# West Broadway Transit Study

# Concept Development of Alternatives

4/7/2015

Prepared by the
SRF Consulting Group Team

for

Metro Transit

**1. Introduction ..... 1**
**2. Streetcar Alternative ..... 1**
*Station Design ..... 1*
*Alignment Alternatives ..... 2*
**3. Arterial BRT Alternative ..... 8**
*Station Design ..... 8*
*Alignment Alternatives ..... 8*
**4. Potential Station Locations ..... 11**
**5. Other Facilities ..... 12**
**6. Previously Dismissed Alignment Alternatives ..... 12**

# 1. Introduction

The West Broadway Transit Study is a collaboration between Metro Transit and various other partners to evaluate transit improvements in North Minneapolis, the North Loop neighborhood, the North Washington Jobs Park, and potential connections to the planned METRO Blue Line Extension LRT stations in Golden Valley or Robbinsdale. The project will analyze the corridor's important connections to other existing and proposed transit lines, such as the Nicollet-Central Streetcar, the C Line, and the Chicago-Fremont arterial BRT line. The project will also evaluate Transit-Oriented Development (TOD) opportunities and market potential throughout the corridor. Overall, the West Broadway Transit Study is seen as more than a transit improvement project, but instead a fully encompassing strategy to improve and revitalize the West Broadway area into a resilient and prosperous corridor.

Kimley-Horn and Associates reviewed the preliminary corridor alignments for the West Broadway Transit Study, and have prepared proposed corridor alignment alternatives for the project. The project is studying both streetcar and arterial bus rapid transit (BRT) options for the corridor. Both modes have varied routes due to cost and technical constraint differences. The routing descriptions for each mode are listed below.

# 2. Streetcar Alternative

Streetcar service is very similar to Light Rail Transit (LRT) service with the exception that right-of-way (ROW) for streetcars is shared with automobiles. Because of the increased interaction with traffic, streetcars cannot provide the same convenience and frequency of service as LRT; however, streetcars can be more attractive in areas where dedicated ROW for LRT is unavailable or would be too costly to obtain. Streetcars are typically single vehicles, ranging in width from 7 feet, 6.5 inches to 8 feet, 8 inches and ranging in length from 66 to 95 feet. The turning radius of streetcars varies based on the vehicle type, typically ranging from 60 to 82 feet. Streetcars are typically powered from overhead catenary wires that are suspended above the track alignment. The majority of the streetcar line would be comprised of embedded track to allow for mixed traffic operations, with the potential for some ballasted track in areas not accessible to traffic.

## Station Design

Streetcar stations are typically spaced at 1/4 or 1/3 mile intervals, or generally every 2 to 3 blocks. Stations typically consist of a boarding platform with raised curb to facilitate near level or level boarding, passenger amenities (i.e. shelters, benches, trash bins, bike loops), wayfinding, real-time information, and fare collection. Platform length depends on the vehicle type and site constraints, but typically varies from 60 to 80 feet. Platforms can be located at the existing curbside which can reduce street parking by at least 150 feet, or can be located on curb bumpouts which removes parking for the length of the bumpout and provides additional space for the station and amenities.

## Alignment Alternatives

### *North Loop*

The North Loop segment is approximately 0.9 miles long, running from Hennepin Avenue to Plymouth Avenue in Minneapolis. The City of Minneapolis is in the planning phases for a north-south streetcar line on Nicollet Avenue through downtown. The West Broadway streetcar alignment would likely connect to the streetcar at the Nicollet Hotel block, a site to be developed by United Properties at Washington Avenue and Hennepin Avenue in downtown Minneapolis. The alignment would run northwest either on Washington Avenue or 2nd Street N through the North Loop neighborhood to Plymouth Avenue.

Washington Avenue in the North Loop segment contains right-of-way averaging 100 feet wide. The roadway from Hennepin to 10th Avenue currently contains four through lanes and curbside metered parking lanes, with turn lanes existing at 3rd, 5th, and 6th Avenues. However, Hennepin County will be restriping Washington Avenue in the 2015 construction season. The roadway from Hennepin to 5th Avenue North will be re-striped to include bike lanes and narrower vehicle travel lanes, and the roadway from 5th Avenue to 10th Avenue will be reconfigured to provide a 3-lane roadway, parking lanes, and buffered bike lanes. Traffic signals exist at the intersections with Hennepin Avenue, N 1st Avenue, N 2nd Avenue, N 3rd Avenue, N 5th Avenue, N 6th Avenue, N 10th Avenue, and Plymouth Avenue. The streetcar alignment would be located in the outside travel lanes in this segment. The configuration of stations would need to accommodate bypass of the on-street bike lanes.

2nd Avenue in the North Loop segment contains right-of-way averaging 80 feet across. The roadway usually contains a 2-lane roadway, two standard bike lanes and curbside metered parking lanes. Traffic signals exist at the intersections with Hennepin Avenue, N 1st Avenue, N 3rd Avenue, N 10th Avenue, and Plymouth Avenue. The streetcar alignment would be located in the traffic lanes for this segment.

If the streetcar alignment runs along Washington Avenue through the North Loop and 2nd Street through the North Washington Jobs Park, the alignment would run along N 10th Avenue for one block between the two streets. The obtuse angle from 10th Avenue to 2nd Street would be more favorable for a streetcar turning radius requirement than providing the connection on Plymouth Ave N.

Both Washington Avenue and 2nd Street through the North Loop would generate similar ridership figures; however, each corridor poses different advantages and disadvantages. 2nd Street contains a smaller right-of-way and contains less traffic, which may help travel time. 2nd Street also runs through primarily developed land, which means initial ridership may be higher than Washington Avenue. However, potential TOD development would be lower on 2nd than on Washington Avenue, and the lack of a public connection from the south to 2nd Street between 5th Avenue and 10th Avenue would isolate a large majority of the North Loop. Comparatively, if the transitway was placed on Washington Avenue, higher traffic counts and wider right-of-way may impact travel time. However, many vacant lots nearby contain high TOD potential, and the corridor contains more connections from the south than 2nd Street.

Initial design constraints in this segment include the implementation of streetcar on the bridges over the Northstar Commuter freight rail tracks, which would require partial reconstruction of the bridge decks

to accommodate direct fixation track. The Washington Avenue bridge over the freight tracks historically carried streetcar vehicles, and both bridges have capacity to allow heavy truck traffic, but further analysis is required to determine if the bridges will need to be replaced or require significant structural modifications to accommodate streetcars. Arterial BRT would not require replacement or modification of the bridges.

The streetcar alignment could also use both Washington Avenue and 2nd Street as a one-way couplet in the North Loop area. This could provide access to a larger service area, but would require reconstruction of two bridges over the Northstar line, as opposed to one bridge using a two-way alignment. Pedestrian connections from 2nd Street to Washington Avenue would also need to be added between 5th Avenue and 10th Avenue, as there is currently no access between those streets in this area.

### *North Washington Jobs Park*

The North Washington Jobs Park segment is approximately 0.5 miles long, running from Plymouth Avenue to West Broadway Avenue in Minneapolis. From Plymouth Avenue, the streetcar alignment would continue to run north through the North Washington Jobs Park on either Washington or 2nd Street until West Broadway Avenue, where it would turn west onto Broadway.

Washington Avenue in the Jobs Park segment contains right-of-way averaging 100 feet wide. The roadway contains four undivided travel lanes and curbside parking lanes. An off-ramp from Interstate 94 approaches Washington at 17th Avenue N, and the road profile includes turn lanes. Washington Avenue abuts Interstate 94 to the west from 15th Avenue N to West Broadway Avenue. Traffic signals exist at the intersections with N 17th Avenue and West Broadway Avenue. The streetcar alignment would be located in the outside travel lanes in this segment. Bus pull out areas also exist to the south of Broadway Avenue and 17th Avenue N which could be utilized for streetcar stations.

2nd Street N in the Job Park segment contains right-of-way averaging 80 feet wide. The roadway contains two travel lanes, two standard bike lanes, and curbside parking lanes. Only one traffic signal exists at the intersection of 2nd Street and West Broadway Avenue. The streetcar alignment would be located in the traffic lanes for this segment. The configuration of stations would need to accommodate bypass of the on-street bike lanes.

Both corridors currently have primarily industrial uses and publically operated facilities owned by the City of Minneapolis. However, a large portion of land west of Washington Avenue is MnDOT-owned right-of-way for Interstate 94, and would be difficult to redevelop in the future. Washington Avenue is also farther away from West River Road and the adjacent park space compared to 2nd Street. Traffic counts along 2nd Street are also much lower than Washington Avenue. For these reasons, the preliminary potential for TOD appears to be higher along 2nd Street.

Initial design constraints include managing various existing overhead power wires throughout the segment, and turning radius constraints onto West Broadway Avenue.

## North Minneapolis, Golden Valley, and Robbinsdale

The North Minneapolis segment runs from Washington Avenue to Girard Avenue along West Broadway Avenue. From Girard Avenue, there are two streetcar alignment alternatives that would continue from North Minneapolis segment; one that terminates in Golden Valley near Courage Kenny Rehabilitation Institute, and one that continues northwest on West Broadway and terminates in Robbinsdale at North Memorial Hospital. The North Minneapolis segment and the two alternatives are described below.

### *North Minneapolis*

The North Minneapolis segment is approximately 0.75 miles long between Washington Avenue and Girard Avenue along West Broadway Avenue. The roadway contains right-of-way averaging 80 feet wide. West Broadway primarily consists of four undivided travel lanes, curbside parking, and turn lanes at some intersections. Many businesses abut the street right-of-way, especially on the south side of the street. Traffic signals exist at the intersections of the I-94 southbound ramps, N 4$^{th}$ Street, Lyndale Avenue, Aldrich Avenue, Dupont Avenue, Emerson Avenue, Fremont Avenue, and Girard Avenue.

Some initial concerns in the section between I-94 and Girard include parking reductions near Friedman's shoe store at the corner of Broadway and N 4th Street, as well as potential center turning lane reductions throughout the corridor. Streetcar in this section would be side-running instead of center-running, due to the less intrusive nature of side-running construction.

### Golden Valley Road Alternative

The Golden Valley Road alternative is approximately 1.75 miles long. The streetcar alignment would run west on West Broadway from Girard Avenue, turn south onto Knox Ave N, and then turn west onto Golden Valley Road. Road right-of-way averages 80 feet on West Broadway to Knox Avenue, 60 feet on Knox Avenue to Golden Valley Road, and 65 feet on Golden Valley Road to the alignment terminus. With the exception of the four lane segment of West Broadway, the majority of the alignment consists of a two lane segment with two parking lanes and occasional turning lanes. Traffic signals exist at the intersections of Girard and Irving Avenues with West Broadway Avenue, and Penn Avenue, Russell Avenue, and Hidden Lakes Parkway with Golden Valley Road.

The transition from West Broadway Avenue to Golden Valley Road presents technical challenges for a streetcar due to the tight curves needed to make the movement. One option would be to have one-way, single-track pairing between Girard Avenue and Knox Avenue in this constrained area. Either option will likely need to take right-of-way from nearby properties to build the necessary curves.

The alignment would run west down Golden Valley Road and meet with the Golden Valley Road Station along the METRO Blue Line Extension. To avoid a challenging turnaround at the freight rail trench, the line would continue west for about ¼ mile to the Courage Kenny Rehabilitation Institute. The routing from Xerxes Ave to Courage Kenny may be technically challenging due to the relatively steep slopes of Golden Valley Road in this area. The streetcar could operate on a tail track at a station near the Courage Center, and make the reverse crossover through a new signal at Hidden Lakes Parkway.

## Robbinsdale Alternative

The North Minneapolis segment for the Robbinsdale alternative is approximately 2.25 miles long. The streetcar alignment would run west on West Broadway from Girard Avenue and continue along West Broadway Avenue towards North Memorial Hospital. West Broadway right-of-way ranges between 70 and 80 feet, and varies between 60 and 100 feet near North Memorial Hospital. West Broadway Avenue consists of four lanes in all areas, with some sections containing parking lanes, intersection turning lanes, center turning lanes, and center medians. Traffic signals exist at Irving, Knox, Logan, Penn, 26th, and 29th Avenues.

One major challenge will be the Theodore Wirth Parkway and Lowry Avenue interchange with CSAH 81. There is adequate space to run the alignment to the median of CSAH 81, transition down to the Lowry and Theodore Wirth intersection, and then run the alignment at-grade to Oakdale Avenue. This would require transitioning the streetcar alignment from a side-running to a center-running alignment at a signalized intersection near 30th Avenue. The alignment would continue on Oakdale Avenue and terminate near the grassy open area at the northwest corner of the intersection of Abbott & Oakdale, with the terminus station adjacent and parallel to Abbott Avenue. If necessary, the alignment could follow a small one way loop along Abbott and the access road abutting the hospital building, with a station located near the hospital entrance. If North Memorial Hospital determines that it will not allow streetcar past the hospital emergency entrance, the alignment could terminate south of the emergency entrance on Oakdale Avenue near the intersection with the West Broadway Avenue frontage road.

If this proves too technically difficult or cost-restrictive, another option could be to turn the alignment west at 29th Avenue before the interchange, and then run on Parkview and Zenith Avenue before terminating at a station on Lowry Avenue near the back entrance of the hospital. A clockwise one-way loop could be created which would continue east on Lowry Avenue and south on York Avenue. This configuration would allow York Avenue to remain a southbound one-way street.

A pedestrian tunnel that connects the main buildings on the North Memorial Hospital campus currently runs underneath Oakdale Avenue, but the specific location and depth of the tunnel is currently unknown. Future coordination with North Memorial Hospital must occur to analyze the potential impacts to this pedestrian tunnel due to construction of the streetcar alignment.

Refer to  for the streetcar alignment alternatives. The streetcar routing options for the West Broadway Transit Study are illustrated by a yellow line. **Figure 2** provides a detailed view of the alignment alternatives near the North Memorial Hospital campus.

**Figure 1: Streetcar Alignment Alternatives**

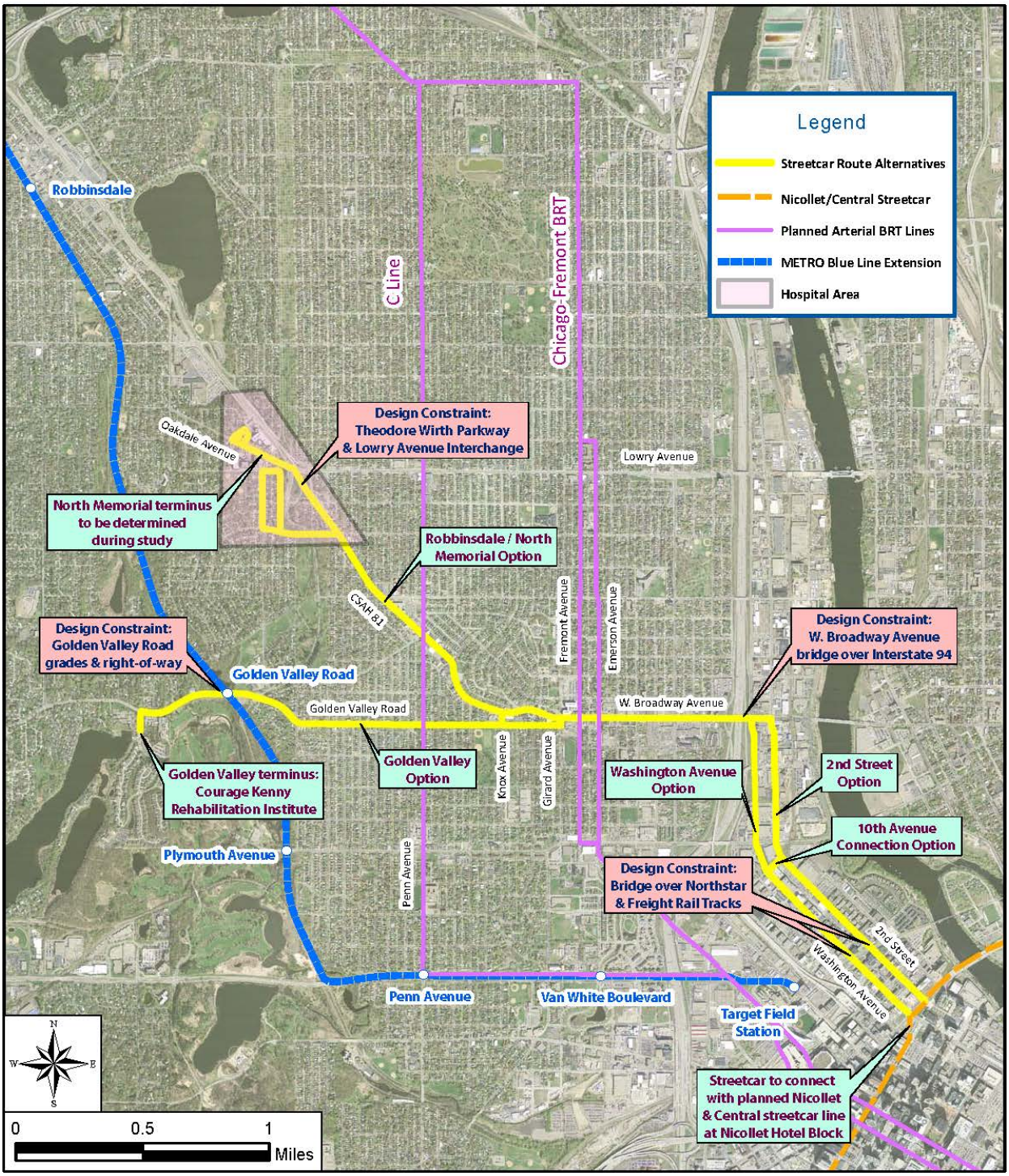


**Figure 2: Streetcar Alignment Alternatives**



# 3. Arterial BRT Alternative

BRT is an enhanced bus service that features high-frequency rides and limited stops along defined routes. In comparison to traditional buses, BRT vehicles are specialized to accommodate more passengers and allow for rapid boarding and alighting. Vehicles range in size from 40 feet to 60 foot articulated buses, and come in diesel, natural gas, and hybrid propulsion options. BRT vehicles typically have a unique appearance and branding to distinguish them from regular bus service.

## Station Design

BRT stations are typically spaced at 1/3 to 1/2 mile intervals to provide a higher speed of service. Stations have similar configurations and amenities to streetcar stations, and can also have raised boarding platforms to accommodate near level or level boarding. Platform length depends on the vehicle type, operational requirements, and site constraints, but typically varies from 60 to 80 feet. Stations can be located at the near side or far side of an intersection, but the far side location is preferred to enhance operational characteristics using transit signal priority (TSP) at the traffic signal.

## Alignment Alternatives

### *North Loop & Downtown*

Similar to a streetcar alignment, the arterial BRT route would run northwest from Hennepin Avenue along either Washington Avenue or 2nd Street to Plymouth Avenue, where it would continue running north.

Arterial BRT routing east of Hennepin Avenue through the downtown core is yet to be determined. Routes along Washington Avenue to Downtown East or along 1st Avenue North to the proposed east-west transit spine on 7th and 8th Streets are all possibilities. A preferred downtown alternative will be determined during the study.

### *North Washington Jobs Park*

Arterial BRT will continue on either Washington Avenue or 2nd Street from Plymouth Avenue to West Broadway Avenue, where the line would turn west. Existing bus pull out areas on Washington Avenue south of Broadway Avenue and 17th Avenue N which could be utilized or reconfigured for arterial BRT stations. Due to lower development potential, stations would not likely be implemented between Plymouth and West Broadway Avenues.

### *North Minneapolis*

Arterial BRT would continue to run in mixed traffic along West Broadway Avenue until Knox Avenue. The line would then either turn south onto Knox Avenue and then west onto Golden Valley Road, or would continue northwest along West Broadway Avenue.

### Golden Valley Road Alternative

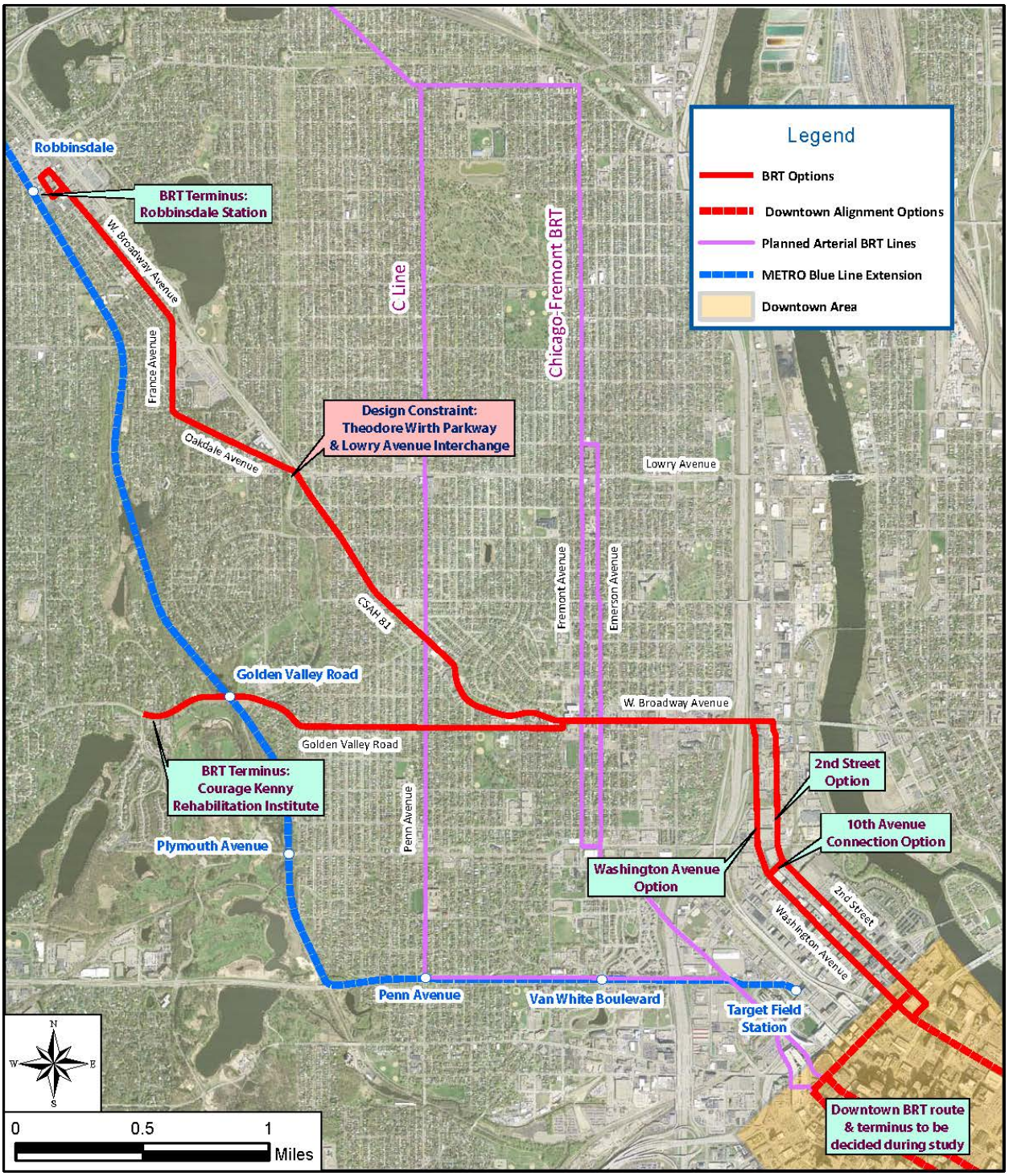
Arterial BRT would continue west along Golden Valley Road until the Courage Center, where it would terminate at a station near Hidden Lakes Parkway. The arterial BRT line would also maintain a station and connection with the planned METRO Blue Line Extension near the existing BNSF freight trench.

Robbinsdale Alternative

Arterial BRT would continue northwest along West Broadway Avenue until the Theodore Wirth Parkway interchange, where it would exit and continue along Oakdale Avenue through the North Memorial Hospital campus. The BRT line could either use a newly constructed bus-only off ramp in the center median at the interchange, or utilize the existing ramps to access the two roadways.

The arterial BRT line would then continue along Oakdale, France, and Broadway Avenues through downtown Robbinsdale to the Robbinsdale Station of the METRO Blue Line Extension. To access the LRT station, the line would turn left onto 41st Avenue N and terminate at the Hubbard Transit Center.Refer to **3** for the arterial BRT alignment alternatives. The BRT routing options for the West Broadway Transit Study are illustrated by a red line.

**Figure 3: Arterial BRT Alignment Alternatives**



## 4. Potential Station Locations

Preliminary station locations were determined for the corridor as part of the Arterial Transitway Corridors Study in 2012. Specific station locations will be refined during the West Broadway Transit Study through community involvement activities and more detailed analysis. Certain areas within the corridor are optimal for station placement, such as locations adjacent to major employment centers, transit transfer points, and important community centers. Throughout the concept development process, station locations for both arterial BRT and streetcar will be assumed to be identical where the two alternatives operate congruently, except in the downtown Minneapolis area. Potential arterial BRT station locations will be determined once a preferred routing through downtown is chosen. Coordination with North Memorial Hospital is also required to determine a preferred station location near the hospital.

A list of potential station locations is shown below in **Tables 1 through 5**.

**Table 1: Potential Station Locations in the North Loop Segment**

| Street | Intersection |
|---|---|
| Washington Avenue | Hennepin (streetcar terminus) |
| Washington Avenue | 2nd Avenue N |
| Washington Avenue | 6th Avenue N |
| Washington Avenue | 10th Avenue/Plymouth Avenue midblock |
| 2nd Street N (alternative) | 2nd Avenue N |
| 2nd Street N (alternative) | 4th/5th Avenue N midblock |
| 2nd Street N (alternative) | 7th/8th Avenue N midblock |
| 2nd Street N (alternative) | 10th Avenue/Plymouth Avenue midblock |

**Table 2: Potential Station Locations in the North Washington Jobs Park Segment**

| Street | Intersection |
|---|---|
| Washington Avenue | 17th Avenue N |
| Washington Avenue | W Broadway Avenue |
| 2nd Street N (alternative) | 17th Avenue N |
| West Broadway Avenue (alternative) | 2nd Street/Washington Avenue midblock |

**Table 3: Potential Station Locations in the North Minneapolis Segment**

| Street | Intersection |
|---|---|
| West Broadway Avenue | Lyndale Avenue |
| West Broadway Avenue | Bryant Avenue |
| West Broadway Avenue | Emerson/Fremont Avenue midblock |
| West Broadway Avenue | Knox Avenue |

**Table 4: Potential Station Locations in the Golden Valley Alternative**

| Street | Intersection |
|---|---|
| Golden Valley Road | Penn Avenue N |

| | |
|---|---|
| Golden Valley Road | Thomas/Upton Avenue N midblock |
| Golden Valley Road | METRO Blue Line – Golden Valley Road Station |
| Golden Valley Road | Courage Kenny Rehabilitation Institute (terminus) |

**Table 5: Potential Station Locations in the Robbinsdale Alternative**

| Street | Intersection |
|---|---|
| West Broadway Avenue | Penn Avenue N |
| West Broadway Avenue | N 26th Avenue |
| West Broadway Avenue | N 29th Avenue |
| West Broadway Avenue | North Memorial Hospital (streetcar terminus) |
| Lowry Avenue N (alt. streetcar only) | Zenith/York Avenue (streetcar terminus) |
| West Broadway Avenue (BRT only) | France & Oakdale Avenue |
| France Avenue (BRT only) | 36th Avenue |
| West Broadway Avenue (BRT only) | 3810 W Broadway Avenue |
| West Broadway Avenue (BRT only) | METRO Blue Line – Robbinsdale Station |

## 5. Other Facilities

An operations and maintenance facility (OMF) would be required for implementation of the streetcar alternative. The OMF would include yard track, vehicle storage, light maintenance, employee parking, and office space. It is assumed that approximately 3 acres is required for the facility, assuming a fleet of 6 streetcars. As part of this study, potential sites will need to be identified along the corridor that conform to the adjacent land uses and provide easy access to the mainline. Streetcar service also requires traction power substations (TPSS) located at approximately 1 mile spacing to provide the catenary power supply. Locations for TPSS will not be identified as part of this study, and will need to be determined in a future design phase.

It is assumed that an OMF would not be required for the arterial BRT alternative, as vehicles could be stored and maintained at an existing facility.

## 6. Previously Dismissed Alignment Alternatives

During the development of "Memo #1 – Relevant Issues" for the West Broadway Transit Study, several alignment alternatives that were previously listed as viable transit options were dismissed from future study. A map of dismissed alternatives is shown in **Figure 4**, and descriptions of each are listed below.

### Lyndale Avenue & Plymouth Avenue alternatives

To reach its terminus at Nicollet Mall, the transitway would turn south from West Broadway onto Lyndale Avenue. The transitway would then either continue on Lyndale to connect with the proposed Chicago-Fremont arterial BRT line, or turn onto Plymouth Avenue and connect to Washington Avenue or 2nd Street North through the North Loop neighborhood to reach downtown Minneapolis.

This option was dismissed for both modes. Lyndale Avenue from Broadway to Plymouth runs primarily through a "suburban-style" neighborhood, and consists of a broken street grid and single-family houses. There are no cross streets on Lyndale from 14th to 18th Avenue, making transit connections difficult. Since most of this area is already built out and contains small single-family lots, development potential is low. Plymouth Avenue from Lyndale Avenue to Washington Avenue consists of a long bridge overpassing I-94 and its associated ramps. Overall, development potential is very low on the Lyndale/Plymouth option and the long bridge would pose a costly technical challenge for streetcar.

### McNair Avenue & Glenwood Parkway alternative

To reach a the Golden Valley Road Station on the METRO Blue Line Extension, the transitway would use McNair Avenue and Glenwood Parkway to reach the station.

This option was dismissed for both modes. McNair Avenue from West Broadway Avenue to Thomas Avenue has a narrow curb-to-curb right-of-way, measuring between 22 and 25 feet. West of Washburn Avenue, the streetcar or BRT would have to operate within Minneapolis Park and Recreation Board property, which could pose a significant topographical and political challenge. Development potential in this corridor is also fairly low.

### County Road 81 alternative in Robbinsdale

To reach a western terminus at the Robbinsdale Station on the METRO Blue Line Extension, the transitway would run along County Road 81 from the Theodore Wirth Parkway interchange to 41st Avenue, where it would turn west and terminate at the LRT station.

This option was dismissed for both modes. County Road 81 provides little access for the walk-up transit users that arterial BRT intends to serve. The other route option to downtown Robbinsdale along Oakdale, France, and West Broadway Avenues serves existing transit riders and is closer to residences, commercial uses, and North Memorial Hospital. Furthermore, use of the Oakdale-France-West Broadway route for arterial BRT allows for replacement of much of the Route 14 and simplifies the route structure so that just one branch of the Route 14 would operate from Robbinsdale Transit Center along Noble Avenue and 36th Avenue to West Broadway.

### Streetcar to downtown Robbinsdale alternative

To reach a western terminus at the Robbinsdale Station on the METRO Blue Line Extension, the transitway would run along Oakdale, France, and West Broadway Avenues from North Memorial Hospital to the LRT station via downtown Robbinsdale.

This option was retained for arterial BRT, but was dismissed for streetcar. The City of Robbinsdale reconstructed Oakdale and France Avenues in 2012 and 2013. Part of this project buried all overhead wire crossings and re-aligned water and sanitary sewer lines to meet separation guidelines. If streetcar were implemented in this area, these streets would need to be reopened and newly replaced utilities would need to be moved. Similar improvements were made to West Broadway Avenue in the early 1990s through downtown Robbinsdale, and included underground wire placement, widened sidewalk construction, reductions of roadway width, and additional pedestrian nodes. Overhead wires were also

buried during reconstruction of Hennepin County Road 81 to improve views of nearby lake and park. For these reasons, streetcar will not be considered for alignments serving downtown Robbinsdale.

**Figure 4: Dismissed Alignment Alternatives**

