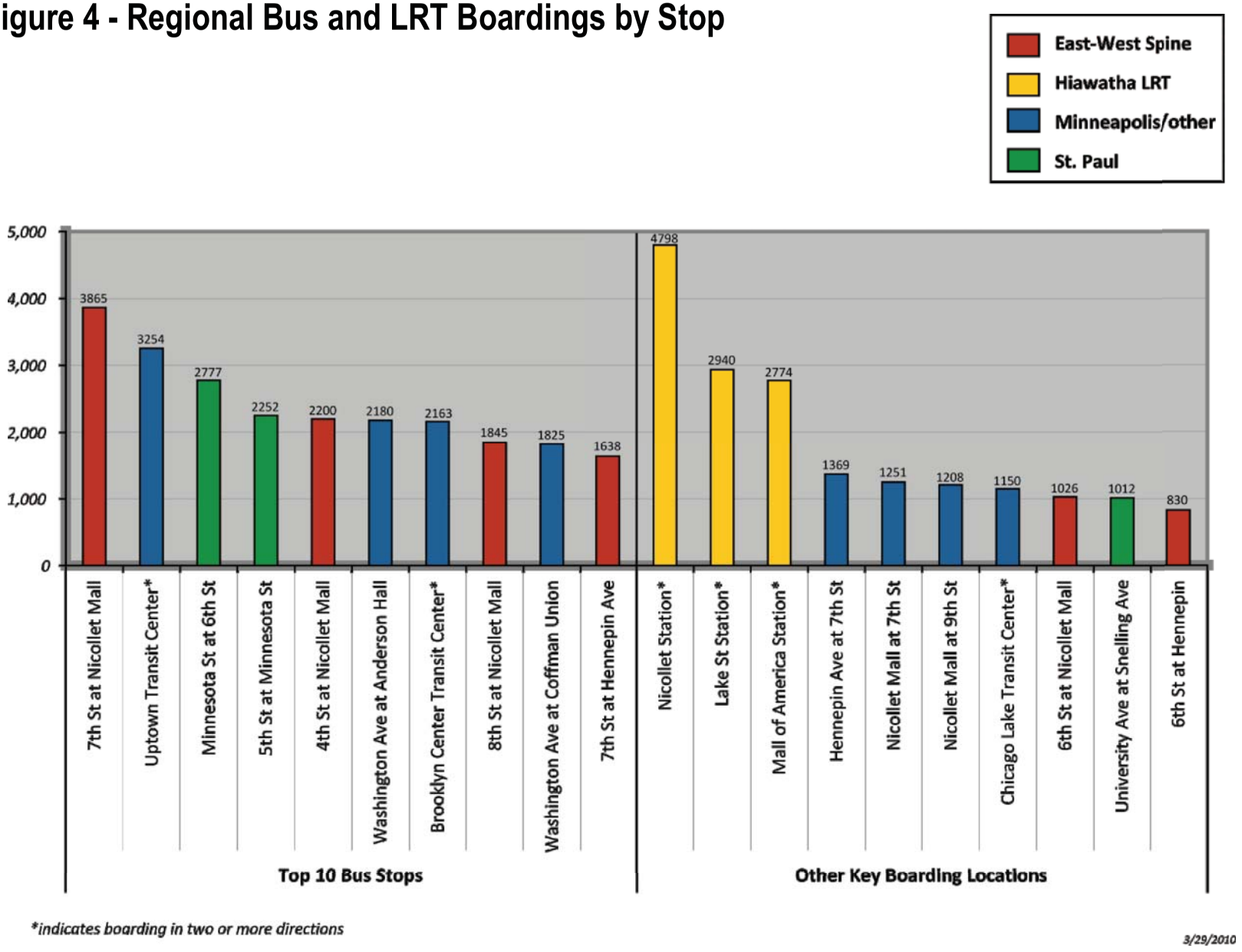


Figure 4 - Regional Bus and LRT Boardings by Stop



*indicates boarding in two or more directions

3/29/2010

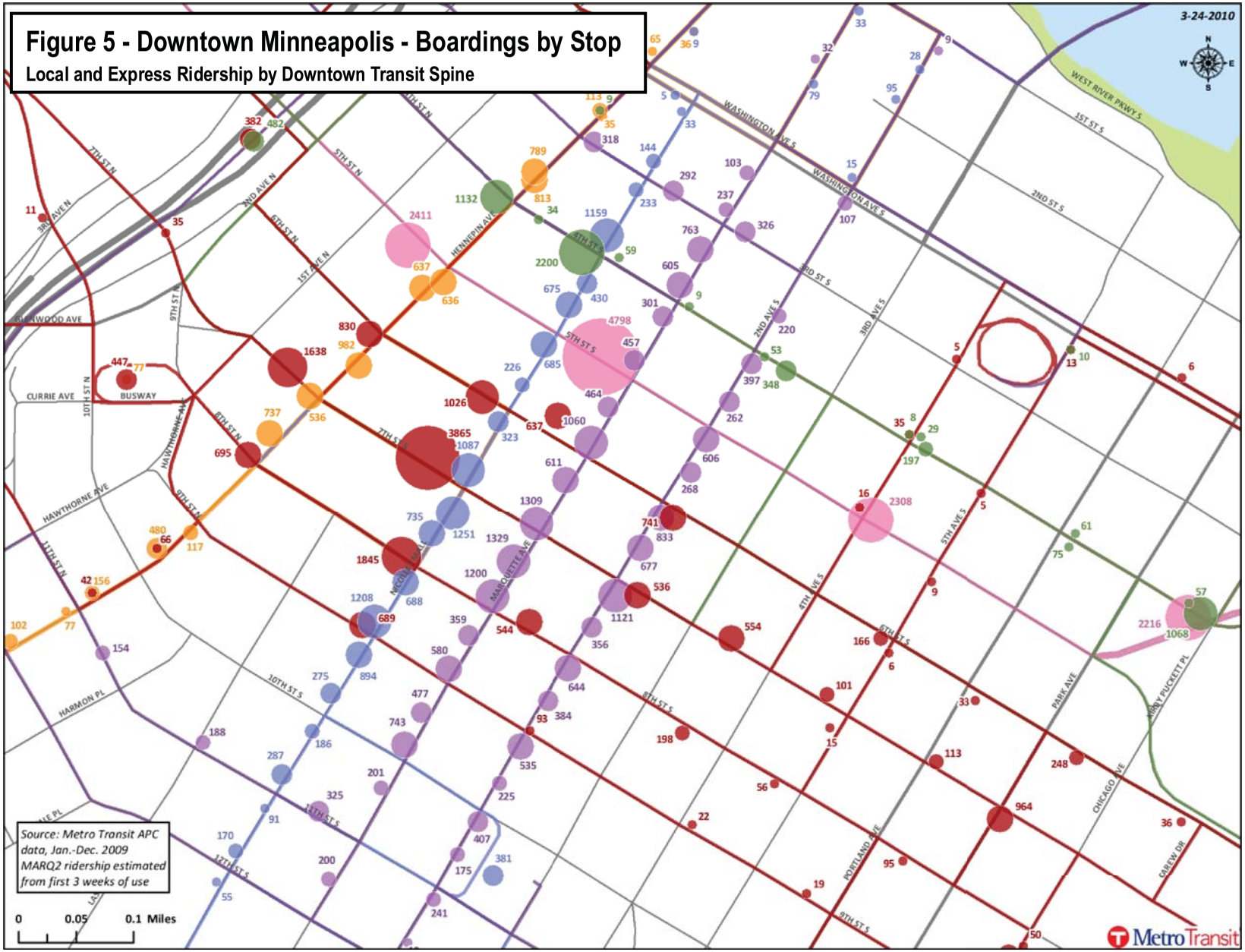


Figure 5 - Downtown Minneapolis - Boardings by Stop
Local and Express Ridership by Downtown Transit Spine
3-24-2010
Source: Metro Transit APC data, Jan.-Dec. 2009
MARQ2 ridership estimated from first 3 weeks of use
0 0.05 0.1 Miles
Metro Transit
WASHINGTON AVE S
WEST RIVER PKWY S
1ST ST S
2ND ST S
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
11TH ST S
12TH ST S
1ST AVE N
2ND AVE N
3RD AVE N
5TH ST N
6TH ST N
7TH ST N
8TH ST N
9TH ST N
10TH ST N
11TH ST N
HENNEPIN AVE
HAWTHORNE AVE
CURRIE AVE
BUSWAY
GLENWOOD AVE
HARMON PL
1ST AVE S
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
PARK AVE
CHICAGO AVE
PORTLAND AVE
MARQUETTE AVE
NICOLLET MALL
ABBY PUCKETT PL
CARLEW DR

Alternative Alignments for an East-West Transit Spine

Several alternative alignments were evaluated for an east-west transit spine to determine if there are reasonable options for improving east-west transit service and facilities through downtown and to assess the impacts and benefits of making changes. Metro Transit developed service plans for each of the following ten alternatives (see Appendix A for maps of each alternative).

Westbound contraflow lane alternatives included:
- 4th Street South
- 6th Street South
- 8th Street South

Eastbound contraflow lane alternatives included:
- 7th Street South
- 9th Street South

With-flow lanes or mixed traffic operation included:
- 6th/7th Street one-way pair (eastbound on 6th Street, westbound on 7th Street)
- 7th/8th Street one-way pair (westbound on 7th Street, eastbound on 8th Street)
- 8th Street two-way
- 8th/9th Street one-way pair (eastbound on 8th Street, westbound on 9th Street)
- 9th/10th Street one-way pair (westbound on 9th Street, eastbound on 10th Street)

Existing and future daily bus volumes for these alternatives, assuming consolidation of existing routes to the transit spine, are shown in Table 4 and Table 5, respectively.

Evaluation of Alternatives

The ten alternatives for an east-west transit spine were evaluated using the process shown in Figure 6, which included three screening steps:

- First, the alternatives were evaluated for physical constraints and impacts on transit service – those alternatives that were not physically feasible or had significant negative impacts on transit service were screened out.

- Second, the alternatives were evaluated for traffic impacts – those alternatives that had unacceptable traffic impacts were screened out.

- Third, the remaining alternatives were evaluated based on curbside impacts, bike lane impacts, and pedestrian zone impacts.

Following the selection of a preferred alignment, additional analysis was completed related to facility improvements, operating issues, capital and operating costs, and implementation strategies (see next chapter of the report).

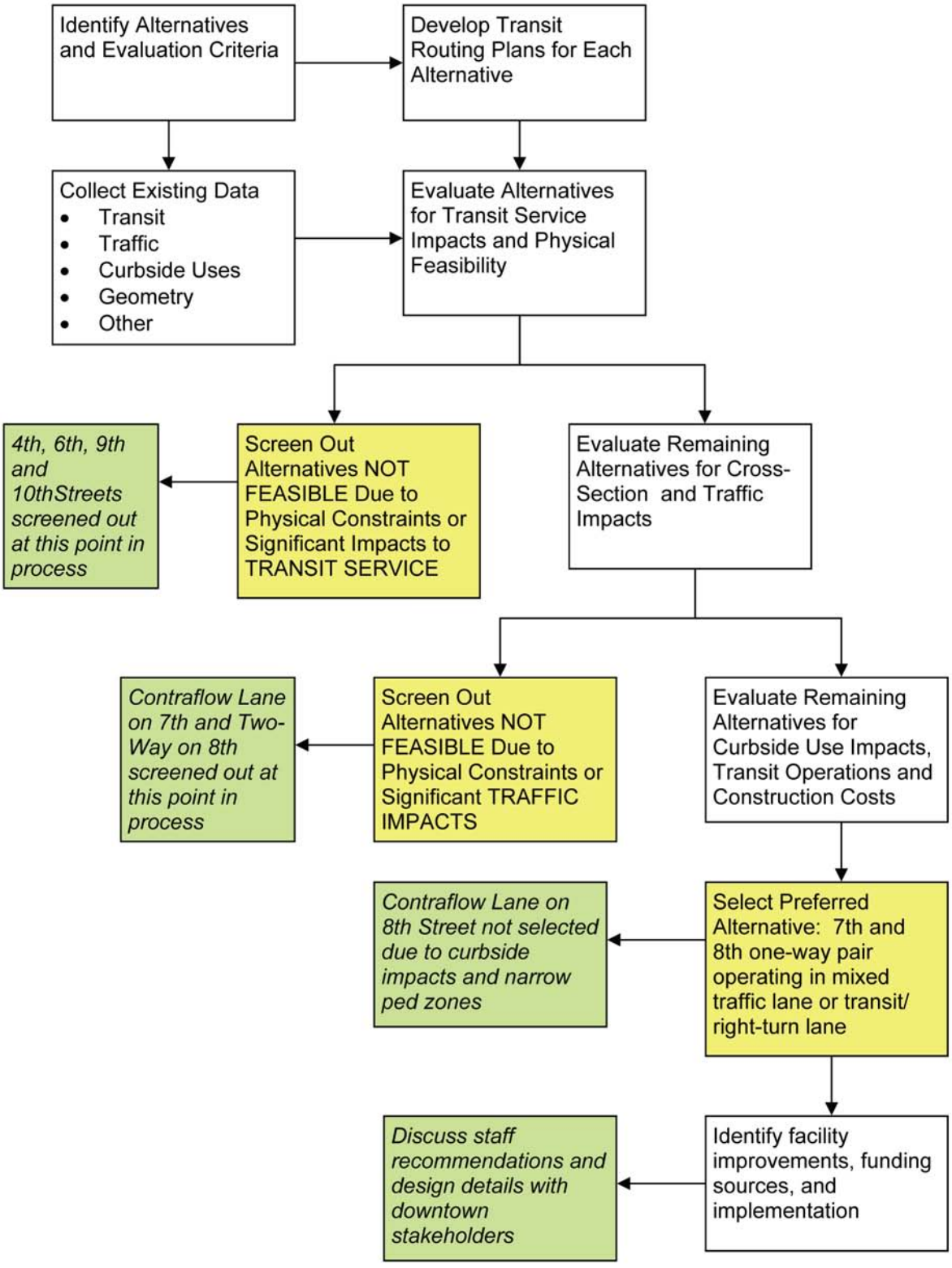
Table 4 – Future (2030) Daily Bus Volumes (Express and Local) by Alternative

Alternative	4th Street	6th Street	7th Street	8th Street	9th Street	10th Street
4th Street Contraflow	752 EB 847 WB	-	-	-	-	-
6th St Contraflow	279 EB 409 WB	625 EB 438 WB	-	-	-	-
7th St Contraflow	279 EB 409 WB	-	473 EB 514 WB	-	-	-
8th St 2-Way or Contraflow	279 EB 409 WB	-	-	473 EB 438 WB	-	-
9th St Contraflow	279 EB 409 WB	-	-	-	473 EB 460 WB	-
6th/7th	279 EB 409 WB	625 EB	506 WB	-	-	-
7th/8th	279 EB 409 WB	-	506 WB	458 EB	-	-
8th/9th	279 EB 409 WB	-	-	458 EB	417 WB	-
9th/10th	279 EB 409 WB	-	-	-	417 WB	458

Table 5 – Future (2030) Bus Boardings (Express and Local) by Alternative

Alternative	4th Street	6th Street	7th Street	8th Street	9th Street	10th Street
4th Street Contraflow	8,540 EB 7,049 WB	-	-	-	-	-
6th St Contraflow	4,270 EB 253 WB	4,270 EB 6,796 WB	-	-	-	-
7th St Contraflow	4,270 EB 253 WB	-	4,270 EB 6,796 WB	-	-	-
8th St Contraflow or Two-Way	4,270 EB 253 WB	-	-	4,270 EB 6,796 WB	-	-
9th St Contraflow	4,270 EB 253 WB	-	-	-	4,270 EB 6,796 WB	-
6th/7th	4,270 EB 253 WB	4,270 EB	6,796 WB	-	-	-
7th/8th	4,270 EB 253 WB	-	6,796 WB	4,270 EB	-	-
8th/9th	4,270 EB 253 WB	-	-	4,270 EB	6,796 WB	-
9th/10th	4,270 EB 253 WB	-	-	-	6,796 WB	4,270 EB

Figure 6 - Evaluation Process and Results



First Screen: Physical Constraints and Transit Service Impacts

The first step in the evaluation process was to assess impacts to transit service and passengers. These factors are given priority because the underlying purpose of an east-west spine is to improve transit service and facilities. Rerouting bus service has potential impacts on transit travel times for passengers and has potential operational impacts that translate into annual operating costs or savings. Rerouting can also change service to major trip destinations such as major employers. The most significant impacts are highlighted in Table 6.

Key Findings – Screen 1

- The core of downtown, representing the highest concentration of trip generators, is generally bounded by Washington Ave, 3rd Ave S, 10th St and Hennepin Ave with the highest density of employment (nearly half of all downtown employees) located between 6th Street, 3rd Ave S, 8th St and Hennepin Ave. Those alternatives that provide east-west service along 6th, 7th and 8th streets provide the shortest walking distances for the largest number of transit passengers. Service along 4th, 9th and 10th Streets require the longest walking distances for the largest number of transit passengers.

- Express transit service connecting to I-94 East is best served via 6th and 7th streets, which provide the most direct connections to I-94 East freeway ramps. It would be desirable to keep these express services on these streets, regardless of the decision related to an east-west transit spine for local bus routes.

- East-west local service needs to easily connect to Chicago Avenue and Park/Portland Avenues on the southeast and to 7th Street and Hwy 55 on the northwest side of downtown. As shown in Appendix A, 4th, 6th and 10th Streets, and to a lesser degree, 9th Street, have very poor through connections to the 7th Street and Hwy 55 corridors. The 4th Street contraflow lane, in particular, requiring very circuitous routing. The number of additional turns required to make these connections is highest for contraflow lanes on 4th Street, 6th Street and 9th Street. These geometric issues are major flaws for the 4th Street contraflow lane, 6th Street, 9th Street and 10th Street alternatives.

- It is desirable to have a good transit service connection to the Hennepin County Medical Center campus, an important destination for seniors and low-income patients that is bounded approximately by Park Avenue, 7th Street, 8th Street and 10th Avenue. The alternatives that use the 4th Street contraflow lane, 9th and 10th Streets do not provide direct service to the HCMC (1-3 block walk).

Table 6 – Comparison of Transit Service Impacts

Alternative	Increase in Travel Time	Increase in Walk Distance	Geometric Issues	Other Service Issues
Contraflow Lanes				
- 4th Street	High	Adds 3-4 block walk to core	Left turn from contraflow lane to Hennepin or 1st; no direct connection to 7th St or Hwy 55	Indirect service to HCMC; no east-west service through downtown south of LRT
- 6th Street	Moderate	None	No direct connection to 7th St or Hwy 55	No available westbound stops between 3rd and 5th Aves
- 7th Street	Minimal	None	None	None
- 8th Street	Minimal	None	None	None
- 9th Street	Minimal	Adds 2 block walk to core	Difficult turns between Hennepin & 2nd Ave N	Indirect service to HCMC
One-Way Pairs				
- 6th/7th	Moderate	None	No direct connection to 7th St or Hwy 55	None
- 7th/8th	None	None	None	None
- 8th/9th	Minimal	9th - Adds 2 block walk to core	None	Indirect service to HCMC on 9th
- 9th/10th	Moderate	Adds 2-3 block walk to core	10th - I-35W ramps; no direct connection to 7th St or Hwy 55	Indirect service to HCMC
Two-Way on 8th	Minimal	None	None	None

- The 4th Street contraflow lane alternative would add significant transit travel time for passengers. Shifting east-west local service to 6th would add a small amount of travel time. Routes along 7th, 8th, 9th or 10th would have minimal impacts on travel times.

- Moving all east-west bus service to the 4th Street contraflow lane would result in no east-west bus service south of LRT. This results in very poor options for intra-downtown east-west transit service for downtown employees, visitors and shoppers.

Due to the significant negative impacts on transit service described above, alternatives using the 4th Street contraflow lane (except University Avenue and I-94 West express service), 6th Street (except express service to I-94 East), 9th Street and 10th Street were eliminated from further consideration for an east-west transit spine.

Screen Two: Potential Traffic Impacts

The following alternatives remained after the first screening based on impacts to transit service:

- 7th/8th Street one-way pair
- 7th Street contraflow lane
- 8th Street contraflow lane
- 8th Street two-way

The next step in evaluation was to assess potential traffic impacts for these alternatives. The volume of traffic on the streets under consideration is important for two reasons. First, high traffic volumes may result in serious congestion and create a negative impact on transit speed and reliability. Second, removing a lane of traffic for transit or adding a high volume of buses to an existing traffic lane may have a negative impact on traffic flow.

Number of Lanes

Both 7th and 8th streets currently have three through lanes with two additional lanes, one along each curb, that are used for parking, curbside use zones, transit stops and peak hour traffic (primarily left and right turns). The typical lane configurations for the existing condition and each alternative are shown in Figure 7.

In the 7th/8th Street one-way pair, there would be four lanes of traffic during the peak periods with buses operating with mixed traffic. Curb extensions could be provided at intersections on the transit side of the street (south side on 8th Street, north side on 7th Street) for additional pedestrian and transit passenger waiting space. This would provide protected parking and curbside use areas on the transit side of the street. On the opposite side of the street (north side on 8th Street, south side on 7th Street), the curbside lane would be used for traffic during peak periods and for curbside uses during non-peak periods.

In either the 7th Street or the 8th Street contraflow lane alternatives, there would be three lanes of one-way traffic and one contraflow transit lane. One direction of buses would operate in mixed flow traffic as they do today. All existing curbside uses on the contraflow lane side of the street (north side on 8th, south side on 7th) would need to be relocated. On the mixed flow side of the

street (south side on 8th, north side on 7th), the curbside lane could be used for traffic during peak periods and for curbside uses during non-peak periods.

In the 8th Street two-way alternative, there would be two lanes of traffic in each direction with parking and curb extensions on both sides of the street. Buses would operate in mixed traffic in each direction. Parking and curbside uses would be accommodated in bays on both sides of the street.

Traffic Volumes

A comparison of peak hour traffic volumes based on existing traffic counts was done for these alternatives as shown in Table 7. The 8th Street two-way alternative was studied in detail during the preparation of the *Downtown Action Plan* as a part of several two-way scenarios for which traffic modeling was completed.[7] That analysis showed that a two-way alternative would operate at an acceptable level of service but with traffic diversions to other nearby streets. More detailed traffic analysis was completed for the 7th/8th Street one-way pair and the 8th Street contraflow lane and the results of this traffic analysis are provided in Appendix B. This additional analysis indicates that both alternatives will operate at acceptable levels of service without diversion to other streets if transit is operating in the mixed traffic lanes. Additional analysis would be needed to determine if operation would be acceptable with a transit/right-turn lane but it is likely that this would operate acceptably with some traffic diversion to nearby streets.

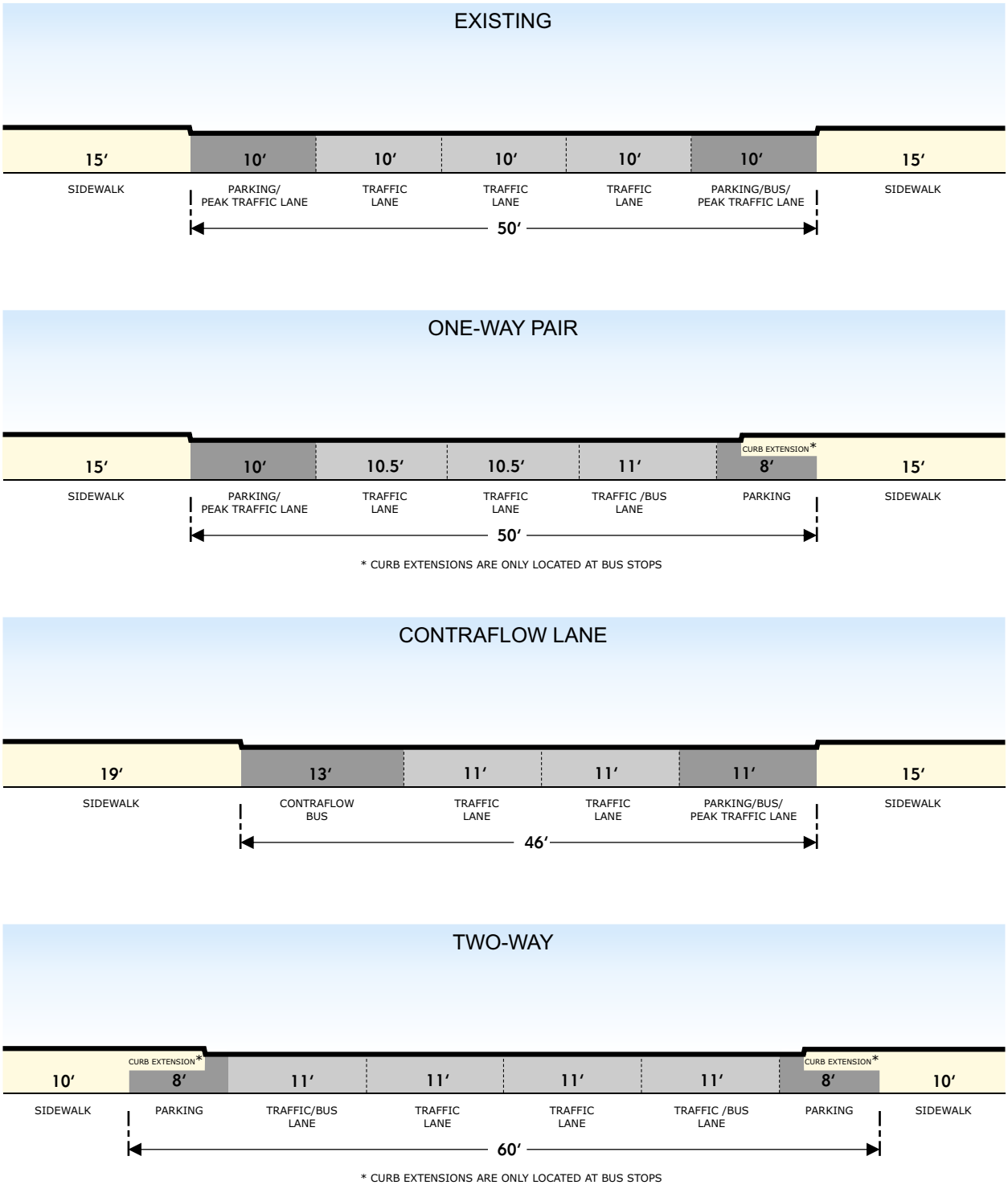
Table 7 – Comparison of Existing Traffic Volumes

	7th Street	**8th Street**
Existing Average Daily Traffic	15-18,000	10-12,000
Existing Peak Hour Volumes at Peak Load Point		
- AM Peak Hour	1,600/hour	900/hour
- PM Peak Hour	1,400/hour	1,100/hour
Existing Number of Hours Over 1000 Vehicles/Hour	6	1
Existing Peak Hour Volume Per Lane*		
- AM Peak Hour	400	230
- PM Peak Hour	350	300
Future Volume/Lane Without Diversions**		
- 7th/8th Street One-Way Pair	400	300
- 7th Street Contraflow Lane	530	300
- 8th Street Contraflow Lane	400	370
- 8th Street Two-Way	400	550

*Assumes equivalent of four lanes (three through lanes plus turn lanes)
**Assumes buses operating in mixed traffic or contraflow lane and no diversion of traffic to nearby streets; a bus/right turn lane could be used but this would impact level of service or result in traffic diversion to nearby streets.

[7] Meyer, Mohaddes Associates et al., *Downtown Transportation Strategy*, prepared for the Downtown Ten-Year Transportation Action Plan, 2006.

Figure 7 - Typical Cross-sections



Key Findings – Screen 2

Key findings related to traffic impacts are:

- 7th Street is the busiest east-west street in the downtown core. Volumes in the morning peak hour range from 1400-1600 vehicles/hour. Volumes in the afternoon peak hour range from 1100-1400 vehicles/hour. This equates to about 400 vehicles/lane/hour at the peak load point. Volumes over 1000 vehicles/hour are present for at least six hours per day on 7th Street. While some traffic would likely divert to other streets, reducing the number of lanes on 7th Street to introduce a contraflow lane does not appear to be a desirable option. ***For this reason, the 7th Street contraflow lane option was screened out for further consideration.***

- In comparison, 8th Street carries only 800-900 vehicles in the morning peak hour and 1000-1100 in the afternoon peak hour, and these volumes exist for only one hour of the day. Reducing a lane of traffic on 8th Street would result in per lane volumes equivalent to that seen on 7th Street and other downtown streets today. Thus, the 8th Street contraflow lane was retained for further analysis (see detailed traffic analysis in Appendix B).

- The traffic analysis completed for the 8th Street two-way option during preparation of the *Downtown Action Plan* assumed that a significant share of traffic would divert to 6th and 10th Streets if 8th Street were made two-way. The traffic analysis indicated that acceptable levels of service could be achieved at most intersections on all streets even with this diversion. However, the downtown business community and Metro Transit were skeptical about the ability to divert enough traffic for 8th Street to operate acceptably as a two-way street. In addition, this alternative would require transit to operate in a more congested mixed traffic environment than today and it is likely that transit service speed and reliability would be reduced. ***Thus, for these reasons, the 8th Street two-way option was screened out for further consideration.***

- Additional traffic analysis was completed for the 7th/8th Street one-way pair and the 8th Street contraflow lane to determine if adequate levels of service could be maintained at the intersections with the transit improvements. This analysis is provided in Appendix B and demonstrates that the levels of service would be comparable for both alternatives, with most intersections operating at a level of service C or better. Thus, both alternatives were retained for further analysis.

Screen Three: Impacts on Curbside Use, Bike Lanes, and Pedestrian Zones

The remaining two alternatives (7th/8th Street one-way pair and 8th Street contraflow lane) were next evaluated for curbside use impacts, bike lane impacts, and available pedestrian zone space. Figure 8 and Figure 9 provide cross-sections for the 7th/8th Street one-way pair and the 8th Street contraflow lane that show proposed curb extensions and bus stops and the associated impacts on curbside uses.

Curbside Uses

Curbside uses include all activities that occur in the curb lanes of a street. The most common curbside uses are on-street parking, deliveries, drop-offs and pick-ups, taxi stands, valet parking, tour bus staging and bus stops. Curbside uses and adjacent land uses for all of the alternative east-west spines were inventoried in the field and from maps maintained by the City of Minneapolis. The expected curb use impacts and benefits of the remaining two alternatives are described in Table 8. Key findings related to impacts on curbside uses are:

- For the 7th/8th Street one-way pair, two valet zones would need to be removed or relocated and one would be restricted during peak hours. One taxi zone would need to be relocated, one would be amended (shortened), and three would be restricted during peak hours. One hotel loading zone and two commercial loading zones would need to be restricted during peak periods.

- For the 8th Street contraflow lane, no valet zones would be affected. One taxi zone would need to be removed or relocated. Five commercial loading zones would need to be removed or relocated, and one tour bus loading zone would need to be restricted during peak hours.

- There would be a net loss of two metered parking spaces with the 7th/8th Street one-way pair and a net loss of 32 metered parking spaces with the 8th Street contraflow lane. These parking spaces, while not designated zones, are also used for deliveries, drop-offs and other short-term curbside uses.

- The IDS Building, located in the block surrounded by Nicollet Mall, Marquette Avenue, and 7th and 8th Streets, would have dedicated transit lanes on three sides of the building with the 8th Street contraflow lane. The 8th Street contraflow lane would be at the building's front door. This significantly limits opportunities for curbside access to the building and its tenants.

Bicycle Lane Impacts

The only existing east-west bike lanes that would be impacted by any of the alignment alternatives are the bike lanes on 9th and 10th streets. These lanes would not be directly affected by buses operating in mixed traffic but they could be affected if contraflow lanes were installed on 9th and 10th streets unless the lanes were restriped to be parallel to the contraflow lanes. There are no existing bike lanes on 7th or 8th streets.

Figure 8 - 7th and 8th Street One-way Pair Cross-sections

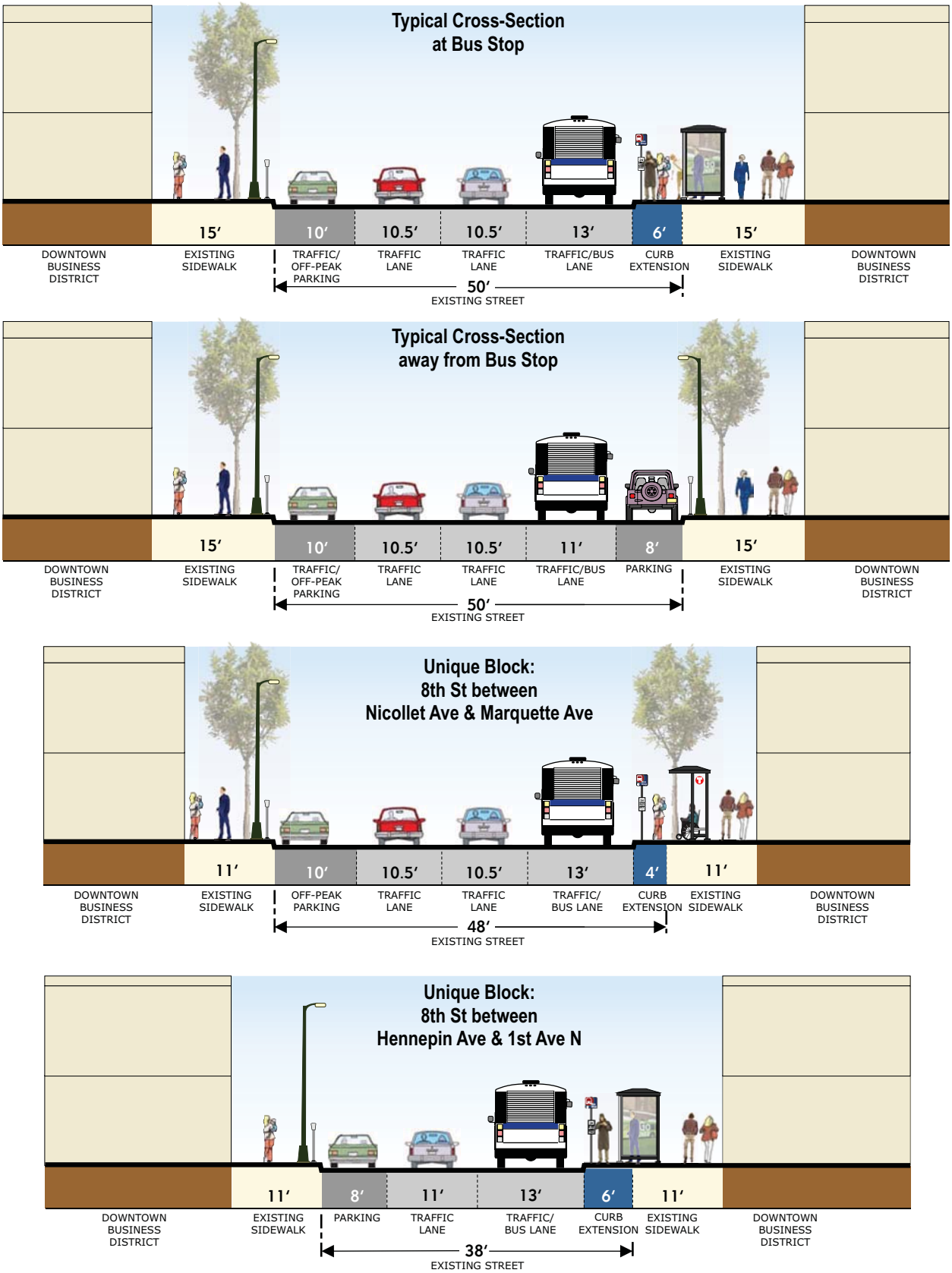
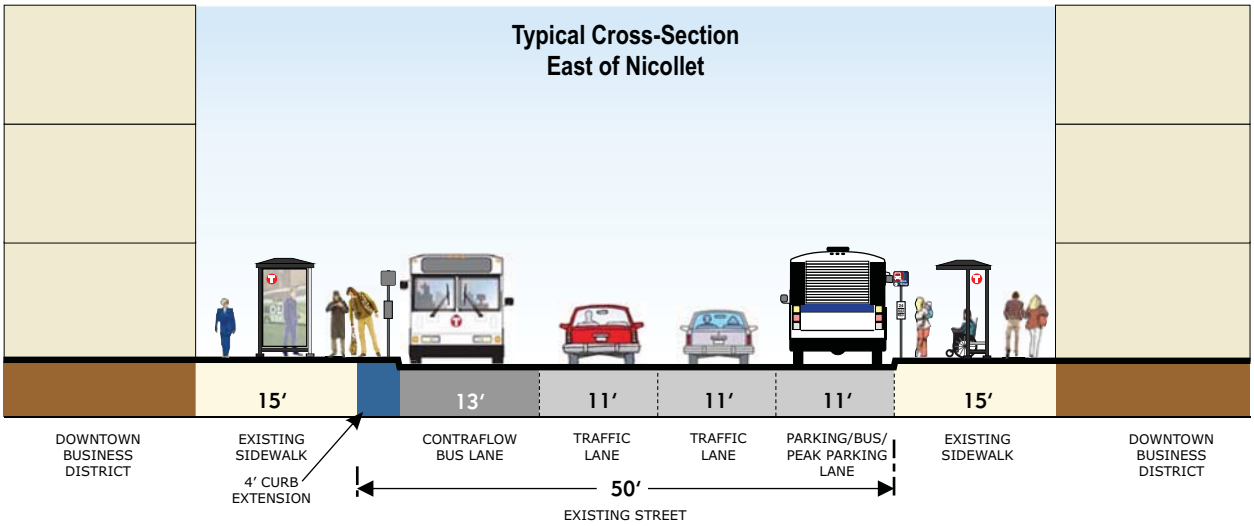
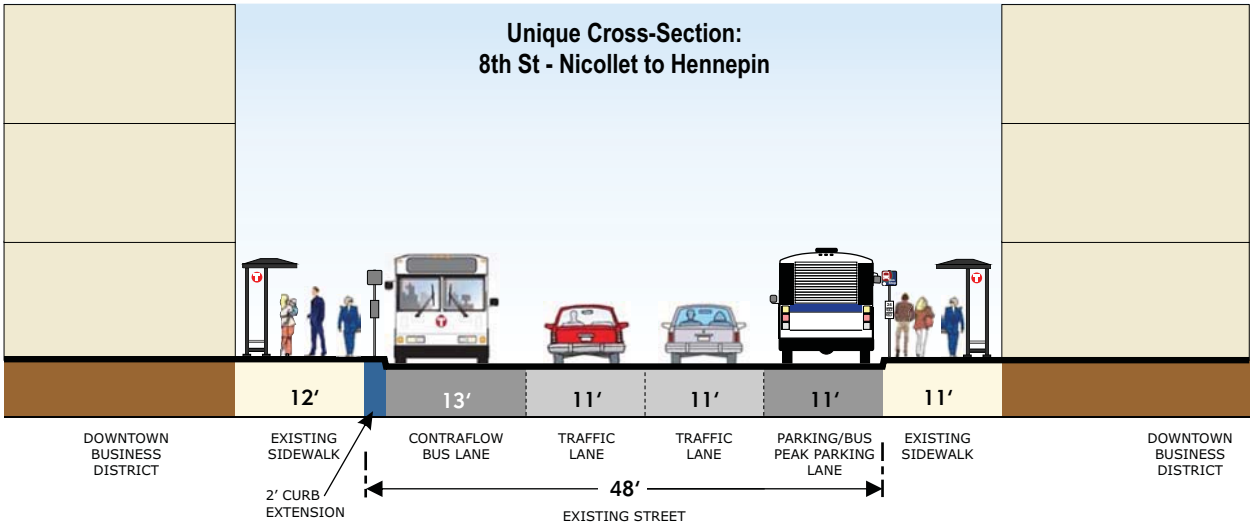


Figure 9 - 8th Street Contraflow Lane Cross-sections





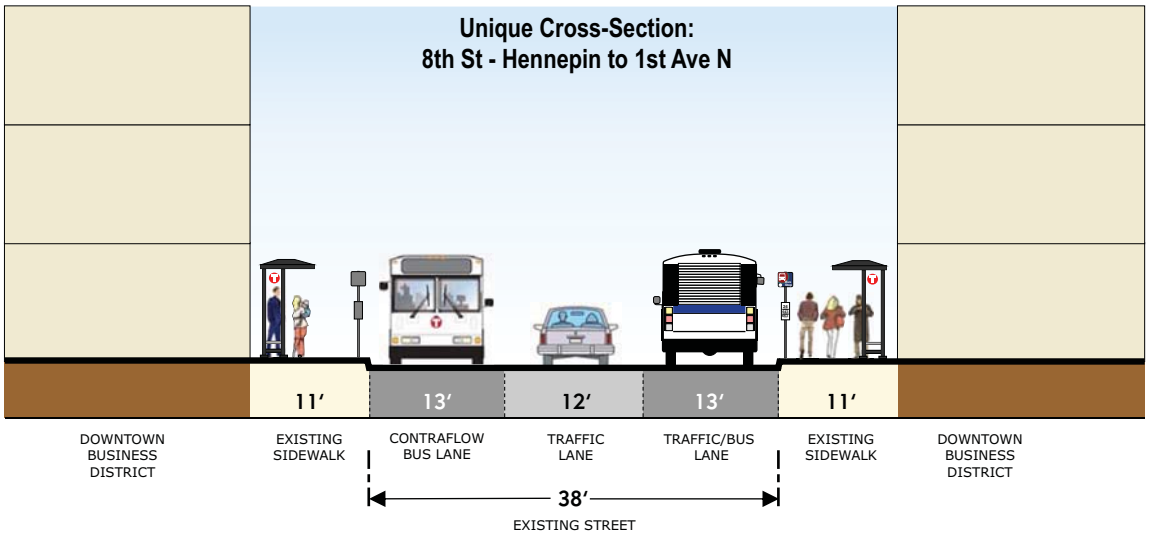


Table 8 – Comparison of Curbside Use Impacts and Benefits

Block Segment	Curb Face	Curb Use Impacts	Curb Use Benefits
7th/8th Street One-Way Pair - 7th Street (Westbound 4th Ave S to 1st Ave N)			
4th Ave to 3rd Ave	North Side	• Remove Valet Zone #34	
3rd Ave to 2nd Ave	North Side	• Remove rush hour restriction zone #1	• Install metered on-street parking (approx 3 stalls)
	South Side	• Approx 3 metered on-streeet parking stalls restricted during peak periods	
2nd Ave to Marquette	North Side	• No impact	• Relocate taxi zone #4 (begin 100' east of corner) • Install metered on-street parking (6 stalls)
	South Side	• Relocate taxi zone #4 to north curb face • Approx 6 metered on-street parking stalls restricted during peak periods • Commercial loading zone #22 restricted during peak periods	
Marquette to Nicollet	North Side	• Amend taxi zone #4 (approx 40 ft shorter)	
	South Side	• Taxi zone #4 restricted during peak periods • Valet zone #63 restricted during peak periods • Hotel loading zone #6 restricted during peak periods	
Nicollet to Ramp Signal	South Side	• Taxi zone #r restricted during peak periods	
Ramp Signal to Hennepin	South Side	• Approx 4 metered on-street parking stalls restricted during peak periods	
7th/8th Street One-Way Pair - 8th Street (Eastbound 1st Ave N to 4th Ave S)			
1st Ave to Hennepin	North Side	• No Impact	• Install metered on-street parking (2 stalls)
LaSalle to Nicollet	North Side	• Commercial loading zone #29 restricted during peak periods • Taxi zone #4 restricted during peak periods	
	South Side	• Rush hour restriction zone #1 amended to 24 hour restriction	
8th Street Contraflow Lane - 8th Street (Eastbound 1st Ave N to 4th Ave S)			
1st Ave N to Hennepin	North Side	• Remove two sections of metered parking (12 stalls)	
Hennepin to LaSalle	North Side	• Remove one section of metered parking (6 stalls)	
LaSalle to Nicollet	North Side	• Remove loading zone #29 • Remove taxi stand #4	
Nicollet to Marquette	South Side	• Restrict tour bus loading #7 during peak periods	
	North Side	• Front door of IDS Building – no stopping permitted	
Marquette to 2nd Ave	North Side	• Remove two loading zones #12	
	South Side	• No impact	• Relocate loading zones #12 to south side (off-peak)
2nd Ave to 3rd Ave	North Side	• Remove two sections of metered parking (8 stalls) • Remove two loading zones #12	
	South Side	• No impact	• Relocate loading zones #12 to south side (off-peak)
3rd Ave to 4th Ave	North Side	• Remove two sections of metered parking (6 stalls)	

Pedestrian Zone Impacts

Adequate pedestrian zone space is especially important in primary transit corridors because enough space must be provided to accommodate the normal pedestrian activity on the sidewalk, the expected number of transit passengers, and the space required for transit shelters and associated transit passenger amenities. Here, the 7th/8th Street one-way pair has a distinct advantage over the 8th Street contraflow lane (see Table 9). Pedestrian zone space, with the proposed curb extensions, would range from 14.5 to 21.5 feet at the bus stops along the 7th/8th Street one-way pair. Pedestrian zone widths at the bus stops along the 8th Street contraflow lane scenario would range from 10.5 to 15 feet on the south (eastbound) side of the street and 10.5-19.5 feet on the north (westbound contraflow lane) side of the street.

Curb extensions can be provided at bus stops in both directions on 7th and 8th Streets with the one-way pair without reducing the number of through traffic lanes. These curb extensions also have the advantage of providing 24-hour protected areas for other curb lane uses. With the introduction of a contraflow lane on 8th Street, sidewalks can only be widened on one side of the street (the contraflow or north side of the street) and no curb lane uses can be accommodated on that side of the street. No additional sidewalk width could be added on the opposite side of the street (which would still be served by transit) without removing an additional traffic lane.

Table 9 – Comparison of Pedestrian Zone Widths at Bus Stops

	Eastbound Bus Stops			Westbound Bus Stops		
	Existing Sidewalk Width	Curb Extension	Total Pedestrian Zone	Existing Sidewalk Width	Curb Extension	Total Pedestrian Zone
7th/8th One-Way Pair						
7th Street North Side						
East of Nicollet				15.0+	6	21.0+
Nicollet to Hennepin				15.5	6	21.5
Hennepin to 1st				15.5	6	21.5
8th Street South Side						
East of Nicollet	15.0+	6	21.5+			
Nicollet to Hennepin	11.5	4	14.5			
Hennepin to 1st	10.5	6	16.5			
8th Street Contraflow						
East of Nicollet	15.0+	0	15.0+	15.5+	4	19.5+
Nicollet to Hennepin	11.5	0	11.5	12.5	2	14.5
Hennepin to 1st	10.5	0	10.5	10.5	0	10.5

Key Findings – Screen 3

A comparison of the 7th and 8th Street one-way pair and the 8th Street contraflow lane is shown in Table 10. Key findings are:

- The 7th/8th Street one-way pair provides significantly wider pedestrian zones than the 8th Street contraflow lane alternative. This will provide better pedestrian flow and transit passenger waiting space as well as greater space for the provision of transit shelters and associated transit passenger amenities.

- The 8th Street contraflow lane impacts fewer valet, taxi and hotel loading zones but a larger number of commercial loading zones. The 7th/8th Street one-way pair results in a net loss of only two metered parking spaces while the 8th Street contraflow lane results in a net loss of 32 metered parking spaces. These parking spaces, while not designated zones, are also used for deliveries, drop-offs and other curbside uses. Overall, the 8th Street contraflow lane would alter curbside uses more significantly than the 7th/8th Street one-way pair.

- The 8th Street contraflow lane would result in dedicated transit lanes on three sides of the IDS block, significantly reducing curbside access to this building.

- There are no existing bike lanes on either 7th or 8th streets.

Based on these findings and findings in the previous screenings, the 7th/8th Street one-way pair is the recommended preferred alignment for the east-west transit spine.

Table 10 – Comparison of Alternatives to Objectives for East-West Transit Spine

Objectives	7th/8th Street One-Way Pair	8th Street Contraflow Lane
Provide an improved level of transit service that is fast, reliable and direct	• Somewhat improved both directions	• Significantly improved westbound (reserved contraflow lane); same as existing eastbound
Provide a high quality waiting environment for transit passengers	• Pedestrian zone widths 14.5-21.0 feet	• Pedestrian zone widths 10.5-19.5 feet
Provide transit capacity to grow	• Somewhat improved both directions	• Significantly improved westbound (reserved contraflow lane); same as existing eastbound
Provide a high quality environment for all pedestrians	• Pedestrian zone widths 14.5-21.0 feet	• Pedestrian zone widths 10.5-19.5 feet
Provide reasonable options for curbside uses	• Removes /relocates 2 valet, 1 taxi zones • Restricts/amends 1 valet, 4 taxi, 1 hotel, 2 commercial loading zones • Net loss 2 metered parking spaces	• Removes/relocates 1 taxi, 5 commercial loading zones • Restricts 1 tour bus loading zone • Net loss 32 metered parking spaces • Curbside restrictions on three sides of IDS Building
Maintain reasonable traffic flow through downtown core	• Impacts 7th Street which is most congested street in core • Acceptable levels of service	• Acceptable levels of service
Consider impacts on existing bicycle lanes	• Does not impact any existing bike lanes	• Does not impact any existing bike lanes

Facility and Service Improvements

One of the key objectives of *Access Minneapolis* in identifying a Primary Transit Network and associated transit spines in downtown was to identify corridors where transit service could be improved through the provision of passenger facilities and associated streetscape amenities. These facilities help to encourage people to use transit by providing a safe, comfortable and pleasant place to wait for the bus and by providing real time information that makes it easy to know when the next bus will arrive. This chapter describes existing facilities along 7th and 8th Streets and makes recommendations regarding facility improvements on these corridors, both for transit passengers and for all pedestrians using the sidewalks along these streets. Anticipated capital costs and changes to address specific transit operating issues are also discussed.

Existing Passenger Facilities and Streetscape Elements

Existing transit passenger facilities and existing streetscape elements along 7th Street (westbound) and 8th Street (eastbound) are shown in Table 11 and Table 12, respectively. There is very little consistency from one block to the next regarding either the passenger facilities that are provided or the streetscaping/landscaping that is present. On eastbound 8th Street, there are shelters at every bus stop, but on westbound 7th Street, there are only shelters at 4 of the 7 bus stops, not including the high volume stops at Nicollet Mall and Hennepin Avenue. Only one of the existing shelters is substantial (8th Street between 2nd and 3rd Avenue at the TCF building). Four of the stops along 7th Street have some streetscaping or landscaping. None of the stops along 8th Street have any significant streetscaping or landscaping. The lack of quality facilities along the east-west spine is notable when compared to other downtown transit corridors, particularly Hennepin, Nicollet, Marquette and 2nd Avenue.

Proposed Facility Improvements

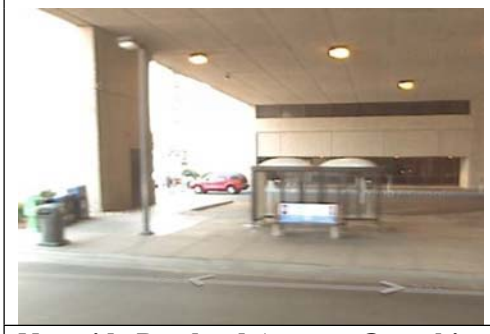
Three general types of facility improvements are proposed for the east-west transit corridor: (1) curb extensions at bus stops, (2) passenger facility improvements, and (3) streetscape improvements. Each is described more fully below. An example of how a typical block might be improved is shown in Figure 10. It should be noted that every block is different and there are many utility vaults and areaways underneath the existing sidewalks that will influence what can be provided and where it can be installed. Complete street reconstruction is not proposed – only modifications to sidewalks to provide curb extensions, transit facility improvements and streetscape elements.

Curb Extensions

Curb extensions are sometimes also referred to as bump-outs or bulb-outs. They are a widening of the sidewalk near intersections that provide greater pedestrian space for people waiting to cross the street and for transit passengers waiting for a bus. They also effectively create bays for parking and other curbside uses. It is proposed that curb extensions be provided at each bus stop between Marquette Avenue S and 1st Avenue N. This affects the four existing bus stops on 7th and 8th streets at Hennepin and at Nicollet and a potential new bus stop at near side 7th and Nicollet (see discussion below about boarding volumes at the 7th/Nicollet bus stop). The width of the curb extension will typically be about six feet but may be narrower or wider depending on

Table 11 – Existing Transit Facilities on Westbound 7th Street Bus Stops

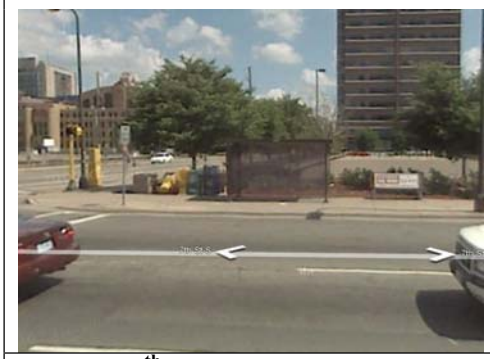
Nearside Park Avenue @ Hennepin County Medical Center 900 daily boardings



Existing Transit Facilities	Existing Streetscape Elements
☑ Bus Stop Sign	☐ Trees
☑ Shelter	☐ Low-Level Lighting
☑ Bench	☐ Decorative Sidewalk
☐ Heat	☐ Other: _____
☑ Trash Receptacle	

Notes: _____

Nearside Portland Avenue @ parking lot 100 daily boardings



Existing Transit Facilities	Existing Streetscape Elements
☑ Bus Stop Sign	☐ Trees
☑ Shelter	☐ Low-Level Lighting
☑ Bench	☐ Decorative Sidewalk
☐ Heat	☐ Other: _____
☑ Trash Receptacle	

Notes: _____

Far-side 5th Avenue S @ parking lot 100 daily boardings

Existing Transit Facilities	Existing Streetscape Elements
☑ Bus Stop Sign	☑ Trees
☑ Shelter	☐ Low-Level Lighting
☐ Bench	☐ Decorative Sidewalk
☐ Heat	☑ Other: parking lot fencing
☑ Trash Receptacle	

Notes: _____

Midblock 3rd/4th Avenue S @ Hennepin County Gov't Center 500 daily boardings

Existing Transit Facilities	Existing Streetscape Elements
☑ Bus Stop Sign	☑ Trees
☐ Shelter	☑ Low-Level Lighting
☑ Bench	☑ Decorative Sidewalk
☐ Heat	☑ Other: plaza area, landscaping
☑ Trash Receptacle	

Notes: _____

Table 11 - Existing Transit Facilities on Westbound 7th Street Bus Stops (continued)

Midblock 2nd/3rd Avenue S @ Grand Hotel 500 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☐ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: _____

Far-side Nicollet Mall @ City Center 3,800 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☐ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☑ Low-Level Lighting
- ☑ Decorative Sidewalk
- ☐ Other: _____

Notes: 2 ad benches inadequate for passenger volume

Far-side Hennepin Ave @ Block E 1,600 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☐ Shelter
- ☐ Bench
- ☑ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☑ Trees
- ☑ Low-Level Lighting
- ☑ Decorative Sidewalk
- ☑ Other: tree corrals, custom trash receptacles

Notes: building awning inadequate shelter for passenger volume

Table 12 – Existing Transit Facilities on Eastbound 8th Street Bus Stops

Nearside Hennepin Avenue @ Art School 700 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☐ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: narrow ad shelter inadequate for passenger volumes

Nearside Nicollet Mall @ US Bank 1,800 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☑ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☑ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: 15' deep building alcove poorly maintained and has poor visibility from street

Midblock Marquette/2nd Avenue @ TCF Building 500 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☑ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☑ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: custom shelter, large sidewalk

Midblock 3rd/4th Avenue @ parking lot 200 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☐ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: _____

Table 12 - Existing Transit Facilities on Eastbound 8th Street Bus Stops (continued)

Midblock 4th/5th Avenue S @ Best Western Hotel 50 daily boardings

Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☐ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: _____

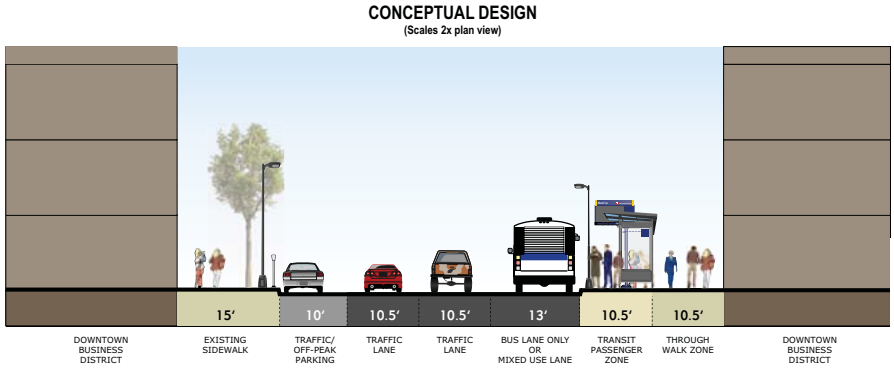
Midblock Park/Portland Avenue @Wells Fargo Bank 100 daily boardings

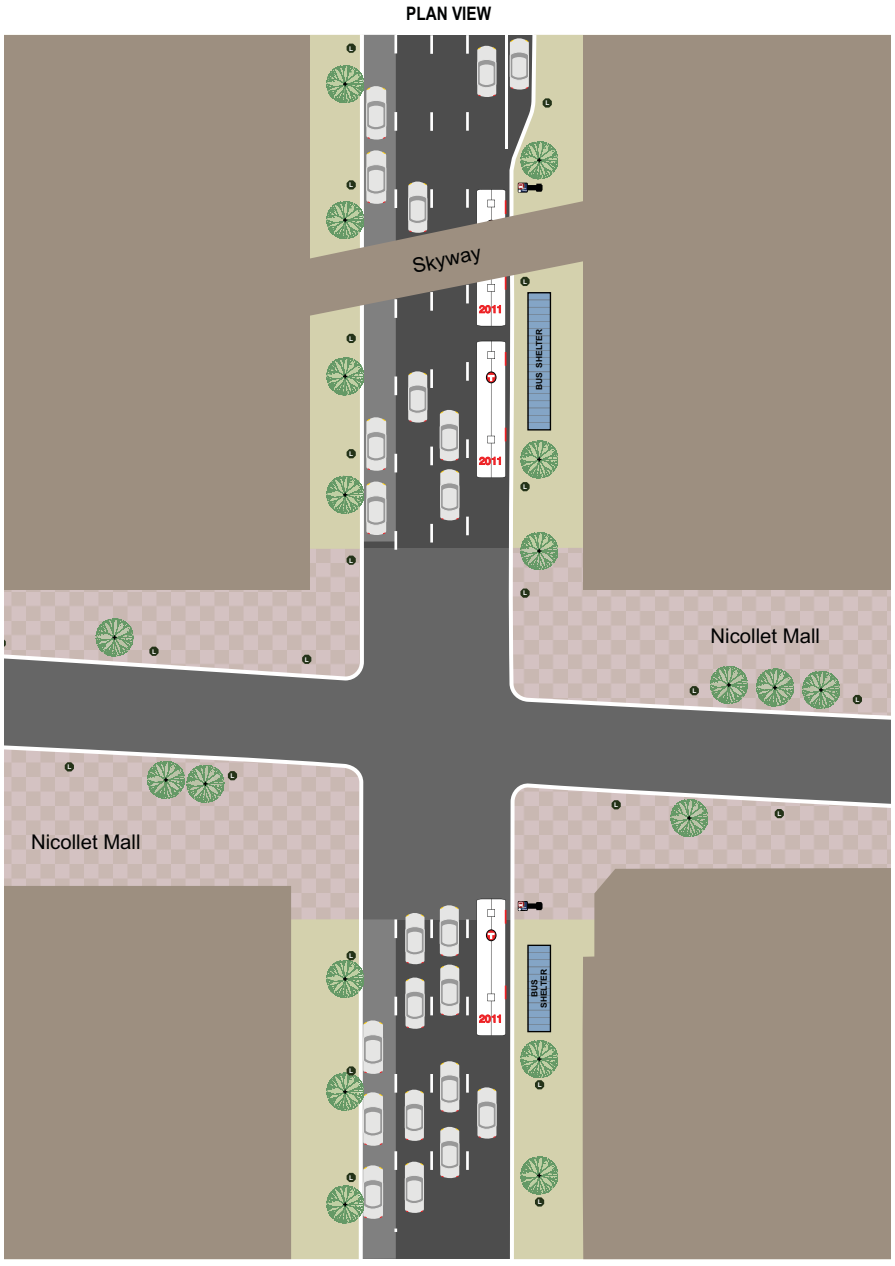
Existing Transit Facilities
- ☑ Bus Stop Sign
- ☑ Shelter
- ☑ Bench
- ☐ Heat
- ☑ Trash Receptacle

Existing Streetscape Elements
- ☐ Trees
- ☐ Low-Level Lighting
- ☐ Decorative Sidewalk
- ☐ Other: _____

Notes: _____

Figure 10 - Typical Transit Passenger and Streetscape Improvements





the existing street and sidewalk width. The length of the curb extension will vary depending on the number of transit passengers waiting and buses stopping at each stop.

To maintain acceptable traffic operations, parking and curbside uses should be restricted during peak periods in the left lane of these blocks; this maintains the existing three travel lanes in addition to the right lane where buses stop next to the curb extension, as shown in Figure ES-2.

Example of Curb Extension

Since complete street reconstruction is not being recommended at this time, sidewalks should be reconstructed only to the extent necessary to provide the curb extensions. Therefore, standard concrete materials are recommended for the sidewalks except in those locations where private property owners have used specialty materials.

Transit Shelter on 2nd Avenue South

Transit Passenger Facilities

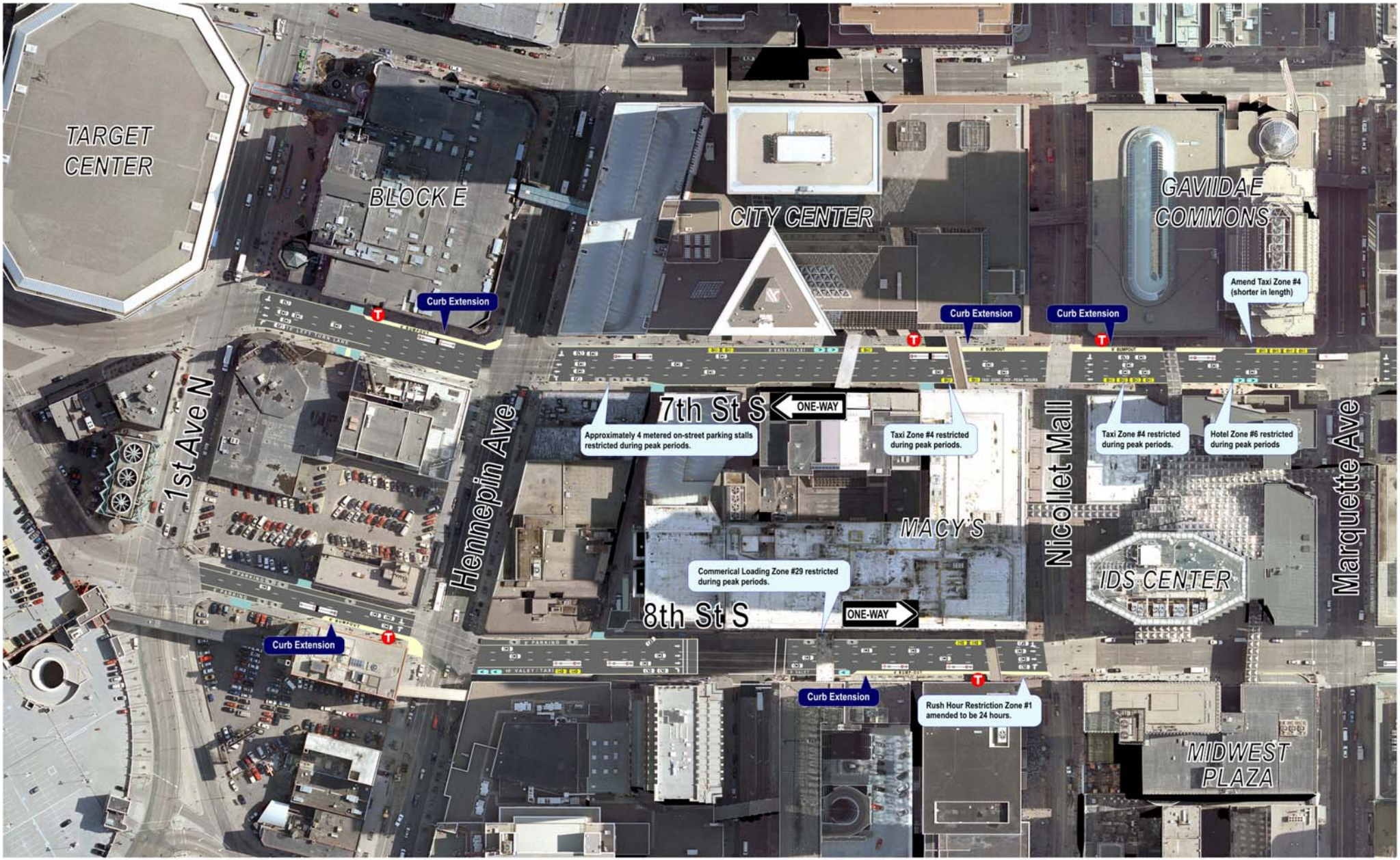
Transit shelters that are appropriately sized for the expected numbers of waiting passengers and that have both heat and light are proposed for the east-west transit spine. In addition, clear signage for each transit stop, transit route and frequency information, and real time transit information are proposed for each stop. Examples of these facilities are shown below.

Real Time Display (RTD) Sign

There are 13 bus stops on the east-west spine in downtown between Chicago Avenue and Hennepin Avenue, seven on 7th Street and six on 8th Street. Four of the seven stops on 7th Street have shelters and all of the stops on 8th Street have shelters. Existing shelters should be removed and upgraded to provide a uniform look and level of service to the corridor. The size of each shelter should be determined based on the number of passengers served at that stop location. All shelters should be heated and lighted.

Benches are provided at all but two of the existing bus stops. If shelters are provided, all of these benches could be removed.

Figure 11 : Proposed E-W Transit Spine Traffic Changes



It is also recommended that real time display (RTD) signs be provided at least at the stops between 3rd Avenue S and 1st Avenue N. There are two other higher volume stops at 7th/Park (HCMC) and at 7th/3rd Ave (Hennepin County Government Center) that would benefit from RTD signs as well. These electronic message signs provide accurate, real time information to transit passengers about the arrival times of approaching buses. Static transit route information should also be provided in each shelter.

A summary of the proposed facility improvements at bus stops is provided in Table 13.

Table 13 - Proposed Facility Improvements by Bus Stop

Bus Stop	Daily Boardings**		Proposed Improvements		
	Current	With Proposed Service Changes	Curb Extension	New or Improved Shelter	RTD
Westbound 7th Street Bus Stops					
Nearside Park Avenue @ HCMC	900	900	--	improved	X
Nearside Portland Avenue @ parking lot	100	100	--	improved	--
Far-side 5th Avenue S @ parking lot	100	100	--	improved	--
Midblock 3rd/4th Avenue S @ Gov't Center	500	500	--	new	X
Midblock 2nd/3rd Avenue S @ Grand Hotel	500	600	--	improved	X
Nearside Nicollet Mall @ Gaviidae*	0	3,000	X	new	X
Far-side Nicollet Mall @ City Center	3,800	1,500	X	new	X
Far-side Hennepin Ave @ Block E	1,600	1,600	X	new	X
Eastbound 8th Street Bus Stops					
Nearside Hennepin Avenue @ Art School	700	800	X	improved	X
Nearside Nicollet Mall @ US Bank	1,800	2,200	X	improved	X
Midblock Marquette/2nd Avenue @ TCF	500	700	--	improved	X
Midblock 3rd/4th Avenue @ parking lot	200	200	--	improved	--
Midblock 4th/5th Avenue S @ Best Western	50	100	--	improved	--
Midblock Park/Portland Avenue @Wells Fargo	100	100	--	improved	--

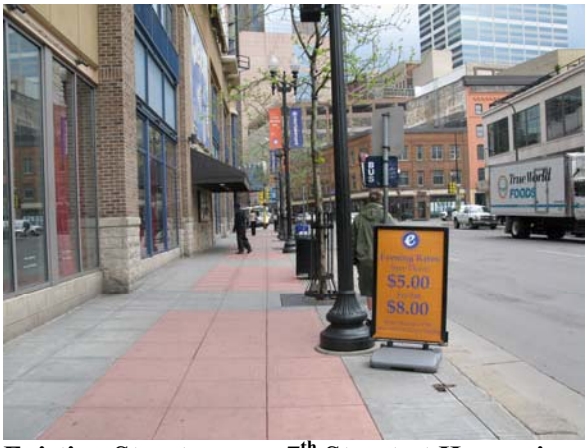
* Potential new split bus stop with addition of buses from 9th Street
** Source: Metro Transit, March-May 2009 APC data

Streetscape Elements

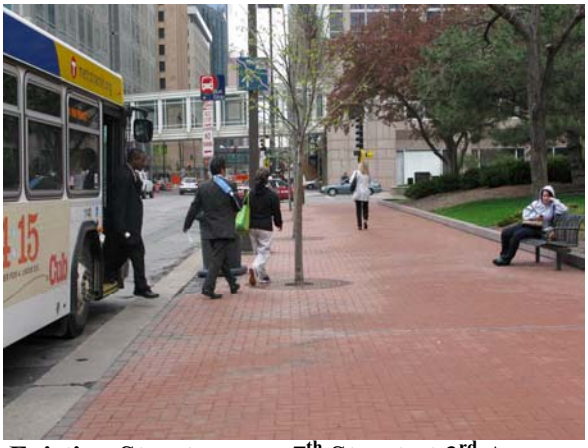
Streetscaping should be provided along both sides of 7th and 8th Streets between at least 2nd Avenue and Hennepin Avenue and, ideally, the entire length between HCMC at Chicago Avenue and 1st Avenue N. A few blocks already have streetscaping and these blocks may require fewer enhancements. Other blocks have nothing. While it may be desirable, it is not necessary for every block along the corridor to have a similar aesthetic. Streetscape elements that should be provided include:

- Pedestrian scale lighting
- Trees and/or planters
- Bike racks
- News corrals in those locations where newspaper boxes are present (at least on 7th Street at 2nd Avenue)

It should be noted that there are many locations along both 7th and 8th Streets where there are underground utility vaults and/or building areaways. It is not possible to plant trees in these locations and there are restrictions regarding what can be placed above these facilities. Thus, the specific facilities that can be provided and their locations will need to be determined through a detailed design process that identifies and addresses these concerns.



Existing Streetscape – 7th Street at Hennepin


Existing Streetscape – 7th Street at 3rd Avenue

Service Improvements

Transit service improvements are primarily achieved through increasing the speed and/or frequency of service. Frequency of service is based on increases in ridership and available funding. Speed is typically improved through: (1) reserving lanes for transit, (2) improving operations through strategies such as signal timing, signal priority, queue jumping lanes at intersections, etc., or (3) decreasing boarding times through level boarding buses/platforms, automated fare collection, etc.

Reserved Lanes for Transit

Given the current bus volumes, the volume of traffic on 7th and 8th Streets, and the demand for curbside services, it is not recommended that lanes be reserved for transit on either street at this time. However, this may become a necessity in the future as transit ridership and the number of peak period buses increases.

Operational Advantages for Transit

It is very difficult to give transit vehicles operational priority in a downtown street grid system as the signal system must operate in an integrated fashion to avoid unintended problems in other parts of the system. The entire downtown signal system will be retimed in 2010. This is expected to improve overall traffic operations and, as such, will improve transit operations on the east-west spine. The city will continue to work to achieve legislation which will make traffic management strategies such as “don’t block the box” more feasible. These strategies will help transit operations as well as improve overall traffic operation.

Passenger Boarding Improvements

Metro Transit has implemented the “Go-To” card in recent years. This card, which is similar to a debit card, can be purchased and then refilled on-line or at specified retail outlets. The card is

electronically scanned when the passenger enters the bus and the appropriate fare is deducted from the card's balance. Boarding times dramatically decrease when a large percentage of passengers use a Go-To card or other card using Go-To technology, such as Metropass and Upass. Unfortunately, a relatively small percentage of riders on east-west local routes currently use Go-To cards. Increasing the use of electronic fare collection is very important aspect of improving overall service along the east-west spine.

Transit Operating Issues

Two transit operating issues were identified which will require future changes in westbound transit operations along 7th Street: (1) lengthy dwell and/or hold times at the stop on 7th Street at the Nicollet Mall, and (2) peak period boarding volumes on 7th Street at the Nicollet Mall. Each of these issues and alternatives for addressing these issues is described below.

Dwell and Hold Times

Dwell time is the combined time required for alightings and boardings at a bus stop. This takes an average of 5 seconds per passenger, slightly less for alightings and more for boardings, however the use of the lift for wheelchairs or strollers significantly increases this time. 7th Street and Nicollet is the peak boarding location for all routes using this stop, including local routes 5, 14, 19 and 22, and dwell time can often reach 2 – 3 minutes per bus. If a curb extension at 7th Street and Nicollet is provided, this dwell time will have an impact on traffic while the buses are stopped in the curb lane. Other vehicles would then have to merge into the adjacent traffic lane to move around the stopped buses. Improving boardings time through faster fare payment (discussed above) and more accessible low-floor buses is key to reducing dwell time.

Buses hold for one of two reasons: they have either reached their timepoint ahead of schedule or the hold time was added as part of their schedule. Buses are not allowed to leave a timepoint stop before the scheduled departure, and are required to wait until that time is reached before they can continue. A well-timed schedule greatly reduces cases of early arrivals.

When bus routes are long and serve two sides of the city, holds are often scheduled at peak loading points to maintain service reliability along the route. Peak loading points are typically in the core of downtown where the passenger loads change from predominantly inbound to predominantly outbound. Holds are scheduled at these locations because they have the least impact on passenger travel times and heavy volume of boardings and alighting at these stops already require 1-2 minutes of dwell time. Route 5 has a scheduled hold for 1-3 minutes at the 7th Street and Nicollet Mall stop.

While dwell time will remain a challenge for traffic movement, four ways were identified by Metro Transit for addressing this issue on 7th Street at Nicollet Mall:

- *Split Route 5 into north and south branches, both using 7th and/or 8th Street.* Eliminates the scheduled hold but the new split routes would need to overlap through downtown, doubling the number of Route 5 (or equivalent) buses on 7th and 8th streets in the downtown core. This option would also force some riders to transfer and would add about $500,000 in annual transit operating cost. This is not considered a feasible option.

- *Establish a hold waiting bay for Route 5 at the end of the sidewalk extension.* Route 5 buses would continue to hold but would pull out of the through lane into a bus bay at the end of the sidewalk extension, reducing the space available for other curbside uses near Nicollet. This hold waiting bay could be provided along the curb either east or west of Nicollet, depending on the length of the curb extension and the need to accommodate other curbside uses.

- *Remove the scheduled Route 5 hold.* Route 5 would no longer have a scheduled hold time in downtown. This would increase the variability in Route 5 arrival/departure times, thus negatively impacting service reliability for passengers using Route 5, one of the most heavily used routes in the regional transit system.

- *Relocate the scheduled hold.* Route 5's scheduled hold would be moved from Nicollet to either the east or west perimeter of downtown (e.g., 7th Street Garage). This would retain the reliability of the service but would delay a full load of riders as they either enter or leave downtown.

Boarding Volumes at 7th/Nicollet Bus Stop

There are nearly twice as many bus boardings at the Nicollet stop on 7th Street (3,865 daily boardings) as any other bus stop in downtown (see Table 14 and Figure 5). The volume at this stop is similar to weekday volumes at downtown LRT stops. This creates crowded conditions on the sidewalk, particularly during peak periods when there are both high volumes of waiting passengers and high volumes of pedestrians. Accommodating these high passenger boarding volumes is an issue that will need to be addressed for the east-west spine. Three options were identified to improve the current situation:

- *Curb extensions.* Curb extensions can be provided at bus stops to increase passenger waiting space. However, this may not provide adequate space at the Nicollet Mall stop due to the high volume of boarding passengers.

- *Interior passenger waiting area.* If space on the first floor of the adjacent building could be leased as a transit passenger facility, then the number of waiting passengers on the sidewalk could be reduced. This would require participation by the property owner and some expense for leasing and remodeling the interior space.

- *Split stop nearside/far-side.* With this option, express routes and Routes 9 and 14 would stop nearside of Nicollet Mall while Routes 5, 19 and 22 would continue to stop far-side. This would reduce the number of boardings at the single stop (currently far-side). This option would also reduce the length of bus stop and curb extension needed on the west (far-side) of the intersection. However, the passenger loading volumes will still be relatively high at the far-side stop. It may also be possible to reverse the routes so that express routes and Routes 9 and 14 stop far-side and Routes 5, 19, and 22 stop nearside.

Table 14 – Existing Boardings at Bus Stops on 7th and 8th Streets

Bus Stop	Daily Boardings[1]	Peak Hour Boardings[2]	Peak Hour Buses[2]	Average Dwell Time[2]
7th Street at 3rd-4th Ave	554	136	36	26.8
7th Street at 2nd-3rd Ave	536	107	36	--
7th Street at Nicollet	3,865	417	36	74.7
7th Street at Hennepin	1,638	101	31	32.6
8th Street at Hennepin	695	43	21	--
8th Street at Nicollet	1,845	203	21	--
8th Street at Marquette-2nd Ave	544	60	21	--
8th Street at 3rd-4th Ave	198	28	21	--

[1]Metro Transit provided data.
[2]Data field collected by Alliant Engineering and Metro Transit week of June 21, 2009. Average dwell time was only collected for 3 stops.

Costs

The estimated capital cost to provide the recommended improvements on 7th and 8th streets between 1st Avenue N and Chicago Avenue is approximately $8 million. This is a very general capital cost estimate prepared by the Department of Public Works based on typical costs for various street construction elements, transit facilities and streetscape elements. These costs assume that complete street reconstruction would not occur and that curb extensions would only need to be provided between Marquette Avenue and Hennepin Avenue. If full street reconstruction is required, then the costs will be very significantly higher than reflected in this document. Both 7th and 8th streets are currently programmed for mill and overlay work in 2011 and 2013. It would be most cost-effective to have other retrofit work done in coordination with the mill and overlay work if funding is available and advance engineering work can be completed in time. It may also be possible to implement improvements in the short-term at the west end of the corridor near Hennepin Avenue and Nicollet Mall where transit and pedestrian needs are greatest and phase in improvements to the west over the longer term.

This cost estimate assumes the following improvements:

- Curb extensions, shelters comparable to those on Marquette and 2nd, and other improvements at the five bus stops on 7th and 8th Streets west of Marquette Avenue South (including a potential new split stop at nearside 7th and Nicollet).
- Full sidewalk replacement at curb extensions to face of building.
- Replacement of existing enhanced streetscape (pavers, lighting, street trees) with the same materials at curb extensions.
- Improved shelters comparable to those on Marquette and 2nd at all 14 bus stops.
- Real-time display signs at 9 bus stops: all bus stops west of 2nd Avenue South on 8th Street, at all bus stops west of 4th Avenue South on 7th Street, and at the 7th/Park bus stop

at HCMC.

- Pavement improvements (mill and overlay or sealcoating) between 1st Avenue N and Chicago Avenue consistent with the City's current capital improvement program. (This accounts for approximately half of the total cost estimate.)

- Streetscape improvements (trees and/or planters) primarily between 2nd Avenue South and 1st Avenue North.

Next Steps

The next steps that need to be taken to move forward on implementation of the proposed east-west transit spine improvements in downtown are:

1. Prepare conceptual layouts for five bus stops with curb extensions.

2. Meet with downtown stakeholders to discuss the evaluation of alternatives, the preferred alignment alternative, and the proposed improvements along 7th and 8th streets.

3. Make modifications to recommendations and associated cost estimates based on input from downtown stakeholders.

4. Obtain approval of the preferred alignment alternative and proposed improvements and authorization to proceed from City Council.

5. Determine if any improvements, particularly operations changes, can be implemented immediately. If so, implement those changes prior to construction.

6. Identify funding sources for implementation and seek funding as needed.

7. Prepare final design plans and detailed cost estimates for proposed improvements, working with property owners and downtown stakeholders regarding streetscape and transit facility improvements.

8. Construct proposed improvements and implement proposed transit service changes.

Summary of Proposed Facility and Service Improvements

The following are key findings and recommendations related to the provision of facility and service improvements along the downtown east-west transit spine:

- To accommodate the high volume of boarding passengers, the westbound bus stop on 7th Street at Nicollet Mall should be split into two bus stops – one at the existing far-side corner and a new stop at the nearside corner.

- To provide sufficient space for passenger facilities and pedestrian movement, curb extensions should be provided at the five bus stops on 7th and 8th streets between Marquette Avenue South and 1st Avenue North (nearside 7th/Nicollet, far-side 7th/Nicollet, far-side 7th/Hennepin, nearside 8th/Hennepin, and nearside 8th/Nicollet). To maintain acceptable traffic operations, parking and curbside uses should be restricted during peak periods in the left lane of these blocks; this maintains the existing three travel lanes in addition to the right lane where buses stop.

- Transit shelters that are heated and lighted should be provided at all fourteen transit stops on the downtown east-west spine. Existing shelters should be removed and upgraded to provide a uniform look and level of service to the corridor. Shelters should be sized for the anticipated volume of boarding passengers.

- Real time display (RTD) transit information signs should be provided at the busiest transit stops, including the seven bus stops between 3rd Avenue South and 1st Avenue N and two other bus stops at 7th St/Park (HCMC) and 7th St/3rd Avenue.

- Streetscape improvements should be provided along both sides of 7th and 8th streets, at least between 2nd Avenue South and 1st Avenue North. Ideally, these improvements should be provided along the entire corridor between Chicago (HCMC) and 1st Avenue North.

- To the extent possible, improvements should be coordinated with the planned mill and overlay projects for 7th and 8th Streets (planned for 2010 and 2011, respectively).

- Dwell and hold time on 7th Street at the Nicollet Mall will impact through traffic. Route 5 hold needs to be accommodated differently than is done today, either through operating the route without a scheduled hold, holding at a different location, or providing for the hold in a parking bay outside the traffic lane.

- Improvements in boarding time will help speed the flow of buses through downtown. On-going efforts to increase market penetration for Metro Transit's contactless Go-To card in traditionally underserved areas is an important factor in meeting this goal.

The estimated capital cost to provide the recommended improvements is approximately $8 million.

Appendix A

Transit Routings for Alternatives


East-West Spine Evaluation
4th Street contraflow
WASHINGTON AVE N
4TH ST N
5TH ST N
6TH ST N
1ST AVE N
9TH ST N
10TH ST N
11TH ST N
HENNEPIN AVE
CURRIE AVE
Target Center
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
11TH ST S
12TH ST S
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
PORTLAND AVE
PARK AVE
CHICAGO AVE
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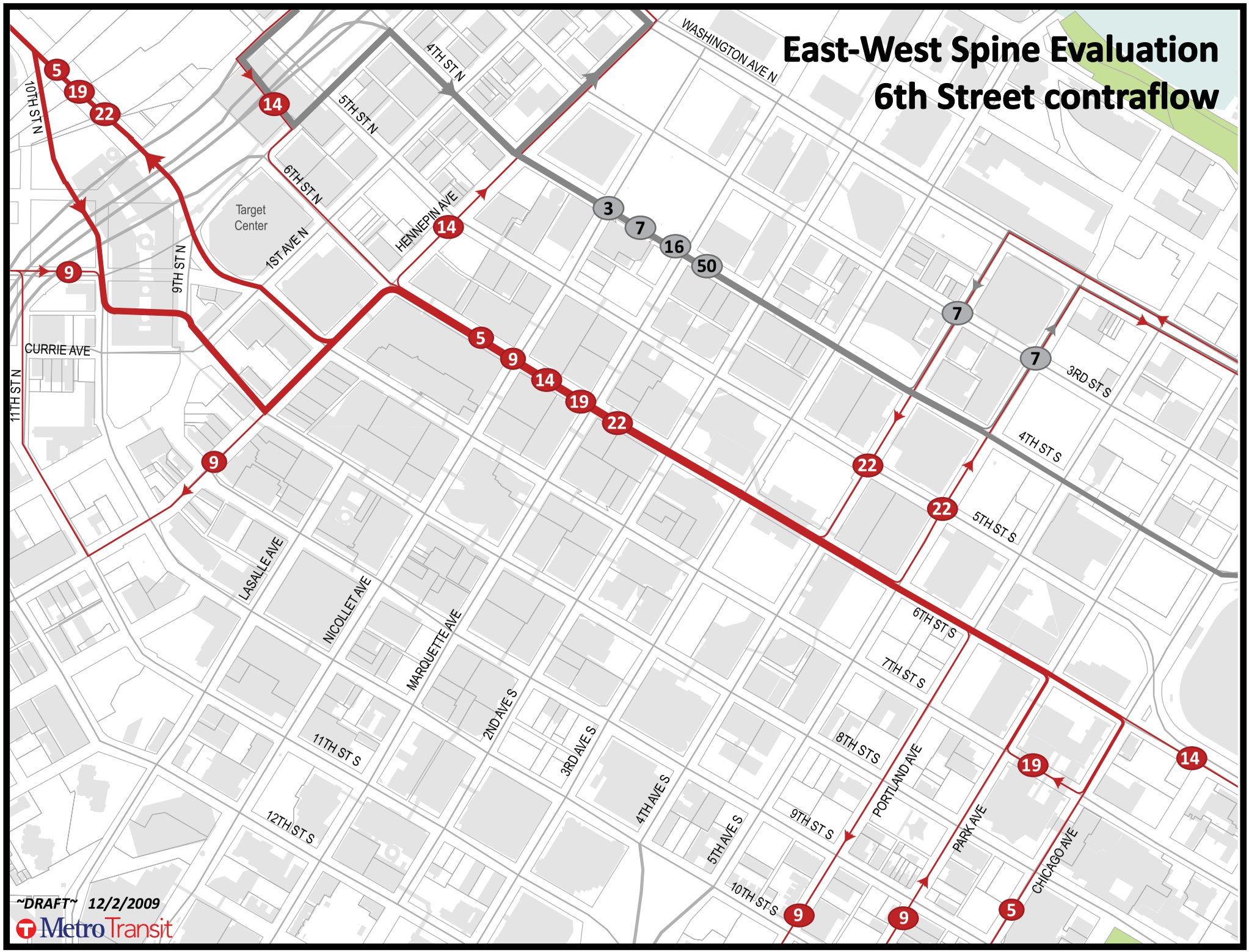
Metro Transit


East-West Spine Evaluation
6th Street contraflow
WASHINGTON AVE N
4TH ST N
5TH ST N
6TH ST N
10TH ST N
9TH ST N
1ST AVE N
HENNEPIN AVE
Target Center
CURRIE AVE
11TH ST N
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
11TH ST S
12TH ST S
10TH ST S
9TH ST S
8TH ST S
7TH ST S
6TH ST S
5TH ST S
4TH ST S
3RD ST S
PORTLAND AVE
PARK AVE
CHICAGO AVE
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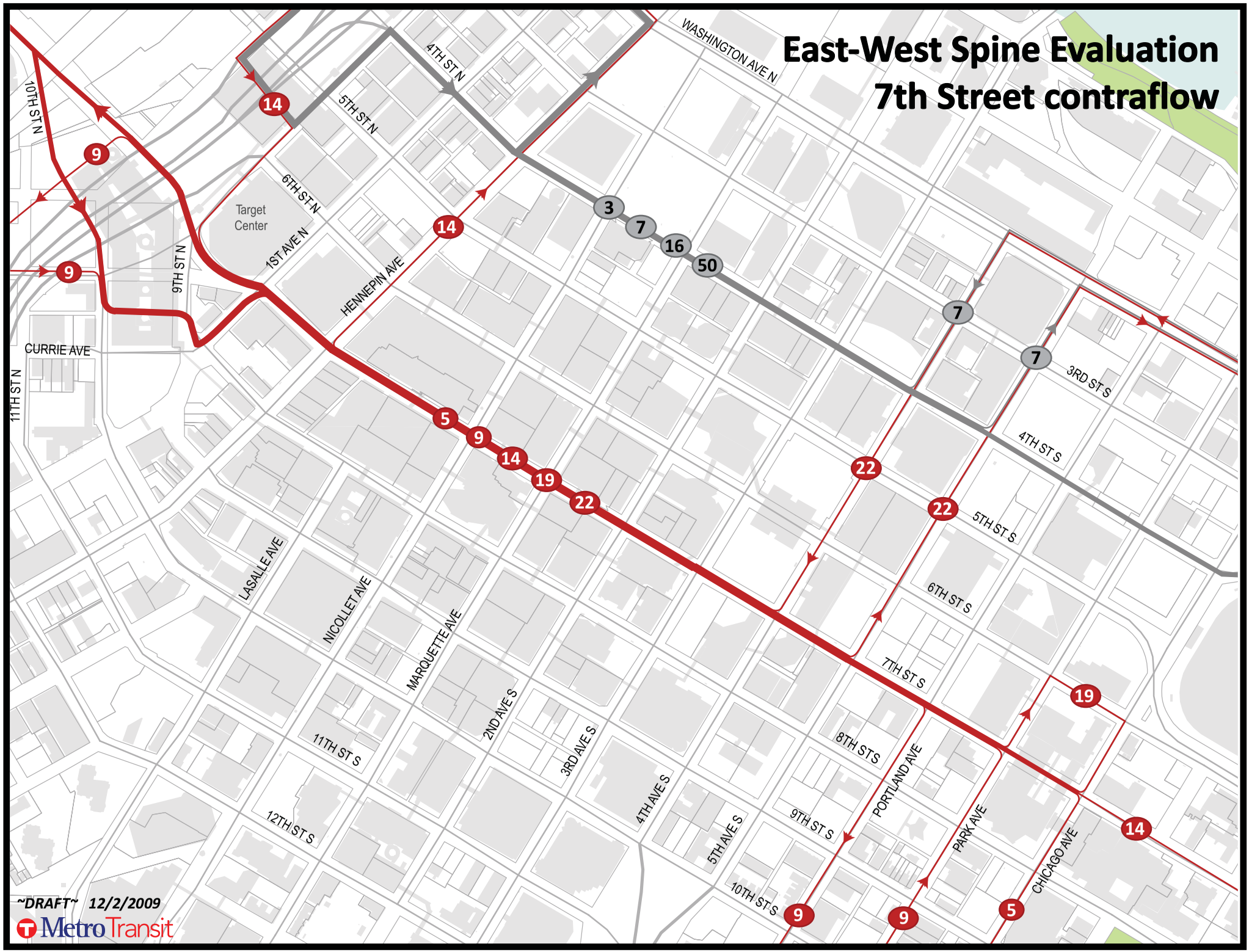
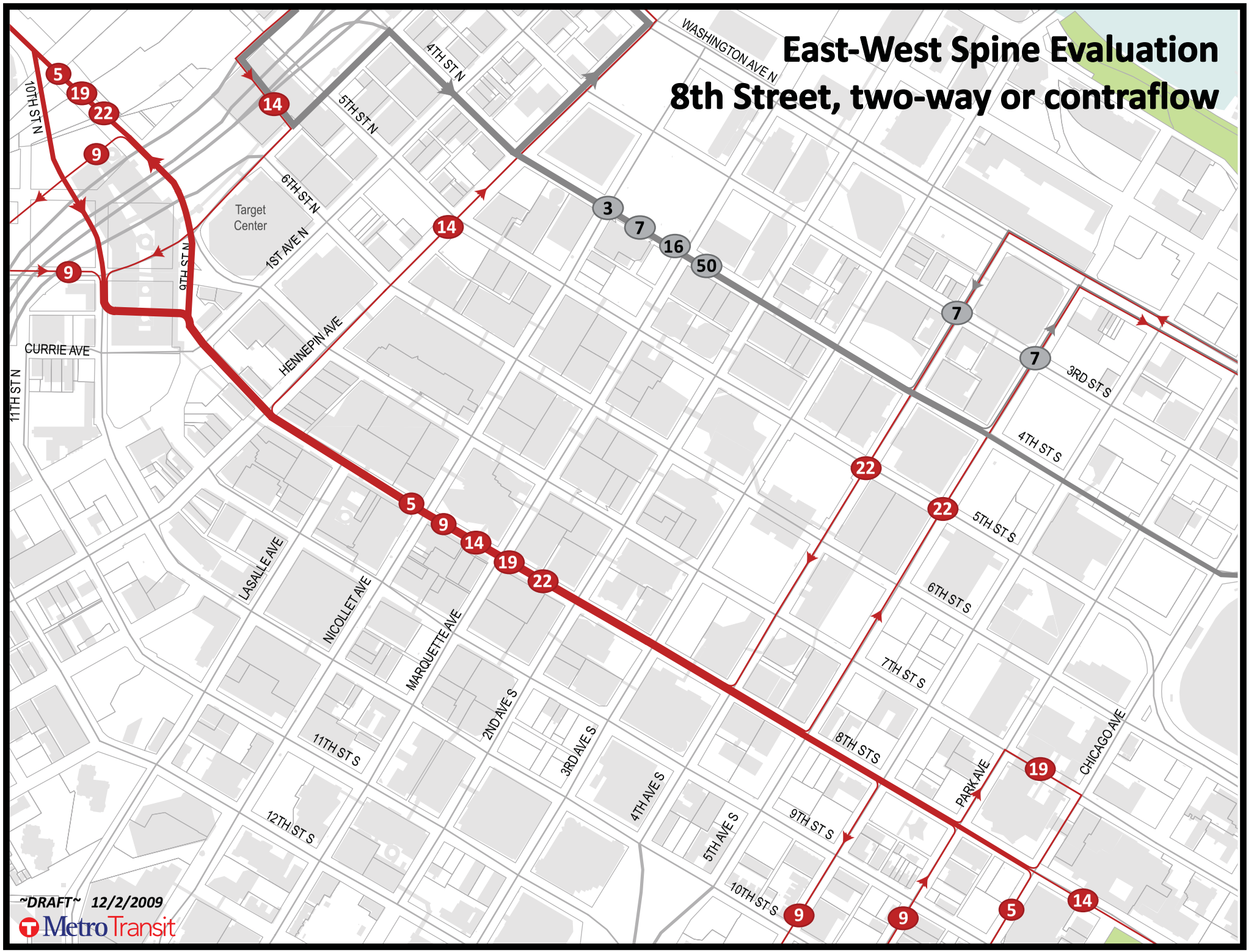
19
22
14
9
3
7
16
50
~DRAFT~ 12/2/2009
Metro Transit


East-West Spine Evaluation
7th Street contraflow
WASHINGTON AVE N
4TH ST N
5TH ST N
10TH ST N
6TH ST N
1ST AVE N
9TH ST N
HENNEPIN AVE
Target Center
CURRIE AVE
11TH ST N
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
11TH ST S
12TH ST S
9TH ST S
10TH ST S
8TH ST S
7TH ST S
6TH ST S
5TH ST S
4TH ST S
3RD ST S
PORTLAND AVE
PARK AVE
CHICAGO AVE
14
9
3
7
16
50
5
19
22
~DRAFT~ 12/2/2009
Metro Transit


East-West Spine Evaluation
8th Street, two-way or contraflow
WASHINGTON AVE N
4TH ST N
5TH ST N
10TH ST N
6TH ST N
9TH ST N
1ST AVE N
Target Center
CURRIE AVE
11TH ST N
HENNEPIN AVE
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
11TH ST S
12TH ST S
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
PARK AVE
CHICAGO AVE
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19
22
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14
3
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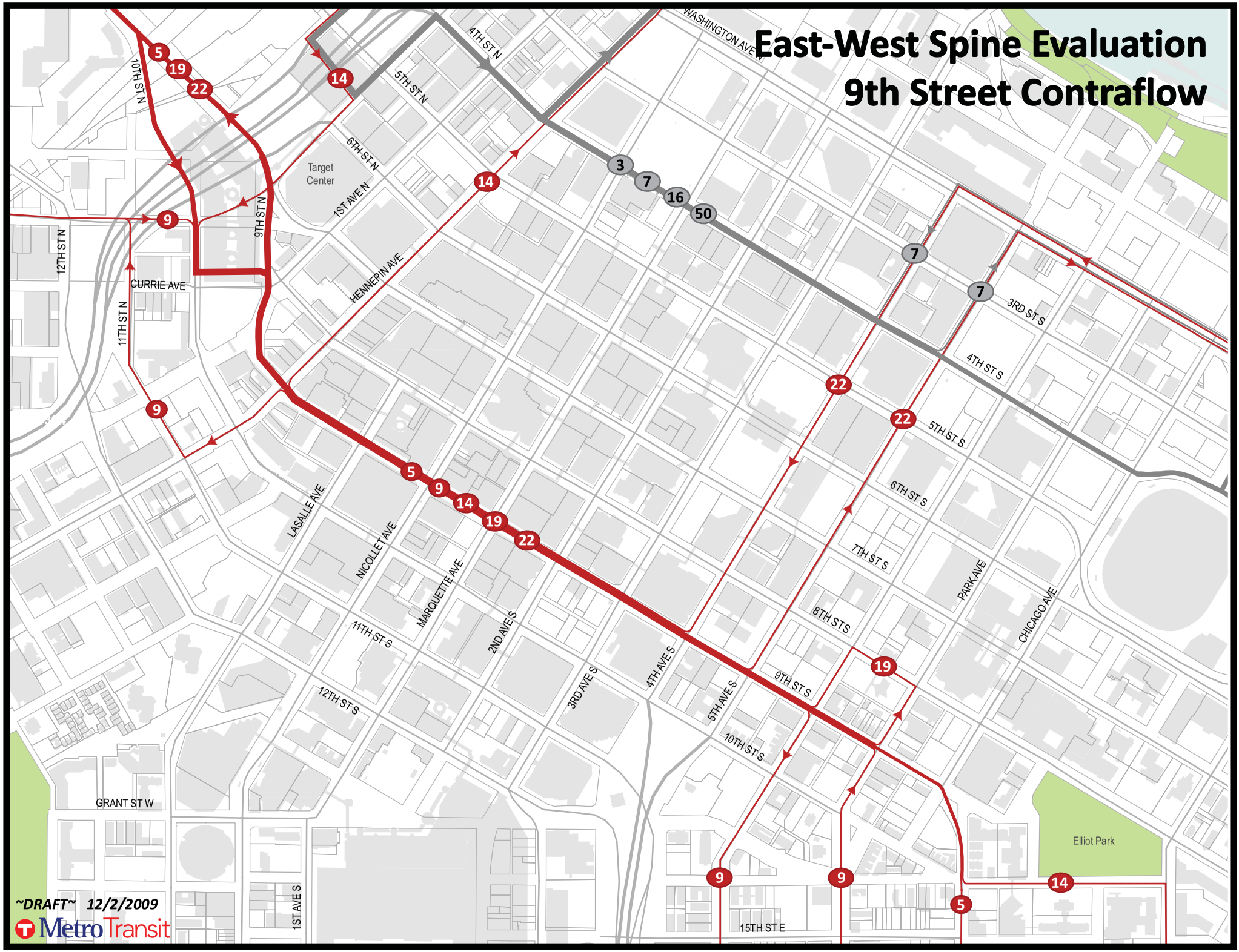
16
50
~DRAFT~ 12/2/2009
Metro Transit


East-West Spine Evaluation
9th Street Contraflow
WASHINGTON AVE N
4TH ST N
5TH ST N
6TH ST N
10TH ST N
9TH ST N
1ST AVE N
Target Center
12TH ST N
CURRIE AVE
11TH ST N
HENNEPIN AVE
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
PARK AVE
CHICAGO AVE
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GRANT ST W
1ST AVE S
15TH ST E
Elliot Park
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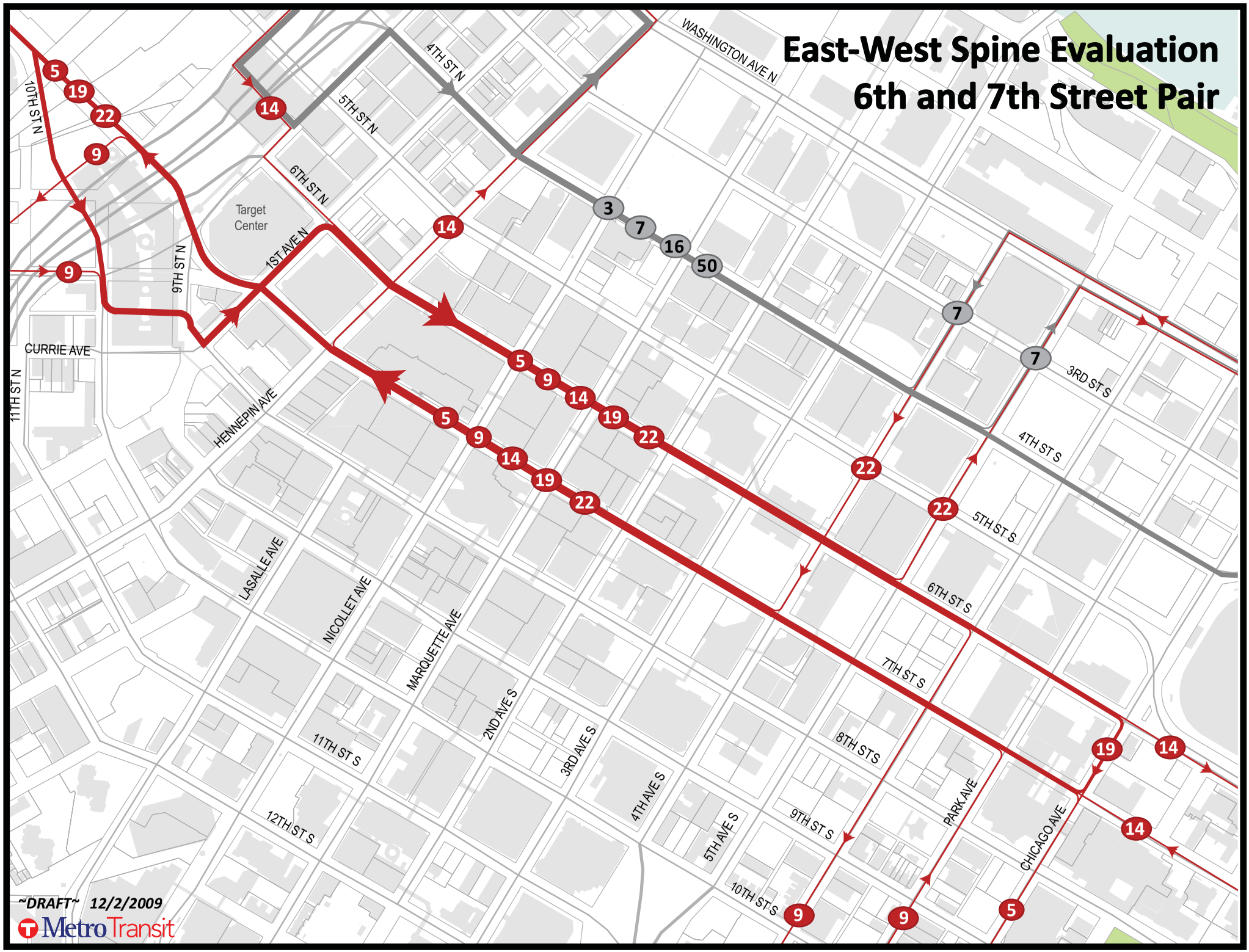
Metro Transit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Target Center
CURRIE AVE
11TH ST N
HENNEPIN AVE
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
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4TH AVE S
5TH AVE S
11TH ST S
12TH ST S
3RD ST S
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6TH ST S
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8TH ST S
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CHICAGO AVE
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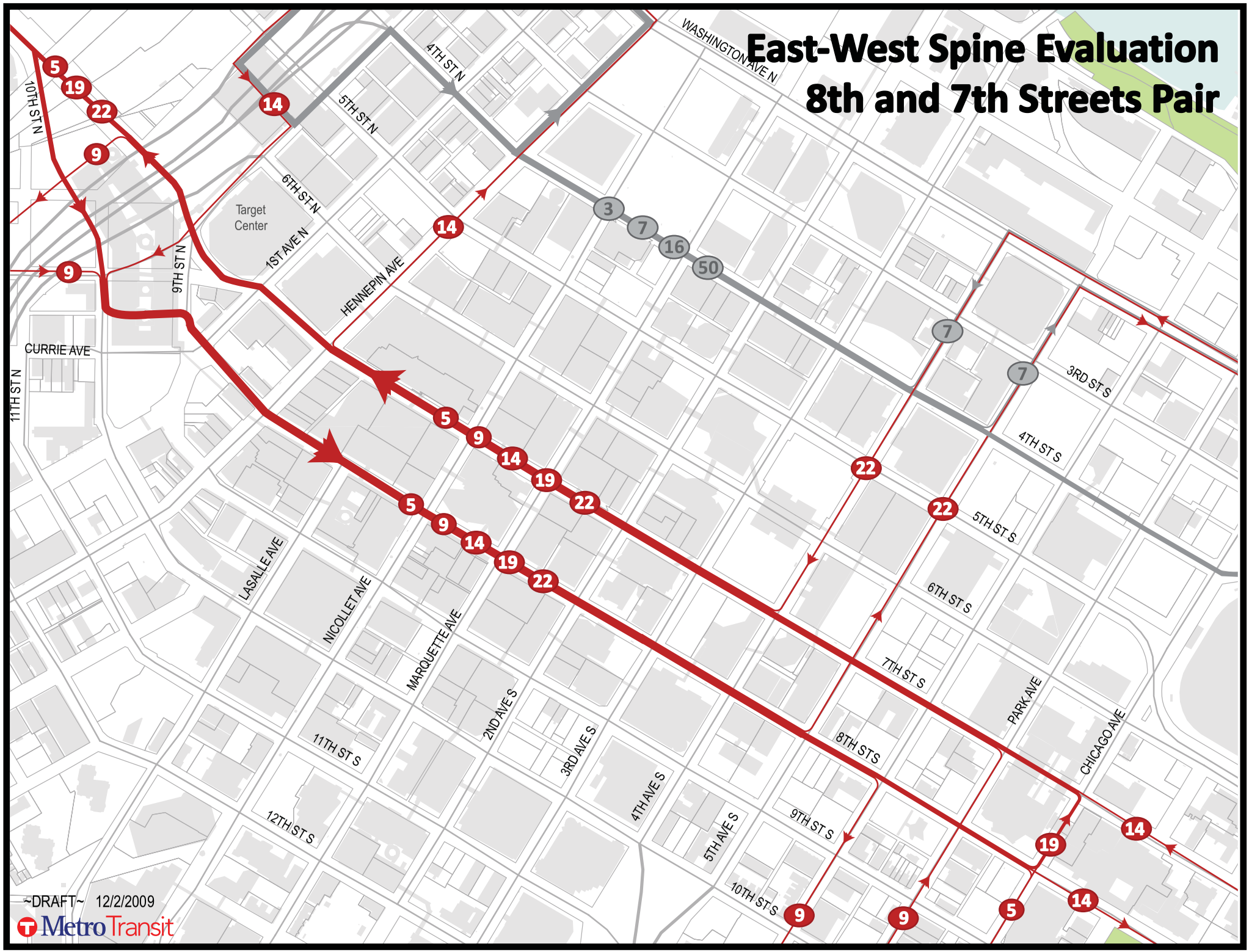
3 7 16 50
7
22
~DRAFT~ 12/2/2009
Metro Transit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HENNEPIN AVE
Target Center
CURRIE AVE
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
LASALLE AVE
NICOLLET AVE
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3RD AVE S
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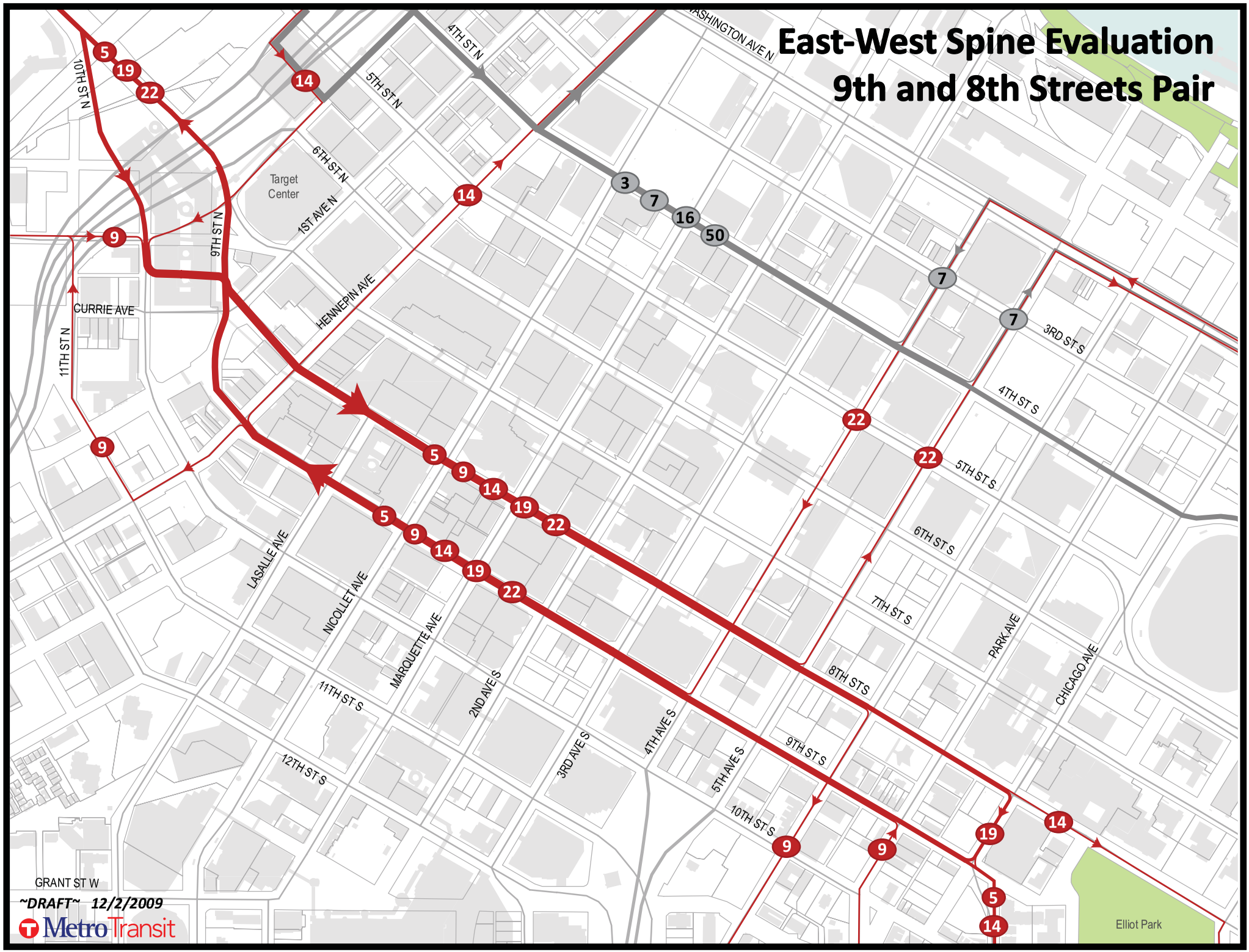
CHICAGO AVE
11TH ST S
12TH ST S
~DRAFT~ 12/2/2009
Metro Transit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Target Center
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CURRIE AVE
11TH ST N
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
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10TH ST S
9TH ST S
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6TH ST S
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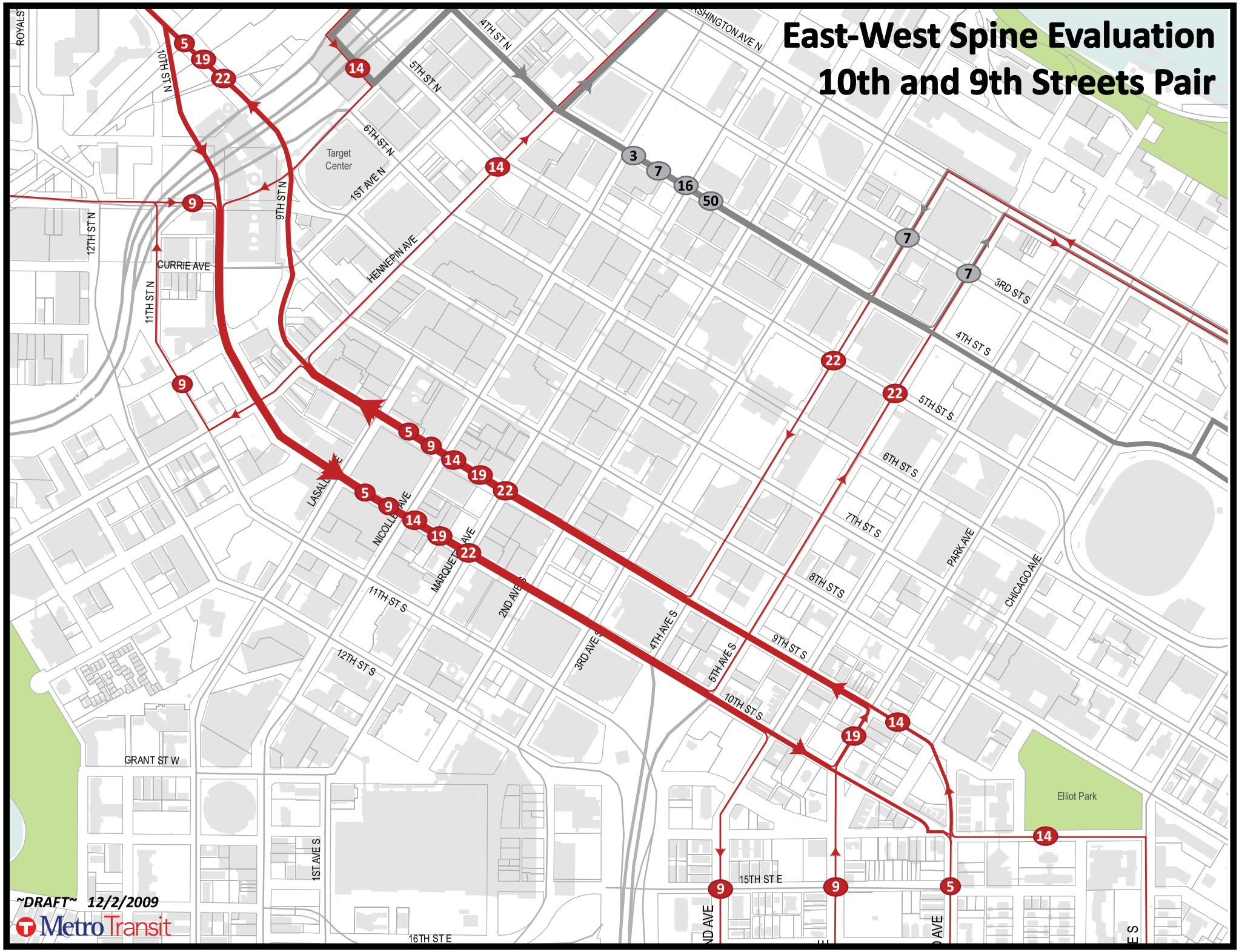
CHICAGO AVE
GRANT ST W
Elliot Park
~DRAFT~ 12/2/2009
Metro Transit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10th and 9th Streets Pair
~DRAFT~ 12/2/2009
Metro Transit
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HENNEPIN AVE
1ST AVE N
6TH ST N
5TH ST N
4TH ST N
WASHINGTON AVE N
Target Center
LASALLE AVE
NICOLLET AVE
MARQUETTE AVE
2ND AVE S
3RD AVE S
4TH AVE S
5TH AVE S
1ST AVE S
11TH ST S
12TH ST S
GRANT ST W
16TH ST E
15TH ST E
3RD ST S
4TH ST S
5TH ST S
6TH ST S
7TH ST S
8TH ST S
9TH ST S
10TH ST S
PARK AVE
CHICAGO AVE
Elliot Park

Appendix B

Traffic Analysis

Table 5. 7th Street/8th Street Intersection Capacity Analysis Summary Comparison

Intersection	Existing Geometry			Scenario 1			Scenario 2			Scenario 3		
	7th Street / 8th Street Approach Delay (s/v)	Total Intersection Delay (s/v)	LOS	7th Street / 8th Street Approach Delay (s/v)	Total Intersection Delay (s/v)	LOS	7th Street / 8th Street Approach Delay (s/v)	Total Intersection Delay (s/v)	LOS	7th Street / 8th Street Approach Delay (s/v)	Total Intersection Delay (s/v)	LOS
WB 7th St at 4th Ave	17.0	21.0	C	17.0	21.0	C	17.0	21.0	C	17.0	21.0	C
WB 7th St at 3rd Ave	32.0	22.0	C	34.0	23.0	C	43.0	28.0	C	30.0	21.0	C
WB 7th St at 2nd Ave	8.0	9.0	A	9.0	10.0	A	17.0	14.0	B	8.0	9.0	A
WB 7th St at Marquette Ave	23.0	20.0	B	19.0	18.0	B	24.0	21.0	C	23.0	20.0	B
WB 7th St at Nicollet Mall	30.0	29.0	C	30.0	29.0	C	31.0	29.0	C	30.0	29.0	C
WB 7th St at Parking Ramp	11.0	11.0	B	12.0	12.0	B	11.0	11.0	B	11.0	11.0	B
WB 7th St at Hennepin Ave	20.0	31.0	C	26.0	34.0	C	39.0	41.0	D	20.0	31.0	C
WB 7th St at 1st Ave	5.0	8.0	A	4.0	8.0	A	6.0	8.0	A	5.0	8.0	A
EB 8th St at 4th Ave	4.0	28.0	C	4.0	28.0	C	5.0	28.0	C	6.0	28.0	C
EB 8th St at 3rd Ave	31.0	23.0	C	32.0	23.0	C	40.0	26.0	C	44.0	28.0	C
EB 8th St at 2nd Ave	6.0	23.0	C	6.0	22.0	C	8.0	23.0	C	8.0	23.0	C
EB 8th St at Marquette Ave	16.0	13.0	B	14.0	12.0	B	19.0	14.0	B	20.0	15.0	B
EB 8th St at Nicollet Mall	8.0	13.0	B	7.0	12.0	B	9.0	14.0	B	8.0	13.0	B
EB 8th St at LaSalle Ave	29.0	39.0	D	22.0	35.0	C	41.0	46.0	D	29.0	39.0	D
EB 8th St at Hennepin Ave	19.0	44.0	D	19.0	45.0	D	27.0	46.0	D	19.0	44.0	D

Scenario 1: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Mixed-Use General Traffic Lane.

Scenario 2: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Diamond/Right Turn Only Lane.

Scenario 3: 8th Street Contra-Flow Bus Only Lane. Eastbound Bus Operates in Mixed-Use General Traffic Lane. 7th Street Maintains Existing Lane Geometrics and Curb-uses. Westbound Express Buses Only.

7th Street / 8th Street Bus Operation Characteristics

Bus Stop	Daily Boardings[1]	Peak Hour Loadings	Peak Hour Percent	No. of Buses	Average Dwell Time (s)	Peak Hour Vacancy (min)	Boarding Time Per Passenger (s)	Synchro Input		Forecast Buses[1]	Peak Hour Vacancy (min)	Synchro Input		Ideal Bus Stop Length[1]
								F_{bb}	Nb			F_{bb}	Nb	
7th Street at 3rd-4th Ave[2]	425	203	47.8%	33	26.8	45.3	7.5	0.75	**61**	47	36.5	0.65	**88**	180' - 220'
7th Street at 2nd-3rd Ave	488	--	--	36	30.0	42.0	--	0.70	**75**	47	36.5	0.61	**98**	180' - 220'
7th Street at Nicollet (FS)[2]	3,582	603	16.8%	35	74.7	16.4	6.2	0.27	**182**	32	20.2	0.02	**166**	140' - 160'
7th Street at Nicollet (NS)	--	--	--	--	--	--	--	--	**--**	15	52.5	(1)	**31**	80' - 100'
7th Street at Hennepin[2]	1,624	121	7.4%	28	32.6	44.8	4.9	0.75	**63**	40	40.0	0.64	**91**	180' - 220'
8th Street at Hennepin	726	--	--	24	30.0	48.0	--	0.80	**50**	26	47.0	0.78	**54**	140' - 160'
8th Street at Nicollet	1,960	--	--	24	30.0	48.0	--	0.80	**50**	26	47.0	0.78	**54**	140' - 160'
8th Street at Marq-2nd Ave	590	--	--	24	30.0	48.0	--	0.80	**50**	26	47.0	0.78	**54**	140' - 160'
8th Street at 3rd-4th Ave	212	--	--	20	30.0	50.0	--	0.83	**42**	26	47.0	0.78	**54**	140' - 160'

[1] Metro Transit provided data.

[2] Existing peak hour loadings, No. of Buses, Average Dwell Time and Peak Hour Vacancy were field collected by Alliant Engineering and Metro Transit during the week of June 21, 2009.

= Override saturation flow rate in Synchro to force right lane sat flow to account for F_{bb} reduction.

F_{bb} = Lane capacity reduction factor to account for bus activity.

NB = Net effective number of buses per hour (Modified from actual) needed for input into Synchro to replicate the correct F_{bb} factor.

Note: The field collected data drew the following key conclusions:

1. The data does not make a clear correlation between peak hour boardings and daily boardings.
2. The average bus dwells for 30s, with exception to Nicollet (due to route 5 bus dwelling longer for schedule).
3. The average dwell time per bus accounts for probability of multiple buses arriving at similar times and appears to offset the variation in dwell time associated with passenger boarding volume differences.

Table 1. Existing Lane Geometrics and Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,636	1,778	2	1	1	1,700	1,100	633	410	309	1,986	1,778	**208**	
WB 7th St and 2nd Ave	90	35.4	1,251	1,360	2	1	1	1,700	1,100	635	411	288	1,969	1,360	**609**	
WB 7th St and Marquette Ave	90	30.5	1,241	1,349	2	1	0	1,700	1,100	547	354	--	1,449	1,349	**100**	**Near Capacity**
WB 7th St and Nicollet Mall	90	44.2	1,458	1,585	1	2	0	1,700	1,100	793	513	141	1,820	1,585	**235**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	1	2	0	1,700	1,100	764	495	135	1,754	1,535	**219**	
WB 7th St and Hennepin Ave	90	33.3	1,461	1,588	2	1	0	1,700	1,100	598	387	446	1,582	1,588	**-6**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,270	1,380	1	2	0	1,700	1,100	723	468	--	1,659	1,380	**279**	
EB 8th St and 4th Ave	90	54.3	1,117	1,214	3	0	0	1,700	1,100	974	630	525	2,923	1,214	**1,709**	
EB 8th St and 3rd Ave	90	32.3	914	993	3	0	0	1,700	1,100	580	375	--	1,739	993	**745**	
EB 8th St and 2nd Ave	90	47.4	1,063	1,155	2	1	1	1,700	1,100	851	550	440	2,692	1,155	**1,536**	
EB 8th St and Marquette Ave	90	25.5	902	980	2	2	0	1,700	1,100	458	296	--	1,507	980	**527**	
EB 8th St and Nicollet Mall	90	57.2	914	993	2	1	1	1,700	1,100	1,026	664	531	3,248	993	**2,255**	
EB 8th St and LaSalle Ave	90	24.5	835	908	1	2	0	1,700	1,100	440	284	--	1,009	908	**101**	
EB 8th St and Hennepin Ave	90	24.4	321	349	0	1	1	1,700	1,100	438	283	227	510	349	**161**	

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

Table 2. Scenario 1 Lane Geometrics and Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,636	1,778	2	1	1	1,700	1,100	633	410	266	1,943	1,778	**165**	
WB 7th St and 2nd Ave	90	35.4	1,303	1,416	2	1	1	1,700	1,100	635	411	250	1,932	1,416	**515**	
WB 7th St and Marquette Ave	90	30.5	1,402	1,524	2	2	0	1,700	1,100	547	354	--	1,803	1,524	**279**	
WB 7th St and Nicollet Mall	90	44.2	1,458	1,585	2	1	1	1,700	1,100	793	513	0	2,100	1,585	**515**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	2	1	1	1,700	1,100	764	495	12	2,036	1,535	**501**	
WB 7th St and Hennepin Ave	90	33.3	1,462	1,589	2	0	1	1,700	1,100	598	387	247	1,442	1,589	**-147**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,270	1,380	1	1	1	1,700	1,100	723	468	298	1,490	1,380	**109**	
EB 8th St and 4th Ave	90	54.3	1,117	1,214	2	0	1	1,700	1,100	974	630	763	2,712	1,214	**1,498**	
EB 8th St and 3rd Ave	90	32.3	914	993	2	0	1	1,700	1,100	580	375	454	1,613	993	**620**	
EB 8th St and 2nd Ave	90	47.4	1,063	1,155	2	1	1	1,700	1,100	851	550	431	2,683	1,155	**1,527**	
EB 8th St and Marquette Ave	90	25.5	902	980	2	2	0	1,700	1,100	458	296	--	1,507	980	**527**	
EB 8th St and Nicollet Mall	90	57.2	914	993	2	1	1	1,700	1,100	1,026	664	520	3,237	993	**2,244**	
EB 8th St and LaSalle Ave	90	24.5	658	715	1	2	0	1,700	1,100	440	284	--	1,009	715	**293**	
EB 8th St and Hennepin Ave	90	24.4	321	349		1	1	1,700	1,100	438	283	222	505	349	**156**	

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

Scenario 1: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Mixed-Use General Traffic Lane.

Table 3. Scenario 2 Lane Geometrics and Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,368	1,487	2	1	0	1,700	1,100	633	410	--	1,677	1,487	**190**	
WB 7th St and 2nd Ave	90	35.4	1,299	1,412	2	1	0	1,700	1,100	635	411	--	1,682	1,412	**270**	
WB 7th St and Marquette Ave	90	30.5	1,241	1,349	2	1	0	1,700	1,100	547	354	--	1,449	1,349	**100**	**Near Capacity**
WB 7th St and Nicollet Mall	90	44.2	1,457	1,584	2	1	0	1,700	1,100	793	513	--	2,100	1,584	**516**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	2	1	0	1,700	1,100	764	495	--	2,024	1,535	**489**	
WB 7th St and Hennepin Ave	90	33.3	1,311	1,425	2	0	0	1,700	1,100	598	387	--	1,195	1,425	**-230**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,119	1,216	1	1	0	1,700	1,100	723	468	--	1,191	1,216	**-25**	**Exceeds Capacity**
EB 8th St and 4th Ave	90	54.3	1,117	1,214	3	0	0	1,700	1,100	974	630	--	2,923	1,214	**1,709**	
EB 8th St and 3rd Ave	90	32.3	914	993	2	0	0	1,700	1,100	580	375	--	1,159	993	**166**	
EB 8th St and 2nd Ave	90	47.4	910	989	2	1	0	1,700	1,100	851	550	--	2,252	989	**1,262**	
EB 8th St and Marquette Ave	90	25.5	890	967	2	1	0	1,700	1,100	458	296	--	1,211	967	**244**	
EB 8th St and Nicollet Mall	90	57.2	908	987	2	1	0	1,700	1,100	1,026	664	--	2,717	987	**1,730**	
EB 8th St and LaSalle Ave	90	24.5	658	715	1	1	0	1,700	1,100	440	284	--	724	715	**9**	**Near Capacity**
EB 8th St and Hennepin Ave	90	24.4	319	347		1	0	1,700	1,100	438	283	--	283	347	**-63**	**Exceeds Capacity**

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

Scenario 2: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Diamond/Right Turn Only Lane.

Table 4. Scenario 1 (Mitigated) Lane Geometrics and Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,636	1,778	2	1	1	1,700	1,100	633	410	266	1,943	1,778	**165**	
WB 7th St and 2nd Ave	90	35.4	1,303	1,416	2	1	1	1,700	1,100	635	411	250	1,932	1,416	**515**	
WB 7th St and Marquette Ave	90	30.5	1,402	1,524	2	2	0	1,700	1,100	547	354	--	1,803	1,524	**279**	
WB 7th St and Nicollet Mall	90	44.2	1,458	1,585	2	1	1	1,700	1,100	793	513	0	2,100	1,585	**515**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	2	1	1	1,700	1,100	764	495	12	2,036	1,535	**501**	
WB 7th St and Hennepin Ave [2]	90	33.3	1,612	1,752	2	1	1	1,700	1,100	598	387	247	1,828	1,752	**76**	**Near Capacity**
WB 7th St and 1st Ave	90	40.3	1,270	1,380	1	1	1	1,700	1,100	723	468	298	1,490	1,380	**109**	
EB 8th St and 4th Ave	90	54.3	1,117	1,214	2	0	1	1,700	1,100	974	630	763	2,712	1,214	**1,498**	
EB 8th St and 3rd Ave	90	32.3	914	993	2	0	1	1,700	1,100	580	375	454	1,613	993	**620**	
EB 8th St and 2nd Ave	90	47.4	1,063	1,155	2	1	1	1,700	1,100	851	550	431	2,683	1,155	**1,527**	
EB 8th St and Marquette Ave	90	25.5	902	980	2	2	0	1,700	1,100	458	296	--	1,507	980	**527**	
EB 8th St and Nicollet Mall	90	57.2	914	993	2	1	1	1,700	1,100	1,026	664	520	3,237	993	**2,244**	
EB 8th St and LaSalle Ave	90	24.5	658	715	1	2	0	1,700	1,100	440	284	--	1,009	715	**293**	
EB 8th St and Hennepin Ave	90	24.4	321	349		1	1	1,700	1,100	438	283	222	505	349	**156**	

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

[2] The westbound approach to the 7th Street/Hennepin Avenue intersection requires 1-TH/LT, 2-TH, 1-TH/RT (Mixed use -Scenario 1 or Bus Only-Scenario 2)

Scenario 1: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Mixed-Use General Traffic Lane.
Mitigation - Requires the Westbound Approach to Hennepin Avenue/7th Street to Include 1-TH/LT, 2-TH, 1-TH/RT. Remove Bump-out On Southwest Corner, Maintain Peak Hour Parking Restricsions Between Hennepin and 1st Avenue.

Table 5. Scenario 2 (Mitigated) Lane Geometrics and Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,368	1,487	2	1	0	1,700	1,100	633	410	--	1,677	1,487	**190**	
WB 7th St and 2nd Ave	90	35.4	1,299	1,412	2	1	0	1,700	1,100	635	411	--	1,682	1,412	**270**	
WB 7th St and Marquette Ave	90	30.5	1,241	1,349	2	1	0	1,700	1,100	547	354	--	1,449	1,349	**100**	**Near Capacity**
WB 7th St and Nicollet Mall	90	44.2	1,457	1,584	2	1	0	1,700	1,100	793	513	--	2,100	1,584	**516**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	2	1	0	1,700	1,100	764	495	--	2,024	1,535	**489**	
WB 7th St and Hennepin Ave	90	33.3	1,461	1,588	2	1	0	1,700	1,100	598	387	--	1,582	1,588	**-6**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,119	1,216	1	1	0	1,700	1,100	723	468	--	1,191	1,216	**-25**	**Exceeds Capacity**
EB 8th St and 4th Ave	90	54.3	1,117	1,214	3	0	0	1,700	1,100	974	630	--	2,923	1,214	**1,709**	
EB 8th St and 3rd Ave	90	32.3	914	993	2	0	0	1,700	1,100	580	375	--	1,159	993	**166**	
EB 8th St and 2nd Ave	90	47.4	910	989	2	1	0	1,700	1,100	851	550	--	2,252	989	**1,262**	
EB 8th St and Marquette Ave	90	25.5	890	967	2	1	0	1,700	1,100	458	296	--	1,211	967	**244**	
EB 8th St and Nicollet Mall	90	57.2	908	987	2	1	0	1,700	1,100	1,026	664	--	2,717	987	**1,730**	
EB 8th St and LaSalle Ave	90	24.5	658	715	1	1	0	1,700	1,100	440	284	--	724	715	**9**	**Near Capacity**
EB 8th St and Hennepin Ave	90	24.4	319	347		1	0	1,700	1,100	438	283	--	283	347	**-63**	**Exceeds Capacity**

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

[2] The westbound approach to the 7th Street/Hennepin Avenue intersection requires 1-TH/LT, 2-TH, 1-TH/RT (Mixed use -Scenario 1 or Bus Only-Scenario 2)

Scenario 2: 7th Street/8th Street One-Way Pair. June 30, 2009 Concept Layout. Bus Operates in Diamond/Right Turn Only Lane.
Mitigation - Requires the Westbound Approach to Hennepin Avenue/7th Street to Include 1-TH/LT, 2-TH, 1-TH/RT. Remove Bump-out On Southwest Corner, Maintain Peak Hour Parking Restricsions Between Hennepin and 1st Avenue.

Table 6. Existing Lane Geometrics + Curb Extensions and Scenario 1 Bus Operations

Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,368	1,487	1	1	1	1,700	1,100	633	410	266	1,310	1,487	**-177**	**Exceeds Capacity**
WB 7th St and 2nd Ave	90	35.4	1,251	1,360	1	1	1	1,700	1,100	635	411	250	1,296	1,360	**-63**	**Exceeds Capacity**
WB 7th St and Marquette Ave	90	30.5	1,241	1,349	2	1	0	1,700	1,100	547	354	--	1,449	1,349	**100**	**Near Capacity**
WB 7th St and Nicollet Mall	90	44.2	1,458	1,585	1	1	1	1,700	1,100	793	513	0	1,306	1,585	**-278**	**Exceeds Capacity**
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	1	1	1	1,700	1,100	764	495	12	1,271	1,535	**-263**	**Exceeds Capacity**
WB 7th St and Hennepin Ave	90	33.3	1,612	1,752	1	1	1	1,700	1,100	598	387	247	1,231	1,752	**-521**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,270	1,380	1	1	1	1,700	1,100	723	468	298	1,490	1,380	**109**	
EB 8th St and 4th Ave	90	54.3	1,117	1,214	2	0	1	1,700	1,100	974	630	763	2,712	1,214	**1,498**	
EB 8th St and 3rd Ave	90	32.3	914	993	2	0	1	1,700	1,100	580	375	454	1,613	993	**620**	
EB 8th St and 2nd Ave	90	47.4	1,063	1,155	1	1	1	1,700	1,100	851	550	431	1,832	1,155	**677**	
EB 8th St and Marquette Ave	90	25.5	902	980	2	2	0	1,700	1,100	458	296	--	1,507	980	**527**	
EB 8th St and Nicollet Mall	90	57.2	914	993	1	1	1	1,700	1,100	1,026	664	520	2,211	993	**1,217**	
EB 8th St and LaSalle Ave	90	24.5	835	908	1	2	0	1,700	1,100	440	284	--	1,009	908	**101**	
EB 8th St and Hennepin Ave	90	24.4	321	349	0	1	1	1,700	1,100	438	283	222	505	349	**156**	

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

Table 7. Scenario 3 8th Street Contra-Flow Lane (7th Street Existing Lane Geometrics and Express Bus Only)

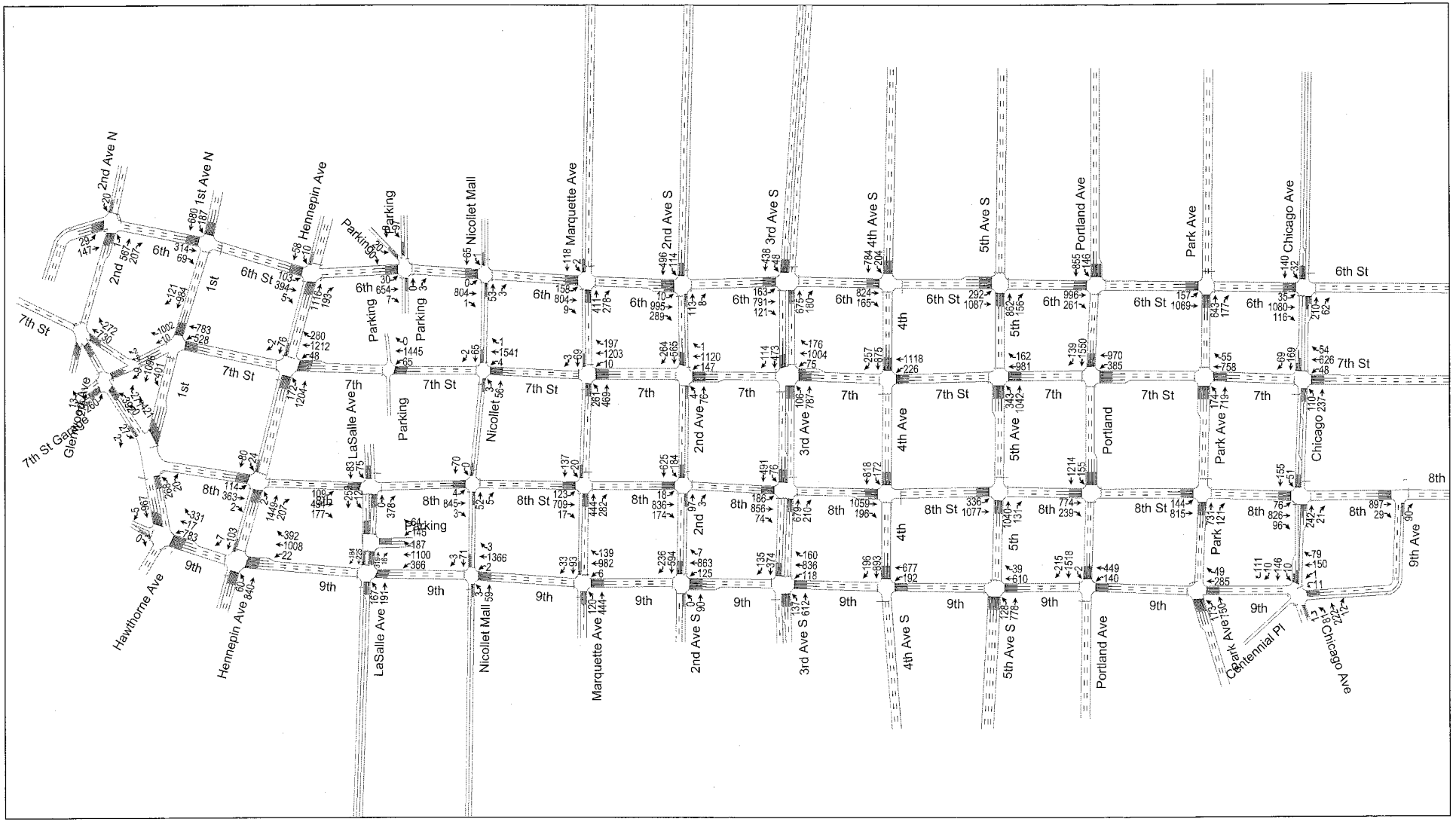
Intersection	Cycle Length (s)	Green Time (s)	Total Approach Volume (vph)	Total Approach Volume (vph)[1]	No. of Thru Lanes	No. of Shared Lanes	No. of Lanes w/Bus Stop	Ideal Thru Lane Capacity (vph)	Ideal Shared Lane Capacity (vph)	Adjusted Capacity of Thru Lane (vph)	Adjusted Capacity of Shared Lane (vph)	Adjusted Capacity of Lane w/ Bus Stop (vph)	Estimated Approach Capacity (vph)	Approach Volume Demand (vph)	Approach Capacity Surplus / Deficit (vph)	Comments
WB 7th St and 4th Ave	90	40.4	1,514	1,646	4	0	0	1,700	1,100	725	469	--	2,900	1,646	**1,254**	
WB 7th St and 3rd Ave	90	35.3	1,636	1,778	2	1	1	1,700	1,100	633	410	365	2,042	1,778	**263**	
WB 7th St and 2nd Ave	90	35.4	1,251	1,360	2	1	1	1,700	1,100	635	411	366	2,047	1,360	**688**	
WB 7th St and Marquette Ave	90	30.5	1,241	1,349	2	1	0	1,700	1,100	547	354	--	1,449	1,349	**100**	**Near Capacity**
WB 7th St and Nicollet Mall	90	44.2	1,458	1,585	1	2	0	1,700	1,100	793	513	457	1,820	1,585	**235**	
WB 7th St and Parking Ramp	90	42.6	1,412	1,535	1	2	0	1,700	1,100	764	495	440	1,754	1,535	**219**	
WB 7th St and Hennepin Ave	90	33.3	1,461	1,588	2	1	0	1,700	1,100	598	387	344	1,582	1,588	**-6**	**Exceeds Capacity**
WB 7th St and 1st Ave	90	40.3	1,270	1,380	1	2	0	1,700	1,100	723	468	--	1,659	1,380	**279**	
EB 8th St and 4th Ave	90	54.3	1,313	1,427	1	1	1	1,700	1,100	974	630	763	2,368	1,427	**941**	
EB 8th St and 3rd Ave	90	32.3	1,174	1,276	1	1	1	1,700	1,100	580	375	454	1,409	1,276	**133**	
EB 8th St and 2nd Ave	90	47.4	1,063	1,155	1	1	1	1,700	1,100	851	550	431	1,832	1,155	**677**	
EB 8th St and Marquette Ave	90	25.5	902	980	1	2	0	1,700	1,100	458	296	--	1,050	980	**69**	**Near Capacity**
EB 8th St and Nicollet Mall	90	57.2	914	993	1	1	1	1,700	1,100	1,026	664	520	2,211	993	**1,217**	
EB 8th St and LaSalle Ave	90	24.5	835	908	1	2	0	1,700	1,100	440	284	--	1,009	908	**101**	
EB 8th St and Hennepin Ave	90	24.4	321	349	0	1	1	1,700	1,100	438	283	222	505	349	**156**	

Note: Ideal lane capacities based on average of field data collected in June 2009. Several intersections throughout downtown were observed to quantify the capacity reduction of shared lane use, pedestrians and bus operations.

[1] Total approach volume adjusted to account for peak hour factor of 0.92. Where exclusive left or right turn lanes are provided, the turning volume is removed from the approach total volume

2004 EXISTING

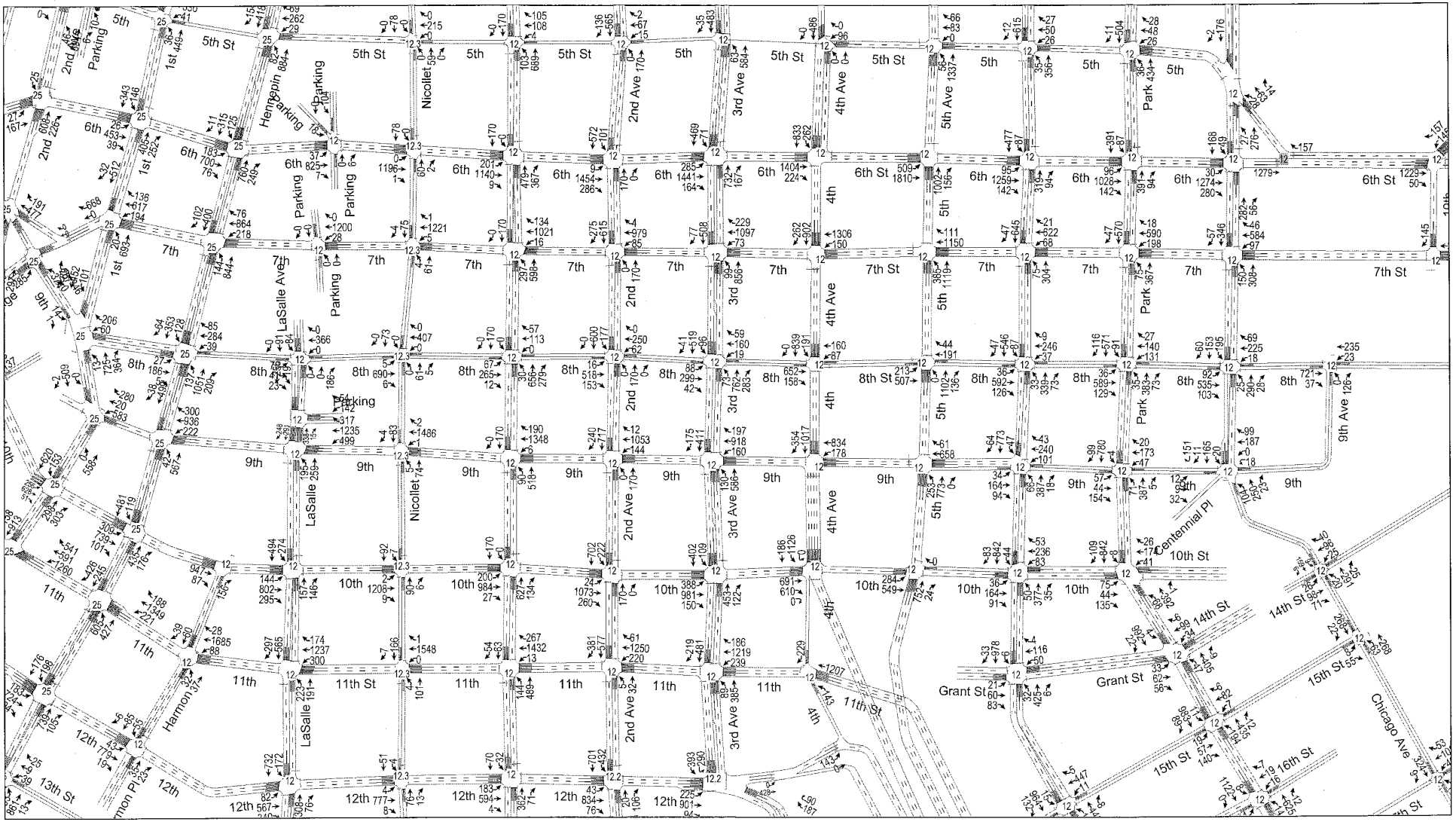
7/7/2009



Intersection Volumes
Source: SEH / MPLS

2030 ACCESS MPLS FORECASTS

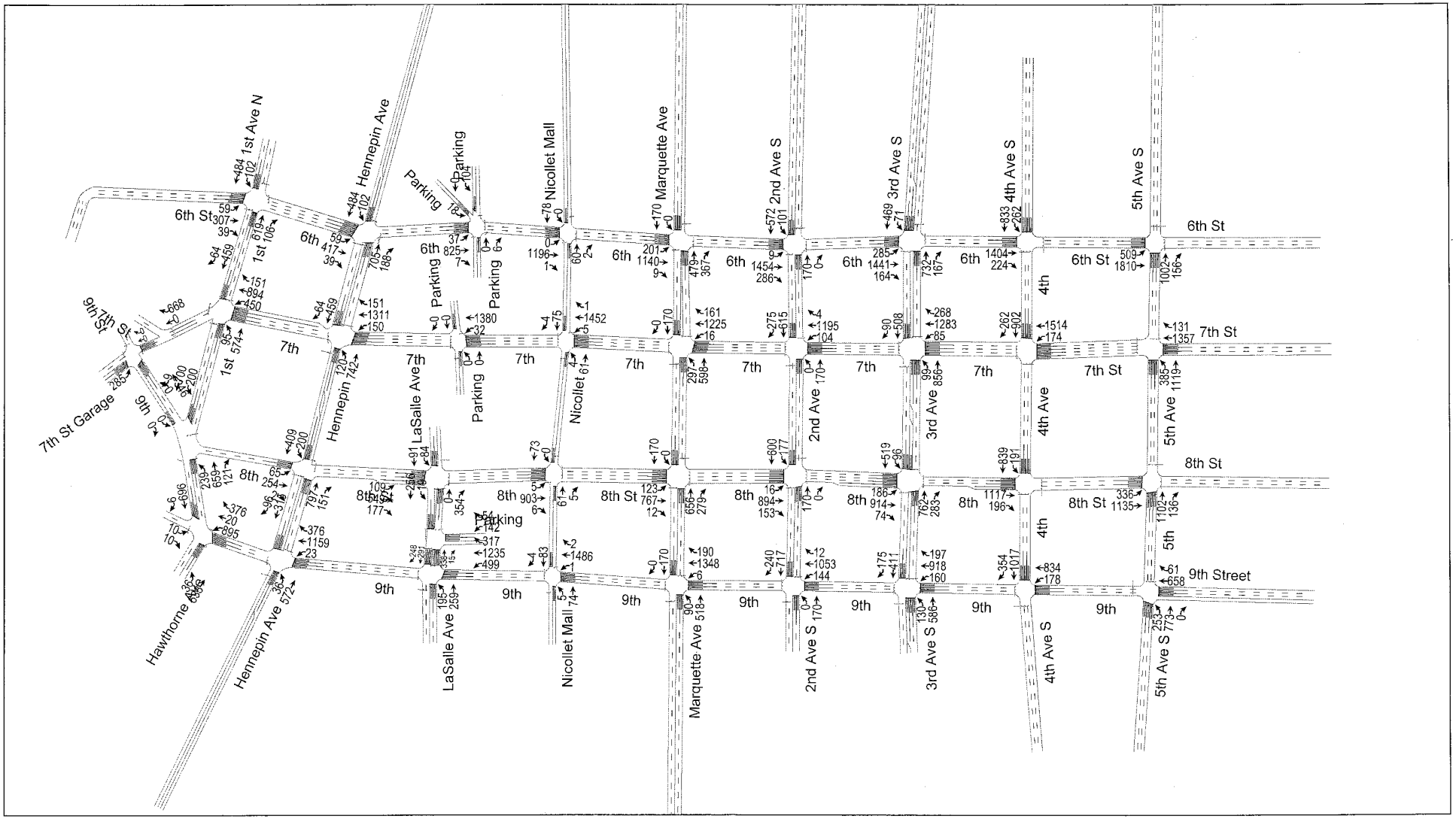
7/7/2009



Intersection Volumes
Source: SEH

2030 EAST-WEST SPINE (MODIFIED VOLUMES)

7/7/2009



Intersection Volumes
Source: ALLIANT

Appendix C

Bus Operations Analysis

Dir	On	At	Stop Location	Current				7th/8th Streets One-Way Pair				8th Street w/ Contraflow			
				Routes	Midday Bus Volumes	PM Peak Hour Bus Volumes	Daily Passenger Boardings	Routes	Midday Bus Volumes	PM Peak Hour Bus Volumes	Daily Passenger Boardings	Routes	Midday Bus Volumes	PM Peak Hour Bus Volumes	Daily Passenger Boardings
WB	7th St	10th Ave S	NS	14	4	5	18	14	4	5	18	*exp only*	0	0	0
WB	7th St	Carew	NS	14	4	5	18	14	4	5	18	*exp only*	0	0	0
WB	7th St	Park	NS	5, 14, 19, exp	16	24	964	5, 14, 19, exp	16	24	964	*exp only*	0	2	19
WB	7th St	Portland	NS	5, 14, 19, 39, exp	16	26	113	5, 9, 14, 19, 39, exp	18	35	132	*exp only*	0	2	4
WB	7th St	5th Ave S	FS	5, 14, 19, 39, exp	16	26	101	5, 9, 14, 19, 39, exp	18	35	101	*exp only*	0	2	23
WB	7th St	3rd/4th Aves	MB	5, 14, 19, 22, 39, exp	19	36	554	5, 9, 14, 19, 22, 39, exp	21	45	576	*exp only*	0	8	129
WB	7th St	2nd/3rd Aves	MB	5, 14, 19, 22, 39, exp	19	36	536	5, 9, 14, 19, 22, 39, exp	21	47	629	*exp only*	0	8	48
WB	7th St	Nicollet	FS	5, 14, 19, 22, 39 exp	19	36	3,865	9, 14, 39 ,exp	6	26	1,496	*exp only*	0	8	283
WB	7th St	Nicollet	NS	-	-	-	-	5, 19, 22	15	21	3,073	-	-	-	-
WB	7th St	Hennepin	FS	5, 19, 22, 39, exp	15	31	1,638	5, 9, 19, 22, 39, exp	17	42	1,638	*exp only*	0	8	14
WB	7th St	2nd Ave N	NS	5, 19, 22, 39	15	23	35	5, 19, 22, 39	15	23	35	5, 19, 22	15	21	35
EB	7th Street Garage			5, 9, 19, 22	17	21	447	5, 9, 14, 19, 22	21	26	467	5, 9, 14, 19, 22	21	26	467
EB	8th St	Hennepin	NS	5, 9, 19, 22	17	21	695	5, 9, 14, 19, 22	21	26	838	5, 9, 14, 19, 22	21	26	838
EB	8th St	Nicollet	NS	5, 9, 19, 22	17	21	1,845	5, 9, 14, 19, 22,	21	26	2,197	5, 9, 14, 19, 22	21	26	2,197
EB	8th St	Marq/2nd	MB	5, 9, 19, 22	17	21	544	5, 9, 14, 19, 22	21	26	654	5, 9, 14, 19, 22	21	26	654
EB	8th St	3rd/4th Aves	MB	5, 9, 19, 22	17	21	198	5, 9, 14, 19, 22	21	26	218	5, 9, 14, 19, 22	21	26	218
EB	8th St	4th/5th Aves	MB	5, 9, 19	14	17	56	5, 9, 14, 19	18	22	91	5, 9, 14, 19	18	22	91
EB	8th St	Portland/Park	MB	5, 19	12	13	95	5, 14, 19	16	18	139	5, 14, 19	16	18	139
EB	8th St	Chicago	FS	-	0	0	0	14	4	5	53	14	4	5	53
WB	8th St	Chicago	NS	-	0	0	0	-	0	0	0	14	4	5	36
WB	8th St	Park/Portland	MB	-	0	0	0	-	0	0	0	5, 14, 19, 39, exp	16	29	1,073
WB	8th St	4th Ave S	NS	-	0	0	0	-	0	0	0	5, 9, 14, 19, 39, exp	18	33	525
WB	8th St	2nd Ave S	NS	-	0	0	0	-	0	0	0	5, 9, 14, 19, 22, 39, exp	21	39	337
WB	8th St	Marquette	NS	-	0	0	0	-	0	0	0	5, 9, 14, 19, 22, 39, exp	21	39	244
WB	8th St	Nicollet	FS	-	0	0	0	-	0	0	0	5, 9, 14, 19, 22, 39, exp	21	39	4,271
WB	8th St	Hennepin	FS	-	0	0	0	-	0	0	0	5, 9, 14, 19, 22, 39	21	32	1,624
WB	9th St	Portland	FS	9, exp	2	9	19	-	0	0	0	-	0	0	0
WB	9th St	4th Ave S	NS	9, exp	2	9	22	-	0	0	0	-	0	0	0
WB	9th St	2nd Ave S	NS	9, exp	2	11	93	-	0	0	0	-	0	0	0
WB	9th St	Nicollet	FS	9, exp	2	11	689	-	0	0	0	-	0	0	0
EB	6th St	Hennepin	NS	14, exp	8	38	830	*exp only*	4	33	687	*exp only*	4	33	687
EB	6th St	Nicollet	NS	14, exp	8	19	1,026	*exp only*	4	14	674	*exp only*	4	14	674
EB	6th St	Marquette	NS	exp	0	28	637	*exp only*	0	23	637	*exp only*	0	23	637
EB	6th St	2nd Ave	FS	14, exp	8	42	741	*exp only*	4	37	631	*exp only*	4	37	631
EB	6th St	5th Ave	NS	14, exp	8	40	166	*exp only*	4	35	131	*exp only*	4	35	131
EB	6th St	Portland	FS	14, exp	8	36	33	*exp only*	4	31	27	*exp only*	4	31	27
EB	6th St	Park/Chicago	MB	14, exp	8	36	248	*exp only*	4	31	161	*exp only*	4	31	161
EB	6th St	Carew	NS	14, exp	8	36	36	*exp only*	4	31	27	*exp only*	4	31	27
EB	6th St	10th Ave	NS	14, exp	8	34	3	*exp only*	4	29	2	*exp only*	4	29	2

NS = near side

FS = far side

MB = mid-block