



MEMORANDUM

Madison Corridor BRT Study – Existing Conditions Memo #1: Corridor Overview

Prepared For: City of Seattle

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Date: December 12, 2014

This memo provides a brief overview of the Madison Street Bus Rapid Transit (BRT) corridor currently under study by the Seattle Department of Transportation (SDOT).

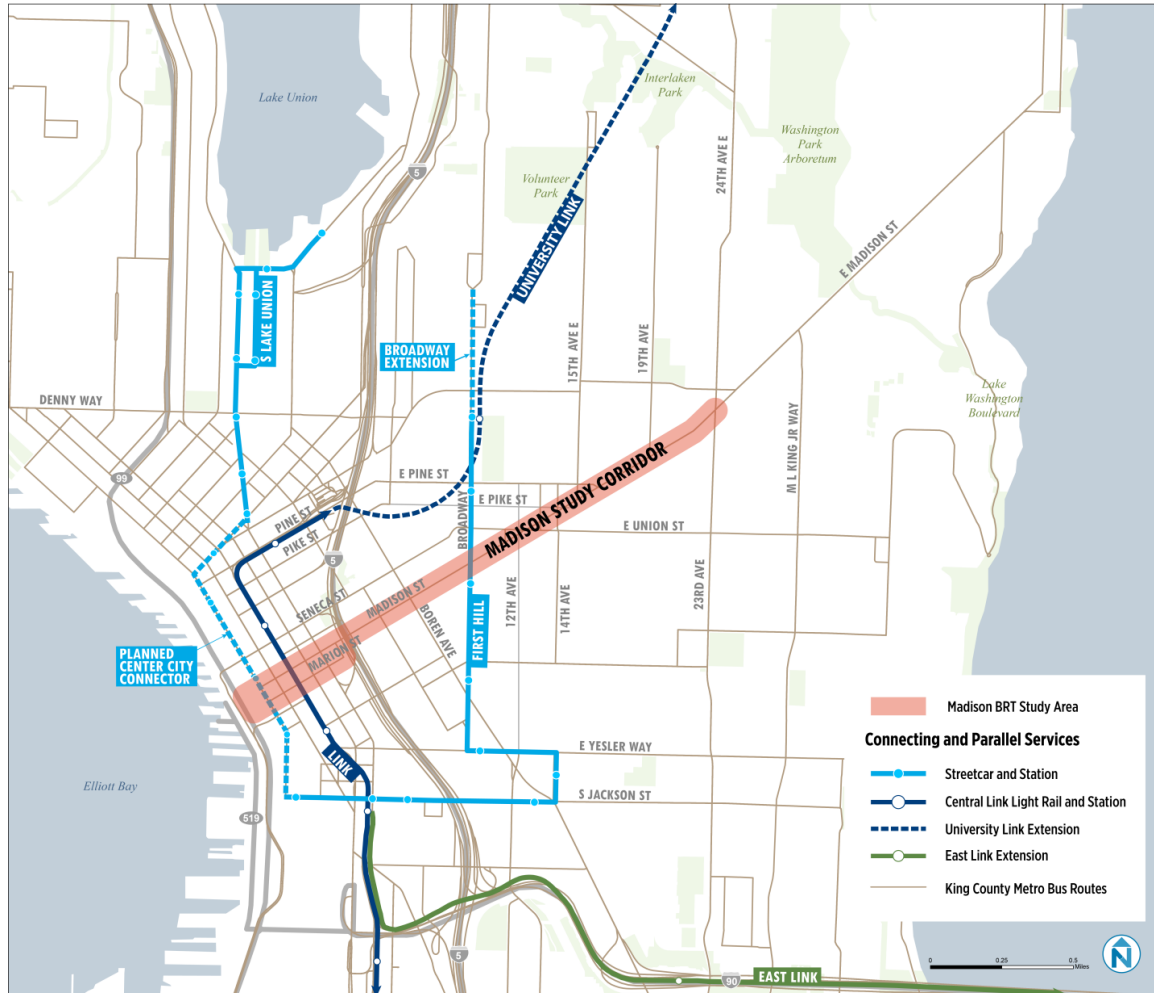
The corridor introduction on the following pages includes:

- a description of primary land uses, major destinations and existing street configurations within each segment of the corridor,
- an overview of key demographic and travel characteristics of the population and workforce within the corridor, and
- a review of previous planning efforts relevant to the corridor and this study.

1 LAND USES AND STREET CONFIGURATIONS

Figure 1-1 illustrates the study area. Segments of the corridor are described individually in the following pages.

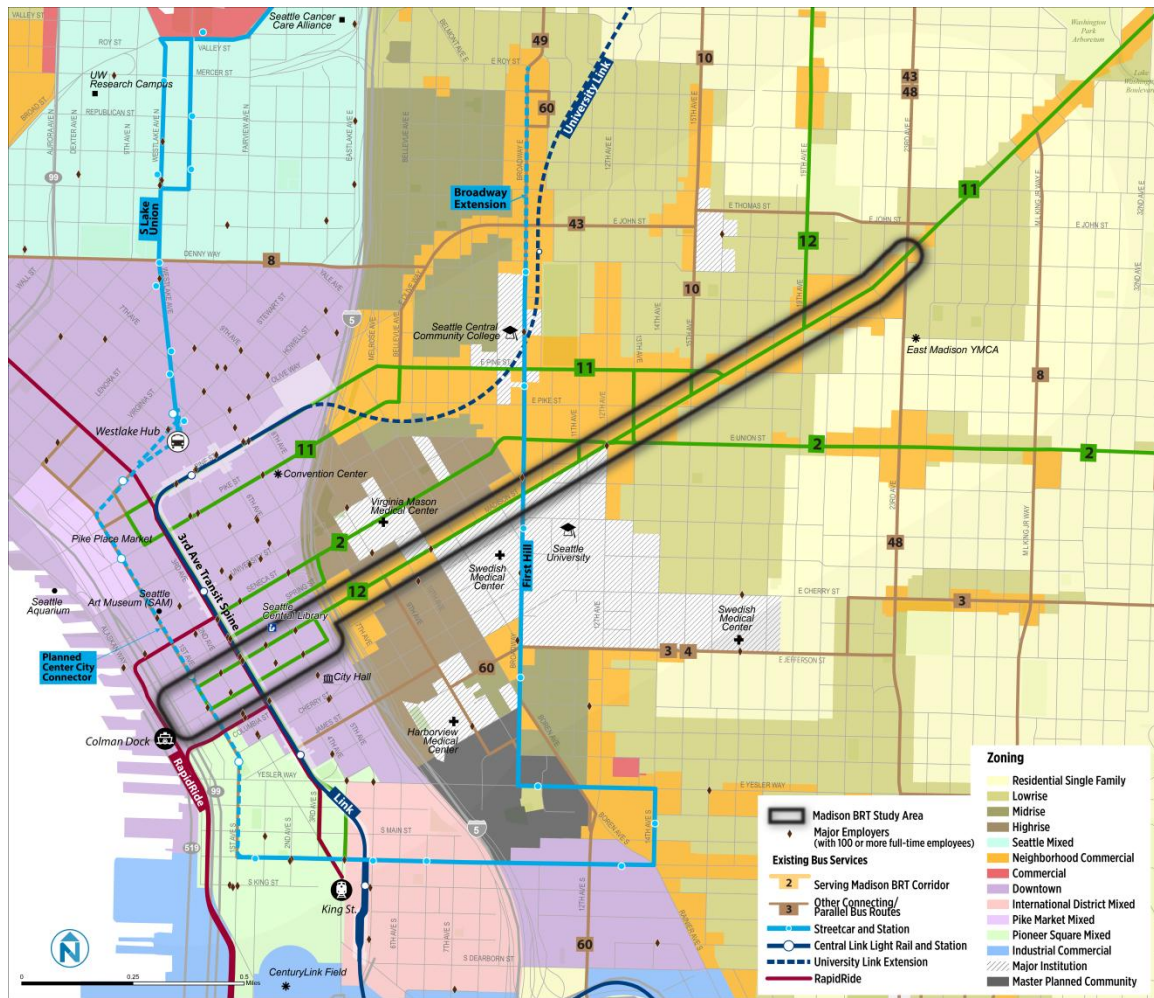
Figure 1-1 Madison BRT Corridor



Madison Corridor Segments

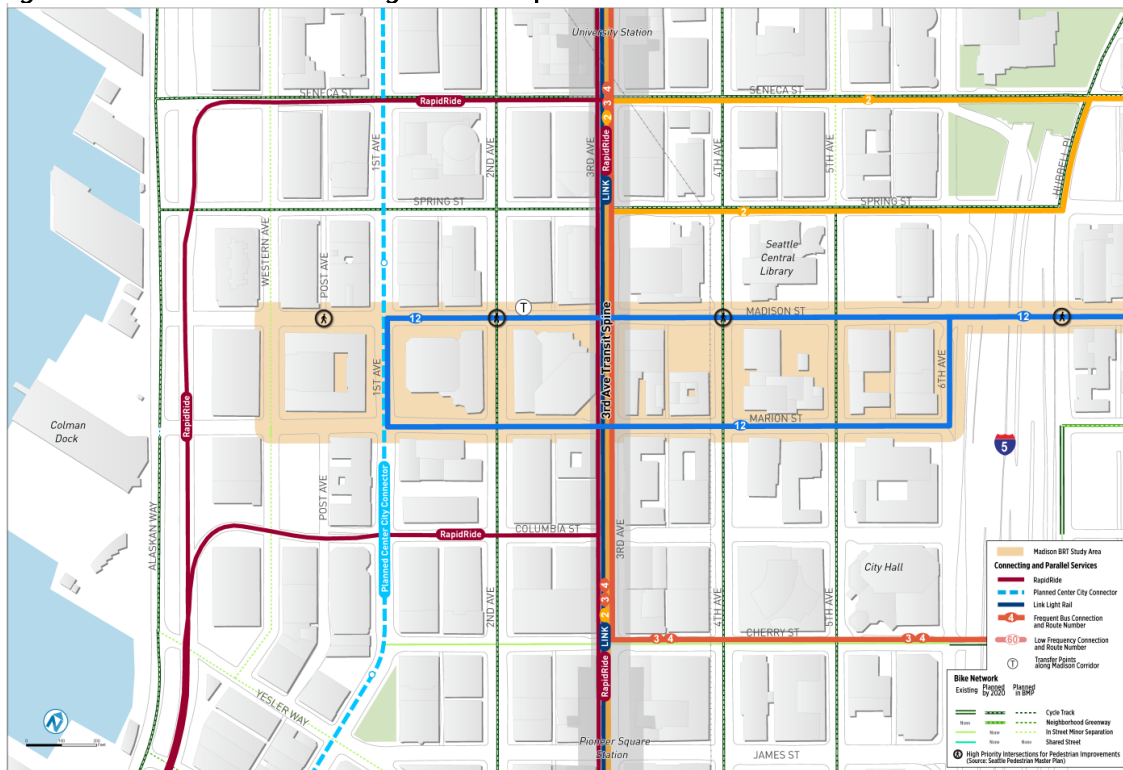
The Madison corridor can be divided into three primary segments based on geography, land use and street configuration (although there is considerable variation in the streetscape and neighborhood character from block to block within these segments). Most of the corridor is zoned as neighborhood commercial, as shown in Figure 1-2 illustrating land use designations.

Figure 1-2 Madison Zoning



Downtown Segment: Waterfront to I-5/6th Avenue

Figure 1-3 Downtown Segment Map

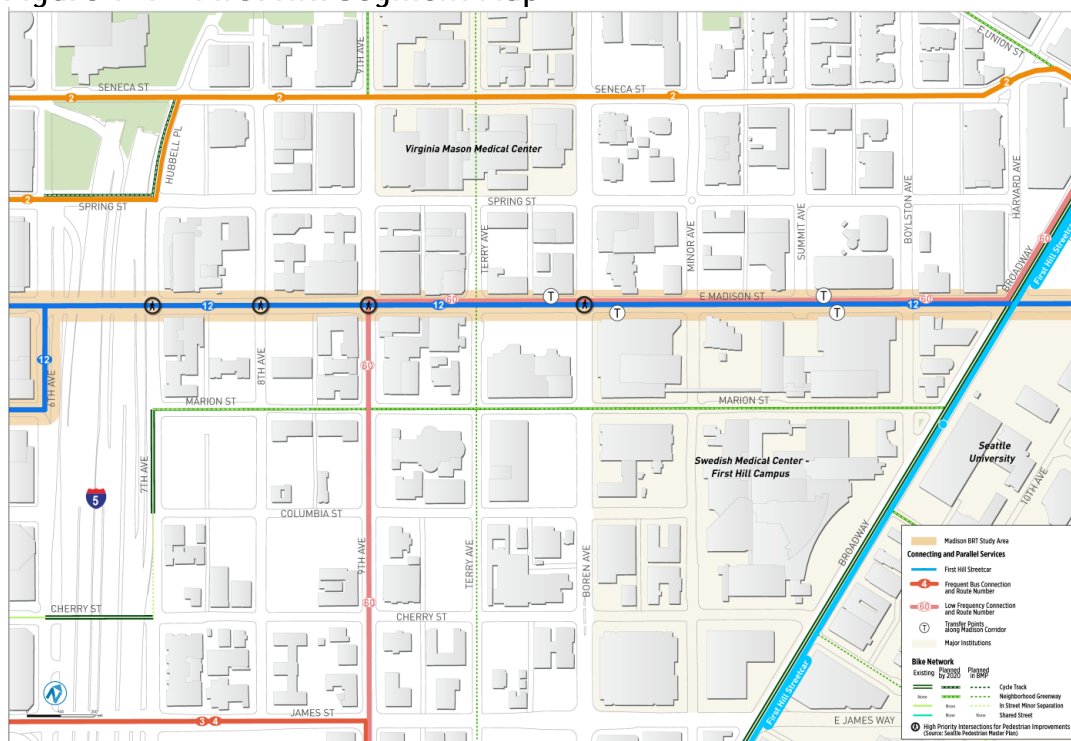


This segment of the corridor runs through the middle of the Seattle Central Business District (CBD), between the Retail Core near Pike/Pine streets to the north and the governmental center and Pioneer Square neighborhood to the south. West of Interstate 5 (I-5), or from Alaskan Way to Sixth Avenue, Madison is one-way in the westbound direction, with two travel lanes and generally one to two parking lanes. Transit therefore utilizes a couplet of Madison and Marion Street in this segment, and Marion from the waterfront to Sixth Avenue is included in the Madison BRT corridor study area. The curb-to-curb dimension in this segment is 40-50 feet, with 12-foot sidewalks.

The western terminus of the study area is at Madison and Alaskan Way, although the actual BRT terminus is still to be determined. Ferry-bound auto traffic accesses Colman Dock via Madison, and exits the terminal via Marion. Pedestrian traffic utilizes the footbridge from Colman Dock to Marion and First Avenue. Moving east along Madison and Marion, land use is primarily office with ground-floor retail, including several federal government buildings. Major buildings on Madison and Marion north of 3rd include the Downtown Seattle YMCA, the Seattle Central Library, the United States Appeals Court, and the Renaissance Seattle Hotel, although there are numerous large office buildings within the area.

First Hill Segment: I-5 to Broadway

Figure 1-4 First Hill Segment Map



East of I-5, Madison operates in both directions, with two travel lanes and a two-way turn lane or parking lane for most of the segment between I-5 and Broadway. Going uphill, Madison returns to two-way operation on the west side of the I-5 overpass, with a single lane of traffic entering from Sixth Avenue. The southbound on-ramp to I-5 at Spring Street is accessed via westbound Madison and northbound Sixth, which contributes to congestion in the area. Paid parking is allowed on the south side of Madison for much of this segment, although parking is not allowed during the PM peak period, between 3 and 7 p.m. Designated carpool parking is located on the south side of the I-5 overpass. The curb-to-curb dimension in this segment varies from 45 to 50 feet, with 8-foot sidewalks on most blocks.

I-5, which is below grade and very wide, acts as something of a barrier between Downtown and First Hill. First Hill is characterized by several major institutions and medical facilities as well as multi-family residential construction, including several large apartment buildings and retirement communities/senior homes. Many larger buildings feature ground-floor retail. There are also some one- to two-story commercial buildings on Madison Street. Moving east from I-5, major buildings include The Polyclinic (Eighth Avenue), Town Hall (Spring and Eighth), Seattle First Presbyterian Church (Eighth Avenue), Virginia Mason Main Campus (between Ninth Avenue and Boren Avenue and between Spring and University Street), St. James Cathedral (Marion & Ninth Avenue), the Puget Sound Blood Center (Terry Avenue), a methadone clinic (Summit Avenue and Seneca), O'Dea High School (Marion & Terry), and Swedish Medical Center (between Madison, Broadway, and Boren).

East Segment: Broadway to 23rd Avenue

Figure 1-5 East Segment Map



East of Broadway, Madison Street becomes East Madison Street, with two travel lanes in each direction and no left-turn lanes. From Broadway to 11th Avenue, the eastbound curb lane is PM-restricted paid parking, while the westbound curb lane is AM-restricted paid and non-paid parking. From 11th to 20th, most blocks allow unrestricted or time-limited unpaid parking on one side of Madison. East of 20th, unrestricted or time-limited unpaid parking is allowed in the curb lane on both sides of Madison on most blocks. The curb-to-curb dimension varies east of Broadway, from close to 50 feet between Broadway and 12th Avenue to closer to 42 feet toward 23rd Avenue. Sidewalk widths also vary, ranging from 8 to 12 feet on most blocks.

East of Broadway, where Madison serves as a dividing line between Capitol Hill to the north and the Central District to the south, the neighborhood character transitions, with numerous residential buildings as well as bars and restaurants. Major buildings and institutions include the Seattle University campus, which extends south from Madison between Broadway and 12th, the Seattle Academy of Arts and Sciences, the Bullitt Foundation (15th), and numerous commercial buildings including the Central Co-op and Trader Joe's. The density of bars, restaurants, and businesses declines east of 18th, with multi-family residential buildings as the primary land use. Other major buildings include the Mt. Zion Baptist Church at 19th and a large residential development with a ground-floor Safeway between 22nd and 23rd.

2 POPULATION AND DEMOGRAPHICS

A demographic analysis of the Madison corridor was conducted using data from the 2010 U.S. Census and 2011 Longitudinal Employer-Household Dynamics (LEHD) On-The-Map tool. Future population forecasts were based on Puget Sound Regional Council (PSRC) Land Use Targets dataset.

Population and Employment Density

Figure 2-1 Population and Employment Density

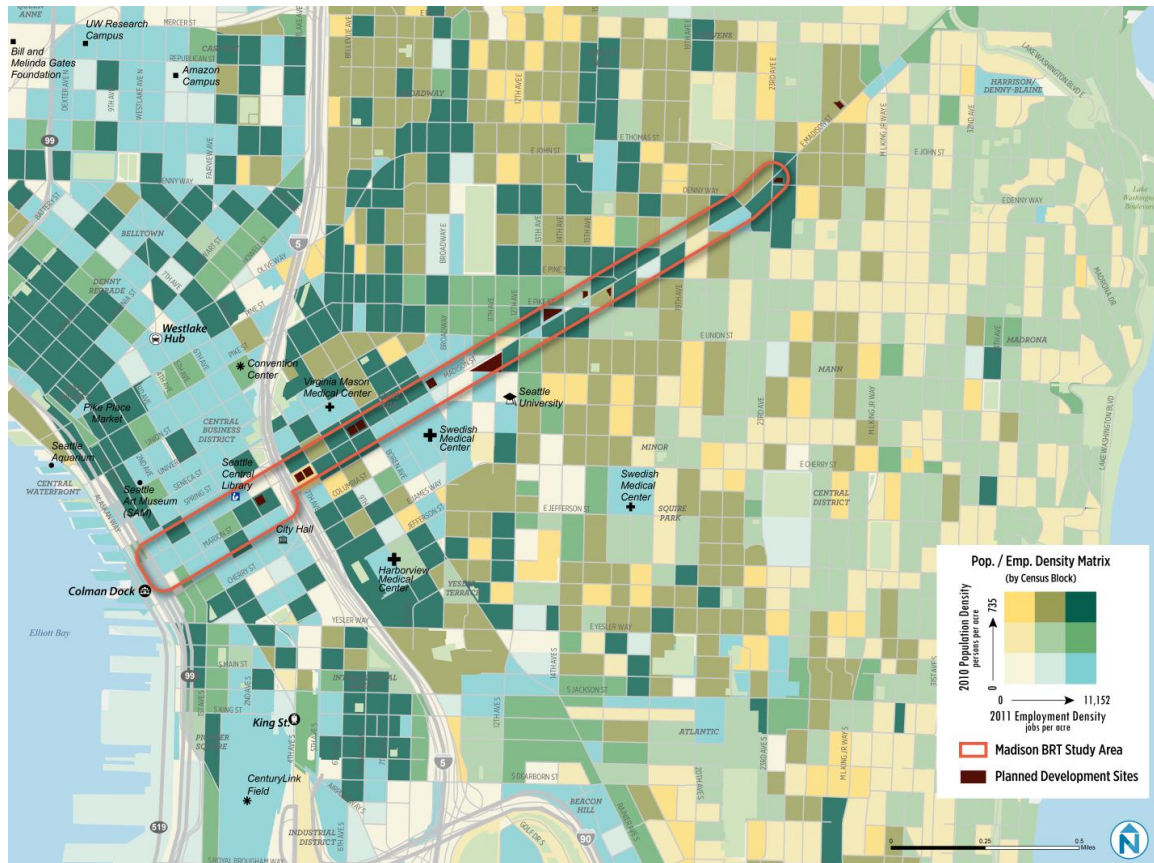


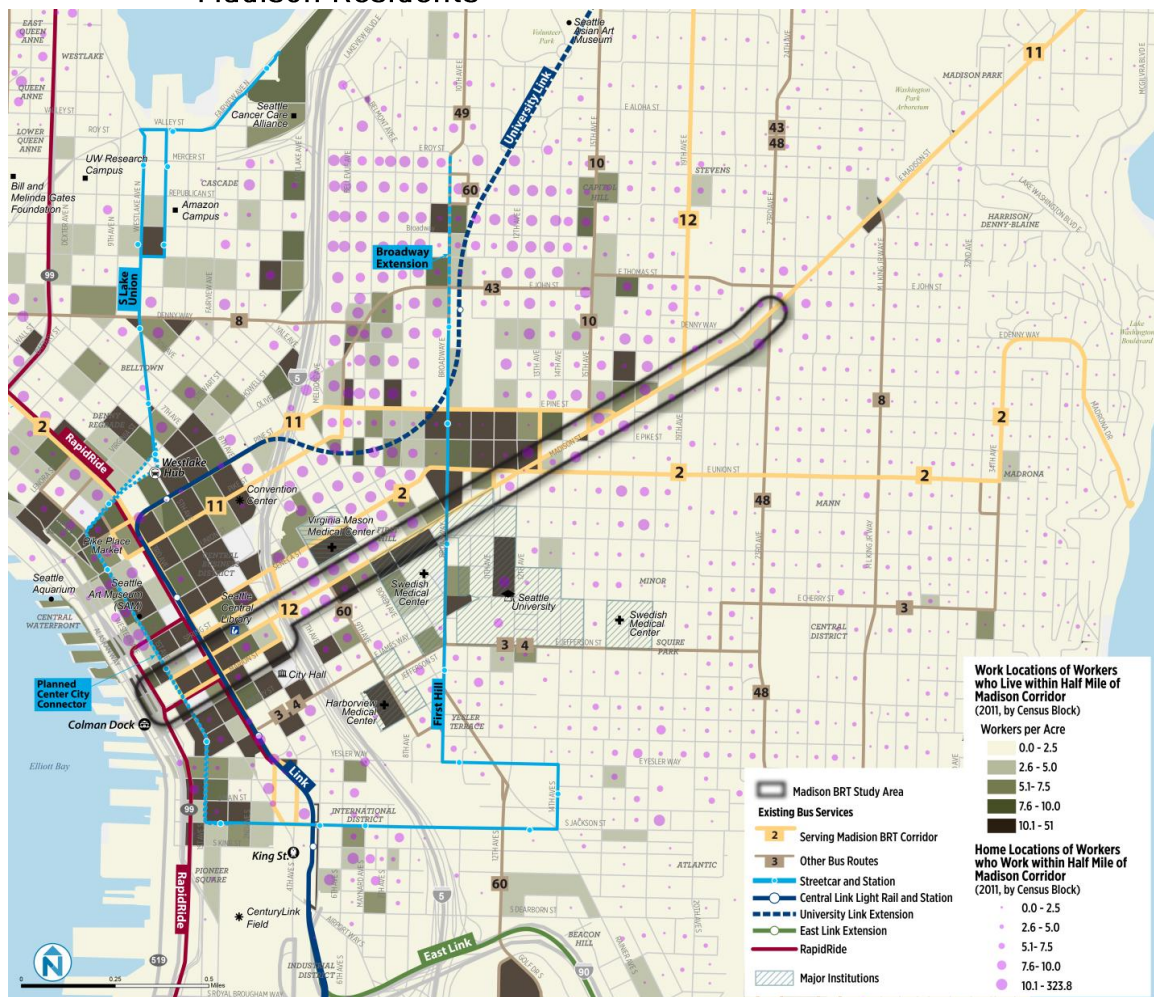
Figure 2-1 shows population and employment density in the Madison study area. The corridor contains numerous block groups with both high employment and high population density, although some portions of the corridor are more employment-oriented (Downtown, portions of First Hill) and some are more residential (eastern part of the corridor). Overall, the area within a half-mile of the Madison corridor contains nearly 30 percent of Seattle's jobs and 10 percent of the City's population. There are a total of 130,000 jobs and 50,000 residents within the area.

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Figure 2-2 shows the home locations of people who work within a half-mile of Madison as well as the density of work locations of people who live within a half-mile of the Madison corridor. A total of 44 percent of those who live within a half-mile of Madison also work within the corridor study area. These work locations are primary concentrated in Downtown Seattle and Capitol Hill (north of Madison) as well as along Madison in First Hill. The home locations of Madison area workers are concentrated along the corridor and to the north in Capitol Hill, suggesting that transit connections to the north through Capitol Hill may be important. There are fewer home locations for Madison area workers to the east and south of the corridor.

Figure 2-2 Home Locations of Madison Workers and Work Locations of Madison Residents

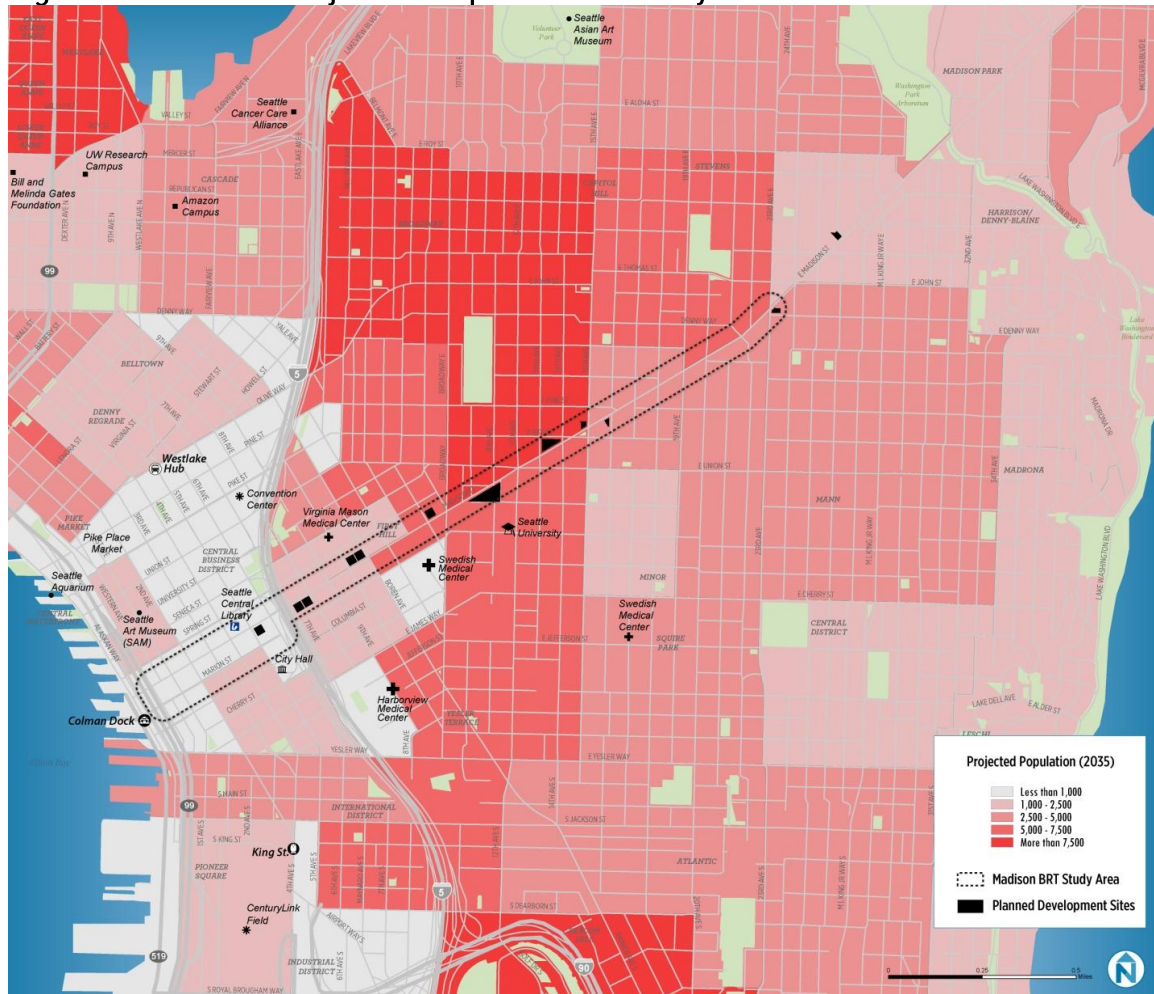


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The Madison corridor is expected to experience continued population growth in the future. Figure 2-3 shows projected population density for 2035, based on Puget Sound Regional Council (PSRC) estimates. In total the area within a half-mile of the corridor is expected to add 60,000 new jobs and 20,000 new residents by 2035.

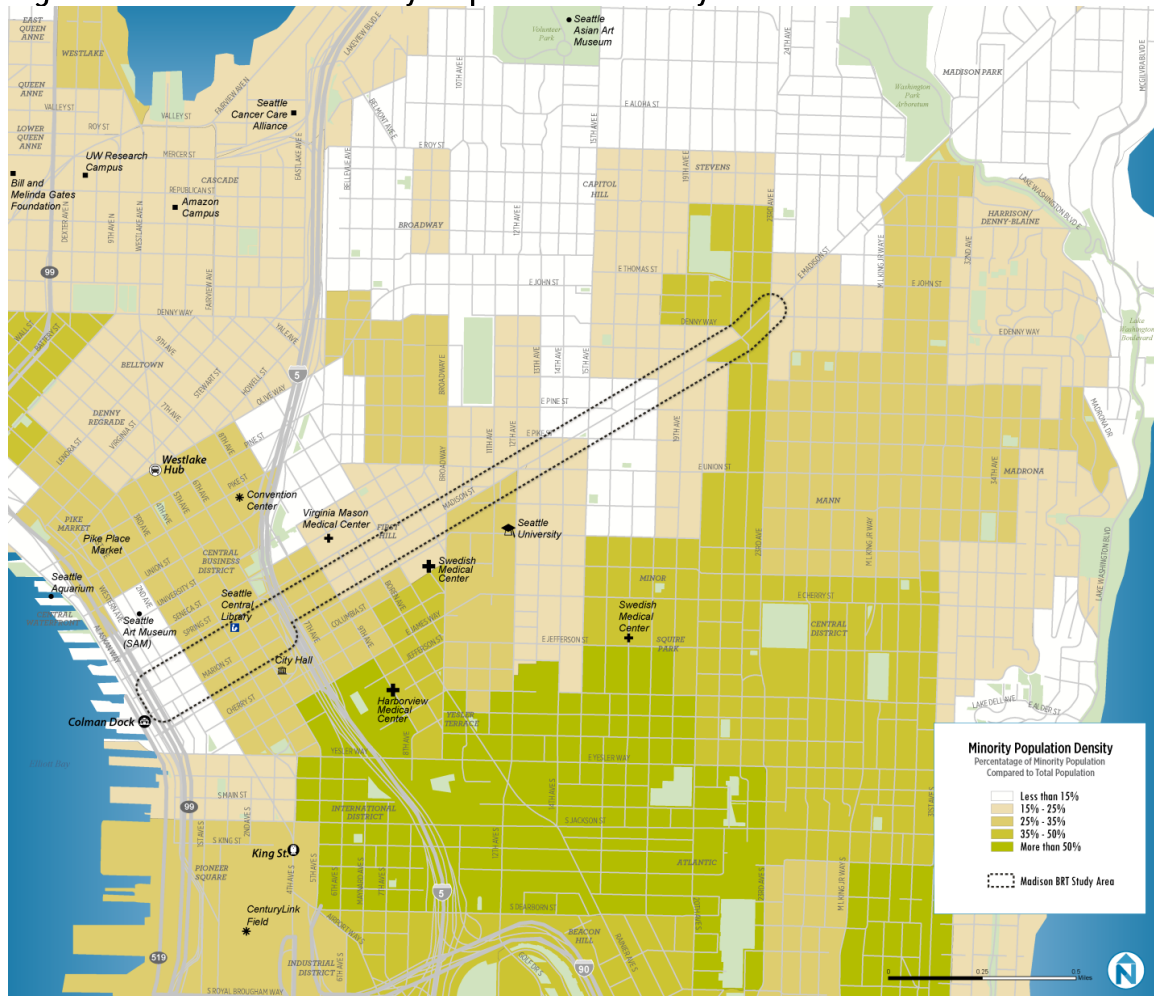
Figure 2-3 2035 Projected Population Density



Demographics

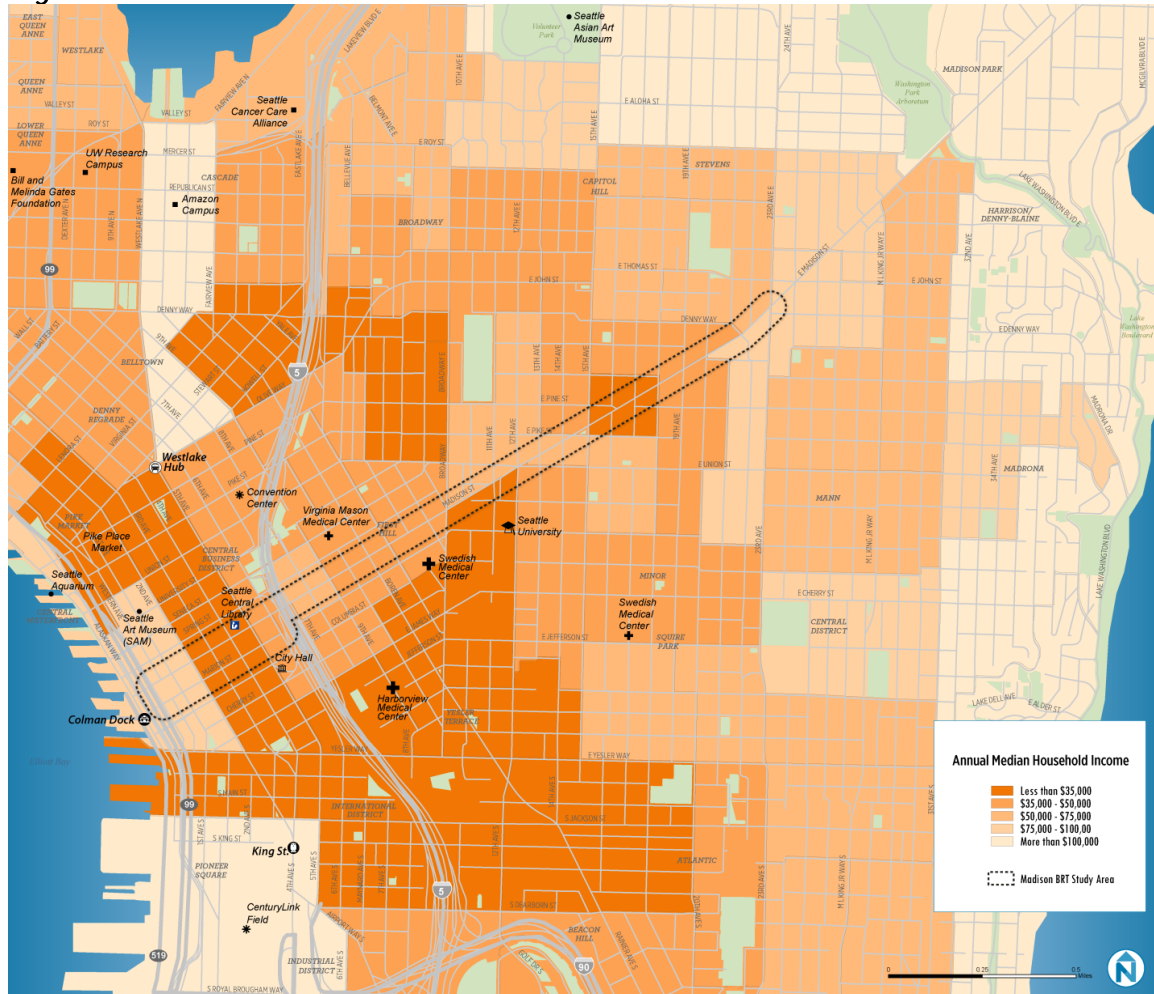
Figure 2-4 and Figure 2-5 show demographics characteristics of the study area. Although racial minority populations are densest in the Central area and south of the corridor, Madison does serve portions of the corridor with moderate density of minority populations, including Downtown and the eastern portion of the corridor. Annual median household incomes in census block groups adjacent to the corridor range from under \$25,000 to \$75,000, with the lowest incomes in Downtown near I-5, near Seattle University, and at the peak of Capitol Hill near 18th Avenue.

Figure 2-4 Racial Minority Population Density



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Figure 2-5 Annual Median Household Income



3 PLANNING CONTEXT

The following sections provide an overview of the planning processes that led to the current Madison corridor study as well as other plans that will inform decision-making in the corridor. The planning context overview begins with the Seattle Transit Master Plan (TMP), which identified Madison Street as a high-priority corridor for high-capacity transit and recommended BRT as the preferred mode. Findings from the TMP evaluation as well as several subsequent studies of potential transit or BRT improvements in the corridor are also described in this section. Finally, other planning documents that are relevant to the Madison corridor are briefly summarized.

Transit Plans

Seattle Transit Master Plan

In 2012 the City of Seattle completed a new TMP, which was an extensive update of the prior Transit Master Plan completed in 2005. The 2005 TMP identified a Frequent Transit Network (FTN), which built upon the 2005 Seattle Comprehensive Plan Urban Village Strategy. The Urban Village Strategy promotes job and residential growth in concentrated centers that may be easily accessed and connected by an efficient multimodal transportation system. The 2005 Transit Master Plan recommended Madison as a corridor that “connects existing urban villages” with service stopping every four blocks.

The 2012 TMP update expanded on the previous plan, including a revised evaluation framework for identifying high-priority transit corridors and evaluation of modes for each corridor including rail modes and rapid bus. As a 20-year planning document, the TMP identified six major transportation priorities:

- Continue Implementation of Priority Bus Corridors
- Develop Center City Transit to Support Downtown Growth and Vitality
- Plan, Fund, and Build Priority High Capacity Transit Projects
- Enhance Walk-Bike-Ride Access where Needs are Greatest
- Improve Transit Information and System Usability
- Pursue Funding to Enhance Transit Service and Facilities

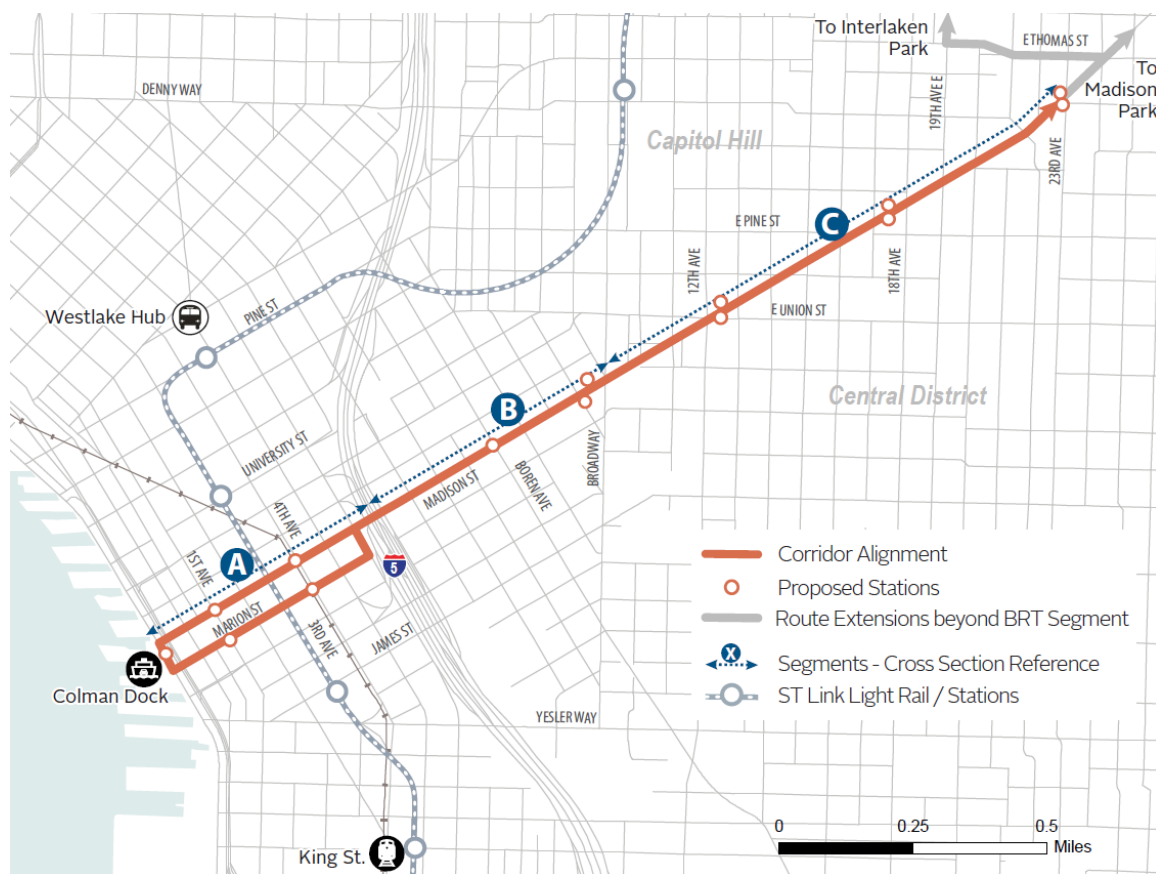
The TMP articulates a long-range transportation vision for Seattle built on the backbone of high-capacity transit or HCT corridors. HCT corridors are those that deliver service with high levels of capacity, frequency, and design quality. HCT can be delivered via BRT or rail modes and can ideally bridge the gap between regional Link light rail and local bus service.

The Madison corridor (Central Area-First Hill-Downtown, via Madison) was identified in the TMP as one of three citywide corridors selected for full modal evaluation for implementation of HCT. In addition to HCT corridors, the TMP also included Priority Bus

Corridors (where transit and infrastructure improvements are a priority, but do not warrant HCT) and Center City Corridors (focusing on circulation in the City's core to improve connectivity of the overall transit network) that are the subject of separate but related planning efforts.

Due in large part to steep grades, the TMP identifies BRT as the recommended mode for the Madison Corridor. The TMP alignment was 2.1 miles in length and consisted of three segments: Madison/Marion, Alaskan Way to 6th Avenue; Madison, I-5 to Broadway; and Madison, Broadway to 23rd Avenue. The proposed corridor including potential stop locations identified in the TMP is shown in Figure 3-1.

Figure 3-1 TMP Madison Corridor

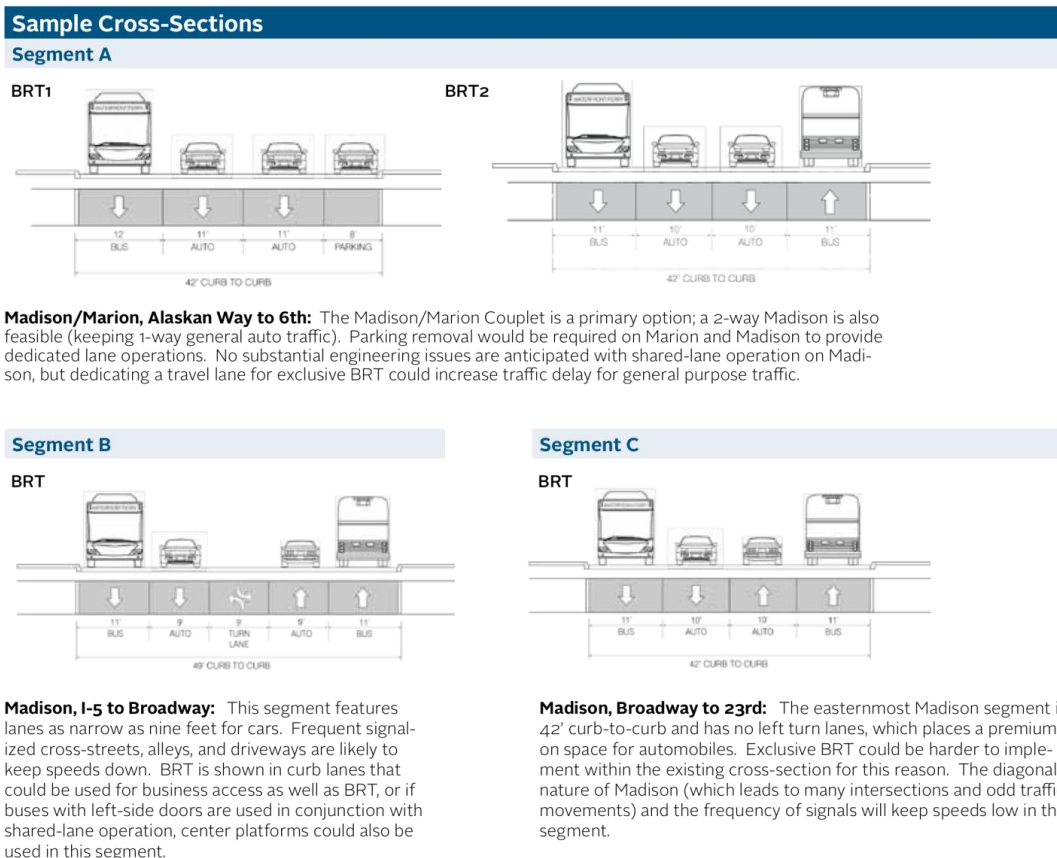


TMP evaluation was based on metrics including potential levels of service, transit ridership, operating and capital costs, and efficiency and productivity measures. Key findings for Madison included:

- 2030 BRT ridership potential: 14,000 riders (6,200 net new riders)
- BRT annual operating cost: \$4.6 million (\$1.05 per boarding)
- Weekday riders per revenue hour: 125
- Total capital cost (\$87 million, \$42.2 million per mile)
- End-to-end travel savings: 8 minutes
- Annual cost per rider (Operations + Capital): \$2.40
- Points of connection: Colman Dock, 3rd Avenue Transit Spine, First Hill Streetcar, Bus Square on 3rd Ave.

These findings were based on assumed peak and off-peak headways of five minutes and on the assumed configurations for each segment shown in Figure 3-2. The Transit Master Plan recommended either a Madison/Marion couplet or two-way operations on Madison for the Downtown segment, with curb-running BRT in the First Hill and East segments.

Figure 3-2 TMP Cross Sections



King County Madison Street Transit Priority Corridor Improvements Conceptual Study

Following completion of the TMP in 2012, King County Metro conducted a study identifying short-term improvements to speed and reliability on the Madison portion of Route 12, the primary transit route currently operating within the corridor. The recommended improvements, shown in Figure 3-3 on the following pages, included signal re-timing and modification, installation of Transit Signal Priority (TSP), bus stop consolidation, and installation of Business Access and Transit (BAT) lanes at select locations. These improvements were estimated to improve transit speeds by three to five minutes on Madison, depending on the route direction and time of day.

Figure 3-3 Route 12 Recommended Improvements

Number	Roadway	Cross Street	Improvement Type
1	1st Ave.	Marion St.	Signal Modification
2	Marion St.	1st Ave. to 6th Ave.	Install BAT Lane
3	Marion St.	3rd Ave.	Bus Stop Consolidation
4	Madison St.	6th Ave. to 1st Ave.	Install BAT Lane
5	Madison St.	3rd Ave.	Bus Stop Consolidation
6	Madison St.	6th Ave.	Signal Modification
7	Madison St.	6th Ave.	Install TSP
8	6th Ave.	Marion St. to Madison St.	Re-Time Signals
9	Madison St.	6th Ave. to 19th Ave.	Comprehensive Street
10	Madison St.	7th Ave.	Signal Modification
11	Madison St.	7th Ave.	Install TSP
12	Madison St.	8th Ave.	Install TSP
13	Madison St.	9th Ave.	Install TSP
14	Madison St.	Terry St.	Install TSP
15	Madison St.	Boren Ave.	Install TSP
16	Madison St.	Minor Ave.	Install TSP
17	Madison St.	Minor Ave.	Bus Stop Consolidation
18	Madison St.	Minor Ave./Summit Ave.	Bus Stop Consolidation
19	Madison St.	Summit Ave.	Install TSP

Number	Roadway	Cross Street	Improvement Type
20	Madison St.	Boylston Ave.	Install TSP
21	Madison St.	Broadway	Install TSP
22	Madison St.	11th Ave.	Install TSP
23	Madison St.	12th Ave.	Install TSP
24	Madison St.	13th Ave.	Install TSP
25	Madison St.	E Pike St.	Install TSP
26	Madison St.	14th Ave.	Bus Stop Consolidation
27	Madison St.	15th Ave.	Install TSP

City of Seattle Madison Street BRT Corridor Study

In 2013, following completion of the TMP and prior to this study, the City of Seattle conducted a study of existing conditions and an evaluation of conceptual alternatives for BRT in the Madison corridor. The study evaluated potential operating conditions for buses, bikes, and autos on Madison Street if configured for BRT. The study corridor included Madison from 1st Avenue to 23rd Avenue, and identified several key issues related to the Madison corridor:

- The Madison Street corridor is designated for multi-modal use with frequent, high capacity transit (BRT) with bike lanes.
- High traffic volumes and congestion exist near the I-5 interchange.
- Intersection levels of service in the corridor are at reasonable levels (LOS D or better) except at the Boren intersection during the AM peak hour.
- Emergency vehicle usage and access needs on Madison Street are unknown.
- The highest parking utilization occurs in the downtown core (100%).
- Bus travel time is as much as 7 minutes longer than auto travel time in the corridor.

The alternatives studied included three design options, each of which was modeled using dynamic assignment software using the proposed configuration as well as proposed service redesign for each alternative. The design alternatives studied included:

- BRT Right Curb Lane: BAT lane with right side stops
- BRT Median Lane: Bus-only lane in median with center island stops
- Hybrid: Combination of right curb lane and median lane for different segments of the corridor

The study found that all alternatives would improve transit travel time by a similar amount, with reductions of two to five minutes over baseline conditions. Auto travel time would

increase by up to two minutes in each alternative, although the alternatives performed differently by direction and time of day. The hybrid curb and median option generally had the lowest impact on auto travel times. Diversion of traffic to other streets ranged from 50-400 vehicles per hour compared to the baseline scenario. Because of lane reduction east of 15th Avenue, the median lane alternative had the highest traffic diversion impacts. The study did not identify significant differences in performance between alternatives and recommended further study of several key issues in the corridor including:

- Narrow Right-of-Way and Sidewalks
- Parking
- Bike Lanes
- Lane Widths
- Freight
- Left Turn Restrictions
- 9-Foot Median Platform Station Design
- Left-Door Boarding
- Terminal Operations
- Diversion Mitigation
- ORCA Card Readers
- Other Design Alternatives

Other Plans and Studies

In addition to the recent transit studies of the Madison Corridor, numerous other plans will both inform the Madison BRT project and incorporate recommendations from the BRT corridor study.

The Madison corridor is the location of various institutions with internal development and TDM plans that may have relevance to potential BRT station location and channelization along the corridor. Institutions with master plans within the corridor include:

- Seattle University
- Virginia Mason Medical Center
- Swedish Medical Center

Several recent governmental plans and studies will also inform the Madison BRT Study:

- **Action Agenda.** SDOT's 2012 Action Agenda outlines policies and actions oriented around five core principles: (1) Keeping it Safe, (2) Focusing on the Basics, (3) Building Healthy Communities, (4) Supporting a Thriving Economy, and (5) Providing Great Service. Of particular relevance to the Madison BRT project, the Action Agenda includes policies to:

- Maximize the environmental benefits of the transportation system
 - Increase mobility and access for everyone
 - Make transit the efficient, affordable choice for a variety of trips
 - Increase efficient and affordable access to jobs and education
 - Support Center City and neighborhood business district access
- **Seattle Jobs Plan.** The Seattle Jobs Plan for 2013 has four organizing themes: Innovate, Educate, Build, and Partner. Of particular relevance to the Madison BRT project, the plan calls for connecting “Seattle’s neighborhoods with high capacity transit, to provide residents and businesses with affordable, reliable ways to get around our city.”
 - **Climate Action Plan.** Seattle’s 2012 Climate Action Plan develops a Carbon Neutral Scenario for the city, consisting of strategies that would reduce greenhouse gas (GhG) emissions by 90% by 2050 relative to 2008 levels. Within the transportation sector, this scenario assumes a 30% reduction in travel by light-duty vehicles (cars and light trucks)¹ travel by 2030 and a 40% reduction by 2050. It targets expansion of transit infrastructure and service sufficient to increase transit’s share of passenger miles from 8% today to 25% by 2050 (a level achieved in cities such as San Francisco). The plan also notes that denser urban development can help facilitate achievement of travel reduction strategies and the carbon neutral goal.
 - **Bicycle Master Plan.** Adopted this spring, the Seattle Bicycle Master Plan articulates a vision and goals for bicycling in the city and maps out a Citywide Network of routes with accompanying Local Connectors. It also identifies facility types ranging from off-street trails to cycle tracks (protected bicycle lanes) and neighborhood greenways. While Madison itself is not part of the Citywide network, protected lanes are recommended on Seneca and Spring in the Center City, and Union in the Central Area; in addition, Marion and University on First Hill are designated as neighborhood greenways.
 - **Pedestrian Master Plan.** The Seattle Pedestrian Master Plan includes policies, programs, design criteria, and projects to further pedestrian safety, comfort, and access. Based on data assessment, the plan identifies High Priority Along the Roadway and High Priority Crossing the Roadway locations for improvement. The latter include many locations within the Madison corridor, including three intersections in the Center City (Alaskan Way, Second, and Fourth avenues) and three to the east (Boren, Broadway Court, and 12th Avenue/Union). Additionally, much of the corridor west of 15th Avenue is within a Tier 1 High Priority Area for improvements.

¹ As defined by the National Highway Traffic Safety Administration, light-duty vehicles include minivans, sport utility vehicles, and trucks with gross vehicle weight less than 8,500 pounds.

- **King County Metro Service Plans.** King County Metro has conducted several recent studies of potential reductions to transit service due to budget constraints, including a Fall 2014 proposal to revise Route 2, deleting the route segment from Downtown to Queen Anne (which would be served by Route 13) and moving service on Seneca to Madison. In this scenario Route 12 would be reduced to weekday peak-only service.
- **Seattle Race and Social Justice Initiative (RSJI).** The RSJI is a social equity initiative, a multifaceted program to combat racism. Among other platforms, it includes strengthened City contracting requirements for women- and racial minority-owned businesses, updated community-based neighborhood plans in Southeast Seattle, and a Neighborhood Matching Fund grant program targeted at social justice-related efforts.
- **Pike-Pine Renaissance: Streetscape Design Vision.** This plan, completed in 2014, presents concepts for the revitalization of Downtown Seattle through the prioritization of pedestrian space in a study area a couple of blocks to the north of the Madison corridor. The plan emphasizes the need to differentiate planning approaches for “Hill Streets” (east-west) from “Avenues” (north-south) in the city’s core. Under this scenario, avenues would become complete streets focusing on slower vehicular movement and grander public spaces; while hill streets, such as Madison, would be promoted as uninterrupted corridors ideal for HCT and BRT, maximizing connectivity across the CBD.

Figure 3-4 Pike-Pine Streetscape Design Vision

Differentiate Hill Streets from Avenues.
Make Hill Streets easier to walk. Strengthen the
Avenues’ grandeur while slowing them down.

