82nd Avenue Transit Existing Conditions

www.oregonmetro.gov/public-projects/82nd-avenue-transit-project

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This report was authored by Metro with significant contributions from Nelson\Nygaard. In addition, the 82nd Avenue regional partners provided valuable feedback, including TriMet, Multnomah County, ODOT, Clackamas County, and the Port of Portland.

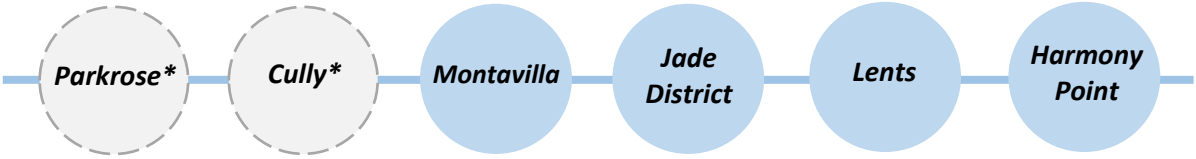
1. INTRODUCTION

This report provides information about the 82nd Avenue corridor to inform the 82nd Avenue Transit Project. It includes information about existing transit service, the people who live in the corridor, and the challenges facing transit operations and access today. The memo may be updated to provide additional information as it is collected.

1.1. Corridor Overview

82nd Avenue is a defining roadway in the Portland metropolitan region and is located in one of the most diverse areas of the state. It is an alternative route to I-205 and serves as a critical north-south corridor for transit users and drivers alike. The 82nd Avenue corridor connects Clackamas Town Center, the Southgate neighborhood in the south, the Jade District and the Montavilla and Roseway neighborhoods heading north, and the Portland International Airport. It is currently served by TriMet's Line 72, the busiest line in the region. Line 72 has more than 14,000 riders boarding daily (average weekday pre-pandemic) and connects to three Light Rail Transit Metropolitan Area Express (MAX) lines, the FX2-Division rapid bus, and many other major east-west bus routes. The communities surrounding 82nd Avenue have greater than average concentrations of low-income populations, immigrants and people of color, English language learners, and transit-dependent residents.

Figure 1-1. 82nd Avenue Corridor Neighborhoods



* = The Transit Project will decide between the Parkrose Neighborhood and Cully Neighborhood, along with Cascade Station and Portland International Airport as the site for the north terminus station.

The 82nd Avenue corridor was identified in regional plans as a location for future high-capacity transit as early as 2010 (Figure 1-2). Additional planning at the county and local levels has supported that recommendation and planned for how bus rapid transit could be designed on the corridor.

Figure 1-2. 82nd Avenue in the Regional High-Capacity Transit Network

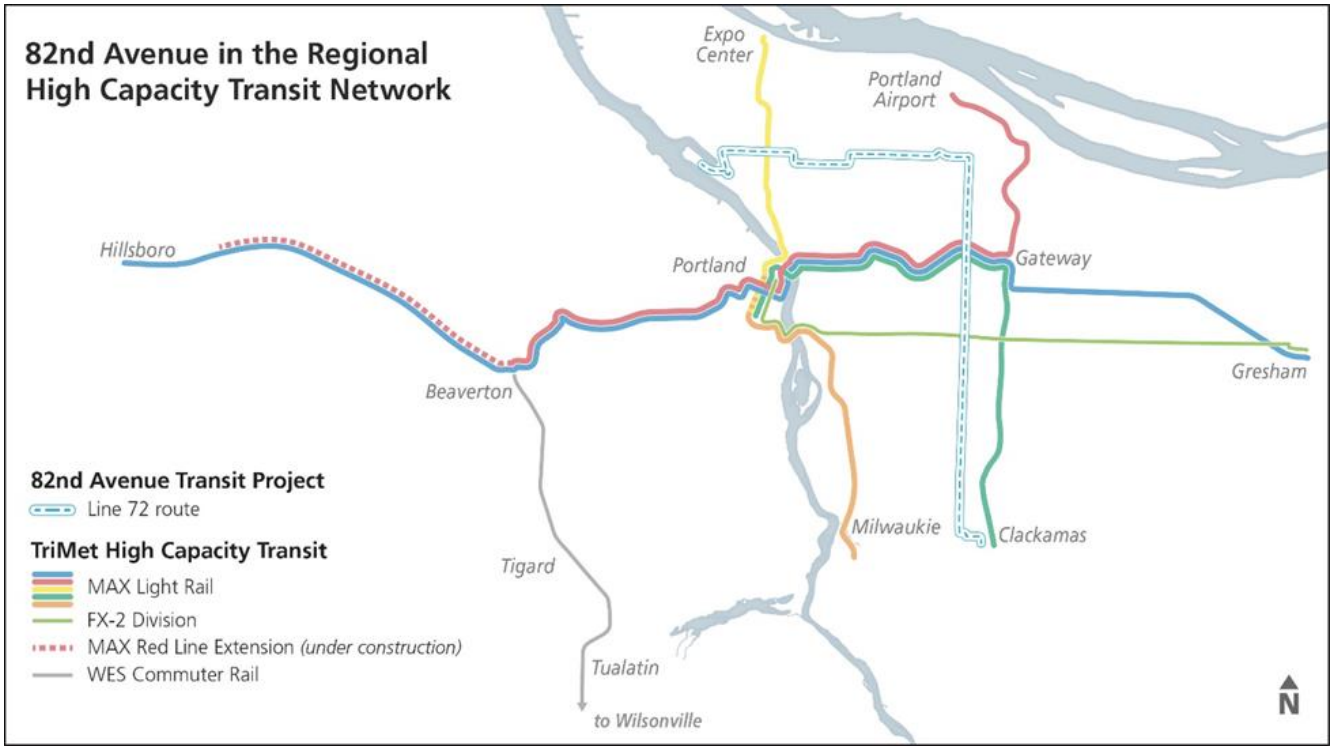
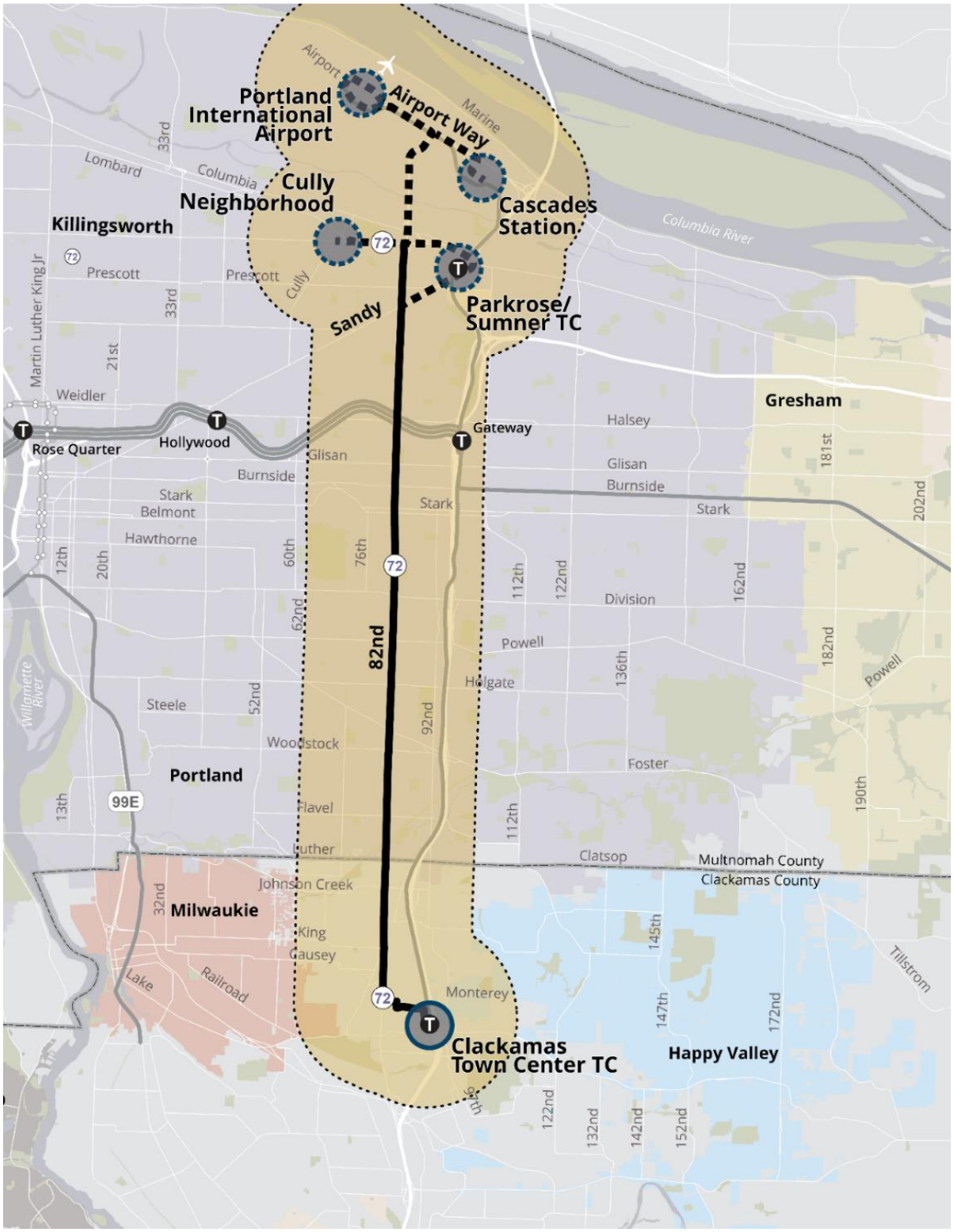


Figure 1-3. 82nd Avenue Transit Study Area with Northern Terminus Options (1 mile buffer)



2. PLANNING CONTEXT

Previous plans for 82nd Avenue documented transit issues, community concerns and visions, and potential solutions. These plans have proposed an overall transportation vision of faster, more reliable transit and safer, more comfortable walking and biking conditions on and/or across 82nd Avenue. These previous plans have analyzed 82nd Avenue/Line 72 within the regional transit network and explored a set of corridor-wide and location-specific transit improvements, such as queue bypasses, BAT lanes, stop consolidation, and transit signal priority (Get Moving 2020, TriMet Delay Dashboard 2019, 82nd Avenue Transit Possibilities 2022).

For issues related to transit access, previous planning processes have collaborated with community members to identify priorities for pedestrian-scale lighting, safer bike and pedestrian crossings, parallel bike routes to 82nd Avenue, and improved sidewalks (PBOT 82nd Avenue Plan 2019, ODOT 82nd Avenue of Roses Implementation Plan 2018). Specific projects that would enhance the safe access to transit have been identified for the potential Line 72 termini areas (Parkrose Community Plan 2022, Columbia Lombard Mobility Corridor Plan 2022, Clackamas Regional Center Pedestrian/Bicycle Plan 2012, TriMet Bike Plan 2016).

In addition, planning efforts have identified top-of-mind community priorities that the 82nd Avenue transit project can influence, such as more trees, community stability, cultural diversity, personal safety and thriving local businesses (Cully TIF Preliminary Plan 2022, Parkrose Community Plan 2022, BPS Barriers to Redevelopment 2019, Jade District Vision 2014).

For more detailed summary of relevant plans, see Appendix A.

3. LAND USE, POPULATION, AND EMPLOYMENT CORRIDOR DEMOGRAPHIC CHARACTERISTICS

This section looks at the corridor land use, employment, demographic, and household characteristics within the 82nd Avenue corridor. Data for the corridor is separated into two categories: the 82nd Avenue corridor including the northern terminus area and the 82nd corridor excluding the northern terminus area.

3.1. Study Area

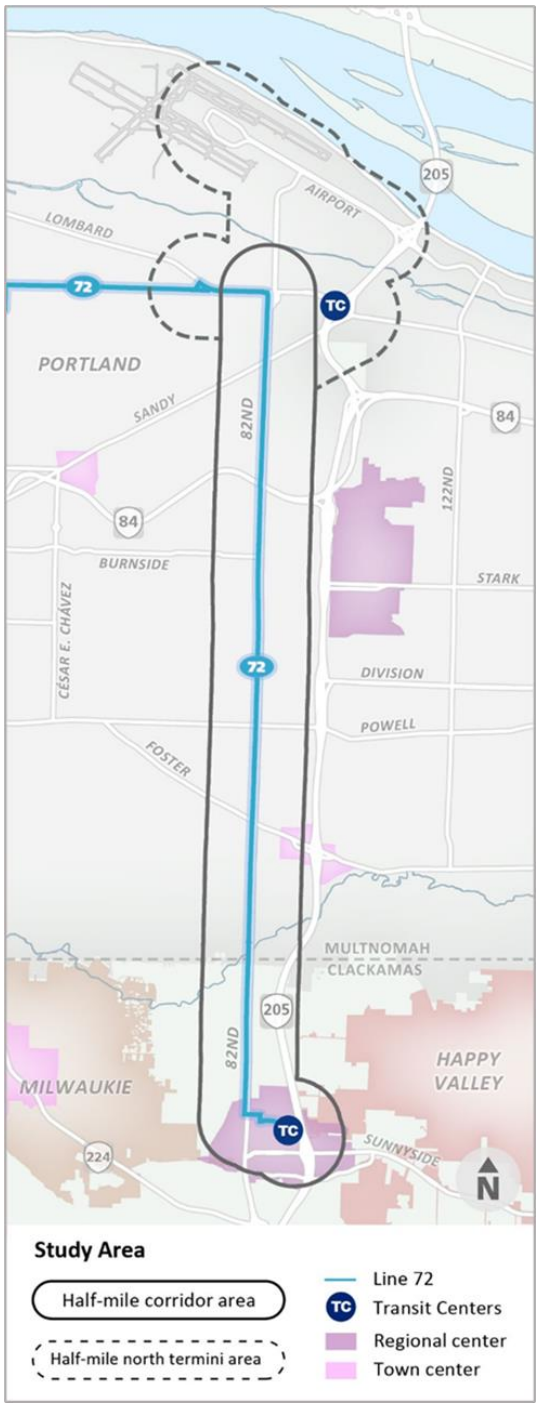
The project study area evaluated for land use and demographics consists of two sections: a corridor area and a north termini area. The corridor area is a half-mile radius buffer surrounding the 82nd Avenue portion of the Line 72 route.[1] This area extends from 82nd Avenue and NE Lombard St south to the Clackamas Town Center Transit Center.

The north termini section is a half-mile area surrounding the Transit Project's four potential north terminus locations. The four locations are Cascade Station business park, the Cully Neighborhood, the Parkrose Transit Center, and the Portland International Airport (PDX). Only one of these locations will be selected as the north terminus location. The north termini area extends from 82nd Avenue and NE Lombard St to all four north terminus options.

Much of the demographic data is reported out by the two separate geographies, as the southern portion of the corridor will be the project area regardless of the final project alignment, while the terminus area will shrink to include only one terminus location.

In addition, a wider study area has been analyzed to understand the transportation components of the project. This is to reflect that the bus route on 82nd Avenue represents one part of the overall transit system and the wider transportation network for the region.

Figure 2-1. Study Area



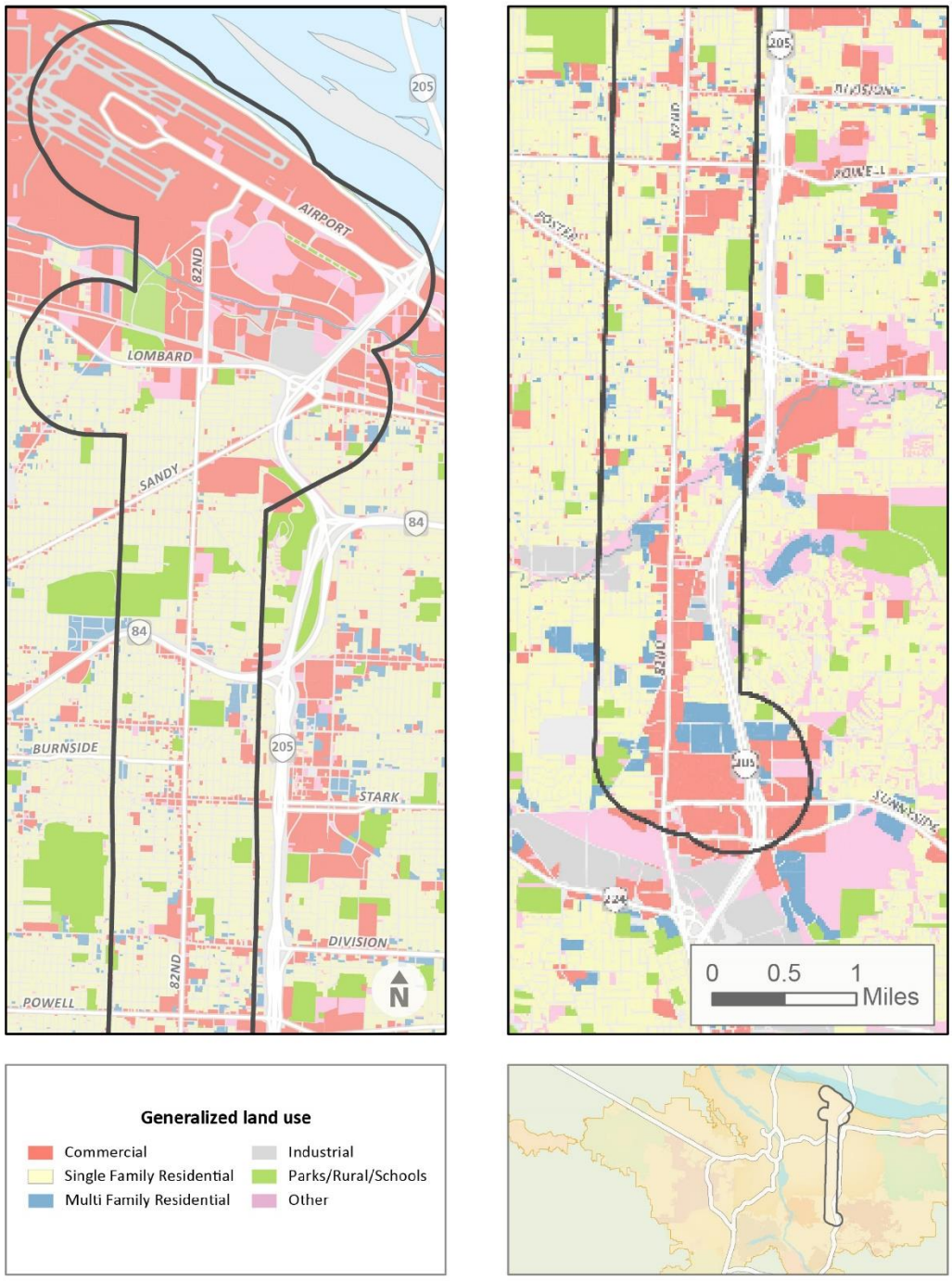
[1] Because census tracts do not fall evenly inside the half-mile study area, demographic variables from the 2020 Census and the American Community Survey (2016-2020) were calculated using areal interpolation. Census tracts were "split" using the study area boundaries. Afterward, an allocation of the specific variable estimate was calculated for the tract area that intersects a study area proportionate to the percentage of areal overlap. Additionally, tracts were "masked" where homes do not exist, such as in parks, cemeteries, large water bodies, and transportation rights-of-way.

3.2. Land Use and Major Destinations

The 82nd Avenue corridor project area is urban in nature and built up with a commercial spine along both sides of the roadway interspersed with multifamily housing and community places as well as some single-family housing zones surrounding the core commercial area (see Figure 3-2). It is anchored by a major destination/employer (Clackamas Town Center) and a transit center in the south and four potential terminus locations in the north: a major transit center (Parkrose/Sumner Transit Center), a major shopping area (Cascade Station), an international airport and employment-rich zone (Portland International Airport), and a growing neighborhood hub (the Cully neighborhood).

There are many regional destinations along the route, including shopping centers catering to the general public and specific ethnic groups (especially Asian and Latinx grocery stores); educational institutions such as Portland Community College, McDaniel High School, the Clackamas Middle College, and a nearby Clackamas Community College campus on Harmony Road; many social services including Bridges to Change, Clackamas Service Center, the Department of Human Services and culturally-specific social services such as the Pacific Islander and Asian Family Center and Slavic Oregon Social Services; community spaces including the Gregory Heights Library, Holgate Library, and the Montavilla Community Center; and many highly regarded restaurants and food cart pods. These destinations are visited regularly by those that live along the corridor, and many are regional attractions.

Figure 3-2. Generalized Land Use



3.3. Population and Employment

3.3.1. Population Today and Projected Growth

The project study area includes a large number of people today, with high growth projected for the future. Roughly 69,000 people live within the half-mile study area (about the same population as Oregon City and Tualatin combined). While most of the corridor is in Portland, the Clackamas County portion is also densely populated, with over 21,000 people (about the same population as the City of Milwaukie) within the study area.

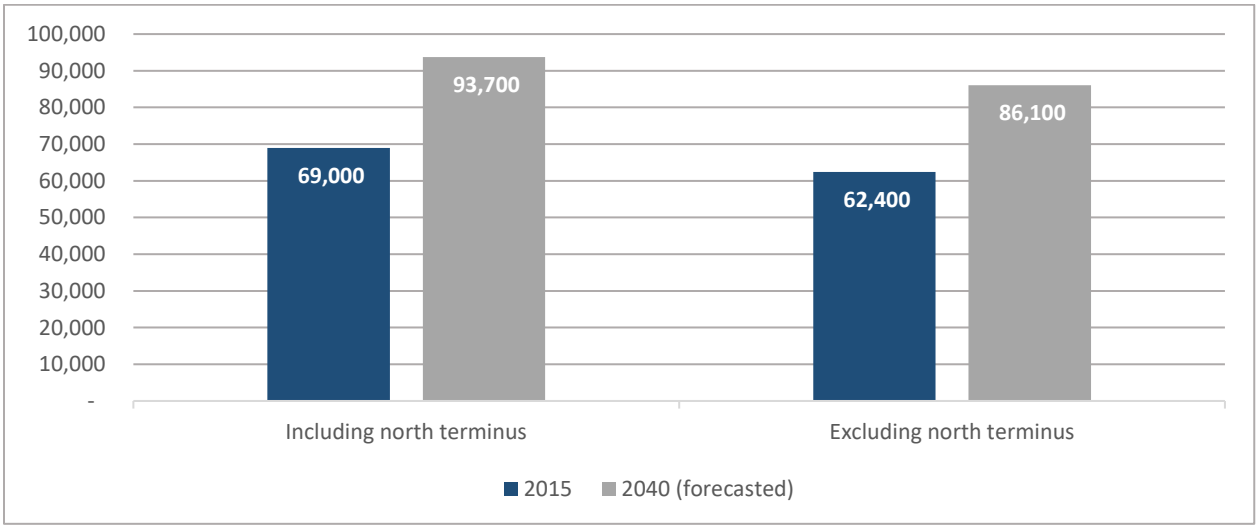
The 82nd Avenue corridor population (including the north terminus area) is forecast to increase 36% by 2040, adding 24,700 people, which is a higher growth rate than that of the region and both counties (see Table 3-1 and Figure 3-3). By 2040, 93,700 people are expected to live in the corridor.

Table 3-1. Forecast Population Change

Population	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
2015	1,598,900	403,600	769,900	69,900	63,000
2040 forecast	2,161,400	538,000	1,015,900	86,000	86,000
2015–2040 growth	562,500	134,400	246,000	23,000	23,000
Percent growth	35%	33%	32%	34%	38%

Source: MetroScope, Metro's tool to forecast land use change over time

Figure 3-3. 82nd Avenue Corridor Population



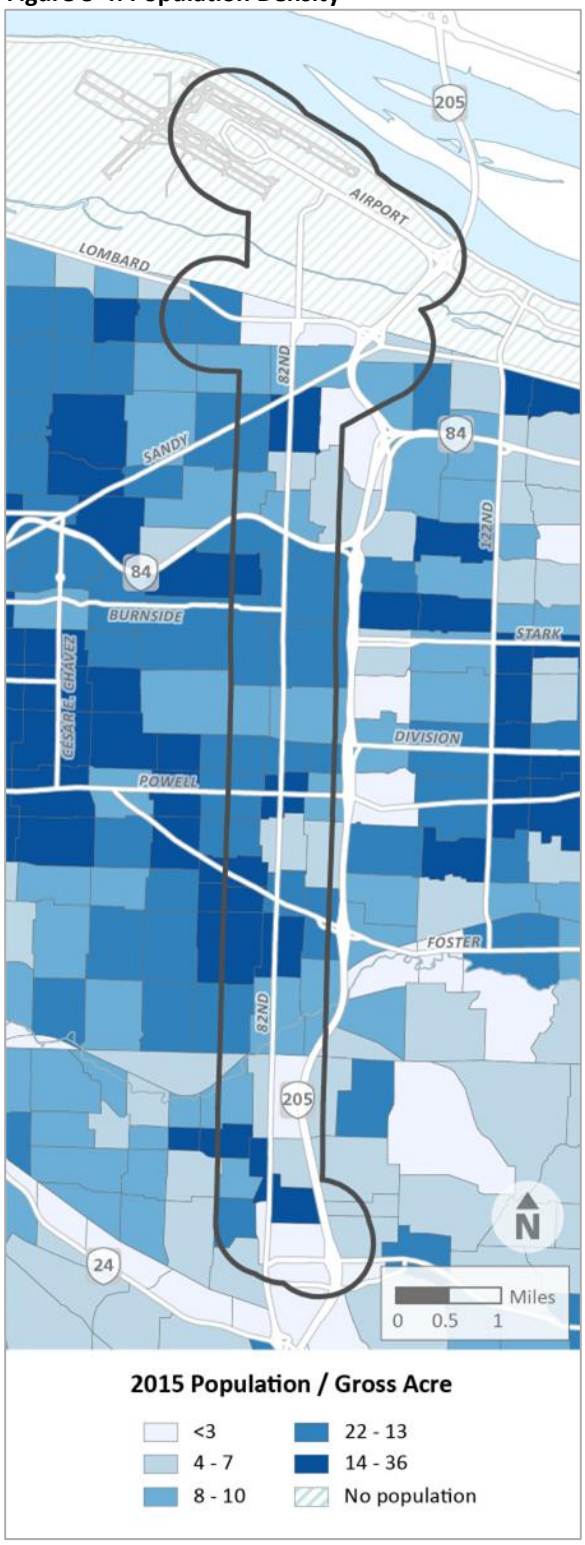
Source: MetroScope, Metro's tool to forecast land use change over time

3.3.2. Population Density

Population density is high enough to support high-capacity transit within the corridor (see Figure 3-4). In general, transit is most productive where there are residential densities of over seven people per acre in a corridor and especially productive where there are multi-family developments combined with commercial developments and other destinations, as is the case along 82nd Avenue.

Most areas along the corridor have between 13 and 36 people per acre. Population density is highest in the Montavilla, Foster-Powell, Mt. Scott-Arleta, and Harmony neighborhoods. There are clusters of apartments located up and down the corridor. The areas with the lowest density are located in commercial and industrial zones at the north and south ends of the corridor. These areas would also attract transit riders as they are major retail, travel, and employment destinations.

Figure 3-4. Population Density



Source: 2016–2020 American Community Survey

3.3.3. Employment and Projected Growth

Employment in the corridor was 30,900 (excluding the northern terminus) and 45,000 jobs (including the northern terminus area) in 2015. This relatively small geographic area accounts for 5–7% of all the jobs in the Portland region. In addition, the number of jobs along the corridor in Clackamas County accounts for 13–15% of the county's total jobs.

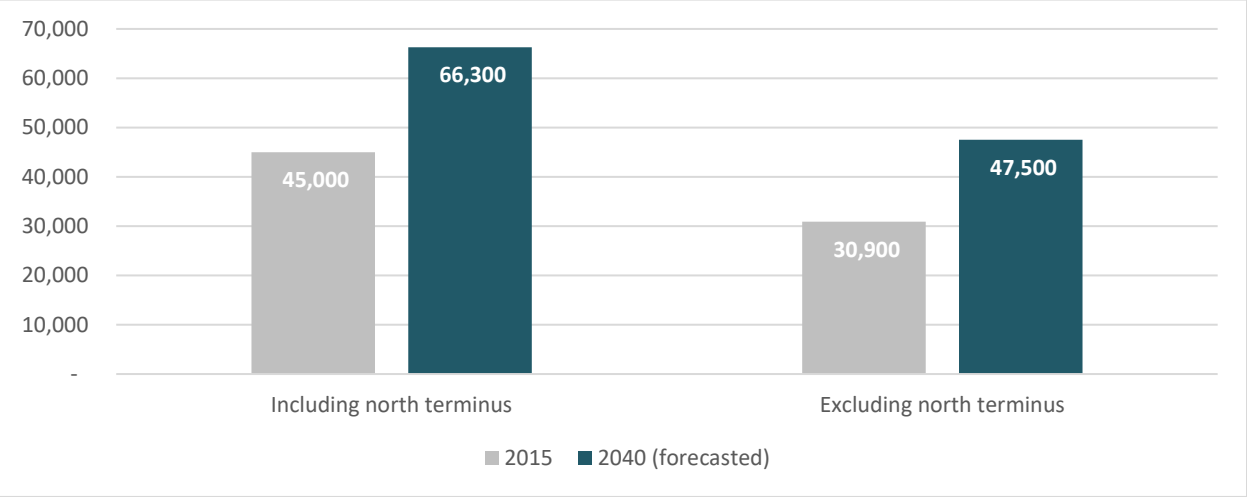
Employment is forecast to increase by 47% by 2040 in the corridor including the northern terminus area and by 54% in the corridor excluding the terminus area (see Table 3-2). The corridor is expected to see a higher employment growth rate than the counties and the region will. By 2040, 66,300 jobs are projected to be located along the corridor (see Figure 3-5).

Table 3-2. Forecast Employment Change

Employment	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
2015	894,200	154,900	494,300	50,600	33,600
2040 forecast	1,238,700	227,500	645,400	73,300	51,200
2015–2040 growth	344,500	72,600	151,100	22,700	17,600
Percent growth	39%	47%	31%	47%	54%

Source: MetroScope, Metro's tool to forecast land use change over time

Figure 3-5. 82nd Avenue Corridor Employment



Source: MetroScope, Metro's tool to forecast land use change over time

3.3.4. Employment Density

Employment density on 82nd Avenue is relatively high, with a mix of small businesses, chain stores, and restaurants lining the commercial corridor. Employment opportunities range from retail and food service jobs to positions in healthcare and education.

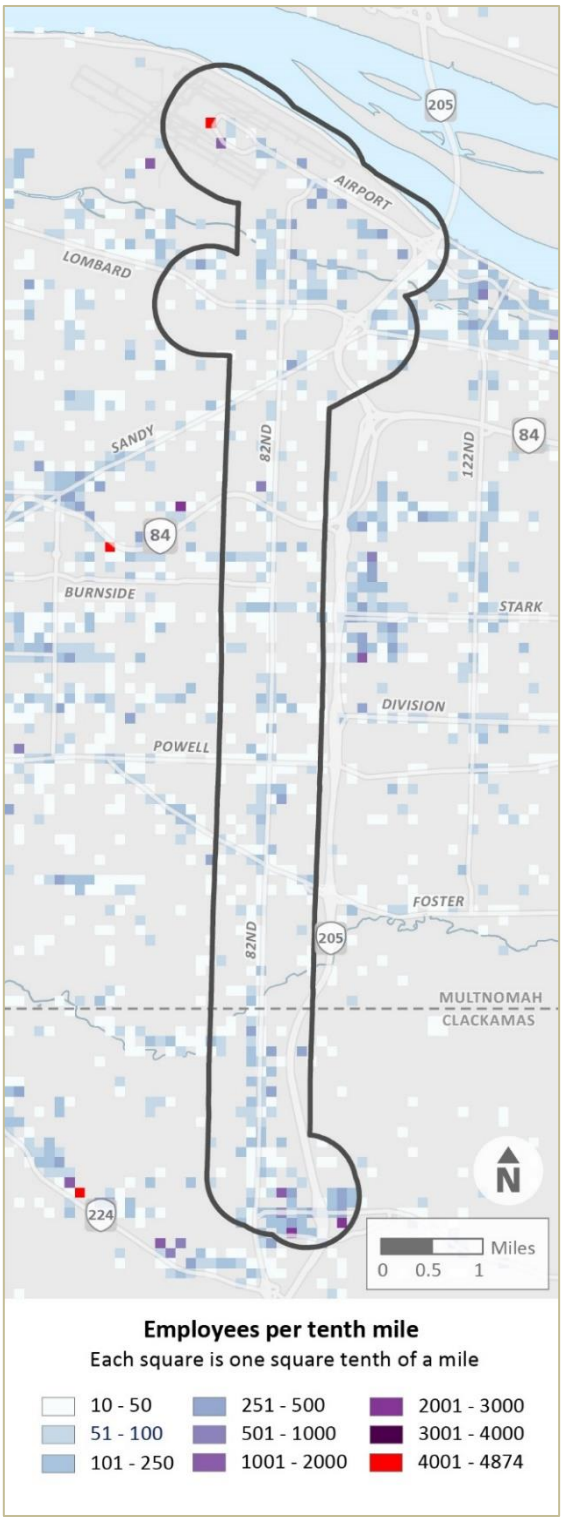
Employment density is highest in the Columbia Corridor and South of SE Monterey Avenue in Clackamas County. Other high-employment areas appear along 82nd Avenue and NE Glisan, SE Stark, SE Division, and SE Holgate.

The Portland International Airport (PDX) is the largest employer in the corridor, with more than 5,000 employees. The Kaiser Sunnyside Medical Center is the second largest employer, with over 2,000 employees.

Other significant employers include Cascade Station, Clackamas Town Center, Eastport Plaza, Johnson Creek Crossing, and Portland Community College Southeast Campus.

The lowest job concentrations appear between SE Stark and SE Main Street and NE Lombard to NE Prescott streets.

Figure 3-6: Employment Density



Source: ESRI

3.4. Population Characteristics

3.4.1. BIPOC Population

The 82nd Avenue corridor has a higher concentration of Black, Indigenous, and People of Color (BIPOC) individuals than the region, Clackamas County, and Multnomah County. Thirty-four percent of the population in the corridor is BIPOC, compared to 19% in Clackamas County and 31% in Multnomah County and the region (Table 3-3 and Table 3-4).

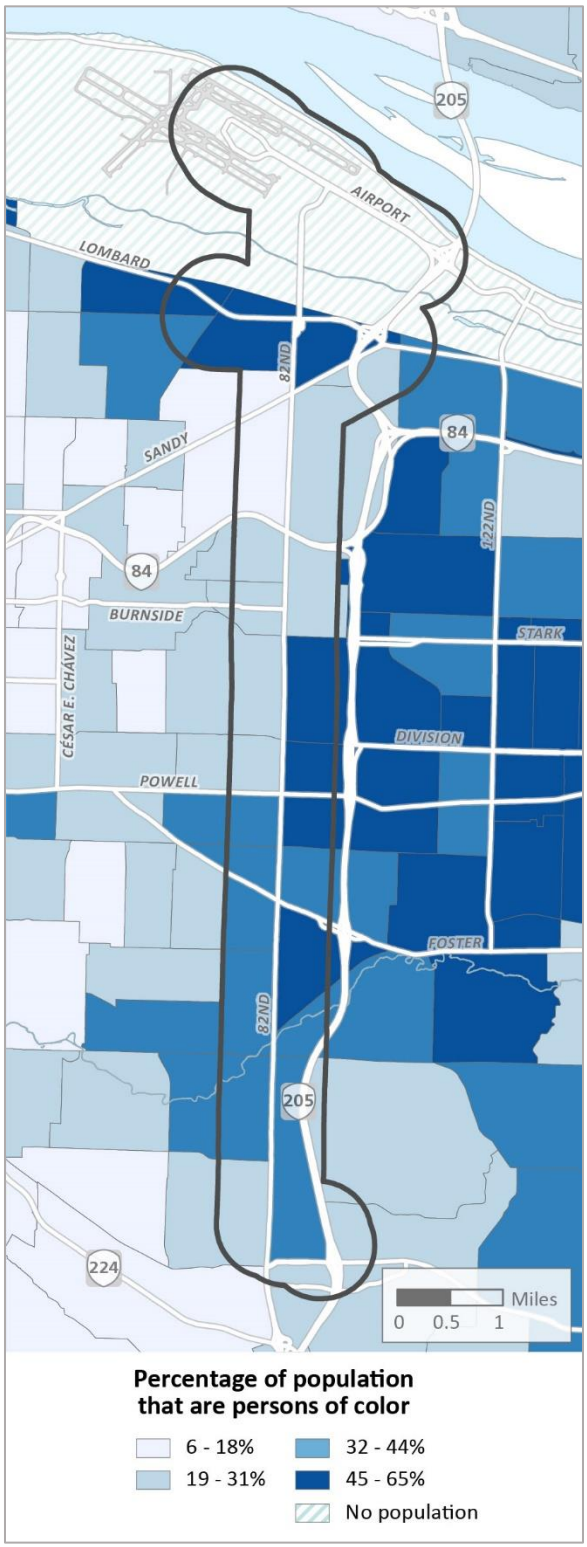
Nearly 26,000 BIPOC residents live along the corridor. Many eastern and southern areas in the corridor have higher percentages of BIPOC residents than the regional percentage (Figure 3-7).

The corridor is home to some of the most diverse census tracts in Oregon. There are several census tracts along the corridor where 45−65% of the population is BIPOC, including

- 82nd Avenue from Lombard St to Sandy Blvd,
- The east side of 82nd Avenue from Stark St to Holgate Blvd, and
- The east side of 82nd Avenue from Foster Rd to Flavel St.

Based on the 2016-2020 American Community Survey, Latinos are the largest ethnic group in the corridor, comprising 37–39% of the total BIPOC population. Asians are the second largest, making up 31–33% of the BIPOC population (Table 3-4).

Figure 3-7. Percentage of BIPOC Population



Source: 2016–2020 American Community Survey

Table 3-3. BIPOC Population Comparisons

Race/Ethnicity	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
American Indian and Alaska Native	8,100	1,900	5,300	500	500
Asian	141,000	18,200	62,100	8,000	7,500
Black or African American	57,700	3,400	42,500	3,100	2,600
Hispanic/Latino	216,700	36,800	95,400	10,200	8,500
Native Hawaiian and Other Pacific Islander	7,900	800	4,900	400	400
Other race	5,300	1,000	2,900	100	100
Two or more races	79,500	16,800	38,400	3,500	3,200
Total people of color	516,200	78,900	251,600	25,900	22,800
Total 2020 Census population	1,652,200	414,700	809,600	75,500	68,000

Source: 2016–2020 American Community Survey

Table 3-4. Percentage of BIPOC Populations Comparisons

Race/Ethnicity	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
American Indian and Alaska Native	0.5%	0.5%	0.7%	1%	1%
Asian	9%	4%	8%	11%	11%
Black or African American	3%	1%	5%	4%	4%
Hispanic/Latino	13%	9%	12%	14%	13%
Native Hawaiian and Other Pacific Islander	0.5%	0.2%	0.6%	1%	1%
Other race	0.3%	0.2%	0.4%	0.2%	0%
Two or more races	5%	4%	5%	5%	5%
Total people of color	31%	19%	31%	34%	34%

Source: 2016–2020 American Community Survey

3.4.2. People Living with a Disability

The 82nd Avenue corridor has a higher percentage of people living with disabilities than the region or counties (see Table 3-5). People with disabilities are known to be more transit-dependent and reliant on good pedestrian facilities than people without disabilities. The high percentage of residents with disabilities signals a need for effective pedestrian design, such as curb ramps and near-level boarding, along the corridor to support transit ridership, convenience, and safety among this population.

Table 3-5. Population Living with a Disability

Persons with a disability	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Population	188,900	49,600	99,000	10,000	9,200
Percentage	11%	12%	12%	13%	14%

Source: 2016–2020 American Community Survey

3.4.3. Low-Income Population

The 82nd Avenue corridor has a much higher proportion of low-income residents than the region and both counties (see Table 3-6). Thirty-two percent of the corridor's population is living below 200% of the Federal Poverty Level ($55,500 for a family of four in 2020), while 24% of the regional population is in that group. Higher proportions of low-income residents indicate a higher proportion of transit-dependent individuals, highlighting a need for transit investment.

There are several areas along the corridor where 43−59% of the population lives below 200% of the federal poverty level (see Figure 3-8). These areas include the following:

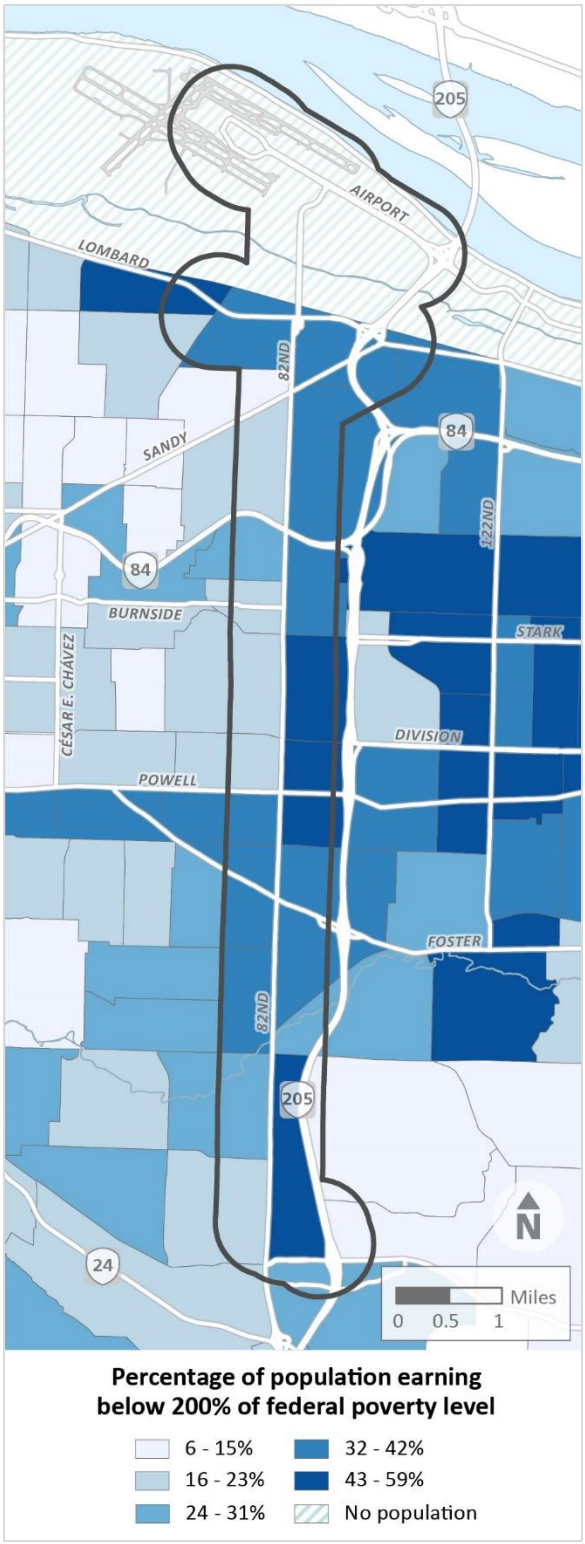
- East of 82nd Avenue and west of I-205 in Clackamas County
- East of 82nd Avenue around of Powell Boulevard
- West of 82nd Avenue and south of Powell Boulevard in Multnomah County

Table 3-6. Low-Income Population

Low-income population Population earning below 2x Federal Poverty Level	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Percentage of population below 2x federal poverty level	391,500	77,600	225,000	24,100	21,400
Low-income population	24%	19%	28%	32%	32%

Source: 2016–2020 American Community Survey

Figure 3-8. Percentage of Low-Income Population



Source: 2016–2020 American Community Survey

3.4.4. Limited English Proficiency

The 82nd Avenue Corridor has a higher percentage of people with limited English proficiency than the region, Multnomah County, and Clackamas County (see Table 3-7 and Table 3-9). Eleven percent of the corridor's population speaks English less than "very well." In addition, these residents with limited English proficiency speak many different primary languages. Spanish is the most widely spoken language among these residents, at over 30%. Other highly used languages in the corridor include Vietnamese, Chinese, unspecified Asian and Pacific Islander languages, and Russian, Polish, or other Slavic languages.

Table 3-7. Population with Limited English Proficiency

Population with limited English proficiency (LEP)	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
LEP population	119,100	16,500	60,000	7,700	6,900
% of population with LEP	8%	4%	8%	11%	11%

Source: 2016–2020 American Community Survey

Numbers may not add due to rounding.

Table 3-8. Population with Limited English Proficiency by Language Spoken

Population with limited English proficiency (LEP) by language spoken	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Arabic	2,800	200	1,300	-	-
Chinese	10,800	1,600	6,300	1300	1,300
French, Haitian, or Cajun	900	200	400	-	-
German or West Germanic	800	200	300	-	-
Korean	3,900	600	600	-	-
Russian, Polish, or Other Slavic	10,000	1,600	7,100	500	500
Spanish	51,000	8,200	21,800	2,700	2,100
Tagalog	2,000	300	700	100	100
Vietnamese	14,900	800	10,200	2,100	2,000
Other Asian and Pacific Island	10,900	1,500	5,600	500	500
Other Indo European	7,100	1,100	2,600	200	200
Other and Unspecified	4,000	200	3,000	200	100

Source: 2016–2020 American Community Survey

Numbers may not add due to rounding.

Table 3-9. Percentage of Population with Limited English Proficiency by Language Spoken

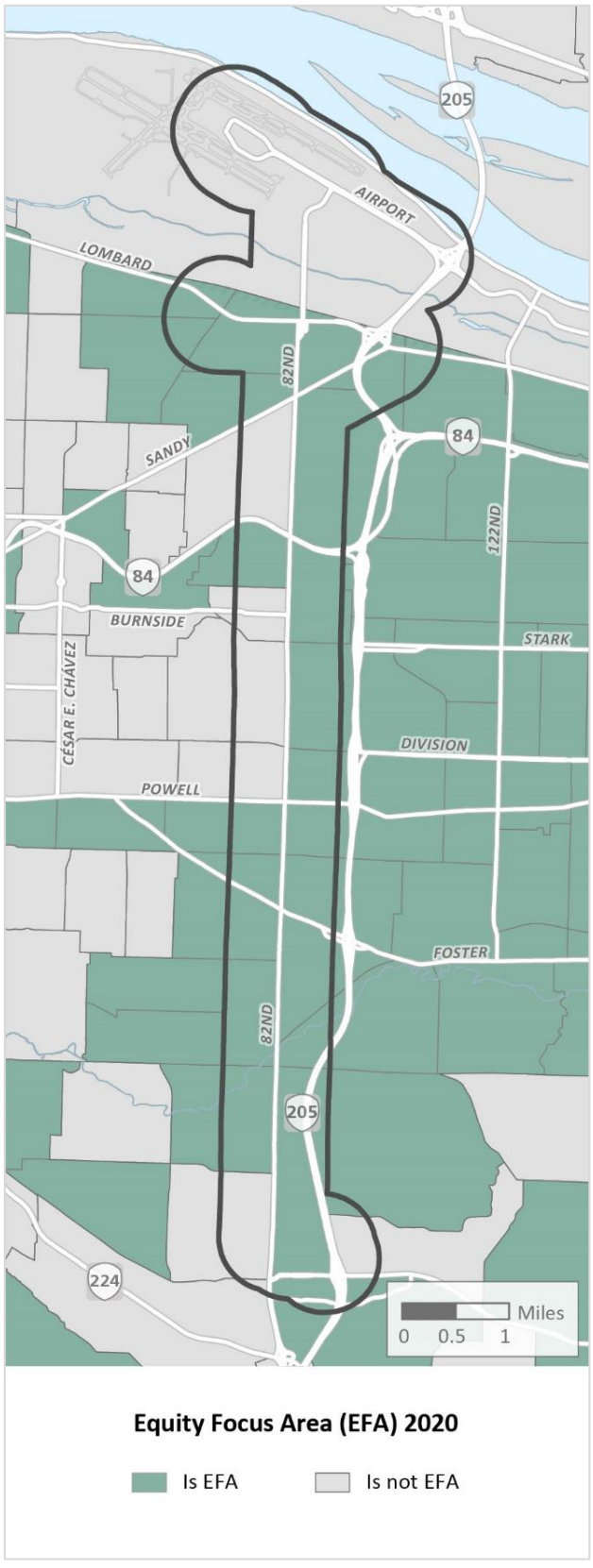
Percentage of LEP population by language spoken	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Arabic	0.2%	0.1%	0.2%	0.0%	0.0%
Chinese	0.7%	0.4%	0.8%	**1.8%**	**2.0%**
French, Haitian, or Cajun	0.1%	0.1%	0.1%	0.0%	0.0%
German or West Germanic	0.1%	0.1%	0.0%	0.0%	0.0%
Korean	0.2%	0.2%	0.1%	0.0%	0.0%
Russian, Polish, or Other Slavic	0.6%	0.4%	0.9%	0.7%	0.8%
Spanish	3.2%	2.1%	2.8%	**3.8%**	**3.2%**
Tagalog	0.1%	0.1%	0.1%	0.1%	0.2%
Vietnamese	0.9%	0.2%	1.3%	**2.9%**	**3.1%**
Other Asian and Pacific Island	0.7%	0.4%	0.7%	0.7%	0.8%
Other Indo European	0.5%	0.3%	0.3%	0.3%	0.3%
Other and Unspecified	0.3%	0.1%	0.4%	0.3%	0.2%

Source: 2016–2020 American Community Survey

3.4.5. Equity Focus Areas

Equity focus areas are defined by Metro as census tracts in which the rate of people of color, people with limited English proficiency, or people with low income (i.e., incomes equal to or less than 200% of the federal poverty level) is greater than the regional average. Additionally, the density (persons per acre) of one or more of these populations must be double the regional average.

Line 72 serves equity focus areas on both sides of 82nd Avenue (see Figure 3-9). The entire eastern side of 82nd Avenue consists of equity focus areas. Most neighborhoods on the western side are equity focus areas except for portions of the Harmony neighborhood in Clackamas County and portions of the Mount Tabor, South Tabor, Montavilla, Roseway, and Madison South neighborhoods. The portions of the neighborhoods that are not designated as equity focus areas include equity populations but are not designated as equity focus areas because they do not meet the population density threshold.



Source: Metro Data Resource Center

3.4.6. Youth and Older Adults

The corridor has a higher percentage of working-age population than the counties and region. Most corridor residents are between the ages of 18 and 64 (see Table 3-10). This is the peak working age range and may result in many people relying on Line 72 to get to work. The percentage of residents 65 years and older is similar to percentages for the region and for Multnomah County.

The percentage of residents 18 and younger is lower in the corridor than in the region and counties. However, several schools are located along 82nd Avenue, including Portland Community College (PCC) Southeast Campus and Leodis V. McDaniel High. Line 72 provides service to each of the schools.

During the 2021−2022 school year, 11,614 students were enrolled in PCC and 1,400 students were enrolled in Leodis V. McDaniel High School. PCC students can ride public transportation, including Line 72, using discounted TriMet passes. Portland high school students are provided TriMet transit passes rather than yellow school bus service to access high school. Consequently, many students are Leodis V. McDaniel High School ride Line 72 to get to school and other destinations. There are a number of elementary schools and middle schools along the corridor that have their own dedicated buses through the Portland Public Schools system.

Figure 3-9. Youth and Older Adults

Age	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Under 18 years of age	342,800	89,200	151,300	13,700	12,100
Percent under 18 years of age	21%	21%	19%	18%	18%
18–64 years of age	1,085,500	250,900	549,600	51,800	46,600
Percent 18–64 Years of Age	66%	60%	68%	69%	69%
65 years of age and over	234,500	74,900	109,000	10,000	9,300
Percent 65 years of age and over	14%	18%	13%	13%	14%

Source: 2016–2020 American Community Survey

3.5. Household Characteristics

3.5.1. Tenancy

The 82nd Avenue corridor has a lower rate of home ownership than Clackamas County and the region. Forty-two percent of households in the corridor are renter-occupied, while only 40% of households in the region are renter-occupied (see Table 3-11).

Table 3-11. Rent vs Own

Housing units	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Total units	687,800	168,600	353,700	57,000	52,900
% Vacant	5%	6%	5%	4%	4%
% Owned	56%	67%	51%	54%	54%
% Rented	40%	27%	43%	42%	42%

Source: 2016–2020 American Community Survey

3.5.2. Housing Cost Burden

Housing cost burden can impact a person's ability to pay for other things, such as the high cost of owning a personal automobile. The threshold for cost burden is paying more than 30% of income for housing. Renters in the corridor are more cost burdened than owners. The housing cost burden for owned units is higher in the corridor than in the region and Clackamas County and equals the rate in Multnomah County (see Table 3-12).

Table 3-12. Housing cost burden[2] by housing type

Housing units with cost-burdened residents	Region	Counties		82nd Avenue Corridor	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Total renter-occupied units	274,400	46,300	152,800	13,500	12,300
Percent of rental units with cost-burdened residents	48%	48%	49%	51%	50%
Total owner-occupied units	385,500	113,000	182,100	17,300	15,600
Percent of owned units with cost-burdened residents	20%	20%	22%	22%	22%

Source: 2016–2020 American Community Survey

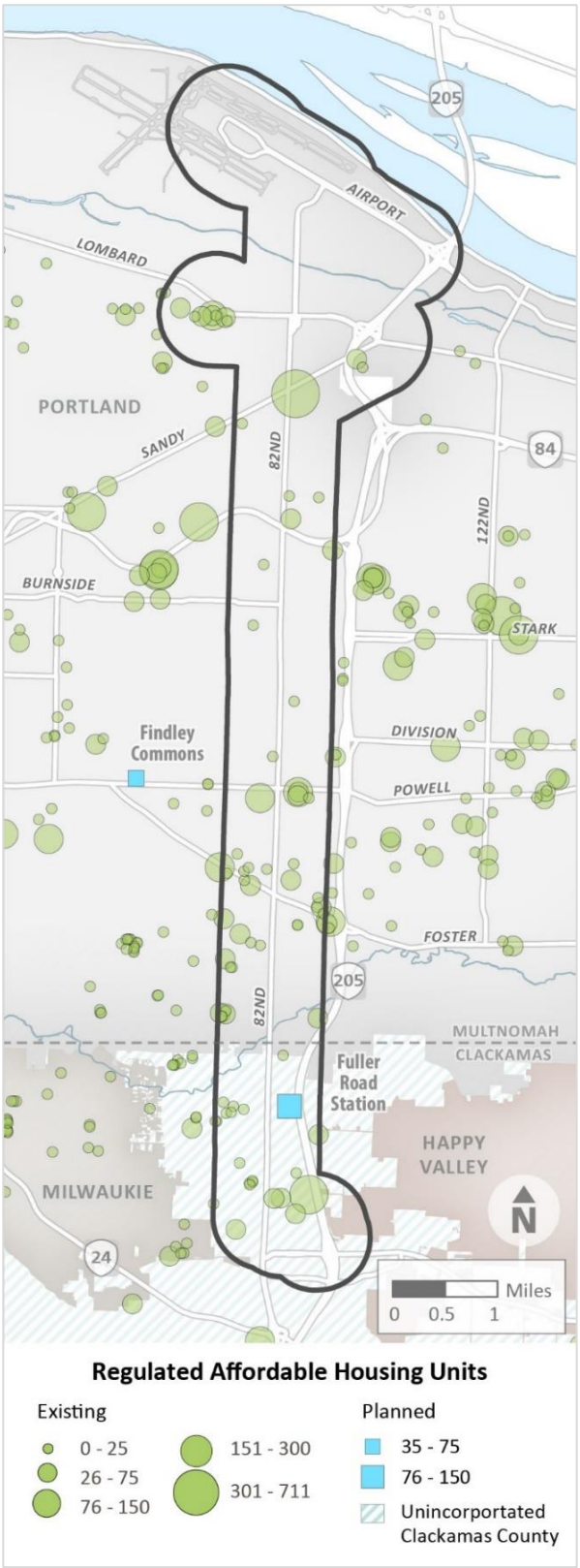
[3] https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=21177

3.5.3. Affordable Housing

Regulated affordable housing is structured to prevent tenants from paying more than 30 percent of their gross household income for rent. Specific rent amounts vary because rent is regulated to be affordable at different income levels, from zero to 80 percent of area median income (AMI).

Table 3-13 and Figure 3-10 present information on existing and planned regulated affordable housing in the corridor. There are over 230 existing units of affordable housing within a half mile of 82nd Avenue. These affordable housing units are located along the entirety of the 82nd Avenue study area except near the airport. Figure 3-10 shows the largest cluster in the Sumner Neighborhood and high concentrations of smaller clusters in the southern portion of the corridor. The corridor has a higher percentage of regulated affordable housing than the regional and Clackamas County percentages.

Figure 3-10. Existing and Planned Regulated Affordable Housing



Source: Metro Affordable Housing Inventory

There are 1,900 planned affordable housing units in the corridor. Below is a summary of some of the affordable housing projects that are completed or in the pipeline.

- **Fuller Road Station** has 100 units of new affordable housing in unincorporated urban Clackamas County, directly adjacent to the MAX Green Line. The six-story building with a mix of one-, two- and three-bedroom homes serves families and individuals with incomes between 30% and 80% area median income (AMI). Twenty-five units are dedicated for families and individuals who are homeless or at risk of homelessness, including foster youth exiting or having exited the system.

- In the Montavilla Neighborhood, **Glisan Landing** will offer 137 new apartment homes to families and people coming out of homelessness. The first building will have 41 units of permanent supportive housing (PSH) prioritizing BIPOC residents, seniors, and survivors of domestic violence/sexual assault. The second building will provide 96 units of family housing with a mix of unit sizes, prioritizing BIPOC residents, immigrant and refugee households, and intergenerational families. Forty-one percent of homes will be available to people with very low incomes (30% AMI or lower).

- Portland Community College (PCC), in collaboration with housing providers in the region, is taking steps to introduce community affordable housing at PCC Southeast Campus. The **PCC SE Housing Project** will offer 124 new apartment units. The units will be open to all community members but heavily marketed to students.

- In the Jade District, APANO is leading public outreach to inform redevelopment plans for the former **Canton Grill** site. Potential redevelopment plans include building affordable housing.

Table 3-13. Existing and planned regulated affordable housing

Regulated affordable housing Existing units	Region	Counties		82nd Avenue Corridor	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Planned units	38,219	3,847	27,371	2,217	1,916
Total existing and planned	3,107	459	1,393	236	236
Regulated affordable housing	41,326	4,306	28,764	2,453	2,152
% Existing housing units that are regulated affordable	6%	3%	8%	8%	7%

Source: Metro affordable housing inventory

3.5.4. Vehicle Ownership

People without access to personal vehicles are more likely to be transit dependent. Eleven percent of households in the corridor do not own a vehicle. The corridor has a higher percentage of zero-vehicle households than Clackamas County and the region (See Table 3-14). This high percentage suggests that Line 72 serves many transit-dependent riders.

Table 3-14. Zero-car households

Vehicle ownership per household	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Households without vehicles	61,900	8,000	43,000	3,400	3,100
% of households without vehicles	9%	5%	13%	11%	11%

Source: 2016–2020 American Community Survey

3.5.5. Commute Mode Share

The 82nd Avenue corridor has a higher percentage of people taking transit to work than the region or both counties (see Table 3-15). A smaller percentage of residents in the corridor walk to work than in Multnomah County and the region; this can be attributed to several factors along 82nd Avenue, including the poor sidewalks, infrequent crosswalk spacing, lack of signalized crossings, and an unpleasant walking environment that is loud and has little tree cover. Three percent of residents bike to work compared to 5% in Multnomah County. A smaller percentage of residents telework in the corridor than in the region and Multnomah County.

Fewer residents in the corridor commute to work by personal vehicle than in the region and Clackamas County. This is consistent with the low vehicle ownership rates in the corridor (see Table 3-14).

Table 3-15. Commute Mode Share

Mode	Region	Counties		82nd Avenue Corridor (half mile)	
		Clackamas	*Multnomah*	*Including north terminus*	*Excluding north terminus*
Personal vehicle	74%	83%	67%	72%	72%
Public transit	8%	3%	10%	11%	11%
Bike	3%	1%	5%	3%	3%
Walk	4%	2%	5%	3%	3%
Other	1%	1%	1%	1%	1%
Telework	11%	10%	12%	10%	10%

Source: 2016–2020 American Community Survey

3.6. Summary

The 82nd Avenue corridor is a highly populated employment hub with close to 70,000 residents and 45,000 jobs. The densities of the residents and the jobs are supportive of high-capacity transit, and the area is expected to grow at a higher rate than the region. By 2040, the ½ mile study area is anticipated to house roughly the same population as the entire City of Beaverton does now. In addition, the corridor has higher rates of individuals from BIPOC, low-income, disability, and limited English proficiency populations than much of the region.

American Community Survey data shows that the corridor has a higher percentage of working-age population and a higher rate of zero-car households than the rest of the region, implying a higher rate of transit-dependent commuters. There is a lower rate of home ownership along the 82nd Avenue corridor

than the rest of the region, and renters in the corridor are more likely to be housing cost burdened than renters in other parts of the region. The percentage of commuters that travel to work by public transit today is higher for the corridor than for the region and much higher than for Clackamas County. These findings highlight the corridor as a growing and densely populated area with a higher rate of marginalized populations and transit dependent individuals than the rest of the region.

4. EXISTING TRANSIT SERVICE

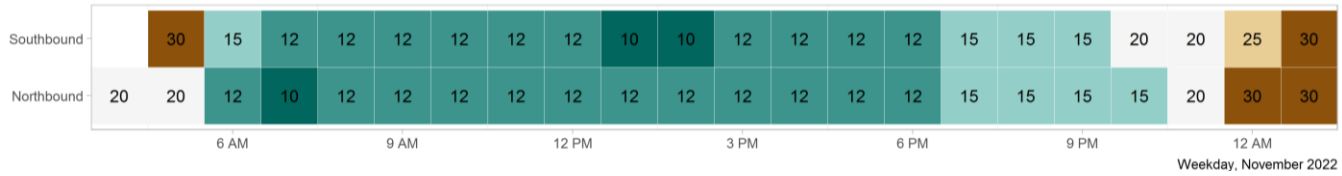
TriMet's Line 72 bus route provides the main existing transit service in the corridor, in addition to short segments of Lines 77, 19, 33, and 71. The following sections describe the characteristics of the Line 72 and other transit connections in the corridor.

Changes in ridership and service have been occurring since 2019. Nationwide transit ridership dipped during the pandemic and has slowly started to rebound. To reflect that situation, this section discusses the Line 72 data for 2019 and spring 2022. Ridership has been rebounding at a faster rate on the Line 72 than other routes. This data is a snapshot in time, but it can help us understand the general characteristics of Line 72 and how it performs.

4.1. Line 72 Characteristics

The Line 72, a frequent service route, serves 82nd Avenue between NE Lombard St to the north and Clackamas Town Center to the south. Service currently runs every 12 minutes between 6 a.m. and 7 p.m., every 15 minutes into the late evening, and up to every 30 minutes after 11 p.m. Line 72 operates from approximately 5 a.m. through 1 a.m. on weekdays. Prior to service reductions associated with the COVID-19 pandemic and ongoing bus operator shortages, the Line 72 operated every 6–8 minutes between 3 p.m. and 6 p.m. Line 72 schedules are regularly evaluated and adjusted.

Figure 4-1. Minutes Between Buses (Weekdays)



At the north end, Line 72 turns west onto NE Lombard St to reach NE Killingsworth St, NE Alberta St, and N Greeley Ave. The line ends on Swan Island in North Portland.

Line 72 has 210 stops, of which 123 are located along the portion between Clackamas Town Center and NE Cully Ave. Over this portion, stops are spaced on average every 850' – closer than TriMet's standard of 1,000–1,600'. As of spring 2022, the line had an average of 8,505 weekday boardings, which is the highest bus ridership in the TriMet network overall. The Line 72 had the third highest ridership retention rate among TriMet's frequent service lines in spring 2022 relative to fall 2019, demonstrating its importance as an essential transit service line.

Table 4-1. Line 72 Characteristics

Measure	Line 72 Total	Swan Island to Cully[1]	Cully to Clackamas Town Center (82nd Avenue Portion)[1]
Length (miles)	17.47	7.43	10.04
Percent of length	100%	43%	57%
Number of stops	210	87	123
Percent of stops	100%	41%	59%
Weekday boardings	8,505	2,253	6,252
Percent of boardings	**100%**	**24.5%**	**73.5%**

Source: TriMet's Spring 2022 passenger census.

[1] Ons and offs at Cully are split based on the direction of travel (e.g., WB ons and EB offs are included in the Swan Island to Cully segment)

4.1.1. Transit Network

Line 72 is connected to other lines in the regional TriMet transit network in 18 locations along 82nd Avenue (see Figure 4-2 and Table 4-2). The highest concentration of connections is at Clackamas Town Center. Line 72 is an important crosstown connector for routes that serve major job centers such as downtown Portland, providing transfer opportunities to the Red, Blue, and Green MAX lines, the new FX2 service along Division, and six other frequent service lines.

It should be noted that in December 2022, TriMet released a new draft service concept that includes upgraded frequency along several routes that intersect the corridor, as well as alignment changes that would increase the total number of transfer opportunities. These changes could come within the next few years and increase the utility of Line 72.

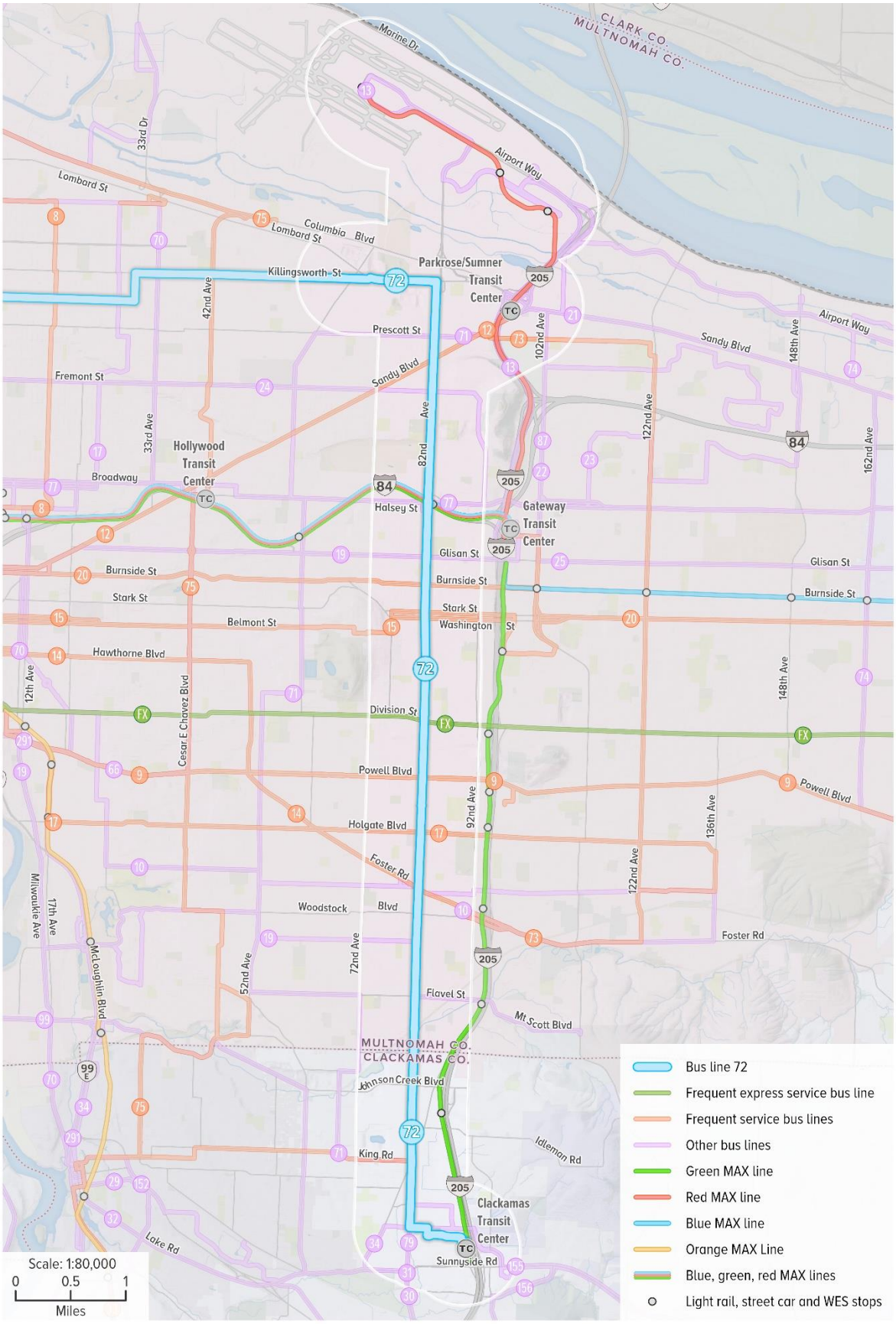
Table 4-2. Line 72 Transit Connections

Street	Existing[1]	Forward Together[1]	Changes
NE Lombard St	-	Line 190	New service along N/NE Columbia Blvd from Pier Park to Parkrose/Sumner TC, via NE Lombard, 82nd Ave, NE Prescott and NE Sandy Blvd.
NE Prescott St	Line 71	**Line 71**, Line 190	New frequent service along Line 71.
NE Sandy Blvd	**Line 12**	**Line 12**, Line 24	Line 24 terminus changed from Gateway TC to Parkrose/Sumner TC, via 82nd Ave and NE Sandy Blvd.
NE Fremont St	Line 24	Line 24	
I-84	**MAX Red, Green, and Blue Lines**	**MAX Red, Green, and Blue Lines**	-
NE Halsey St	Line 77	**Line 77**	New frequent service along Line 77.
NE Glisan St	Line 19	Line 19	-
E Burnside St	**Line 20**	**Line 20**	-
SE Stark St/ Washington St	**Line 15**	**Line 15**	-
SE Division St	**FX2**	**FX2**	-
SE Powell Blvd	**Line 9**	**Line 9**	-
SE Holgate Blvd	Line 17	Line 17	-
SE Foster Rd	Line 10, **Line 14**	**Line 14**	Elimination of service on SE Harold (Line 10)
SE Woodstock Blvd	-	**Line 4**	New frequent service along SE Woodstock Blvd from Sellwood to Lents.
SE Duke St	Line 19	-	Elimination of service on SE Duke St between SE 72nd and 82nd Ave.
SE Flavel St	Line 19	Line 10	Portions of Line 19 replaced by Line 10, with service east and west of 82nd Ave.
SE Johnson Creek Blvd	-	Line 7	New service along SE Johnson Creek Blvd from Sellwood to SE Fuller Rd MAX Station.
SE King Rd	**Line 33**, Line 71	**Line 33**	Line 71 re-aligned off of SE King Rd and 82nd Ave and new frequent service introduced.
SE Harmony Rd	**-**	**Line 71**	
Clackamas Town Center Transit Center	Lines 29, 30, 31, **33**, 34, 71, 79, 152, 155, 156, Clackamas County Connects Clackamas Industrial Shuttle Service and **MAX Green Line**	Lines 29, 30, 31, **33**, **71, 79**, 145, 152, 155, and **MAX Green Line**	New frequent service along Lines 71 and 79. Line 79 upgrade to Frequent Service is pending the availability of additional revenue to mitigate impacts of tolling the Abernethy bridge.

Source: TriMet.

Note: Bold denotes transfer available to frequent service line.

Figure 4-2. Transit Network



4.1.2. Transit Demand and Capacity

In the spring of 2022, Line 72 had the highest number of boardings of any bus line in the TriMet network and carried more passengers than the MAX Orange or Yellow Lines. Table 4-3 shows the top 11 TriMet lines by boardings in spring 2022.

Table 4-3. Top 11 TriMet Lines by Average Weekday Boardings (Spring 2022)

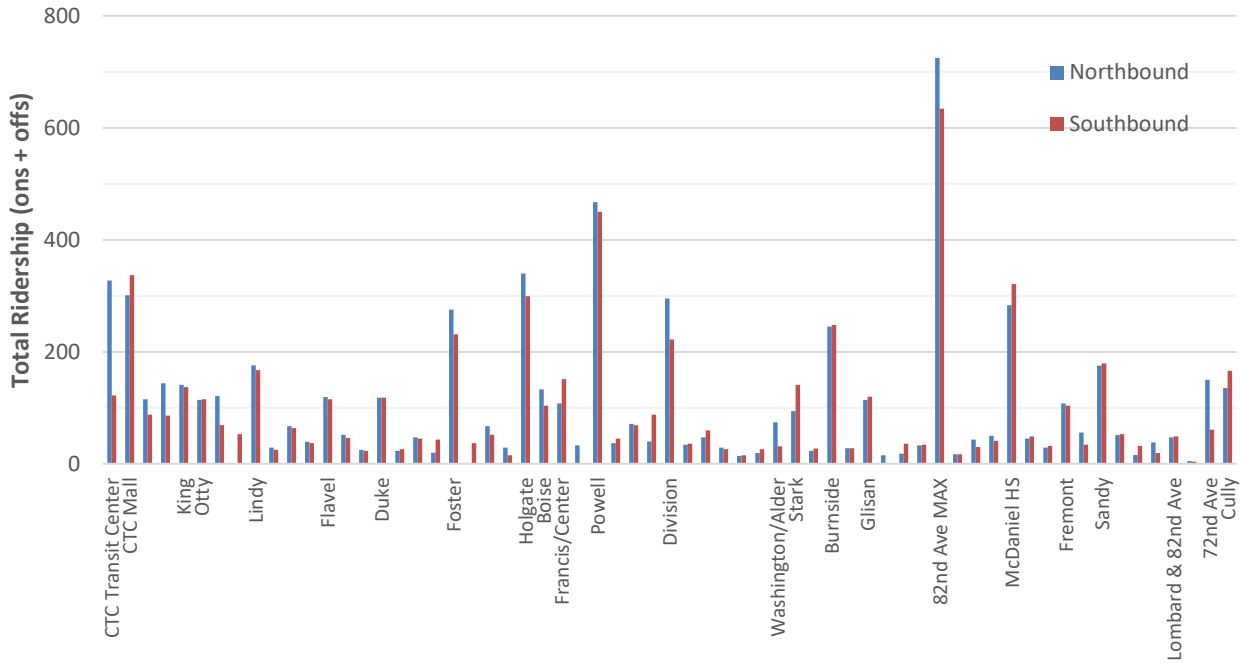
Line	Boarding Rides (Weekdays)
MAX Blue Line	23,150
MAX Red Line	10,960
MAX Green Line	10,260
72-Killingsworth/82nd Ave	**8,500**
MAX Yellow Line	6,840
20-Burnside/Stark	6,610
9-Powell Blvd	4,980
75-Cesar Chavez/Lombard	4,960
MAX Orange Line	4,880
57-TV Hwy/Forest Grove	4,510
2-Division[1]	4,470

Source: TriMet's Spring 2022 passenger census.

[1] Boardings on Line 2 counted before introduction of FX2 service along SE Division in September 2022.

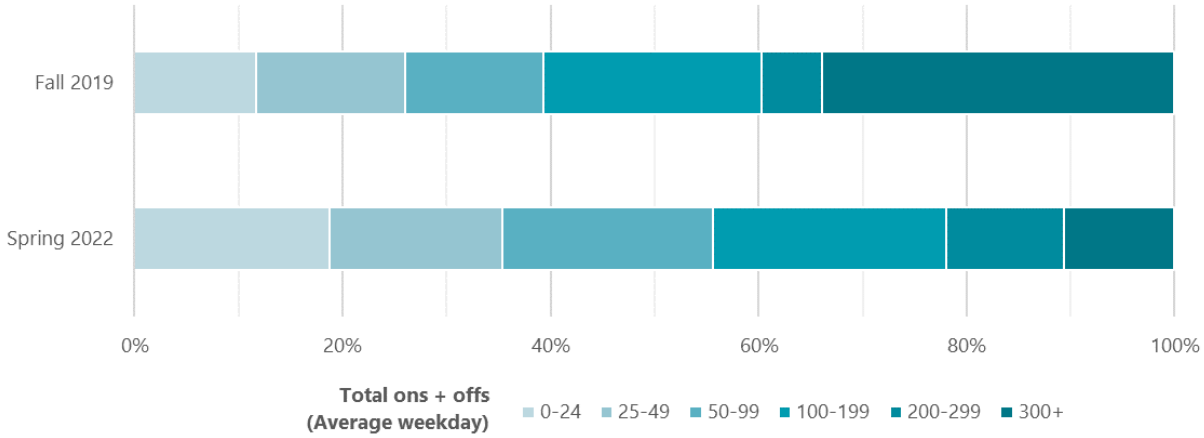
Figure 4-3 shows the ons and offs from TriMet's spring 2022 passenger census. Ons and offs are highest at the I-84 MAX stop, followed by Powell Boulevard, Holgate Boulevard, the stop serving Clackamas Town Center Mall on the north side, and McDaniel High School. Ridership is generally highest at locations where transfers are available to other TriMet lines. On-board passenger loads tend to be highest between Woodstock and Fremont. The highest loads, however, are more concentrated between Holgate and Burnside.

Figure 4-3. 2022 Average Weekday Ridership by Stop



Despite the high number of stops along 82nd Avenue, ridership on Line 72 is concentrated at key stops along the corridor. Low ridership stops (fewer than 50 people per day) accounted for approximately 60–70% of stops along 82nd Avenue. Conversely, in spring 2022, nearly one-fourth of the total ridership on Line 72 occurred at the six highest ridership stops. Figure 4-4 shows the distribution of stop-level ridership in both fall 2019 and spring 2022.

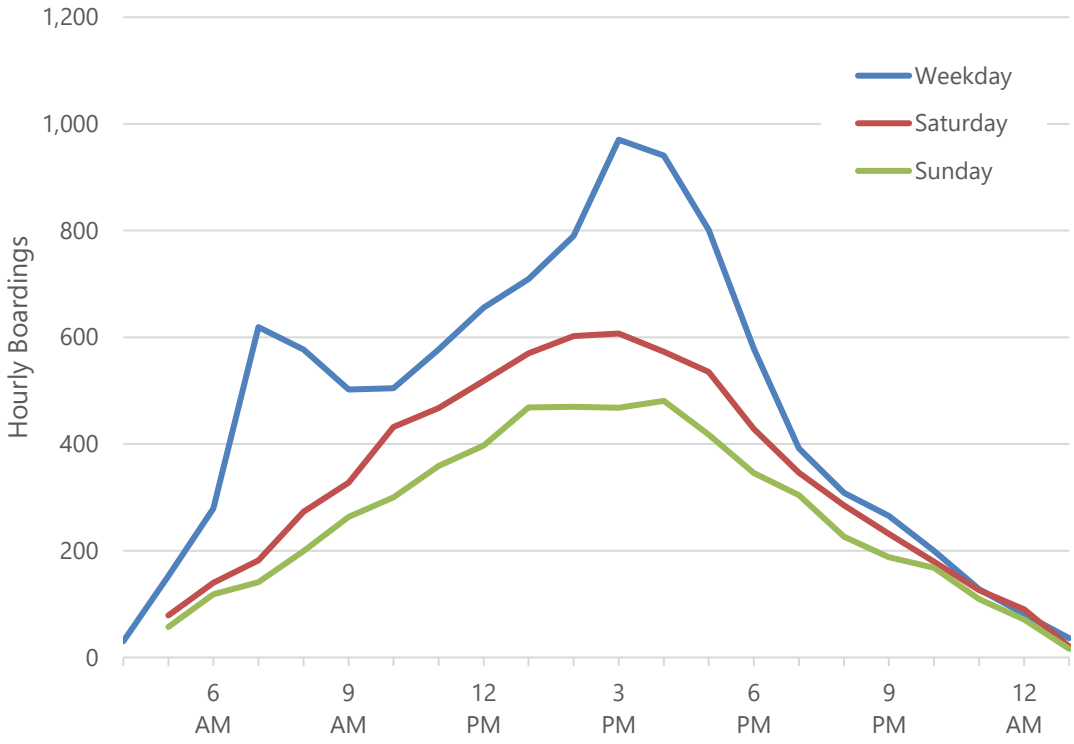
Figure 4-4. Stop-Level Ridership Summary (2019 and 2022)



Ridership by Time of Day

Boardings on Line 72 are the highest of any bus line in the TriMet system on both weekdays and weekends. Unlike many lines where ridership over the course of a weekday follows two distinct peaks – one during the morning commute and one during the evening commute – ridership on weekdays on Line 72 is much higher in the evening peak than the morning, while ridership during the middle of the typical weekday is equal to or higher than the morning peak. This indicates that riders use Line 72 for more types of trips than the typical 9–5 commute, such as medical appointments, shopping, or to get to and from essential service jobs. Additionally, Line 72 serves two major educational destinations – PCC Southeast and McDaniel High School – which contributes to the earlier afternoon peak demand than other lines.

Figure 4-5. Boardings by Hour by Day of the Week (Fall 2019)



Source: TriMet Fall 2019 AVL data

Ridership on weekends follows a more typical pattern over the course of both Saturday and Saturday, with the highest number of boardings occurring in the middle of both days roughly between 12 p.m. and 5 p.m.

Ridership on Connecting Services

As noted previously, Line 72 is an important north-south route in the TriMet network, connecting to several frequent service and other lines within the 82nd Avenue corridor. While specific data on transfers to and from Line 72 was not available at the time of this report, more generalized understanding of where transfer activity is most likely to occur can be gleaned from capturing ridership totals on lines that cross 82nd avenue at the stop immediately adjacent to the street. Table 4-4 shows total ridership on the services that connect to Line 72 at 82nd Avenue. Most activity occurs on lines that have frequent service, including Line 9 (Powell), Line FX2 (Division), Line 20 (E Burnside), and at the Clackamas Town Center Transit Center.

Table 4-4. Ridership on Cross Lines (Spring 2022)

Line	Street	EB Riders	WB Riders	Average	Rank
71	NE Prescott	30	24	27	14
12	NE Sandy	134	145	140	9
24	NE Fremont	27	39	33	13
MAX, 77	I-84/MAX	187	196	192	5
19 (N)	NE Glisan	38	39	39	11
20	E Burnside	254	228	241	4
15	SE Stark/Washington	85	108	97	10
2[1]	SE Division	272	269	271	3
9	SE Powell	354	300	327	2
17	SE Holgate	200	132	166	7
14	SE Foster	151	188	170	6
19 (S)	SE Duke	37	33	35	12
33, 71	SE King	148	150	149	8
Many	Clackamas Town Center TC	346	346	346	1

Source: TriMet's Spring 2022 Passenger Census

1 Boardings on Line 2 counted before introduction of FX2 service along SE Division in September 2022.

Comparing Ridership in 2022 to 2019

The portion of Line 72 within the 82nd Avenue corridor retained 64% of fall 2019 ridership in spring 2022, which is higher than all but a few frequent service lines. Table 4-5 shows the overall comparison of boardings on Line 72 between fall 2019 and spring 2022, while Figure 4-6 shows the stop-level ridership retention in each direction. Between 2019 and 2022, seven stops were removed or are no longer served, including stops at Russell (between McDaniel HS and Sacramento). The central portion of the corridor between Glisan and Woodstock experienced the lowest ridership retention, while the southern end of the corridor (generally south of Duke) retained the most ridership. 2022 ridership at McDaniel High School and the associated Sacramento stop appear very high compared to 2019 because campus was closed for renovation during Fall 2019 and ridership was much lower as a result.

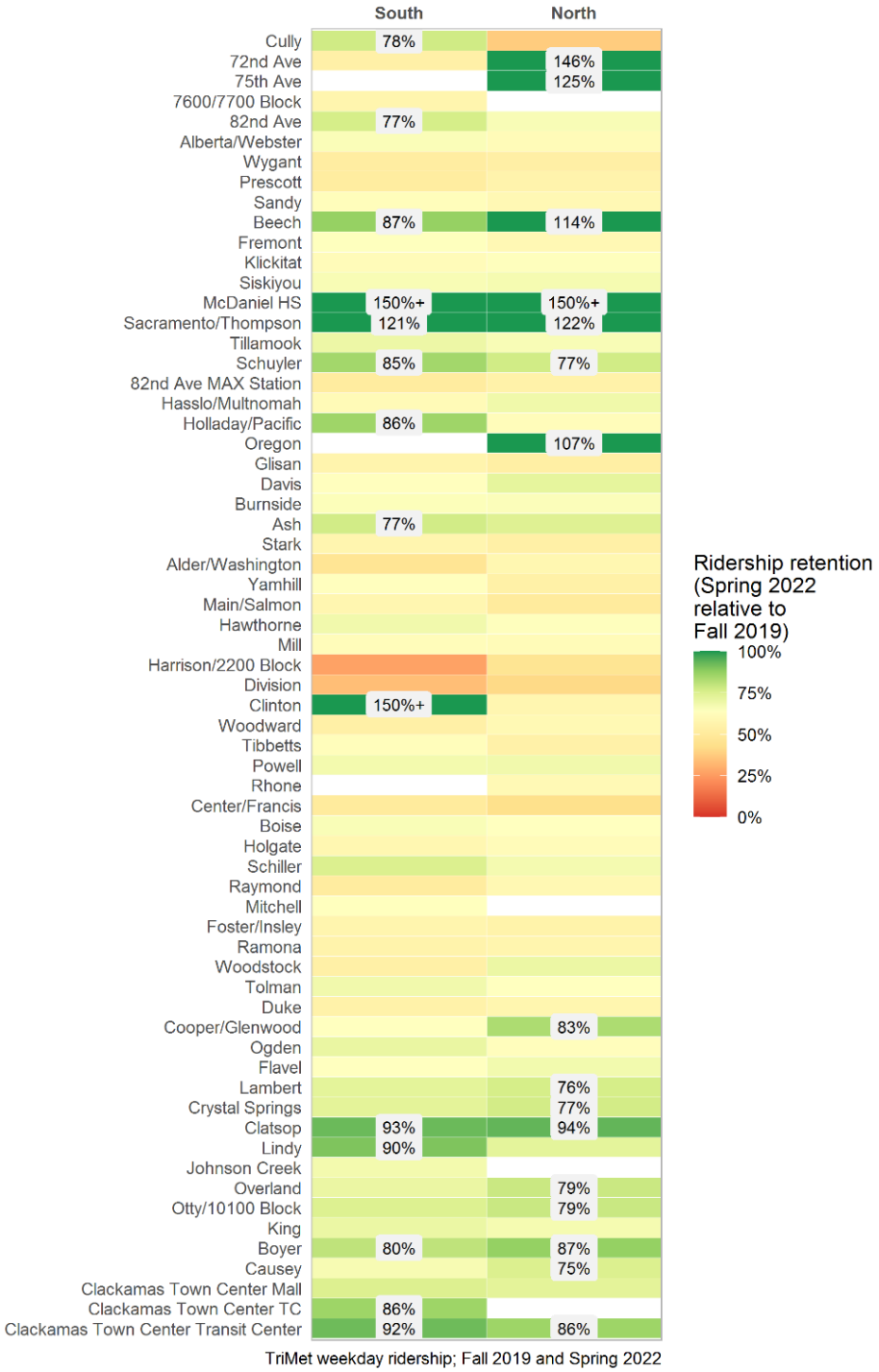
Table 4-5. Line 72 Boardings by Direction (Cully to Clackamas Town Center)

Day of Week	Direction	Fall 2019	Spring 2022	% Retained
Weekday	NB	5,431	3,558	66%
	SB	4,312	2,694	62%
	Total	**9,743**	**6,252**	**64%**
Saturday	NB	3,979	2,522	63%
	SB	3,098	1,919	62%
	Total	**7,077**	**4,441**	**63%**
Sunday	NB	3,147	2,096	67%
	SB	2,431	1,587	65%
	Total	**5,578**	**3,683**	**66%**

Source: TriMet Fall 2019 and Spring 2022 Passenger Census

Figure 4-6 shows the distribution of stops by total boarding activity (both "ons" and "offs") between fall 2019 and spring 2022. In 2019, there was a much higher percentage of stops experienced high amount of activity (the darker color toward the right of the graphic), while ridership in Spring 2022 wasn't as concentrated at high-volume stops.

Figure 4-6. Line 72 Stop-Level Ridership Retention by Direction (Cully to Clackamas Town Center)



4.1.3. Summary

The 82nd Avenue corridor sees some of the highest demand for transit in the entire Portland region. Line 72 carried the highest bus ridership in the TriMet network on weekdays as well as weekends in both fall 2019 and spring 2022, and the 82nd Avenue portion of the line accounts for most of the line's total ridership (75%). Ridership has rebounded since the pandemic but has come back stronger in the Clackamas County portion than the City of Portland segment. Midday ridership is high on both weekdays and weekends,

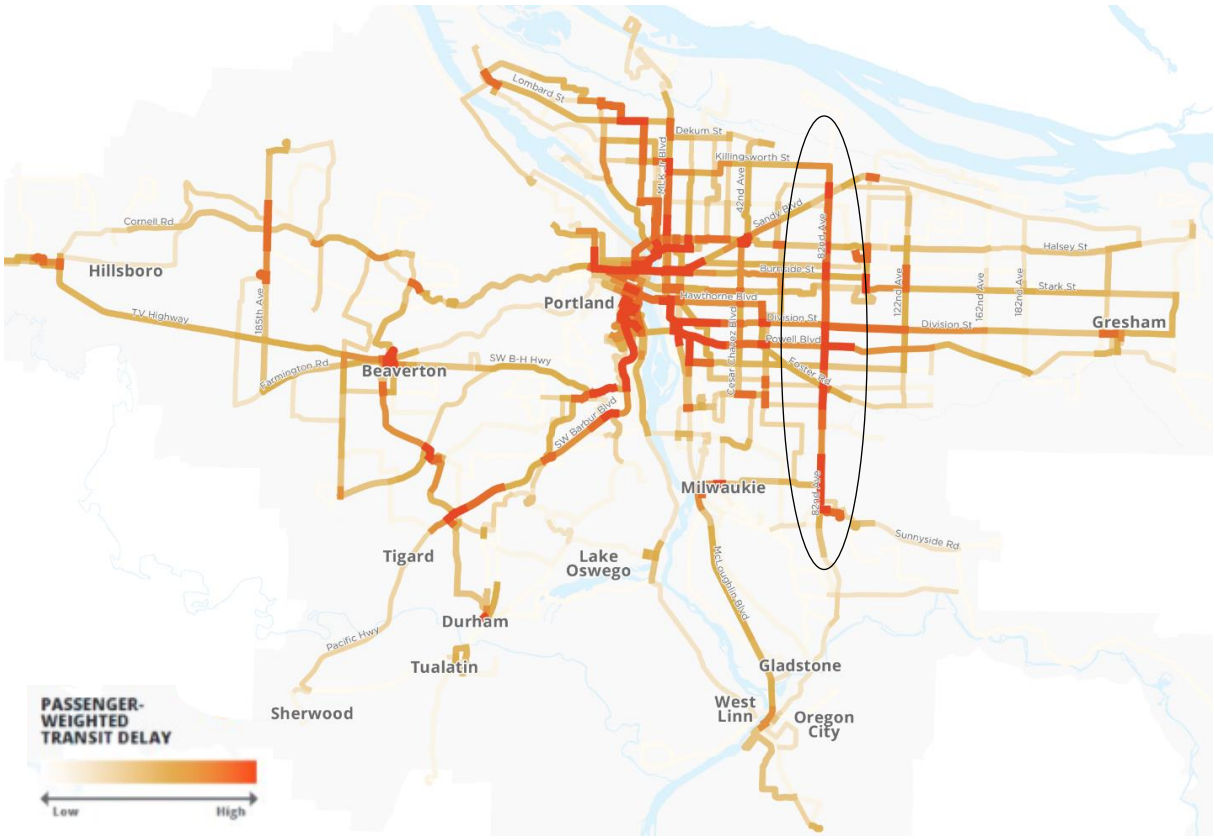
indicating higher prevalence of non-peak trips (e.g., shopping trips and medical appointments). Ridership is high at stops located at transfer points, especially near frequent service lines. Ridership is concentrated at a few significant stops (1/4 of all boardings occurred at only 6 stops in 2022), and many stops have few to no boardings per day. These closely spaced, low ridership stops could indicate opportunities for stop optimization.

82nd Avenue is a constrained corridor with relatively narrow right-of-way. Expanding the street's people-moving capabilities will be challenging without increasing the capacity of transit serving the corridor. This can be done through any combination of introducing higher-capacity transit buses, increasing the frequency of service, and providing transit priority treatments that help transit vehicles move more efficiently throughout the corridor.

4.2. Transit Speed and Reliability

Because the 82nd Avenue corridor experiences such a high demand for transit, slow transit speeds and delayed buses on Line 72 affect far more riders than on most other transit services in the Portland area, as seen in Figure 4-7.

Figure 4-7. TriMet Network-Wide Transit Delay (82nd Ave Highlighted)



Source: Metro and TriMet. Get Moving 2020 Better Bus Report. September 2020.

Bus speed and reliability is primarily affected by the following:

- **Street design & operations.** Buses can only operate as quickly and efficiently as the street systems and design can accommodate, meaning that roadway geometry, signal spacing, and other measures that affect car speeds also affect the speed of buses.
- **Traffic congestion.** Without dedicated space, buses are stuck in the same congestion that automobiles experience along 82nd Avenue today.
- **Stop activity.** Buses must slow down when approaching bus stops, wait for passengers to board and alight, and then accelerate back to running speed. Also, the bus needs to wait to merge into a gap in the traffic if the stop is not in-lane.

TriMet collects data on bus operations through automated vehicle location (AVL) devices, which provide a granular level of data on bus speed and reliability between every bus stop on 82nd Avenue. Although TriMet collects this data continuously, the 82nd Avenue Transit team had ready access to processed data from 2019.

4.2.1. Bus Travel Times and Delay

Bus running speeds averaged between 10 and 27 mph in 2019, compared to the theoretical maximum speed represented by the speed limit, which is 30 mph in the City of Portland and 35 mph in Clackamas County. Bus speeds are generally slower in the afternoon and evening compared to the morning. Figure 4-8 shows average bus running speeds in both the a.m. peak and the p.m. peak.

The total time it takes for buses to complete a trip includes both running time and dwell time. As shown in Table 4-6 and Table 4-7, travel time between Cully and Clackamas Town Center Transit Center on a bus could be as short as 40 minutes, which is the average travel time in the northbound direction in the early morning. Between early morning and the afternoon peak, buses on average experience 13 additional minutes of total travel time southbound and 21 additional minutes of total travel time northbound. Both run times and dwell times increase in the middle of the day.

Table 4-6. Average One-Way Bus Travel Time (Weekdays, Fall 2019)

	Southbound (Cully > CTC)			Northbound (CTC > Cully)		
	Run Time	Dwell Time	Travel Time	Run Time	Dwell Time	Travel Time
Early a.m.	39	7	46	34	6	40
A.m. Peak	42	9	51	40	8	48
Midday	44	13	57	42	12	54
P.m. Peak	50	9	59	50	11	61
Evening/Night	40	8	48	39	10	49
Daily Average	**43**	**10**	**53**	**43**	**10**	**53**

Source: TriMet AVL data provided in 2020

Table 4-7. Average One-Way Bus Travel Time (Weekdays, Fall 2019)

	Southbound (Cully > CTC)			Northbound (CTC > Cully)		
	Run Time	Dwell Time	Travel Time	Run Time	Dwell Time	Travel Time
Early a.m.	39	7	46	34	6	40
P.m. Peak	50	9	59	50	11	61
Percent Difference	**30%**	**29%**	**28%**	**47%**	**83%**	**52%**

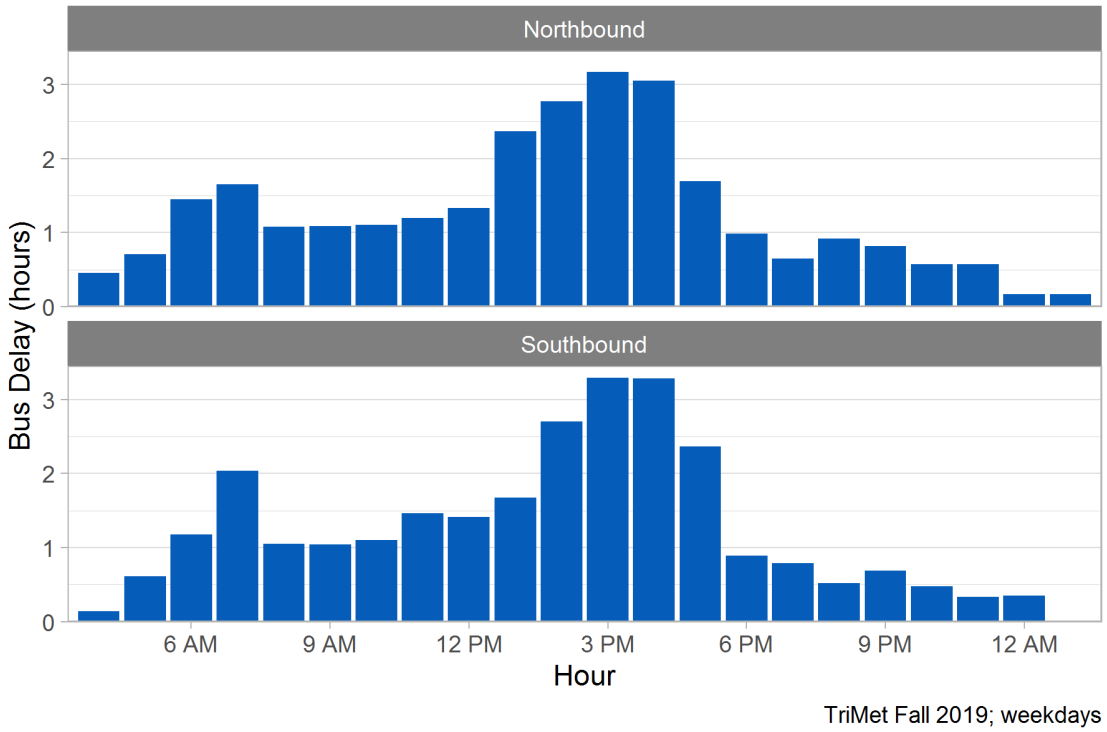
Source: TriMet AVL data provided in 2020

Delay is a measure of variability experienced over time. TriMet calculates this as the difference between the 20th and 80th percentile run times between individual stops on a particular trip (excluding time at bus stops). The cumulative delay among multiple trips and stops is used to represent aggregate delay along a route. Delay can be multiplied by the number of passengers on-board to calculate passenger delay – or the delay experienced by individual passengers. Due to both travel speed variability and high usage, Line 72 experiences the highest cumulative passenger delay in the TriMet system. Of the delay experienced on Line 72, delay is greatest along 82nd Avenue. Passenger delay per mile per trip along 82nd Avenue is 114% greater (or more than twice as high) than along Killingsworth. If Line 72 were split into two routes, the 82nd Avenue portion would rank first for passenger delay normalized by miles and trips among all TriMet bus lines, while the Killingsworth portion would drop to nineteenth. Figure 4-9 shows the delay experienced by buses on the 82nd Avenue portion of Line 72 in 2019 by time of day and direction. Delay is most prominent in the afternoon and evening, generally between 1 p.m. and 6 p.m.

Figure 4-8. Average Bus Speeds During Peak Periods

Source: TriMet Fall 2019

Figure 4-9. Bus Delays on 82nd Ave by Direction (Weekdays, 2019)



Overall, buses experienced 15 minutes of delay on average per weekday trip on 82nd Avenue in 2019, which accumulates to 55 hours of bus delay over the course of a typical weekday. Passengers on board Line 72 on 82nd Avenue experienced 22 total hours of passenger delay on average per weekday trip (for all passengers, over a single bus trip), which is 4,854 hours of total passenger delay on a typical weekday in 2019.

Delay is not distributed evenly throughout the corridor. Table 4-8 shows the top ten locations for passenger delay within the corridor. The magnitude of delay at Powell, Division, and Glisan is significantly higher than other locations throughout 82nd Avenue, due to both high passenger loads and significant impacts from vehicular traffic at these locations. Figure 4-10 shows daily delay along 82nd Avenue, while Figure 4-11 shows delay in both the a.m. and p.m. peak periods.

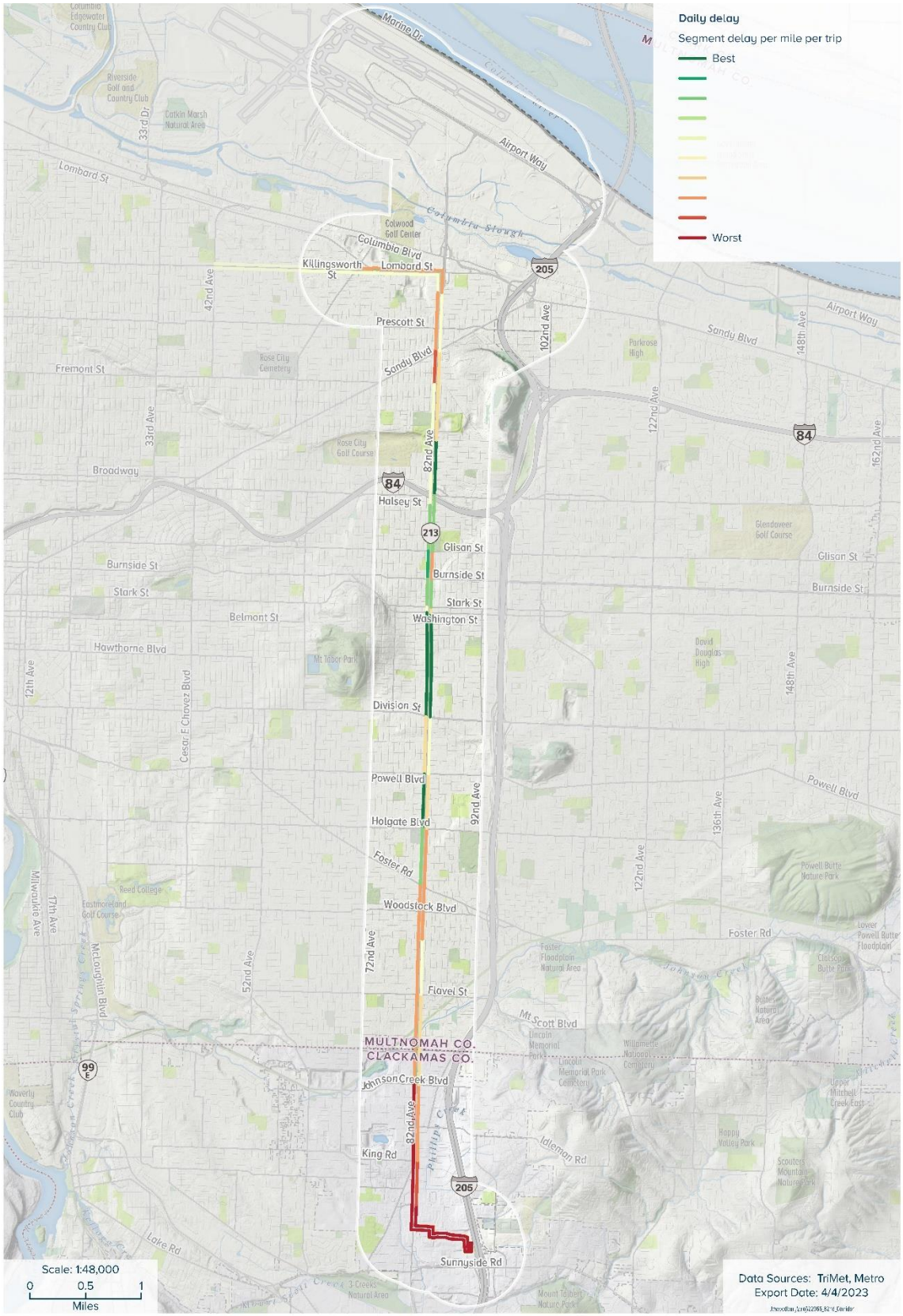
Table 4-8. Top Ten Intersections for Passenger Delay (Weekdays, 2019)

Rank	Intersection	Passenger Delay Per Mile (Hours)
1	SE Powell	173.1
2	SE Division	137.3
3	NE Glisan	113.7
4	SE Flavel	94.4
5	SE Woodward	87.6
6	SE Woodstock	87.1
7	SE Boise	87.0
8	NE Sandy	77.8
9	NE Fremont	73.1
10	SE Foster	69.3

Source: TriMet Fall 2019

Passenger Delay is calculated for the stop pairs approaching each intersection. Delay from both directions is combined into the values shown here. Stop pairs for the 82nd Ave MAX Station and at SE Stark/SE Washington include two approach stop pairs in each direction.

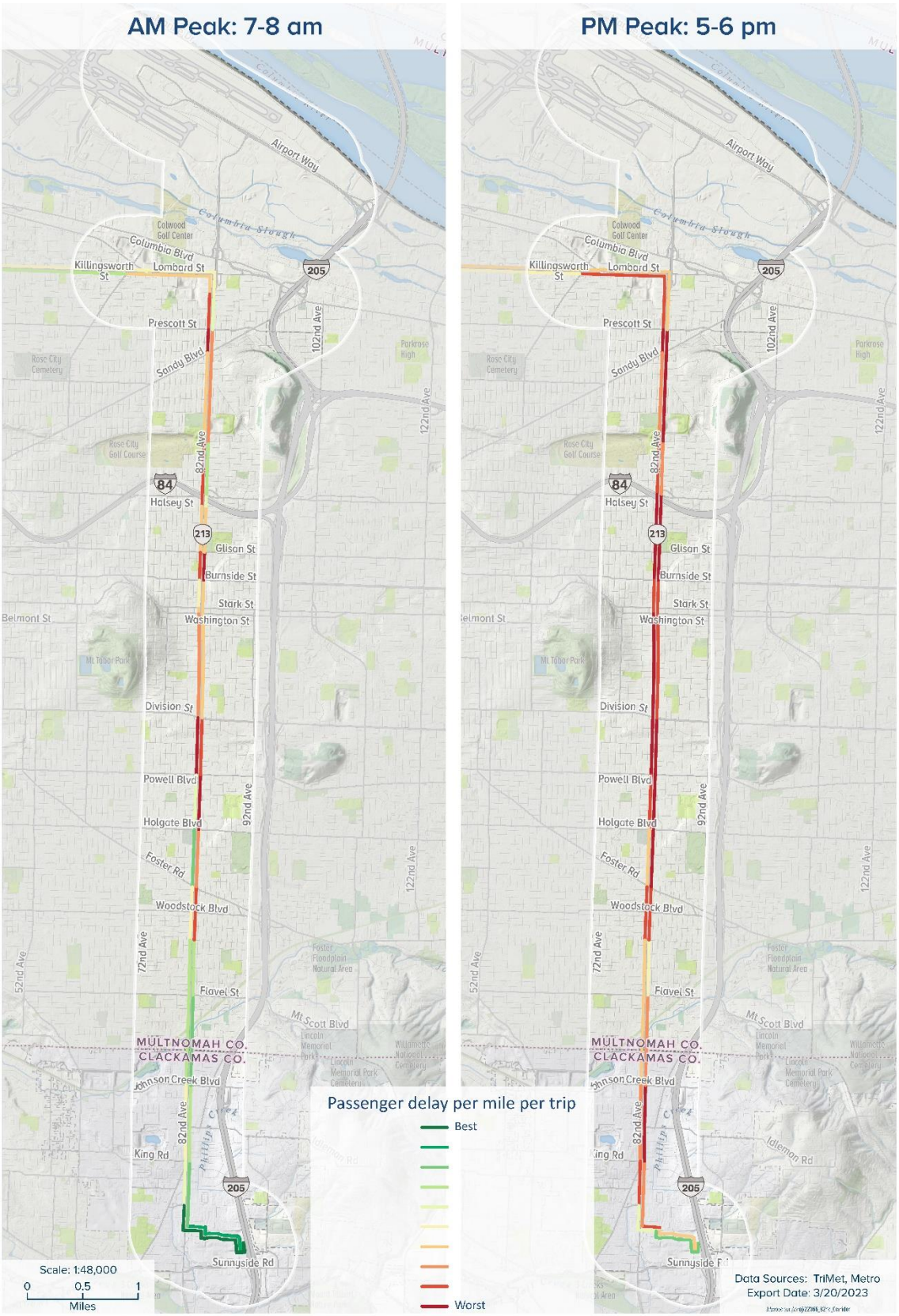
Figure 4-10. Daily Bus Delay along 82nd Ave (Weekdays, 2019)



Source: TriMet Fall 2019.

Note: Multiple stop pairs are grouped into the segments shown here.

Figure 4-11. Passenger Delay During Peak Period on 82nd Ave (Weekdays, 2019)



Source: TriMet Fall 2019.

Note: Multiple stop pairs are grouped into the segments shown here.

Table 4-9 shows the top ten intersections that experience the widest range in transit travel times in both the northbound and southbound directions. A wider range of travel times indicates higher variability and higher levels of delay. High variability means that people can miss a critical doctor's appointment or be late to work. Worry about being late can also make it so people must catch an earlier bus to provide a buffer of time. In general, most intersections experience higher travel time variability in the northbound direction than the southbound, including each of the listed intersections in the northbound list except for Powell. No intersections in Clackamas County have travel time variability ranking within the top ten in either direction.

Table 4-9. Top Ten Intersections for Travel Time Variability by Direction (Weekdays, 2019)

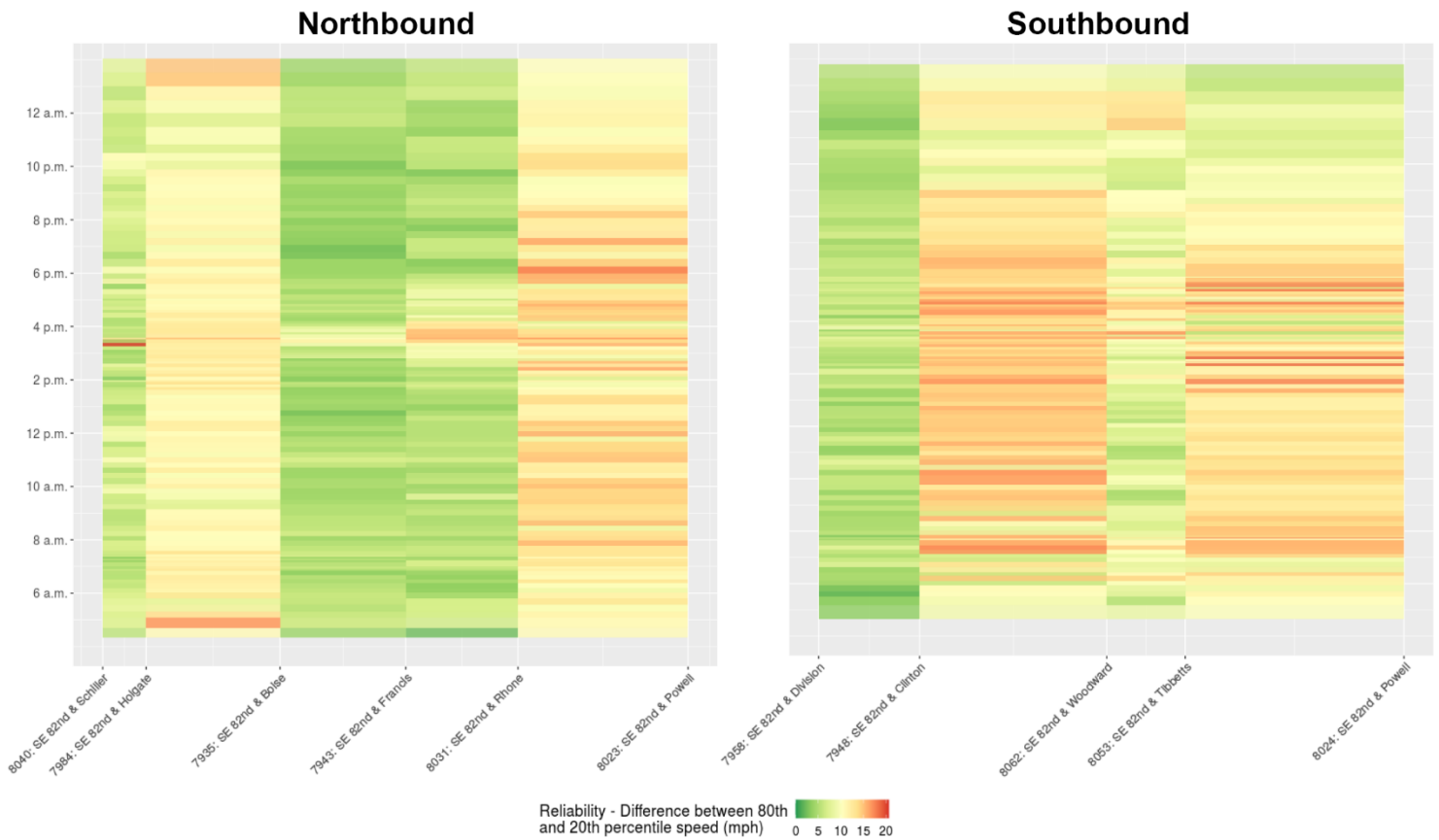
Southbound				Northbound			
Rank	**Intersection**	**Range (20th–80th percentile run time, seconds)**	**Total Variability**	**Rank**	**Intersection**	**Range (20th–80th percentile run time, seconds)**	**Total Variability**
1	SE Powell	35–138	**103**	1	SE Powell	30–120	90
2	SE Woodward	25–64	**39**	2	SE Division	22–77	**55**
3	NE Prescott	33–67	**34**	3	NE Glisan	24–77	**53**
3	SE Division	22–56	34	4	NE Killingsworth	66–114	**48**
5	NE Sandy	25–57	32	5	NE Sandy	38–82	**44**
6	82nd Ave MAX Station	29–56	**27**	6	SE Holgate	35–77	**42**
7	SE Duke	21–46	**25**	7	SE Flavel	23–63	**40**
8	NE Fremont	15–38	23	8	SE Foster	27–61	**34**
9	NE Glisan	23–45	22	9	SE Boise	19–51	**32**
10	SE Flavel	22–42	20	10	NE Siskiyou	20–51	**31**

Source: TriMet Fall 2019

Travel Time Variability is calculated for the stop pair approaching the intersection. Values are not normalized by distance. Both the range and the difference between the 20th and 80th percentile run times (excluding dwell) are listed. Data is for all trips throughout the entire day.

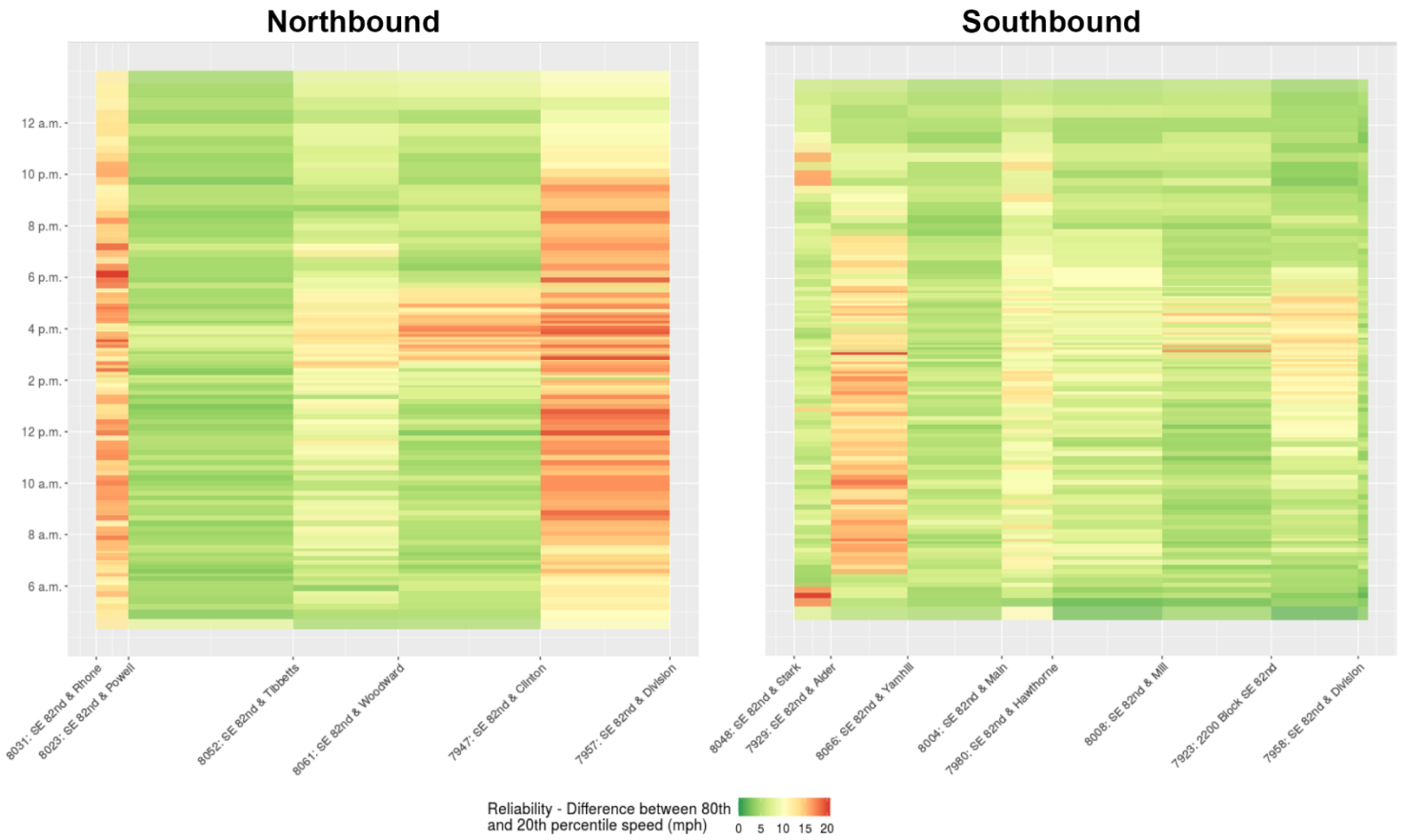
Travel time also varies significantly by time of day. Figure 4-12 through Figure 4-14 show a snapshot of delay by time of day at the three highest delayed intersections on 82nd Avenue (Powell, Division, and Glisan) The vertical axis is time of day (morning at the bottom and evening at the top), and the horizontal axis is the stops along the route (for an individual group of stops). Bus travel direction is always shown left to right. Stops are spaced relative to their distances between each other. Darker shades of orange and red indicate higher levels of delay, with green indicating low levels of delay. Delay is generally worse in the evening at all three intersections in both directions. However, there are some times of day when the delay at the intersection is so high it affects delay at the preceding stop pair, as seen on northbound 82nd Avenue approaching Division, where reliability is negatively affected back to SE Tibbetts from about 2 p.m. to 6 p.m. Some locations along the corridor experience delay at almost all times of day – for example, northbound 82nd Avenue buses experience delay almost all day at Division.

Figure 4-12. Travel Time Reliability by Time of Day at 82nd Ave and Powell (Weekdays, 2019)



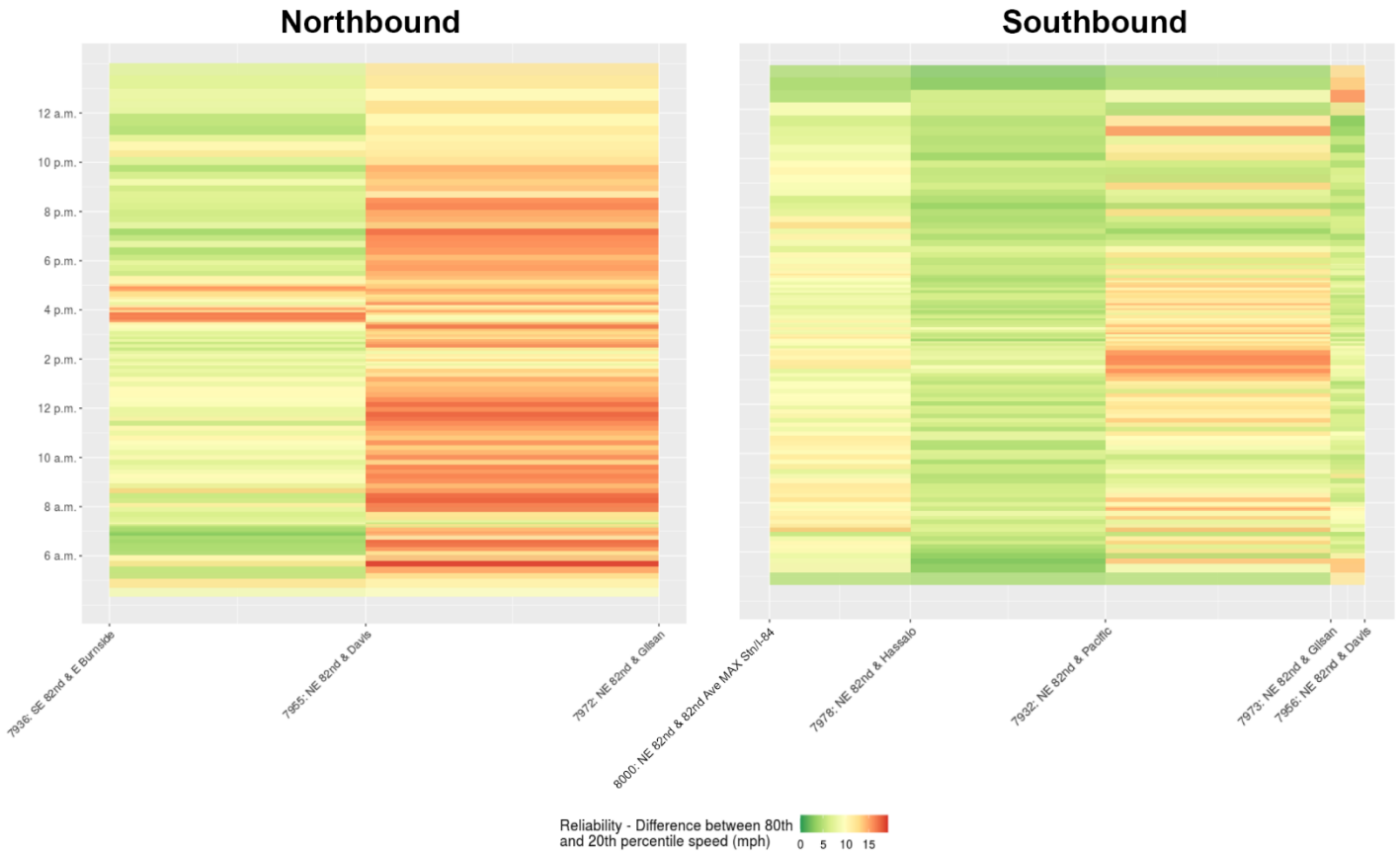
Source: TriMet Fall 2019

Figure 4-13. Travel Time Reliability by Time of Day at 82nd Ave and Division (Weekdays, 2019)



Source: TriMet Fall 2019

Figure 4-14. Travel Time Reliability by Time of Day at 82nd Avenue and Glisan (Weekdays, 2019)



Source: TriMet Fall 2019

4.2.2. Traffic Congestion

Buses on 82nd Avenue today are stuck in the same traffic congestion that automobiles experience within the corridor. The 82nd Avenue corridor study includes a comprehensive analysis of existing and future (2040) traffic outlined in a separate report (Appendix C). Part of this traffic analysis included a comparison of baseline transit travel times within the City of Portland from SE Clatsop to NE Sandy for both existing (2022) traffic conditions as well as forecast travel times for transit in 2040 given expected changes in traffic conditions.

Table 4-10. Existing and Future Baseline Transit and Automobile Travel Times within City of Portland

Transit	Total Travel Time (82nd at Clatsop to 82nd at Sandy, mins)	
	Southbound	Northbound
Existing Conditions (2022)	32.2	34.3
Future Baseline Conditions (2040)	39.4	43.0
Percent Change	+22%	+25%
Automobile	**Total Travel Time (82nd at Clatsop to 82nd at Sandy, mins)**	
	Southbound	Southbound
Existing Conditions (2022)	18.6	20.2
Future Baseline Conditions (2040)	26.5	30.8
Percent Change	+42%	+52%

Source: Portland Civic Corridor Traffic Analysis, DKS Associates

Overall, transit travel times are significantly longer than automobile travel times in both the existing conditions and future baseline condition within this segment of 82nd Avenue. However, transit travel time is expected to rise less than auto travel time. This is likely because buses already experience significant delay along the corridor, so the rate of increase is comparatively less than the increase for autos.

4.2.3. Bus Stop Activity

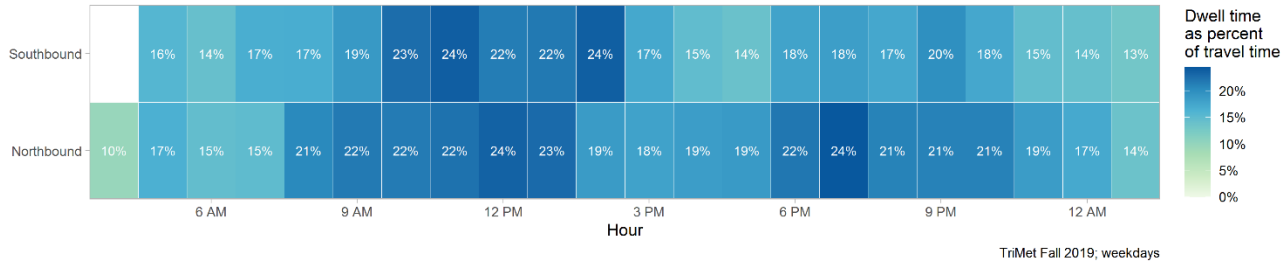
In addition to delay caused by general congestion, buses on 82nd Avenue experience longer overall travel times due to the number of stops and length of time buses spend dwelling at each stop. Overall, an average trip along 82nd Avenue between Cully and Clackamas Town Center Transit Center lasts approximately 53 minutes. As seen in Table 4-11 and Figure 4-15, dwell time is approximately ten minutes, or 20% of that total trip time. Dwell time as a percent of travel time is greatest between 8 a.m. and 3 p.m. when passenger load is highest and boarding/alighting times are longest, and from 6 p.m. to 8 p.m., approaching one-quarter of total travel time.

Table 4-11. Dwell Time Compared to Total Transit Travel Time

Direction	Average travel time	Average dwell time	Percent dwell time
North	52.6 min	10.3 min	19.6%
South	53.2 min	9.9 min	18.6%

Source: TriMet Fall 2019

Figure 4-15. Dwell Time by Time of Day and Direction



At the stop level, average dwell time along 82nd Avenue is 20 seconds, but that dwell time can vary depending on whether a rider requests a lift. The average dwell time for stops without lifts is 19 seconds, while the average for stops with lifts is 75 seconds (which occurs at approximately 2% of stop events). As shown in Figure 4-16, most stop events with lifts experience a dwell time between 35 and 125 seconds, while stop events without lifts experience dwell time between 5 and 25 seconds. TriMet's goal for dwell time for FX service is 20 seconds, meaning that the current dwell time without lifts falls within the target for high performing transit service and that implementing near-level boarding could facilitate easier and more convenient boarding for passengers who currently need to request lifts. Near-level boarding typically uses a platform height of nine inches (compared to a typical curb height of six inches) to facilitate easier boarding and reduce the need for lifts.

Figure 4-16. Stop-Level Dwell Time Distribution with and without Lifts

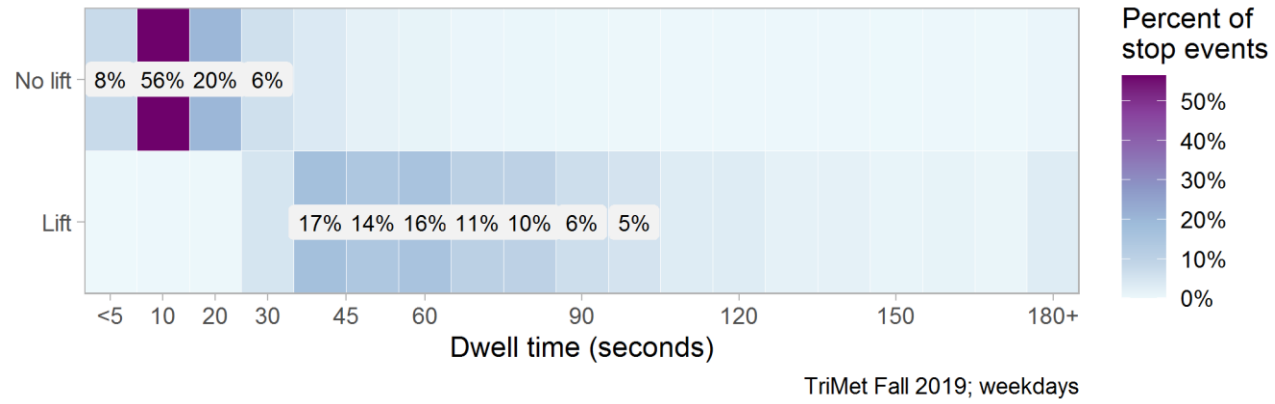
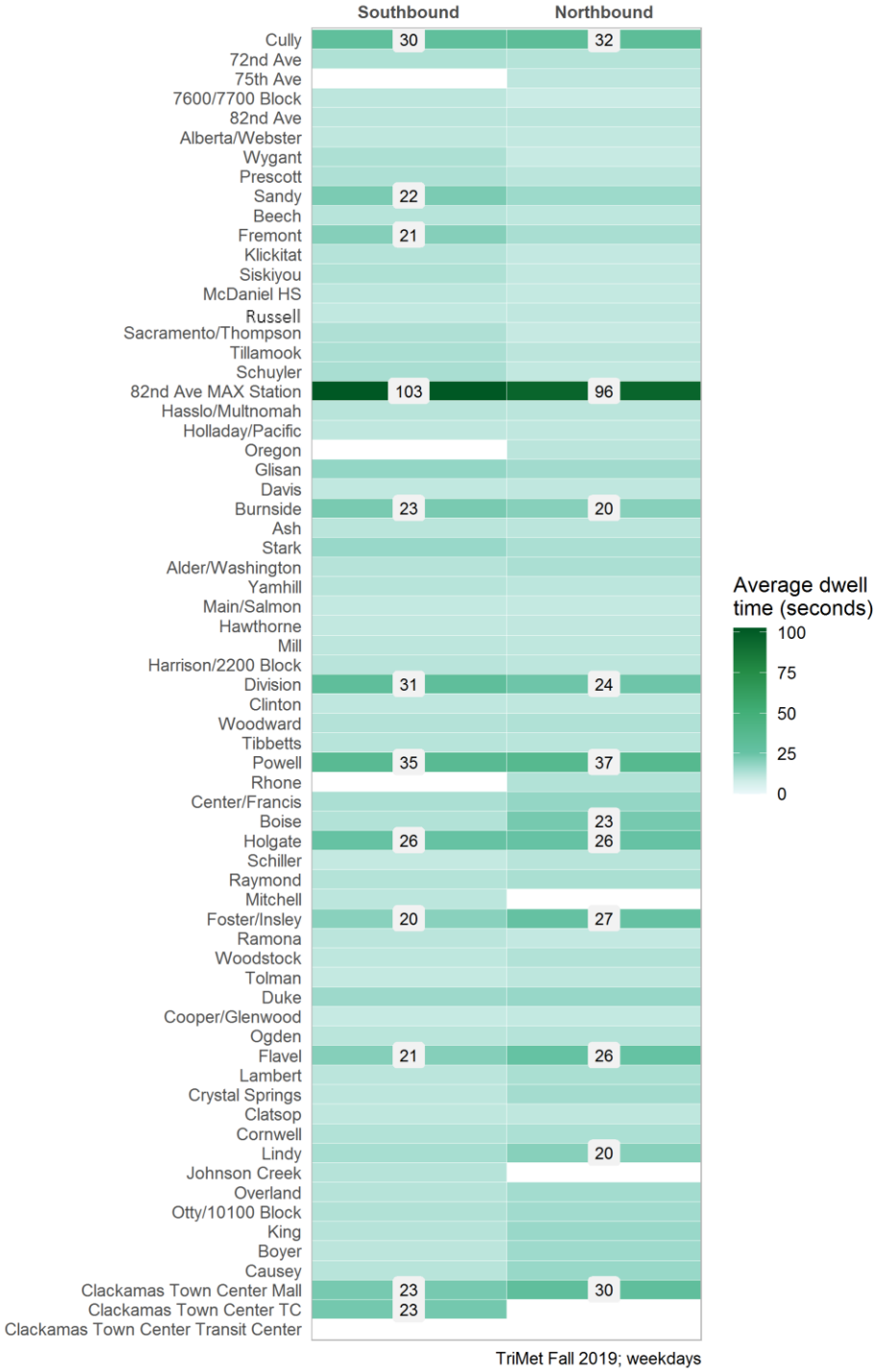


Figure 4-17 shows average dwell time by stop by direction. Other than the stop at I-84/MAX (which includes a scheduled hold of 0–120 seconds to facilitate transfers to the MAX lines), the longest dwell time occurs at Powell, Cully, Division, Holgate, and Flavel. Stops such as Boise that feature a pullout for the bus to board and passengers to alight also show higher average dwell than other stops, which could indicate additional time buses have to wait to re-enter traffic. Providing in-lane bus stops without pullouts can help minimize additional dwell time caused by vehicular traffic.

Figure 4-17. Average Dwell Time by Stop by Direction



Without the ability to make level or near-level boardings, riders using wheelchairs, strollers, or other mobility devices are forced to request the deployment of the lift ramp, which the driver must complete manually. An FX improvement with near-level boarding would reduce the need for lifts and improve the convenience and mobility for those who must use the ramp as well as the travel times for other riders on the bus. The number of lifts that riders request can significantly impact the length of dwell time at each

stop, while also increasing trip and travel time for those who need them. Table 4-12 shows the top ten stops by the percentage of total monthly lifts requested. Most of these stops are located within the Clackamas County portion of the 82nd Avenue corridor.

Table 4-12. Top Ten Stops by Percent Lifts Requested (Average Weekday)

Rank	Stop	Monthly lifts requested	Monthly lifts requested (as a percent of monthly ridership)
1	Johnson Creek	38	3.6%
2	Oregon	9	3.0%
3	Boyer	132	2.9%
4	Flavel	133	2.8%
5	Lindy	185	2.7%
6	Otty/10100 Block	119	2.6%
7	Boise	105	2.2%
8	72nd Ave	90	2.1%
9	Overland	79	2.1%
10	Crystal Springs	54	2.1%

Source: TriMet Spring 2022 Passenger Census

Note: Monthly ridership estimated by multiplying daily ridership (boardings and alightings) by 20 to represent a typical month.

As noted previously, there are 122 individual stops along the 82nd Avenue portion of Line 72 (between NE Cully and Clackamas Town Center). This equates to an average of 850' between each stop, or 6–7 stops per mile. As shown in Figure 4-18, the vast majority of stops are located less than 1/8 of a mile (or 660') from the next stop, which is significantly closer than the average stop spacing of 1/4 to 1/2 of a mile on most BRT systems and closer than TriMet spacing standards, which vary between 1,000 and 1,600' (or 5–6 blocks) depending on the line context. More frequent stops generate longer travel times, as the bus must decelerate, load passengers, merge back into traffic, and re-accelerate at each stop. Figure 4-19 shows how stop spacing differs along the corridor. In general, stops are spaced farther apart in Clackamas County and closest together in Northeast Portland and Montavilla.

Figure 4-18. Stop Spacing for Line 72 on 82nd Ave (Chart)

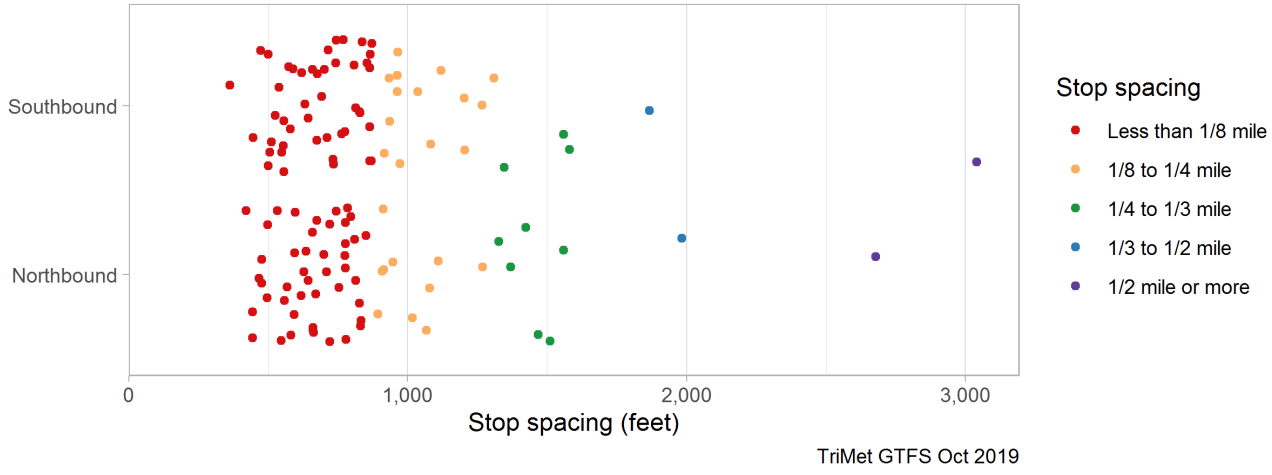
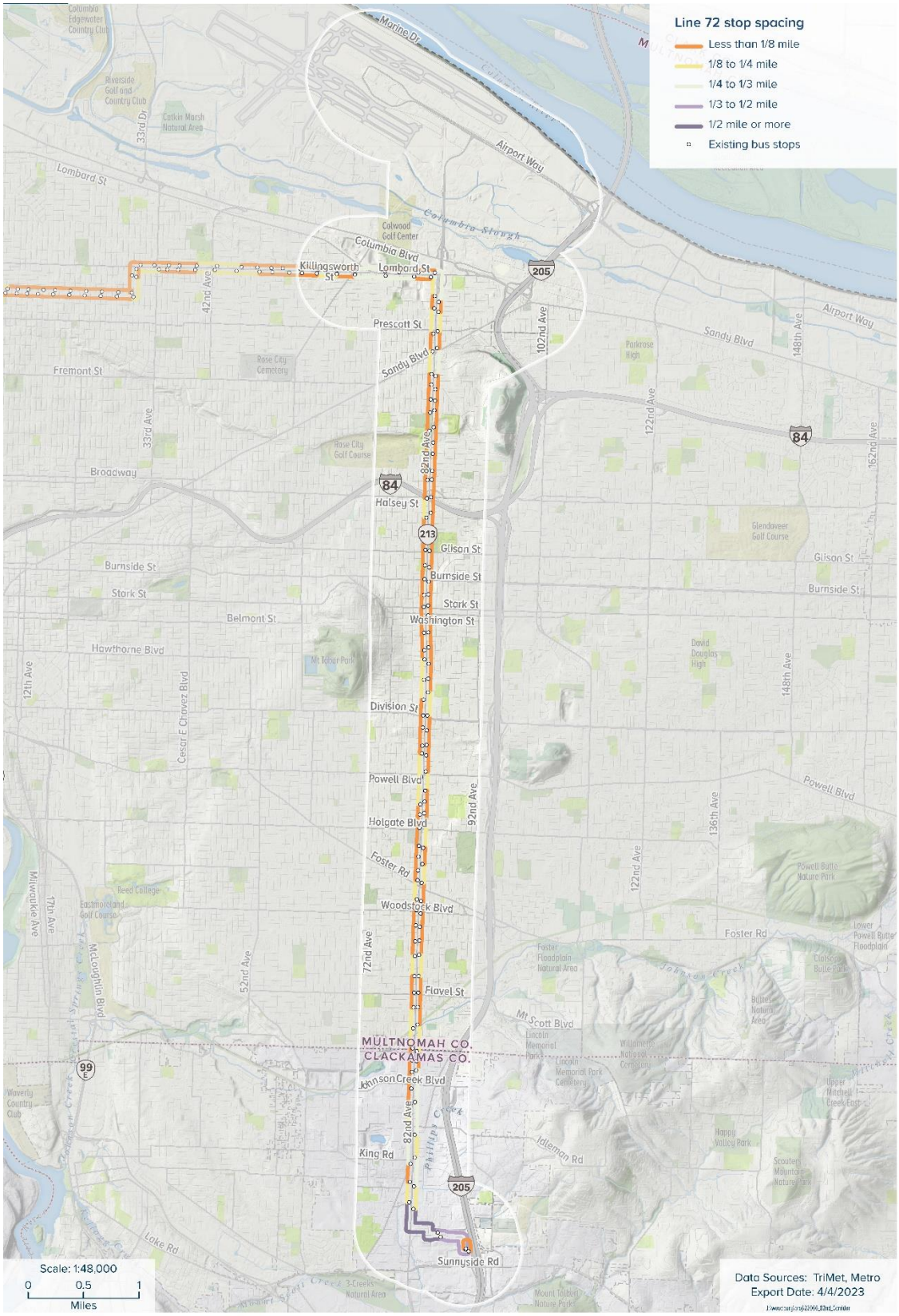


Figure 4-19. Stop Spacing for Line 72 on 82nd Avenue



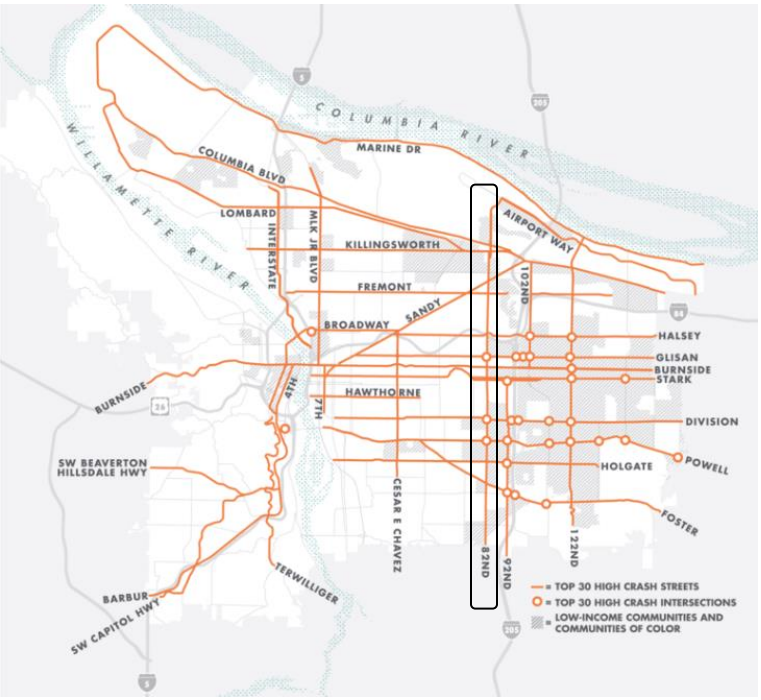
4.2.4. Summary

Line 72 experiences the most passenger delay in the TriMet network, and the 82nd Avenue portion accounts for most (82%) of the passenger delay on Line 72. Transit travel times are significantly longer than auto travel times and are forecast to increase as traffic congestion worsens (Appendix C). Transit speed and reliability is generally worse in the afternoons and evenings, especially in the northbound direction, and unlike many corridors, there are significant speed and reliability issues on weekends, especially near major retail destinations (e.g., the Jade District and Clackamas County). The intersections at Powell & Division currently experience the highest magnitude and variability of transit delay and will continue to get worse as traffic congestion increases. This delay can have cascading effects on upstream intersections as queues spill back to adjacent intersections, highlighting the need to consider comprehensive speed and reliability improvements beyond the worst intersections. Stops are spaced closely together in the 82nd Avenue corridor; closely spaced, low-ridership stops may present opportunities to consolidate stops and decrease the total dwell time experienced by buses on 82nd Avenue.

4.3. Transit Access and Safety

Safe access to transit – especially for riders who walk or roll to transit stops – is critical to an equitable, successful transit system and project. 82nd Avenue is one of the highest need corridors based on crash prevalence and severity in the Portland region, especially for crashes involving pedestrians. The corridor is both a City of Portland High Crash Network Street and on Metro's High Injury Corridor network, including the segment within Clackamas County. The corridor contains three of the 30 top crash intersections in the City of Portland at Glisan, Division, and Powell – the first two of which are also in the top 1% of regional high injury intersections. Figure 4-20 shows the 82nd Avenue corridor within the City of Portland's High Crash Network.

Figure 4-20. City of Portland High Crash Network



Source: Portland Bureau of Transportation

4.3.1. Crashes

Crashes along 82nd Avenue are primarily concentrated at major intersections. Given the local service nature and lack of parking spaces provided along Line 72, most riders arrive at stops by walking or rolling. Pedestrians and cyclists are the most vulnerable road users and have suffered the majority of fatalities from crashes along 82nd Avenue.

In the five years of crash data collected between 2015 and 2019, there were 8 bike/pedestrian fatalities along 82nd Avenue, representing 62% of the total number of fatalities experienced in the same period. From north to south, those fatalities occurred at:

- Halsey (pedestrian)
- Glisan (pedestrian)

- Davis (pedestrian)
- Clinton (pedestrian)
- Henderson (bike)
- Flavel (two fatalities: one bike, one pedestrian)
- Overland (pedestrian)

Table 4-13 shows the top ten existing bus stops in close proximity to crashes by frequency of crashes overall, as well as the top ten for frequency of crashes causing a fatality or serious injury and involving pedestrians or bicyclists. Bus stops near high-crash intersections such as Glisan, Sandy, Holgate, Burnside, and Division stand out for many of these categories. Although there are a high number of crashes within Clackamas County, there are fewer bus stops and their locations tend to be farther from major intersections, so there are fewer crashes near bus stops in Clackamas County than in the City of Portland.

Table 4-13. Bus Stops with Highest Frequency of Different Crash Types within 100' (2015–2019)

Rank	Overall Crashes		Fatal and Serious Injury Crashes		Pedestrian Crashes		Bicycle Crashes	
	Stop Location	Number	Stop Location	Number	Stop Location	Number	Stop Location	Number
1	NE Glisan	87	NE Glisan	6	SE Woodward	7	SE Boise	4
2	NE Sandy	79	NE Alberta/ Webster	4	NE Multnomah/ Hassalo	4	SE Clatsop	2
3	NE Fremont	68	NE Sandy	3	NE Sandy	4	SE Flavel	2
4	SE Division	65	SE Clinton	3	SE Overland	4	82nd Ave MAX Station	1
5	SE Flavel	65	SE Division	3	SE Center/Francis	3	E Burnside	1
6	SE Holgate	64	SE Stark	3	SE Foster/Insley	3	NE Cully	1
7	E Burnside	61	82nd Ave MAX Station	2	NE Glisan	2	NE Glisan	1
8	SE Powell	58	SE Center/ Francis	2	SE Clinton	2	NE Multnomah/ Hassalo	1
9	SE Stark	51	SE Cooper/ Glenwood	2	SE Holgate	2	NE Prescott	1
10	SE Woodstock	51	SE Duke	2	SE Otty	2	NE Sandy	1

Source: ODOT Crash Data (2015-2019)

Figure 4-21 shows the location of individual crashes that involved bicycles or pedestrians and the severity of the crashes Some notable concentrations of crashes involving vulnerable road users can be seen at I-84/MAX, in Montavilla, from just north of Division to just south of Holgate, near Foster and Flavel, and south of Johnson Creek Blvd in Clackamas County. In general, these are also locations with a high concentration of nearby retail destinations.

Complete results from the corridor safety analysis within the City of Portland can be found in Appendix B.

Figure 4-21. Crash Density along 82nd Ave with Existing Bus Stops

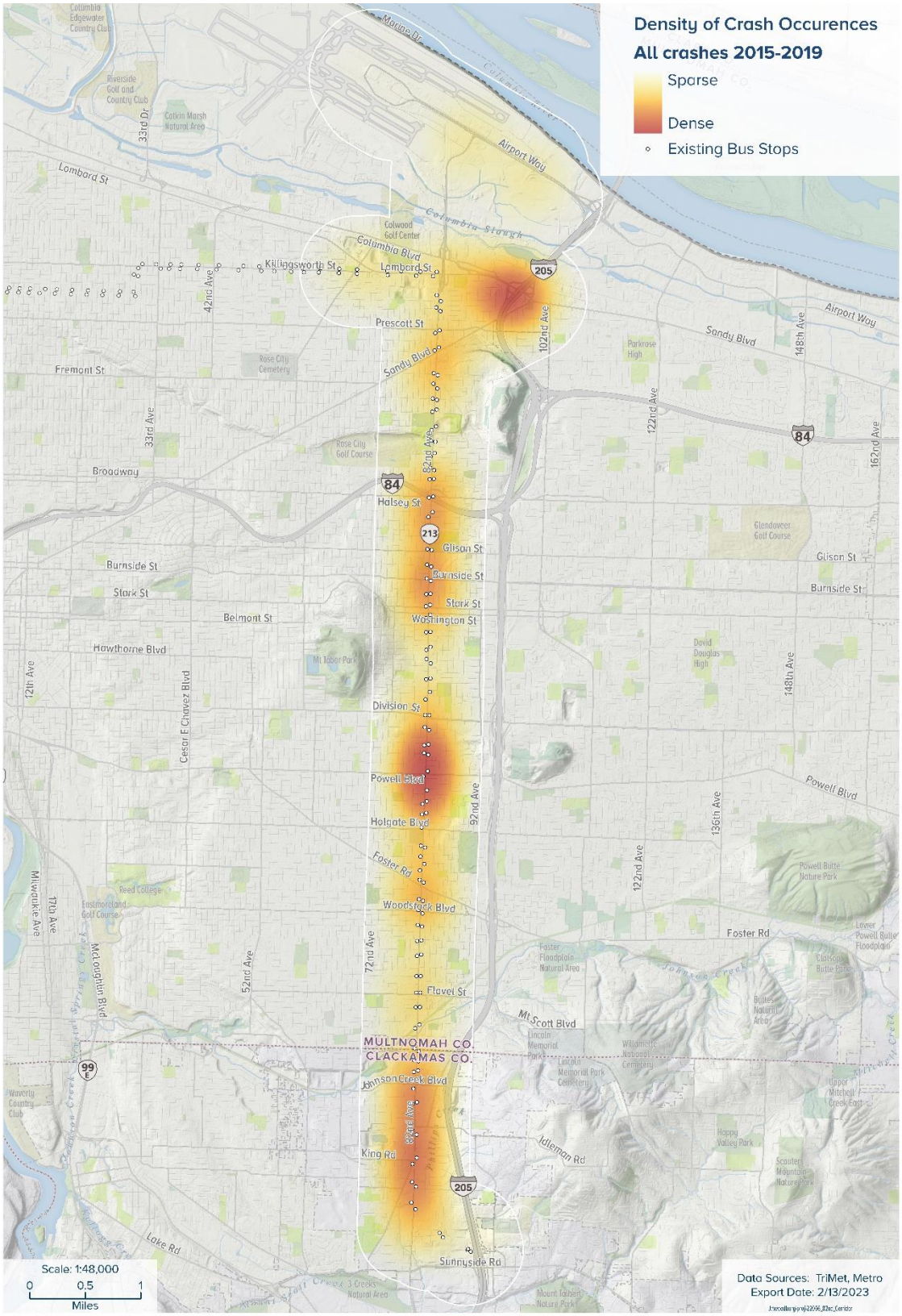


Figure 4-22. Crash Severity along 82nd Ave with Existing Bus Stops

4.3.2. Safe Crossings

As a busy vehicular and freight corridor with four lanes of moving traffic, providing dedicated crossings for pedestrians and cyclists is critical to ensuring that transit riders can access stops in both directions along 82nd Avenue safely. Additionally, the City of Portland has established standards for crossing spacing: every 530' within established pedestrian districts and every 800' in all other locations. In Clackamas County, the 82nd Avenue corridor is classified as urban mix, for which a stop spacing of 250–550' is recommended. Today, there are 22 full signals that allow safer crossing of the corridor, as well as two rectangular rapid flashing beacons (RRFBs) – examples of which are shown in Figure 4-23. With these crossings, the average crossing spacing along the entire corridor is 1,096'. Figure 4-26 shows crossing spacing according to the PBOT crossing standards throughout the corridor.

Figure 4-23. Example of Rectangular Rapid Flashing Beacon along 82nd Ave (at NE Thompson St)

Source: Google Maps

As part of the City of Portland's agreement to take ownership of portions of 82nd Avenue, PBOT has funded and located ten full signal rebuilds, 13 additional half signals, and seven additional RRFBs within the City of Portland portion of 82nd Avenue. An example of a full signal with access management on Powell is shown below in Figure 4-24 and Figure 4-25. ODOT has also identified locations for two additional RRFBs outside of the City of Portland as part of the Foster to Thompson paving project: one at SE Glencoe Rd and one at the WinCo Food, roughly where SE Thompson Rd would connect with 82nd Avenue.[3] Once these crossings

[3] https://www.oregon.gov/odot/projects/pages/project-details.aspx?project=21177

are constructed, the average crossing spacing will decrease to 759'. Figure 4-27 shows the existing and funded crossings along 82nd Avenue.

Figure 4-24: Full Signal with Access Management on Powell and 28th

Figure 4-25: Aerial Rendering of Full Signal at Powell and 28th

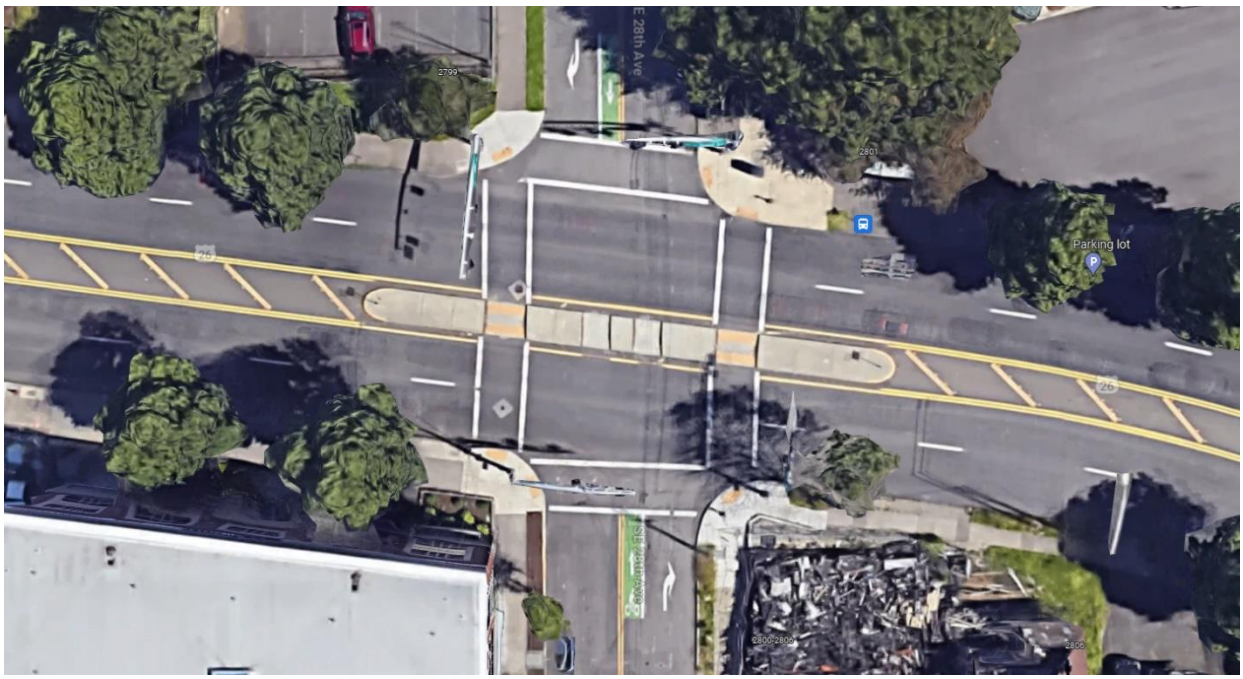


Figure 4-26. Existing Crossing Spacing and Pedestrian Districts along 82nd Ave

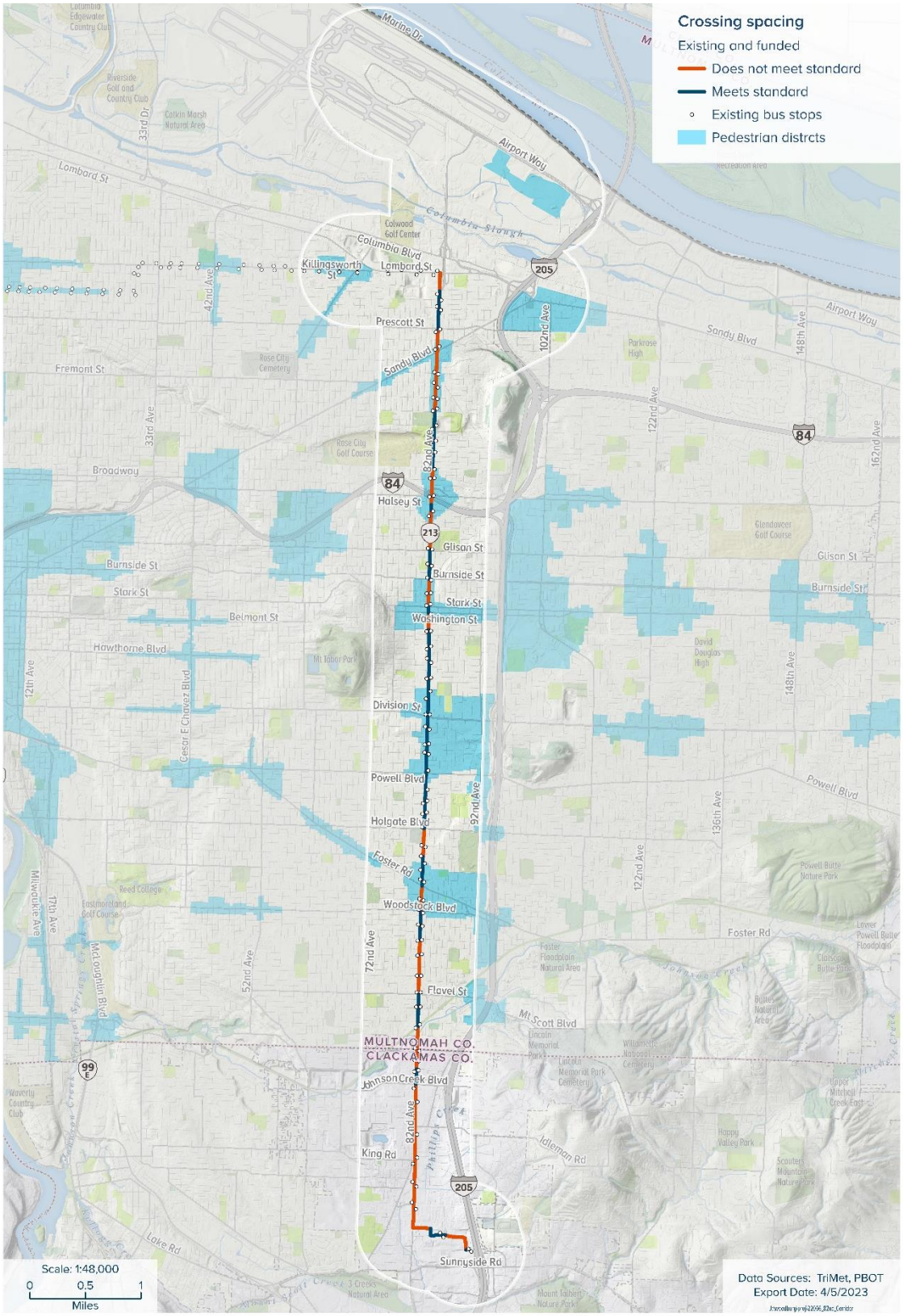
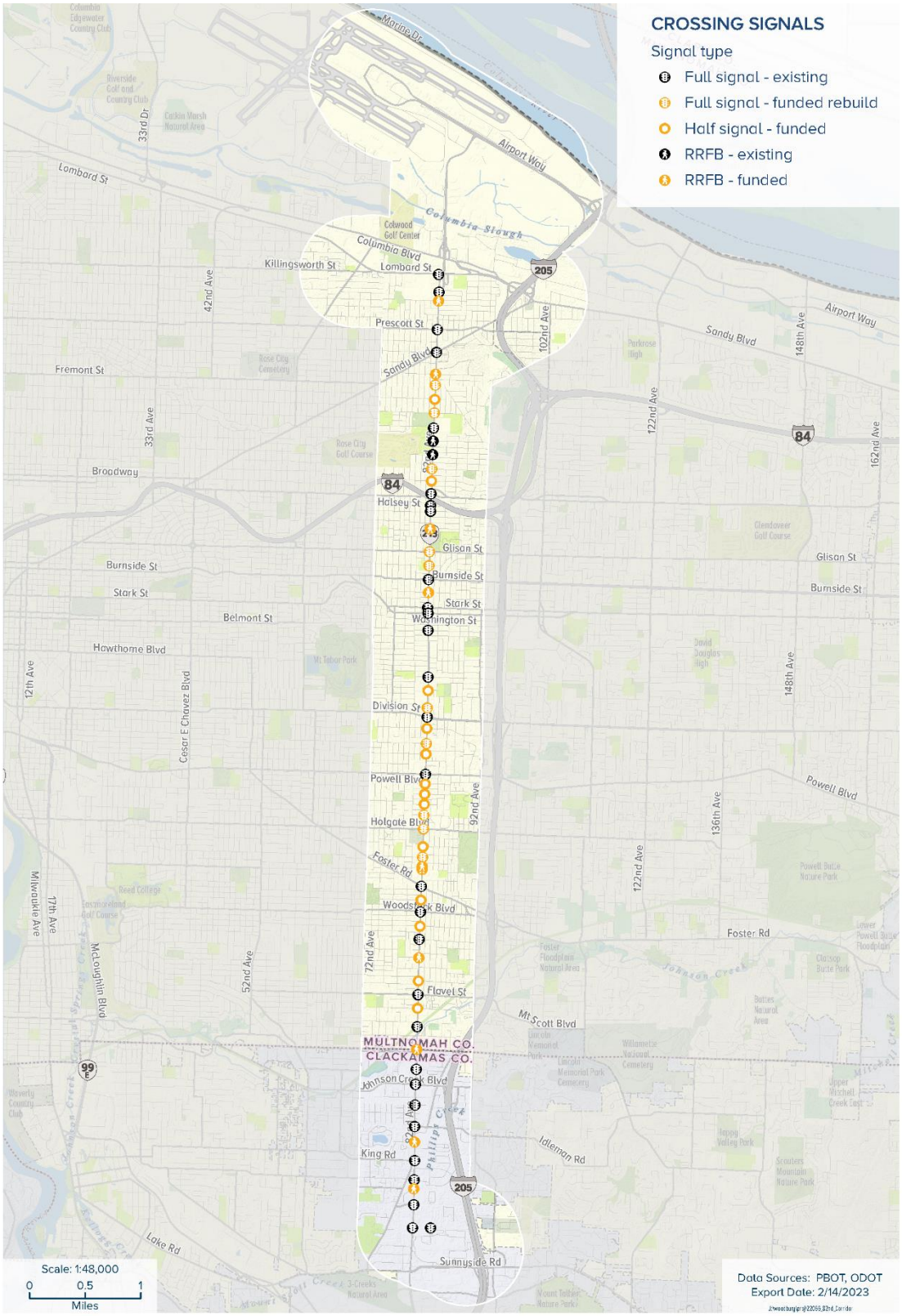


Figure 4-27. Existing and Funded Crossings along 82nd Ave



Most bus stops have existing or funded crossings within 200', although some crossings are just beyond that distance from existing bus stops, including the following:

- Wygant (SB)
- Hassalo (SB)
- Main (SB)
- 2200 Block/PCC (SB)
- Insley/Foster (SB)
- Ogden (NB & SB)
- Otty (NB)

NACTO recommends crossings with 120–200' of stops. When crossings are farther than 200 feet away, transit riders on the opposite side of the street may choose to cross directly (and potentially unsafely) at the stop to catch a bus. These may be locations where additional crossing infrastructure is warranted or where bus stop location changes could bring the stop closer to an existing or planned safe crossing.

4.3.3. Walk and Bike Access

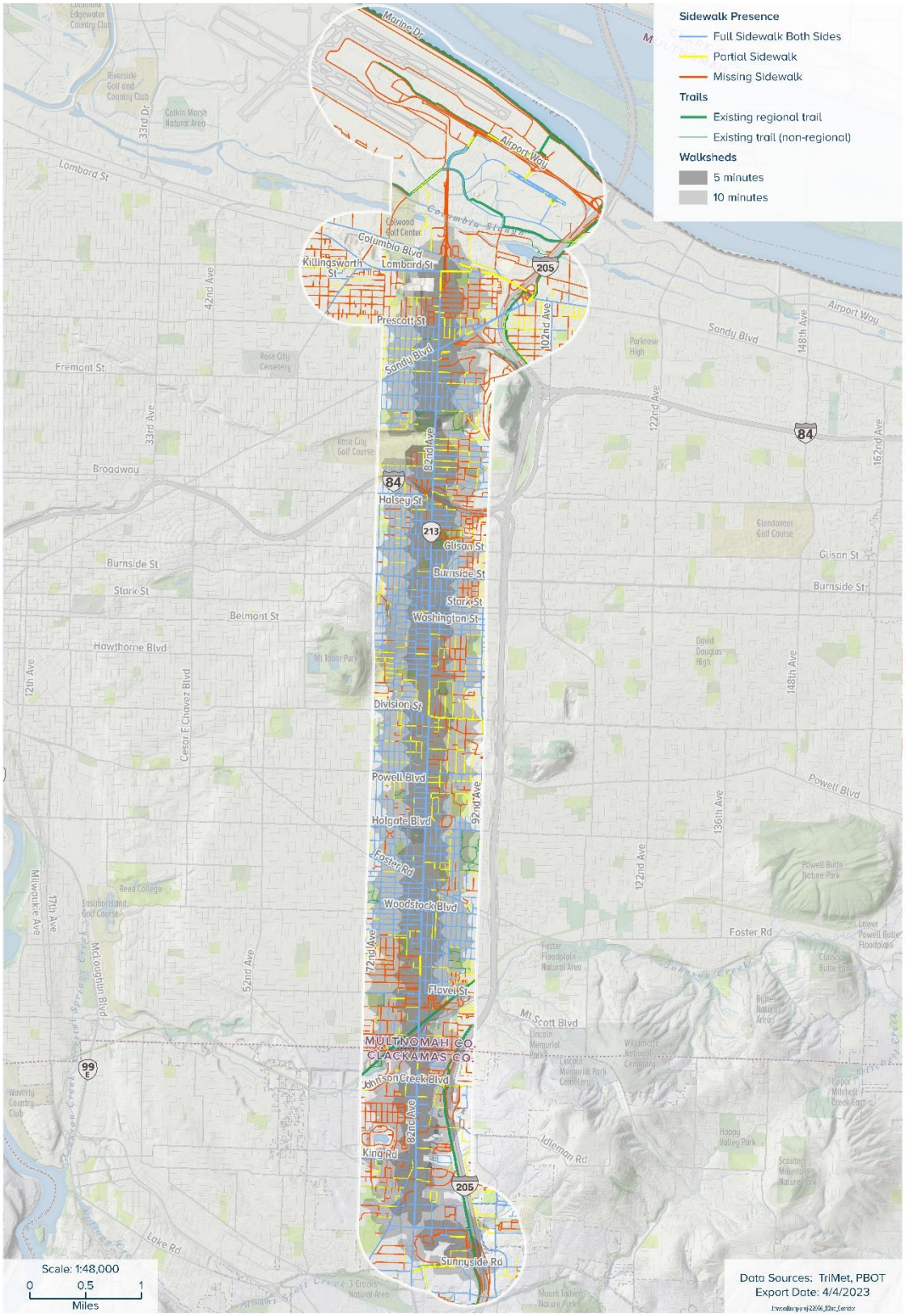
Since most riders access Line 72 by walking or rolling, the presence and quality of pedestrian and bicycle infrastructure within the 82nd Avenue corridor greatly impacts the quality of riders' "first/last mile" journey to transit.

Generally, the street grid within 1/2 mile of 82nd Avenue is fairly complete, as can be seen by mapping the distance that the average person could reach within a ten-minute walk from existing stops shown in Figure 4-28. The ten-minute walkshed and 1/2 mile "as the crow flies" buffer around the corridor cover a similar geography, with some exceptions noted:

- Near and north of NE Lombard
- Rose City Golf Course
- Where I-205 jogs west in Clackamas Co.
- West of 82nd Avenue in Clackamas Co.

This walkshed analysis highlights the presence of pathways pedestrians can use in theory, but the reality is that the quality and existence of actual pedestrian infrastructure in surrounding neighborhoods is poor. Most notable areas where sidewalks are missing include the east side of 82nd Avenue north of NE Alberta Street and in intermittent gaps between SE Lambert Street and SE Luther Road. Although sidewalks exist along the majority of the corridor, there are narrow segments with utility poles and other intrusions, areas with curb-tight sidewalks, lack of street trees, and frequent driveways. These are all factors that reduce the comfort and ease of walking in the corridor.

Figure 4-28. Five- and Ten-Minute Walkshed to Existing Bus Stop and Existing Stations



Along 82nd Avenue itself, sidewalks exist along most of the corridor, although the quality and width of sidewalk varies substantially. Within the City of Portland, the narrowest sidewalks are generally between Halsey and Burnside and south of Flavel. Missing/substandard sidewalks also exist at the northern end of Clackamas County as seen in Figure 4-29, although many of these locations are being addressed through ODOT's Foster to Thompson paving project. Additionally, the City of Portland collects data on ramp compliance with the Americans with Disabilities Act (ADA) design standards. Fifty-six percent of locations that should have a sidewalk ramp along 82nd Avenue are either non-compliant or have an unknown compliance status.

Figure 4-29. Substandard Sidewalk in Clackamas County (Near SE Luther Rd Looking North)

Source: Google Maps

Figure 4-30 shows existing sidewalk width along 82nd Avenue where data is available.[4] The minimal width of existing sidewalks also means that large portions of 82nd Avenue lack space for tree coverage, which can significantly degrade the experience of accessing transit as riders who walk or roll along 82nd Avenue are exposed to heat and rain.

Figure 4-31 shows the status of sidewalks within the portion of the study area located within Clackamas County.

[4] This map is missing width data for five sections of sidewalks: there are sidewalks on the north and south side of Monterrey Avenue connecting to the Clackamas Town Center Mall bus stop, between the mall and the Clackamas Town Center Transit Center, on both sides of Alderwood Road and Cascades Parkway, on the east side of NE 82nd Avenue Way between Alderwood and NE Airport Way, and on the north side of Airport Way. Additionally, a multi-use path from Air Cargo Road to the airport terminal will be completed by TriMet and the Port of Portland as part of the Better Red project by early 2024.

Figure 4-30. Sidewalk Width Along Alignment

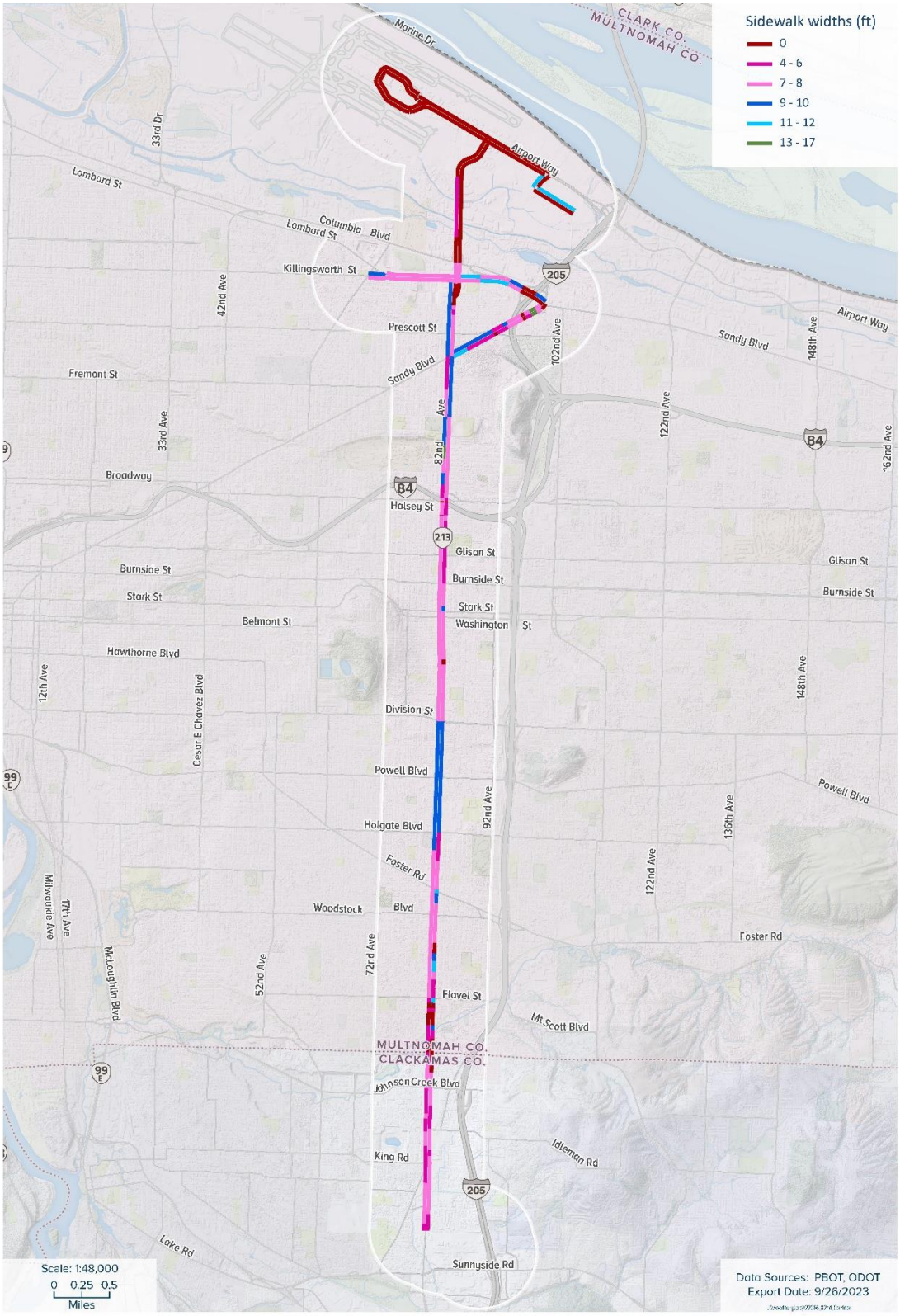
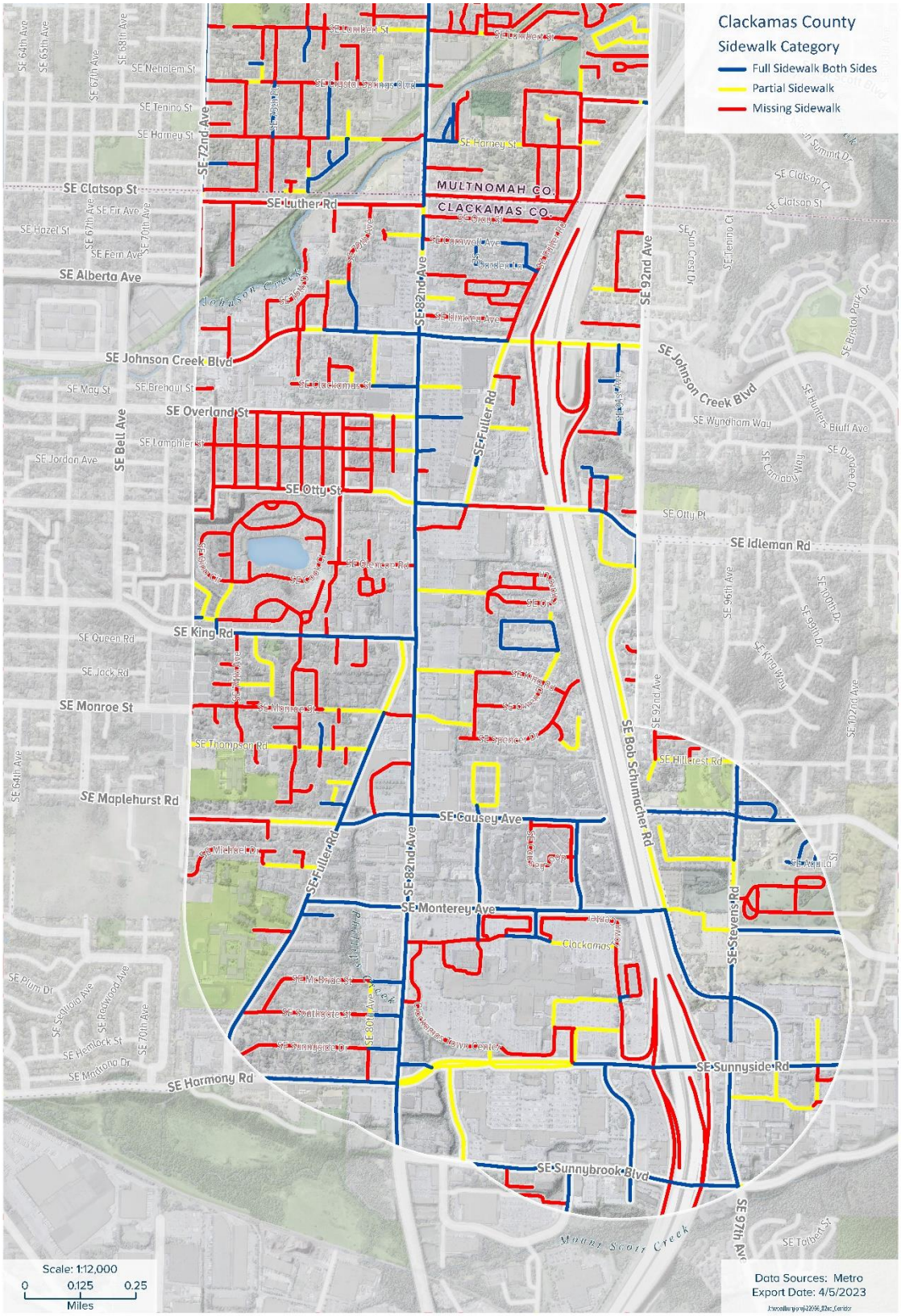


Figure 4-31. Sidewalk Status within Clackamas County



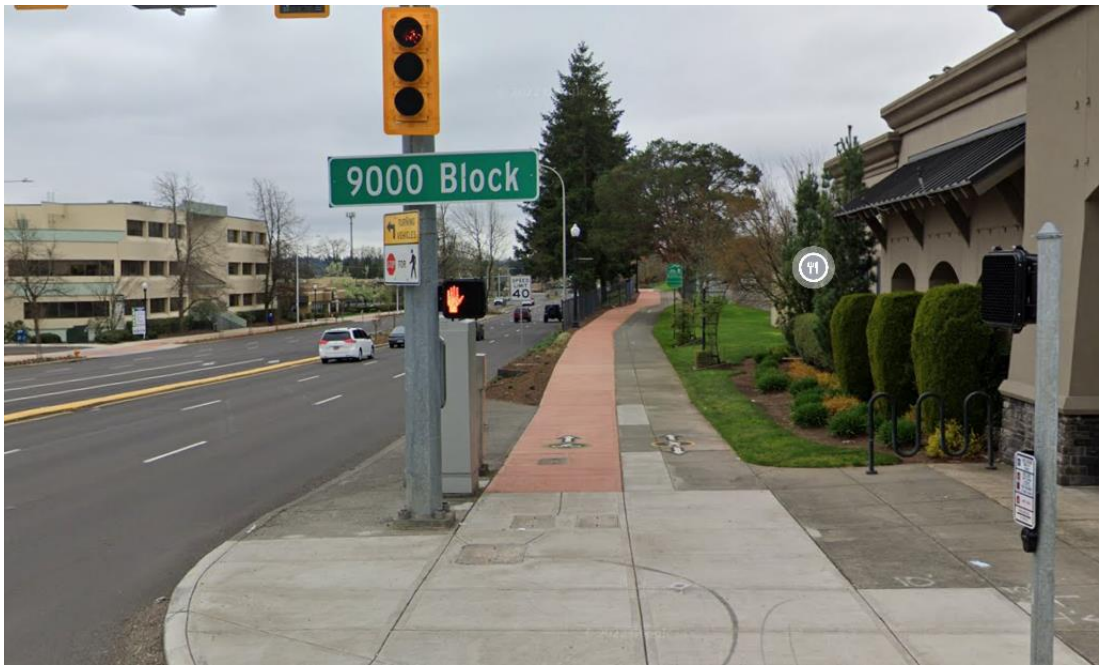
Bike lanes on 82nd Avenue exist only south of Johnson Creek Blvd in Clackamas County. The treatment type varies significantly in this portion of the corridor, ranging from simple painted lanes to lanes with painted buffers to some segments of shared bike/Business Access and Transit (BAT) lanes in the northbound direction. Recent multimodal improvement projects within Clackamas County show that the potential exists to introduce improved bike (and pedestrian) infrastructure along busy retail-dominated arterials that could be a model for improvements along 82nd Avenue. Given the high volume of automobile traffic on 82nd Avenue and the posted speed limit of 35 miles per hour, ODOT's Blueprint for Urban Design and Highway Design Manual prioritizes some level of protection for any bicycle facilities located on street.

North of Johnson Creek Boulevard, the 82nd Avenue right of way is severely constrained, meaning that accommodating on-street bicycle facilities would require significant reconfiguration of the roadway. The City of Portland acknowledges the right of way constraints by not designating 82nd Avenue as a bicycle priority street, meaning that bicycle access to and from transit on 82nd Avenue will rely on improvements to parallel and connecting facilities rather than dedicating space for bikes on 82nd Avenue itself.

Figure 4-32. Bike Lane on 82nd Ave at Boyer Dr (Looking North)

Source: Google Maps

Figure 4-33. Recently Built Shared-Use Path Example along SE Sunnyside Rd (South of Clackamas Town Center)



Source: Google Maps

4.3.4. Bus Stop Amenities

Another facet of transit accessibility is the type of amenities provided to riders while they wait for buses. Due to the minimal right-of-way available, most existing stops have minimal amenities (as seen in the example shown in Figure 4-34):

- 36% have shelters/weather protection
- 57% have seating
- 65% have crosswalks
- 83% have *some* level of lighting (although this is inconsistent throughout the corridor and mostly does not meet safe lighting standards TriMet uses for bus stop areas)

Figure 4-34. Bus Stop with Minimal Amenities

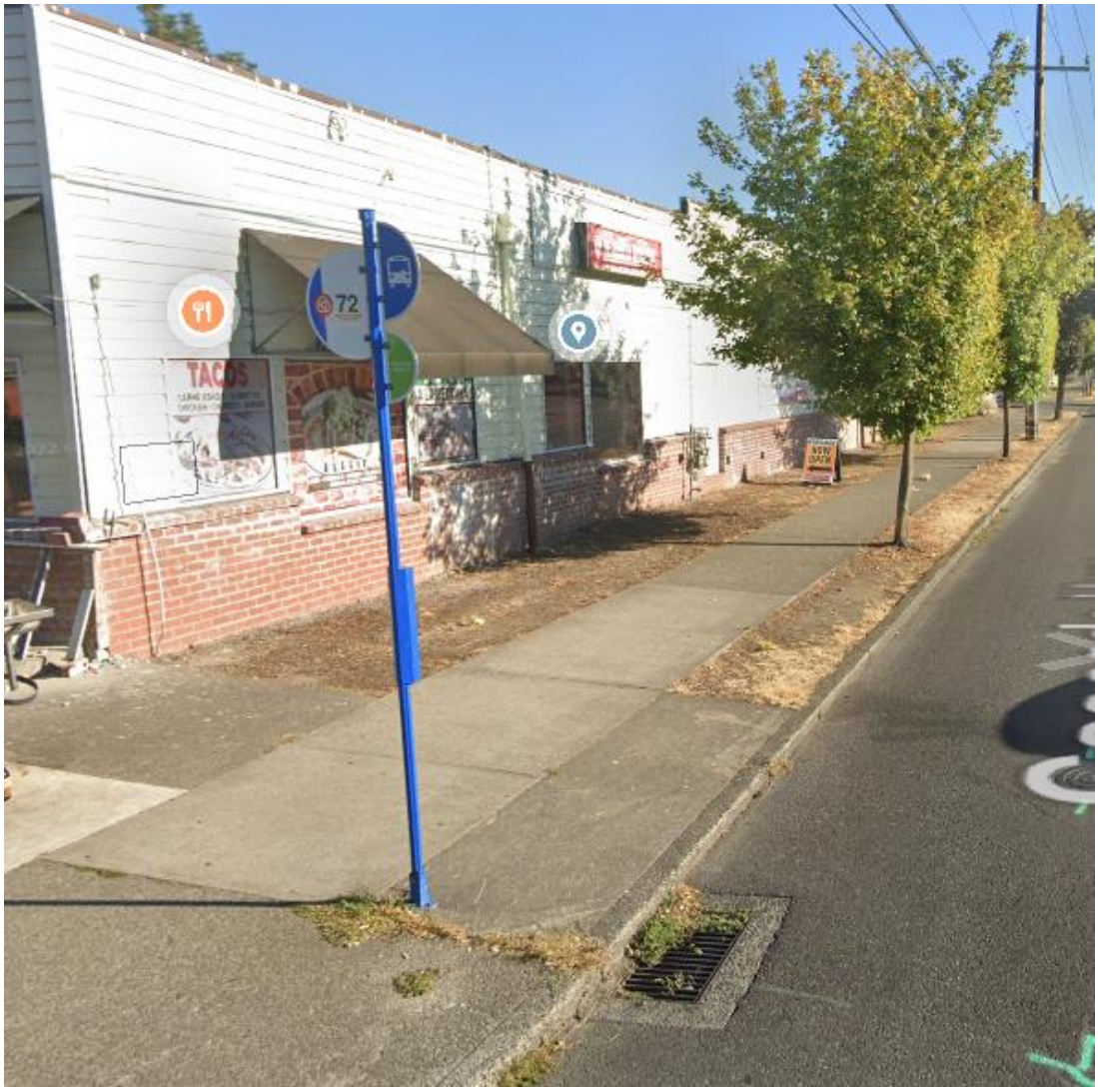
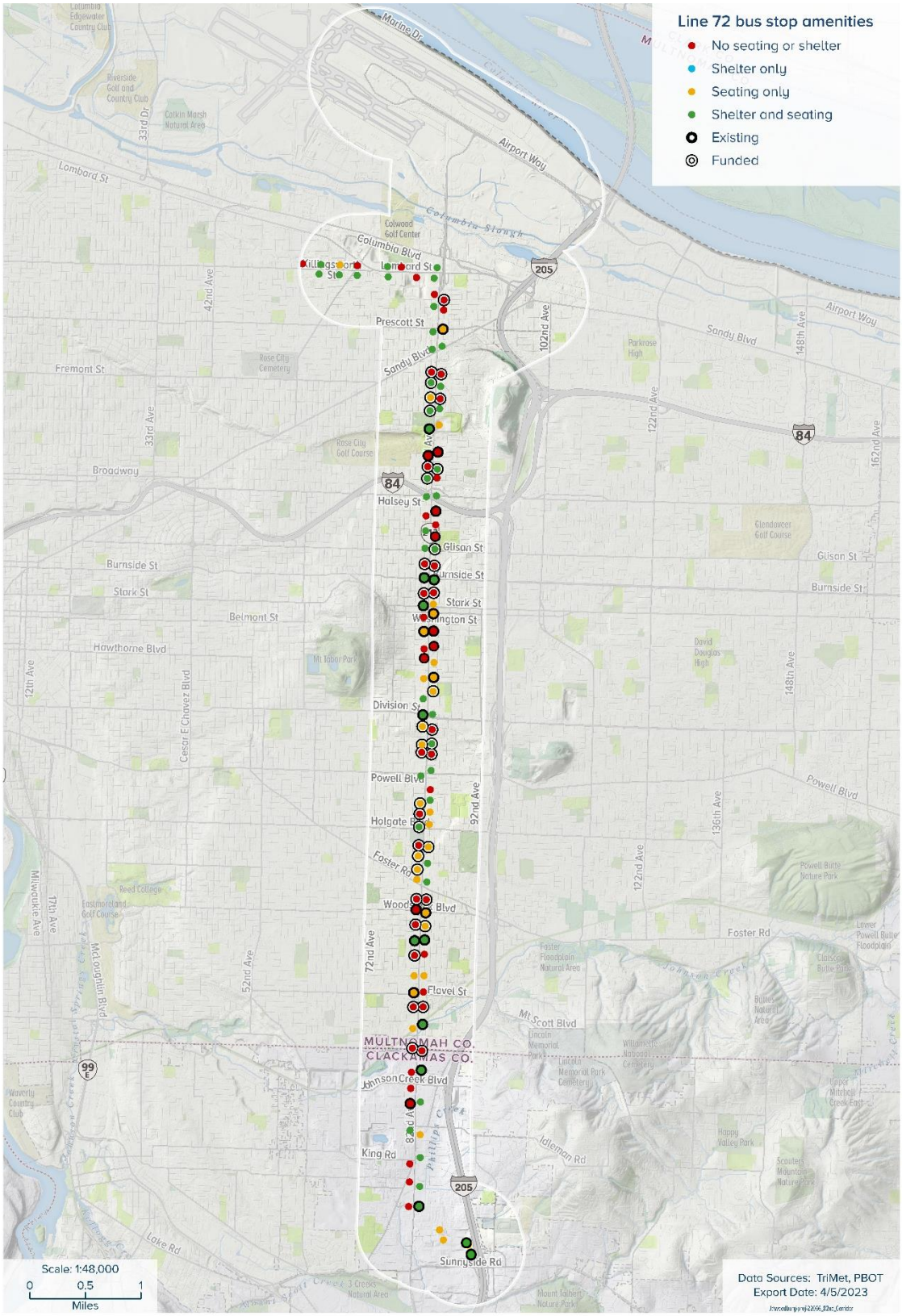


Figure 4-35 shows the distribution of stop amenities along 82nd Avenue today. In general, only the busiest stops have both shelter and seating, although some locations lack shelter in one direction (such as southbound Foster and northbound Holgate). Most of the stops in Montavilla lack any kind of amenity.

Figure 4-35. Stop Amenities



4.3.5. Summary

Safe pedestrian access to transit is an important contributor to transit use and comfort for riders. The current infrastructure along 82nd Avenue is lacking for pedestrians, cyclists, and transit. 82nd Avenue is one of the highest crash and highest injury corridors in the region, and the unsafe infrastructure is especially apparent in the rates of pedestrian and bicycle crashes resulting in serious injuries or fatalities that have occurred in the past five years. Crossing improvements planned by PBOT and ODOT will improve access to existing stops, but some gaps will remain. Sidewalk quality varies throughout the corridor but is generally best between Division and Holgate and worst in the southern part of the City of Portland and the northern part of Clackamas County. Bike facilities along the corridor only exist within Clackamas County, and given the narrow right-of-way, improving bicycle access to transit north of Johnson Creek Blvd will require investment in cycling infrastructure connecting to and parallel to 82nd Avenue. The narrow right-of-way also limits the availability of bus stop amenities such as seating and shelter for people riding transit, further degrading the quality of transit trips along the corridor. With a major transit improvement bus stops would be upgraded to stations and require additional space to accommodate shelters, lighting, seating, and other amenities in many locations.

5. PHYSICAL CONSTRAINTS AND OTHER CONSIDERATIONS

In planning new transit investments in the corridor, it is important to maximize use of the existing infrastructure while minimizing impacts to residences, utilities, businesses, and the roadway network. Because 82nd Avenue runs through already developed communities, the majority of the corridor has limited available right-of-way to expand the roadway width. The street width (from curb-to-curb) is typically 56' with some 60' segments, which allows for a maximum of five lanes in the City of Portland jurisdiction. Right of way is typically 70' or 80' where sidewalks have been widened. Many locations have buildings at or close to the sidewalk. Widening is not feasible or acceptable in many cases. Additionally, widening would lengthen the pedestrian crossings, causing more vulnerability and safety concerns.

The ODOT segment of 82nd Avenue in Clackamas County has some areas with 6 lanes, including right turn lanes and narrow, discontinuous bike lanes.

APPENDICES

A. Summary of Previous Work

B. Safety Analysis

C. Building a Better 82nd Avenue Transportation Investment Project and 82nd Avenue Transit Project: Existing Conditions and Future Baseline Traffic Operations Memorandum

Findings from Previous Efforts

Transit Existing Conditions Appendix 2/1/23

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

1 Executive Summary

2 82nd Ave Corridor Plans

3 Northern Termini Plans

4 Clackamas County Plans

5 Transit Analysis Plans

Executive Summary

Plans Reviewed

- **82nd Ave Corridor Plans**
  - East Portland in Motion Final Report, PBOT, 2012
  - Jade District Vision, APANO, 2014
  - Enhanced Transit Corridors Plan, PBOT, 2018
  - 82nd Ave – Avenue of Roses Implementation Plan, ODOT, 2018
  - Barriers to Redevelopment, BPS, 2019
  - 82nd Ave – Planning for a future Civic Corridor, PBOT, 2019
  - Equitable Real Estate Plan and Implementation Strategy, APANO, 2022

- **Northern Termini Plans**
  - Parkrose Community Plan, PBOT & BPS, 2022
  - Parkrose Community Plan Transportation Safety Solutions: Final Report, PBOT, 2022
  - Cully TIF Preliminary Plan, Prosper Portland, 2022
  - Cully Commercial Corridor and Local Street Plan, PBOT & BPS, 2012
  - Portland International Airport Bicycle & Pedestrian Master Plan, Port of Portland, 2014
  - Columbia Lombard Mobility Corridor Plan, PBOT, 2022

- **Clackamas County Plans**
  - Clackamas Regional Center Pedestrian/Bicycle Plan, Clackamas County, 2012
  - TriMet Bike Plan, 2016
  - Drive to Zero Safety Action Plan, Clackamas County, 2019
  - Clackamas County Comprehensive Plan, Clackamas County, 2012
  - Fuller Road Station Area Plan, Clackamas County, 2007
  - Transit Development Plan, Clackamas County, 2021

- **Transit Analysis Plans**
  - TriMet Delay Dashboard, 2019
  - Get Moving 2020, Metro, 2020
  - Rose Lane Project, PBOT, 2020
  - Powell-Division Transit & Development Project, Metro, 2017

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Building on previous work – City Of Portland

- **Where previous plans are strong**
  - Cataloguing community concerns and identifying patterns of transit delay (BPS 2019, ODOT 2019, TriMet 2019, Get Moving 2020)
  - Proposing a broad transportation vision and set of tools (ODOT 2018, ETC 2018, PBOT 2019, Get Moving 2020)
    - Better bike crossings and parallel routes
    - Safe pedestrian crossings and sidewalks
    - Faster, more reliable transit
  - Documenting overall community vision for 82nd (APANO 2022 & 2014, BPS 2019, Get Moving 2020)
    - Community stability
    - Cultural diversity
    - Green and gathering space
    - Thriving local businesses
  - Acknowledging the varied corridor context, character and nodes of activity (ODOT 2018, BPS 2019)
  - Proposing zoning/policy changes that will eventually support 82nd transformation through redevelopment (BPS 2019, PBOT 2019)

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Building on previous work – City of Portland

- **Where previous plans have gaps**
  - Phasing – what needs to happen now, what are mid-term capital projects, what can wait for redevelopment?
  - Limited place-specific design (Get Moving 2020, Transit Possibilities 2022)
    - How to balance priorities at pinch points with limited right of way?
  - Corridor-wide application of transit tools (roadway and operational)
  - Regional implications of changes to 82nd

Building on previous work – Northern Termini

- **Where previous plans are strong**
  - Cataloguing community *transportation-focused concerns* (safety for walking and biking, crossing spacing on Sandy, lighting, transit access to industrial areas)
  - Cataloguing top-of-mind *related concerns* (need for affordable housing, risk of displacement, personal safety, support for small local businesses)
  - Proposals for targeted bike and ped improvements that would improve access and safety around potential Northern Termini (improved crossing of NB off ramp at Sandy, new signal at Killingsworth and Lombard)
- **Where previous plans have gaps**
  - Community feedback specifically from transit users

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Building on previous work – Clackamas County

- **Where previous plans are strong**
  - Long term vision for Clackamas Town Center area (Comp Plan 2013) and Fuller Rd (Fuller Rd Station Area Plan 2007)
  - Project ideas for 82nd in Clackamas County (TriMet ped bike overpass over I-205, Safety Action Plan funded projects)
- **Where previous plans have gaps**
  - Updated vision for Clackamas Town Center, including property owner plans
  - Little recent documentation of community engagement conversations about vision and needs for 82nd
    - May be updated as part of Walk Bike Clackamas, engagement in progress

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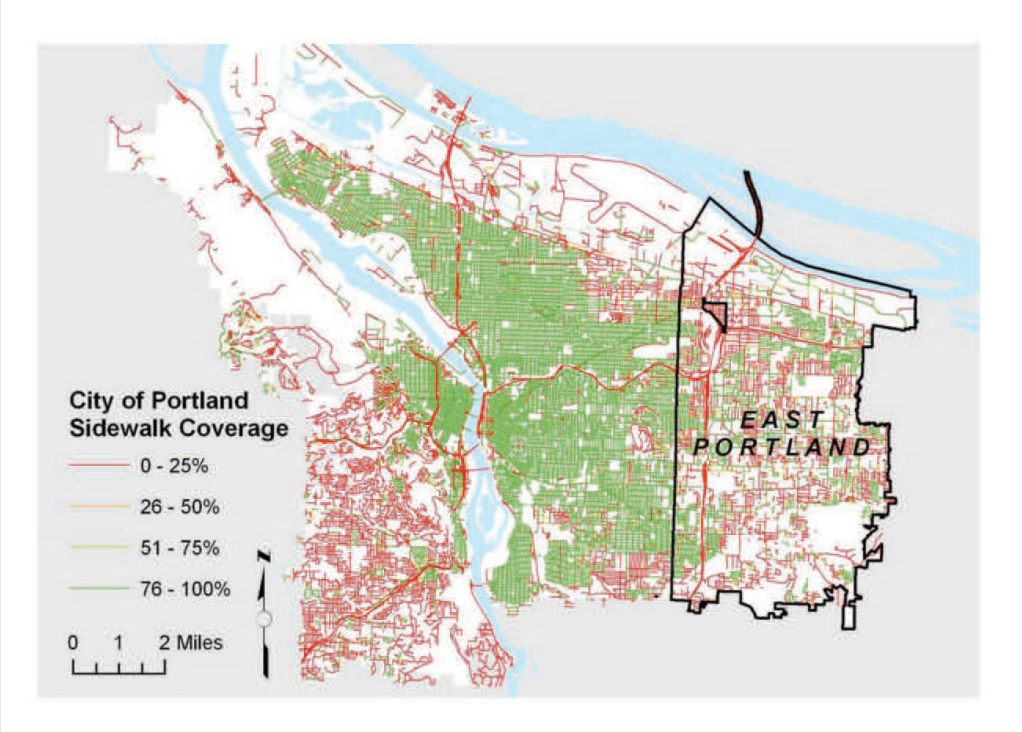
82nd Ave Corridor Plans

2

East Portland in Motion Final Report

PBOT, 2012

- 5-year implementation strategy to expand the active transportation network east of 82nd Avenue
- Community engagement findings:
  - Desire for safer access to transit by walking or biking
  - Desire for basic infrastructure (fixing potholes, adding sidewalks) and acceptance of multiple types of sidewalks depending on context (curb tight, one side of street)
  - Preference for low-stress bikeways (i.e. neighborhood greenways over enhanced bike lanes on busier streets)
  - Prioritization of programs for children
- Recommends over 80 projects or programs
  - Sidewalk infill
  - Crossing improvements
  - Neighborhood greenways
  - Education and encouragement programs



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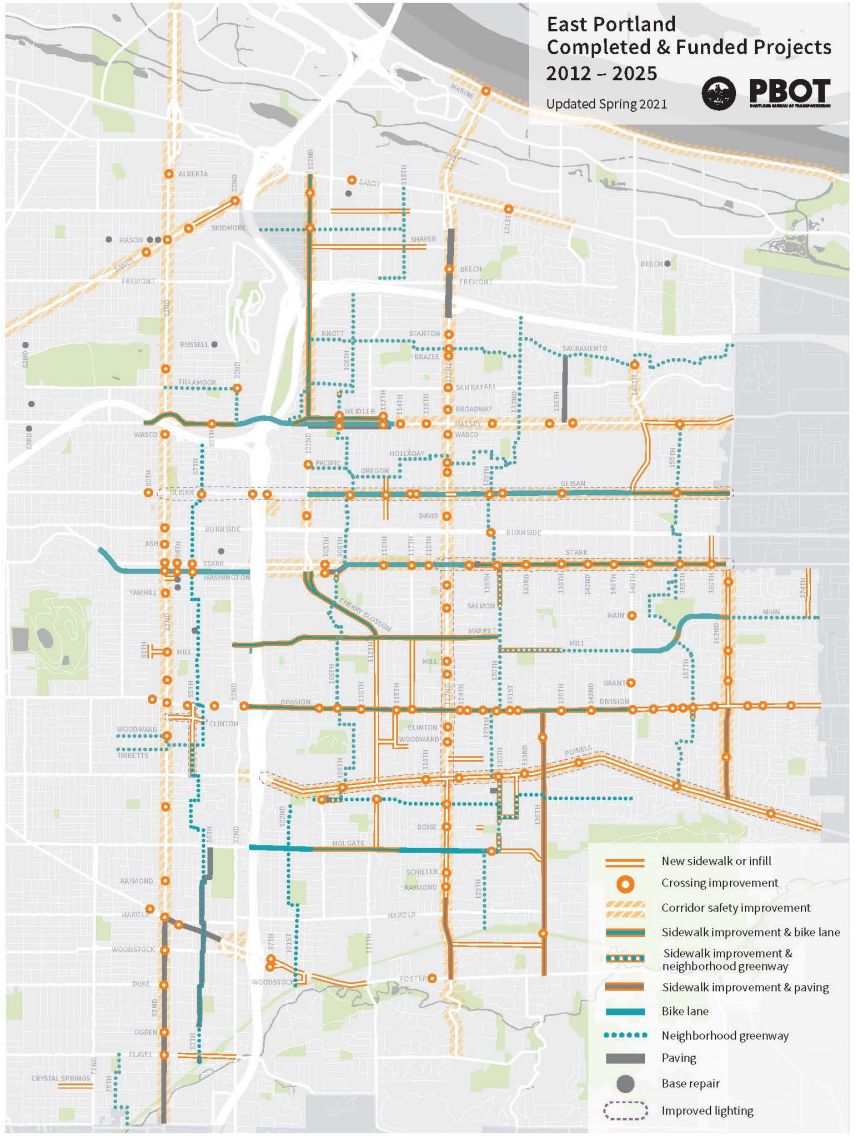
EPIM Key Takeaways

Many EPIM projects have been funded or completed in the past 10 yeas. The original EPIM project list excluded 82nd as it was under ODOT control at the time.

Community engagement discussion from EPIM suggest this project focuses on low stress bicycle routes parallel and across 82nd, a context-sensitive approach to improving sidewalks, and safe connections to transit stops.



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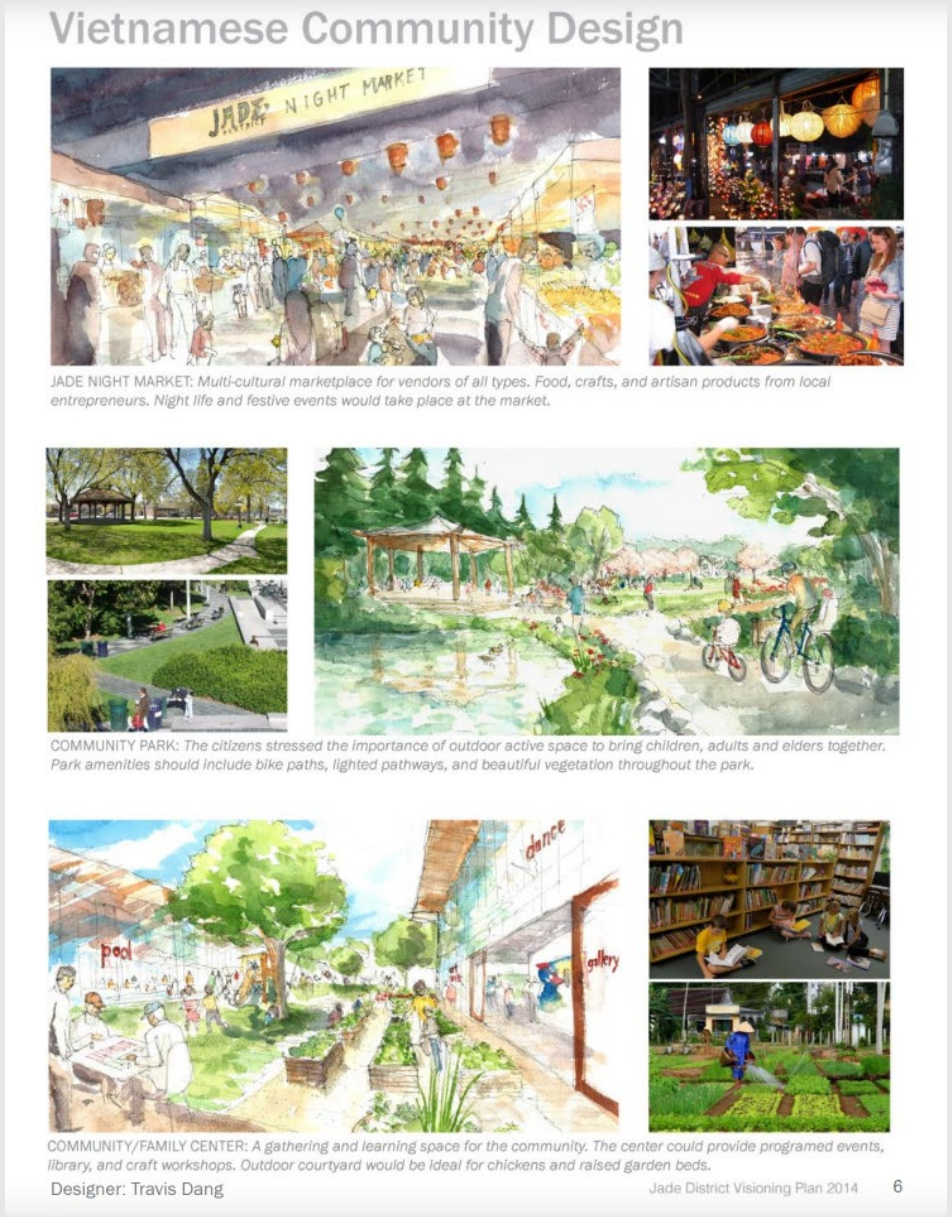
Jade District Vision

APANO, 2014

- 5 community workshops (Chinese, Vietnamese, Latino, White non-Russian Speaking, White Russian-Speaking) and 1 multicultural workshop
- Common themes among different communities:
  - Increase in crossings on 82nd and Division, especially near schools
  - Maintenance and art programs
  - Street safety enhancements
  - Increase in green and gathering spaces
  - Increase in restaurant and retail
  - Celebration of different communities
- Identified 82nd east-west crossings as short-term projects (now funded crossings by PBOT)
  - SE Harrison St
  - PCC
  - SE Clinton
  - SE Tibbets



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Jade District Vision Key Takeaways

To ensure the diverse communities around 82nd Ave feel represented and welcomed by the proposed changes to the corridor, the 82nd Corridor project may consider similar small workshops and coordination with the CBOs and individuals involved in the Jade District Vision

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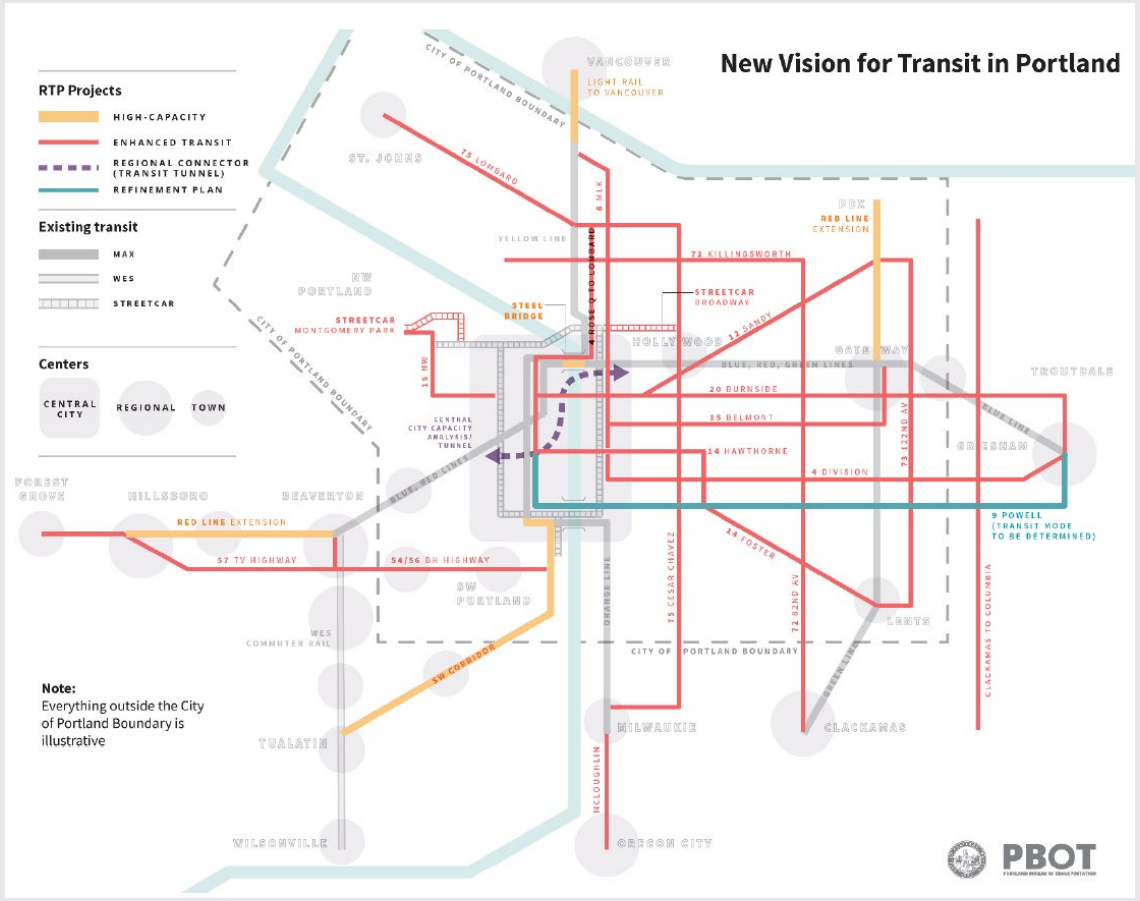
Enhanced Transit Corridors Plan

PBOT, 2018

- Planning process to improve transit capacity, reliability, and travel time
- Guided by policy and informed by transit operational data
- Deployed quicker than High-Capacity Transit capital projects
- Created toolbox to identify transit priority enhancements:
  - Laneways and Intersection Treatments
  - Multi-Modal Interaction
  - Stops and Stations
  - Operations/Other
- Aimed to support transportation and climate goals and policy
- Four categories of recommendations:
  - New approach to transit (high capacity transit, enhanced transit, growing transit)
  - New vision for transit (network of ETCs)
  - Additional policy recommendations, actions, and next steps
  - City-wide enhanced transit monitoring program



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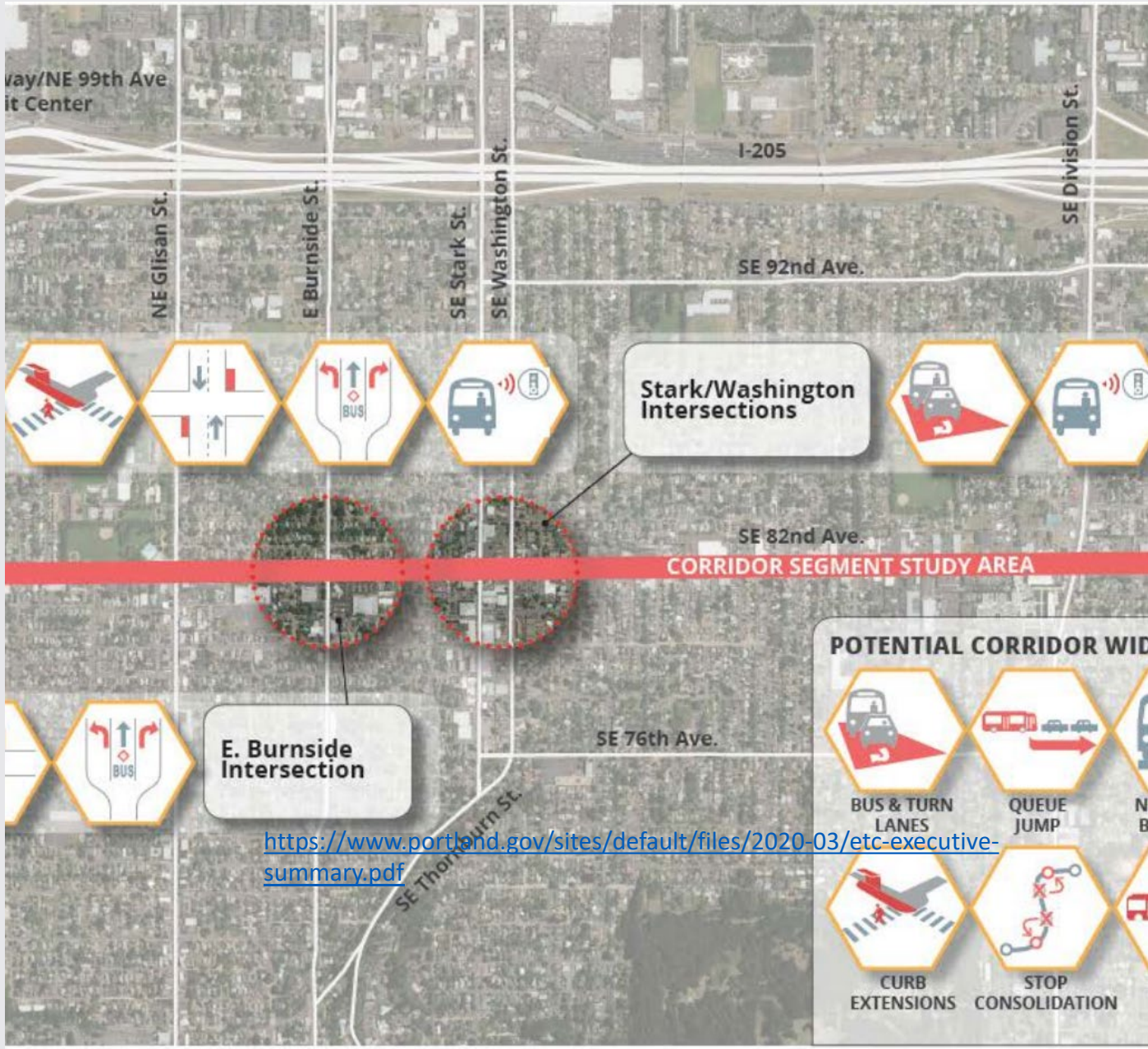
Enhanced Transit Corridors Plan

- Identified as one of the routes forming the ETC network
- Used in conceptual application of the enhanced transit tools
  - Focus of this closer look for 82nd Ave was between I-84 and SE Powell Blvd
- Identified future needs and studies:
  - Collaboration with ODOT
  - Safety studies to determine impacts associated with transit interventions
  - Traffic modeling and design analysis of traffic modifications at Burnside and at I-84



https://www.portland.gov/sites/default/files/2020-03/etc-executive-summary.pdf

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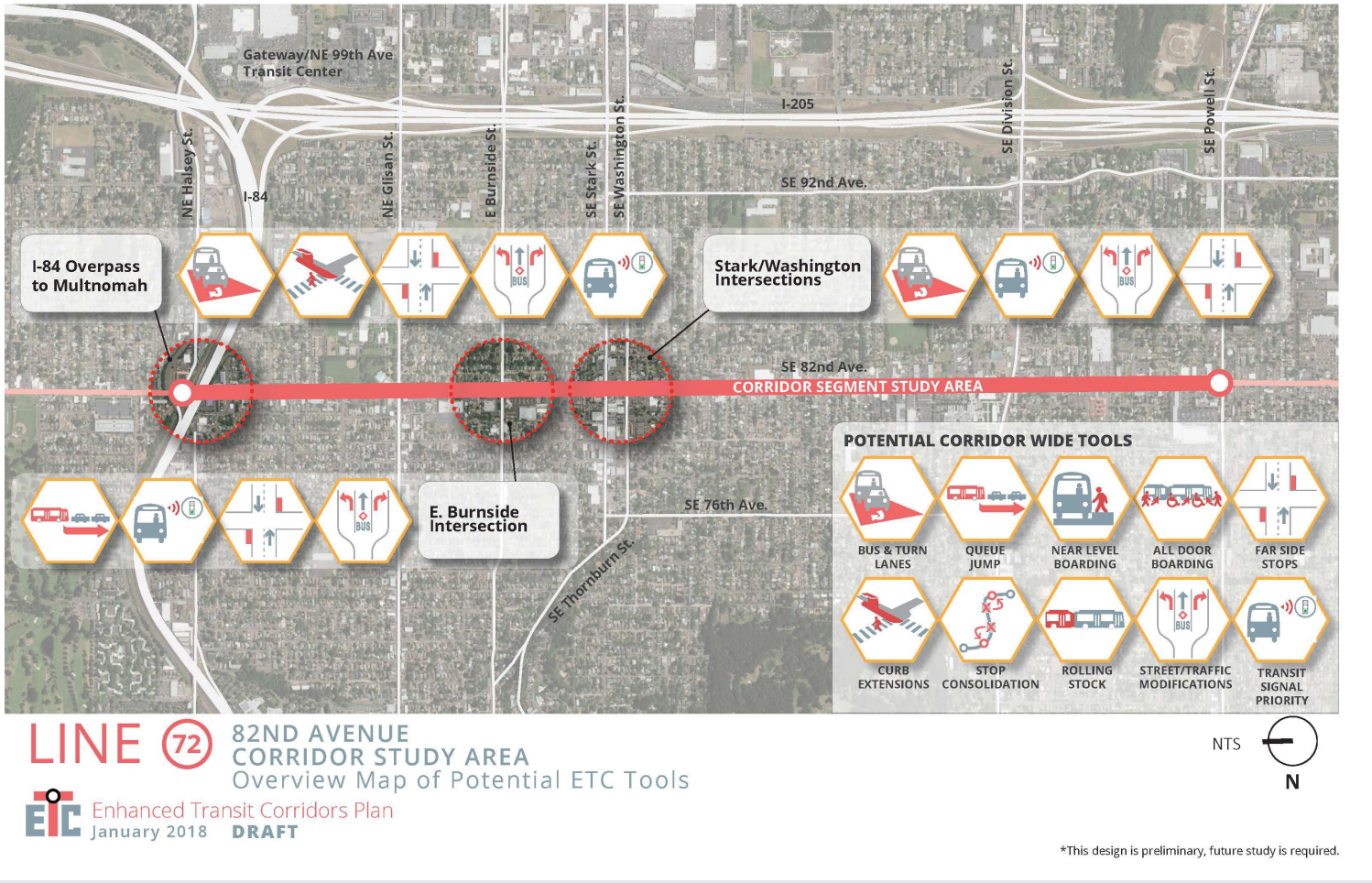
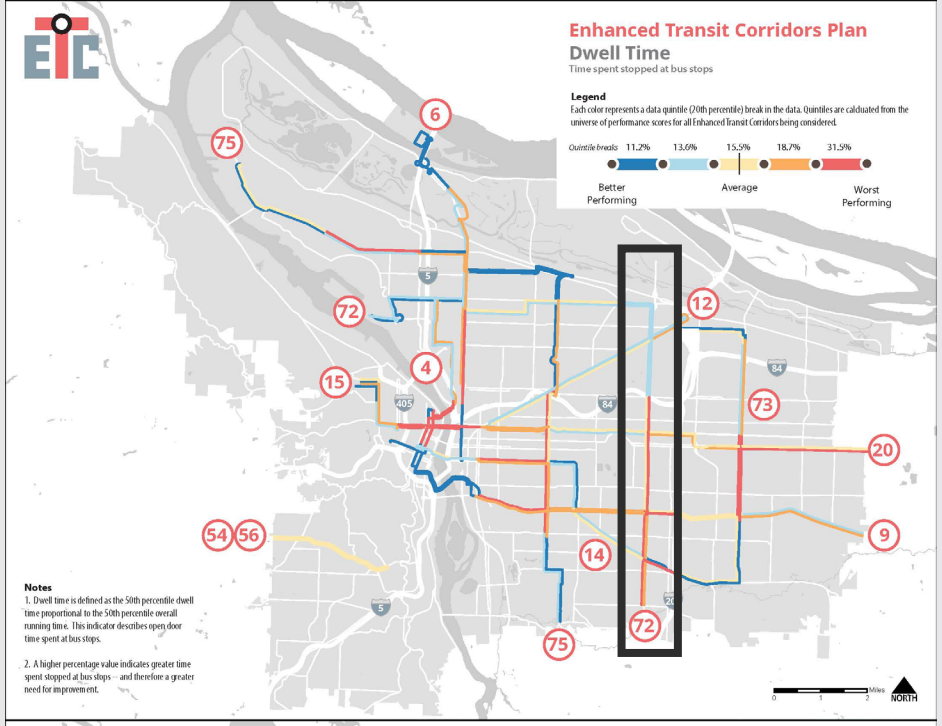
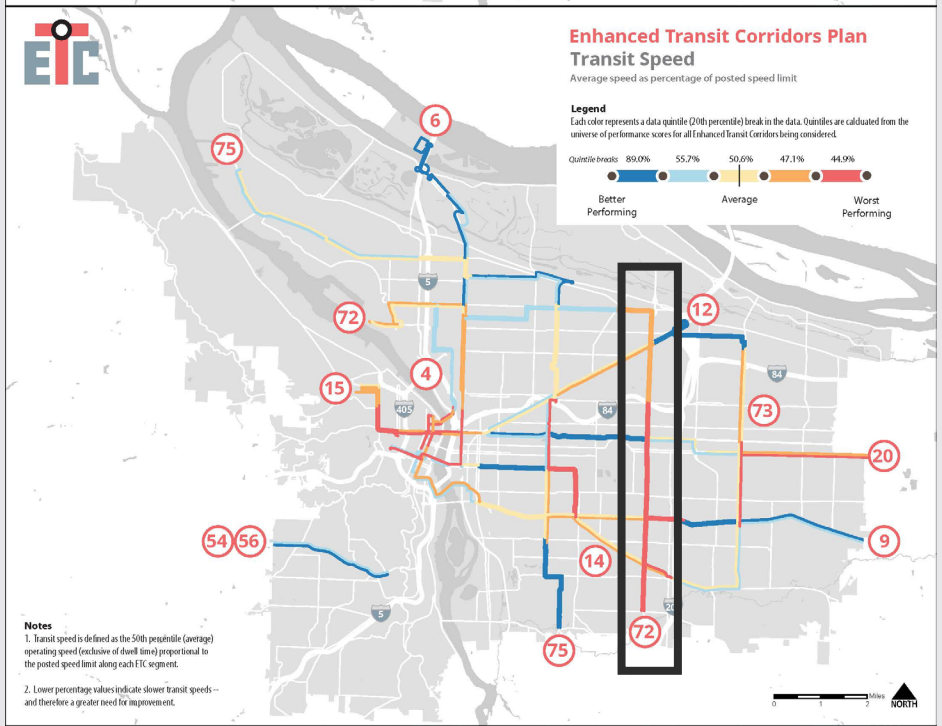
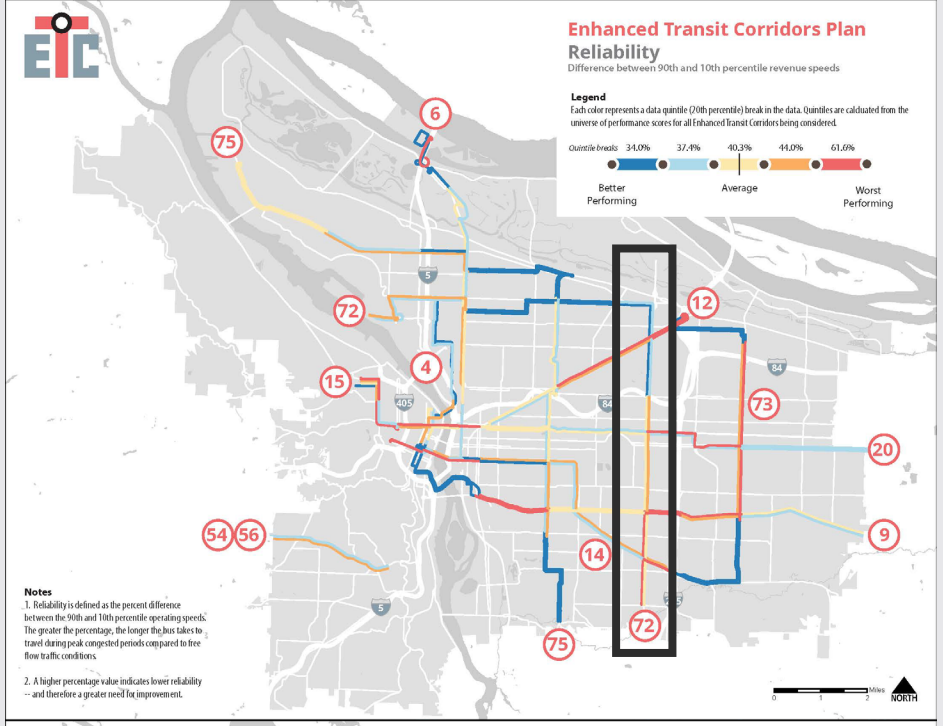
ETC Key Takeaways

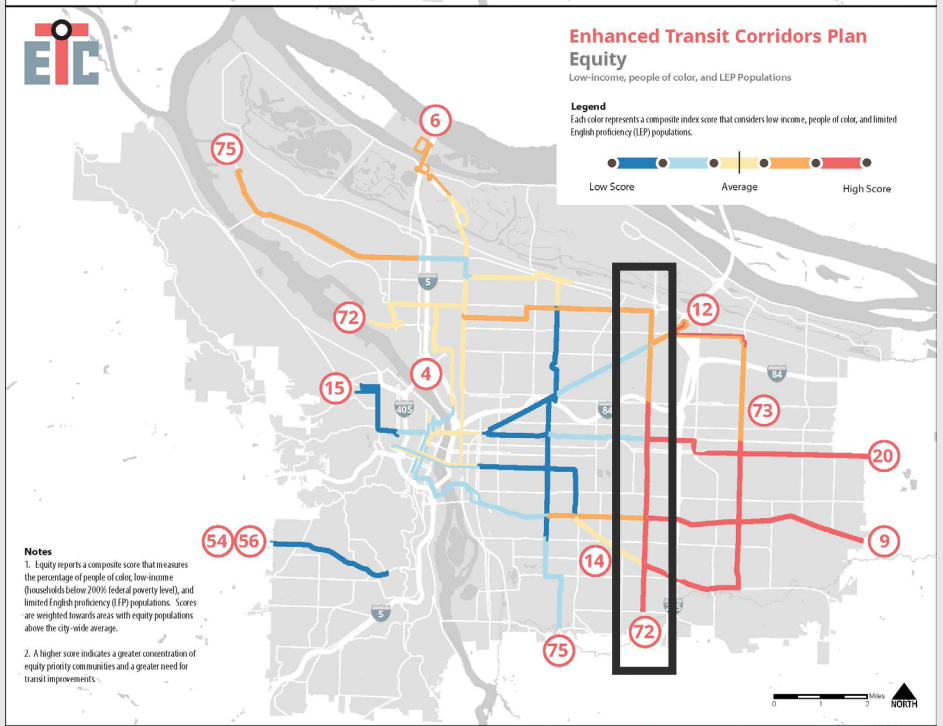
- Identified as ETC based on screening for transit performance, equity, and future growth
- Workshopped corridor for application of ETC toolbox
  - Can't implement full-length dedicated transit lanes - need for ROW acquisition or impacts to turn/travel lanes
  - Further study needed for site specific application of tools




Enhanced Transit Corridors Plan
Dwell Time
Time spent stopped at bus stops
Legend
Each color represents a data quintile (20th percentile) break in the data. Quintiles are calculated from the universe of performance scores for all Enhanced Transit Corridors being considered.
Quintile breaks 11.2% 13.6% 15.5% 18.7% 31.5%
Better Performing
Average
Worst Performing
Notes
1. Dwell time is defined as the 50th percentile dwell time proportional to the 50th percentile overall running time. This indicator describes open door time spent at bus stops.
2. A higher percentage value indicates greater time spent stopped at bus stops -- and therefore a greater need for improvement.
Miles
NORTH


Enhanced Transit Corridors Plan
Transit Speed
Average speed as percentage of posted speed limit
Legend
Each color represents a data quintile (20th percentile) break in the data. Quintiles are calculated from the universe of performance scores for all Enhanced Transit Corridors being considered.
Quintile breaks 89.0% 55.7% 50.6% 47.1% 44.9%
Better Performing
Average
Worst Performing
Notes
1. Transit speed is defined as the 50th percentile (average) operating speed (exclusive of dwell time) proportional to the posted speed limit along each ETC segment.
2. Lower percentage values indicate slower transit speeds -- and therefore a greater need for improvement.
Miles
NORTH


Enhanced Transit Corridors Plan
Reliability
Difference between 90th and 10th percentile revenue speeds
Legend
Each color represents a data quintile (20th percentile) break in the data. Quintiles are calculated from the universe of performance scores for all Enhanced Transit Corridors being considered.
Quintile breaks 34.0% 37.4% 40.3% 44.0% 61.6%
Better Performing
Average
Worst Performing
Notes
1. Reliability is defined as the percent difference between the 90th and 10th percentile operating speeds. The greater the percentage, the longer the bus takes to travel during peak congested periods compared to free flow traffic conditions.
2. A higher percentage value indicates lower reliability -- and therefore a greater need for improvement.
Miles
NORTH


Enhanced Transit Corridors Plan
Equity
Low-income, people of color, and LEP Populations
Legend
Each color represents a composite index score that considers low income, people of color, and limited English proficiency (LEP) populations.
Low Score
Average
High Score
Notes
1. Equity reports a composite score that measures the percentage of people of color, low-income (households below 200% federal poverty level), and limited English proficiency (LEP) populations. Scores are weighted towards areas with equity populations above the city-wide average.
2. A higher score indicates a greater concentration of equity priority communities and a greater need for transit improvements.
Miles
NORTH

82nd Avenue of Roses Implementation Plan

ODOT, 2018

- Divided into 4 focus areas based on typology (residential, town center, and suburban)
- Focused on strategies under 3 funding scenarios (low, medium, high)
- Categorized needs and aspirations into 4 areas:
  - Pedestrian Safety, Comfort, and Access for All
  - Maintenance Needs
  - Support Transit
  - Access Management
- Limited study of jurisdictional transfer and sections to inform future work

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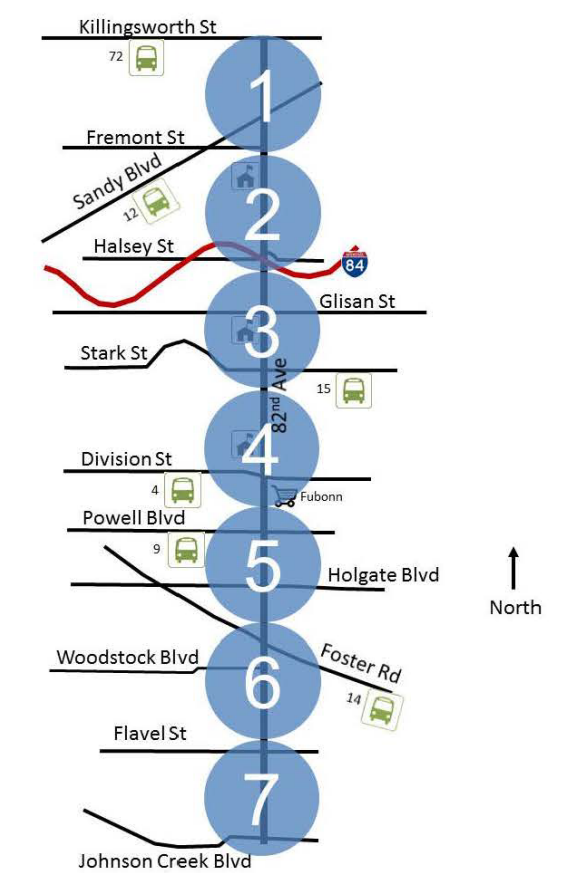
82nd Avenue of Roses Implementation Plan

ODOT, 2018

- Community engagement takeaways
  - Most popular zones to visit: Powell to Flavel (Zones 5 and 6)
  - Priorities for identifying focus areas
    1. Crash locations
    2. Sidewalk gaps
    3. Community destinations/schools/parks
    4. Concentration of low income, people of color
    5. Transit (use of bus stops, transfer locations)
- Referenced 6 potential sections developed with the community but only included a generic section in the final plan (see key takeaways)



Zone map provided in survey

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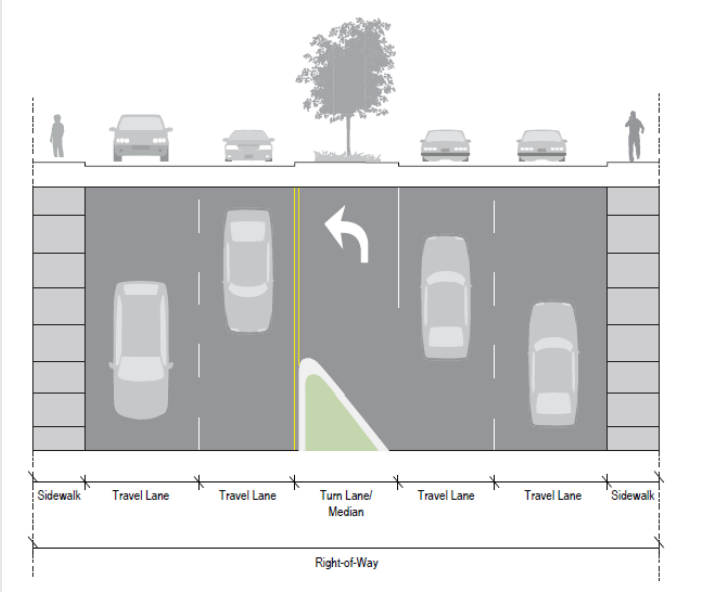
82nd Ave of Roses Key Takeaways

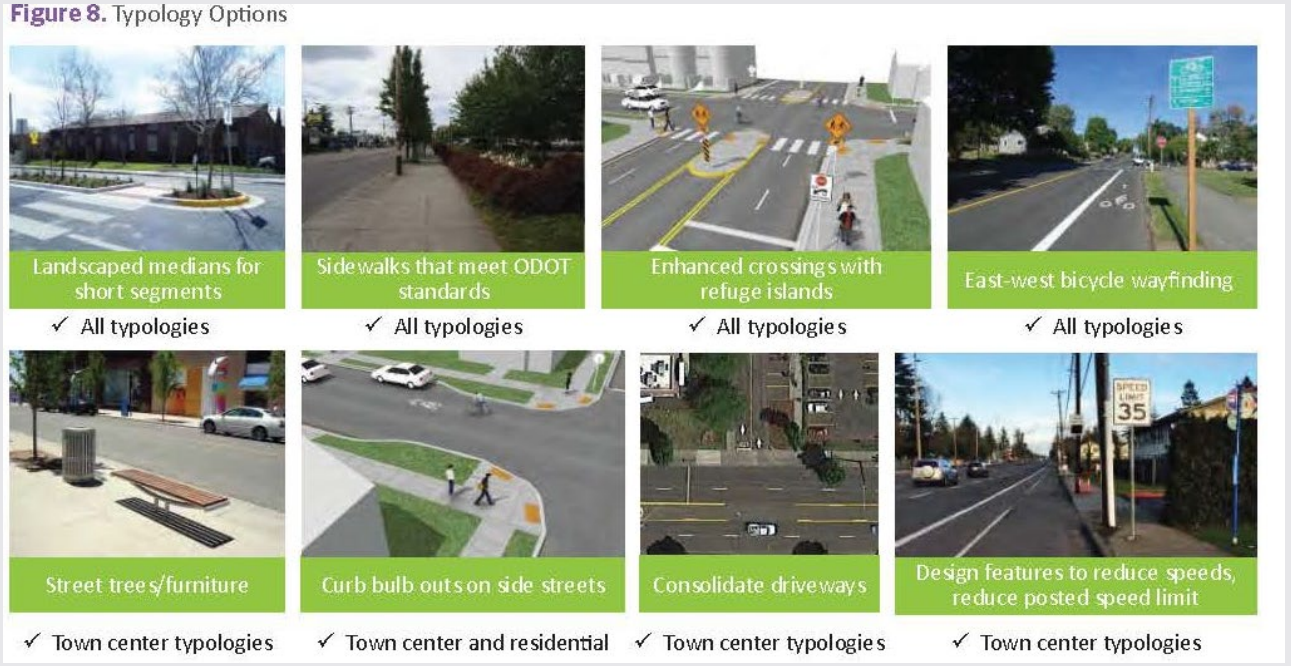


Operating under ODOT's "high funding scenario" (>$10M) described as:

- More frequent pedestrian crossings
- Upgraded sidewalks
- Repaving
- Place-making elements

Could also include:

- Sidewalk reconstruction (at least 6' wide)
- Consolidated driveways



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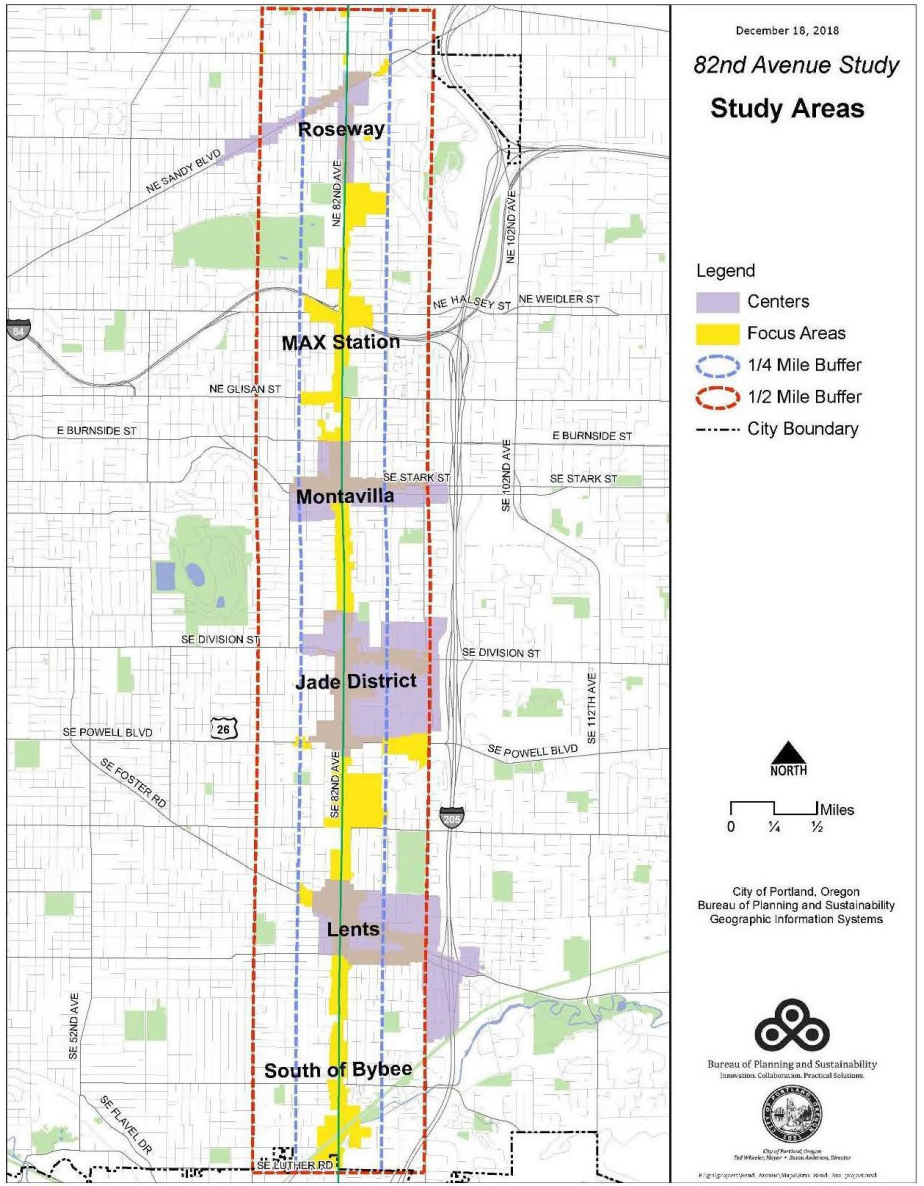
Barriers to Redevelopment

BPS, 2019

- Focused on barriers and opportunities for redevelopment on 82nd
- Coordinated with ODOT Ave of Roses Implementation Plan, PBOT Planning for a Future Civic Corridor
- Identified near term actions for BPS (e.g., zoning adjustments to split zoned properties, employment zone)
- Generated policy recommendations to address physical (pedestrian safety, parking) and social needs (displacement, homelessness), such as:
  - Mixed use industrial development
  - Creative development districts

Figure 2. *82nd Avenue Study* – Study Areas



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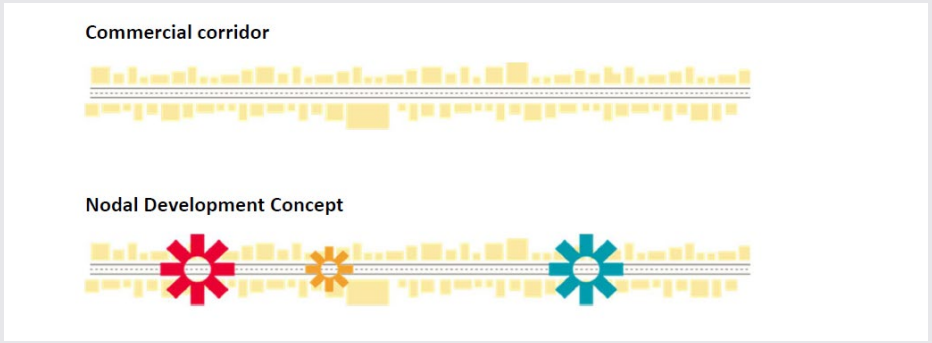
Barriers to Redevelopment

BPS, 2019

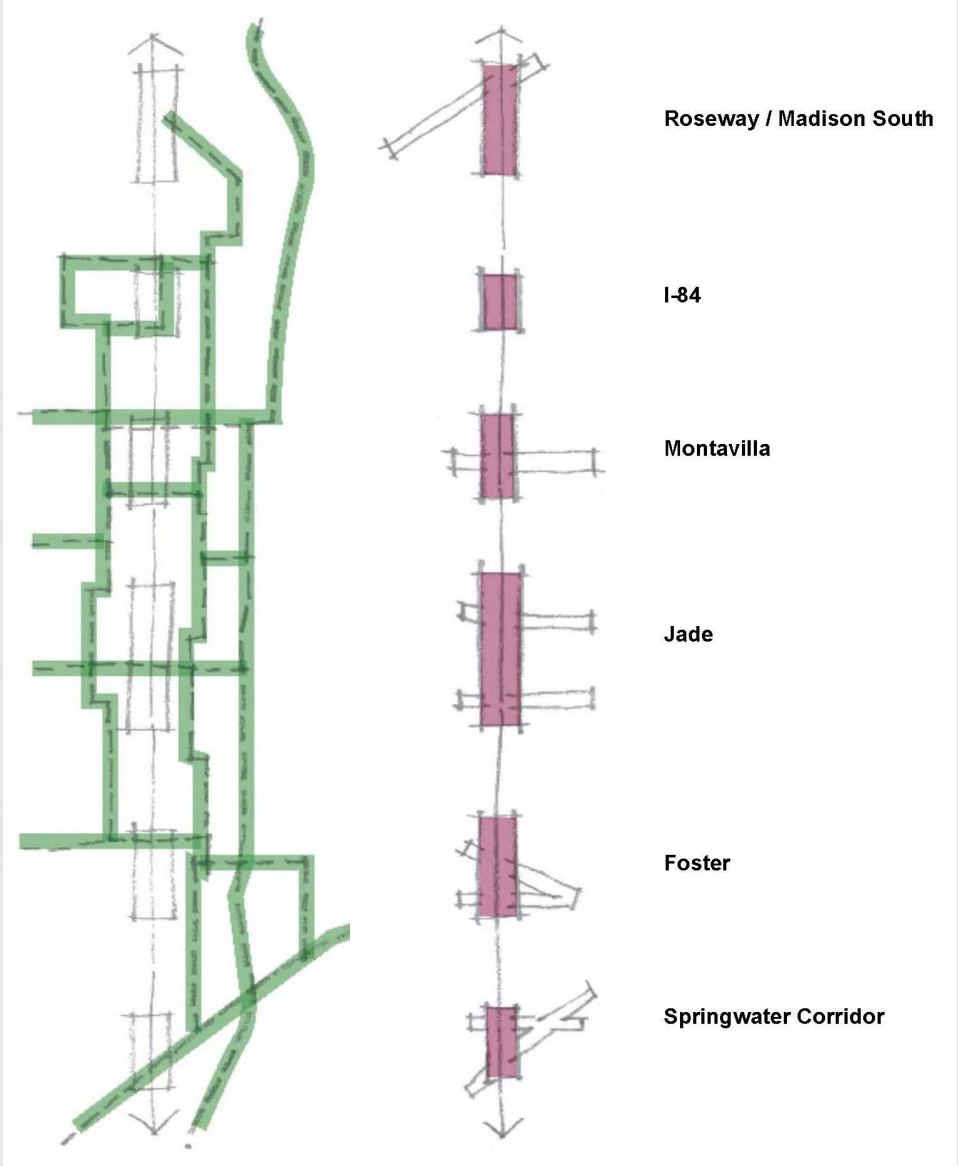
- Community engagement key takeaways
  - Observations from 82nd Ave businesses:
    - Benefits: low cost of land, low rent, diversity, community
    - Challenges: drugs, houselessness, crime
    - Obstacles: regulated parking, high development costs
  - Community vision from ODOT 82nd Ave online survey:
    - Neighborhood center with shops and businesses
    - Low-cost creative space

BPS Key Takeaways

The plan recommends a nodal development concept over revitalizing an entire commercial corridor at once. The nodal approach acknowledges the change in character, market, land use and intensity and allows the public sector to focus investments on places with existing areas of activity. For example, the plan recommends Montavilla and Jade district as highest priority for placemaking investments.



The plan highlights the transportation barriers to redevelopment, such as need for more safe crossings, sidewalks that appear as long curb cuts for a single business. In earlier studies, the team proposed parallel ped/bike routes around 82nd centers.



Source: ODOT Ave of Roses CAC Meeting 8 – presentation by BPS February 2018

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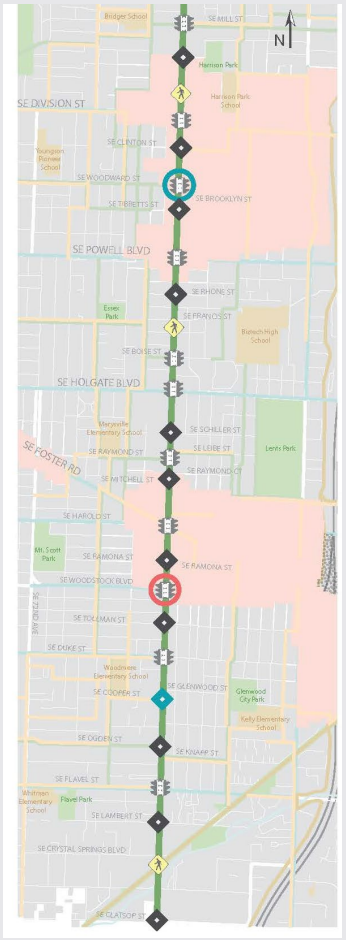
82nd Avenue Plan – Planning for a Future Civic Corridor

PBOT, 2019

- Purpose: to identify capital improvement projects, policies, design practices to support transition to Civic Corridor
- Policy Vision for Civic Corridors includes:
  - Policy 3.48. Integrated land use and mobility
  - Policy 3.49. Design great places
  - Policy 3.50. Mobility corridors
  - Policy 3.51. Freight
- Primary focus to increase safety and remove transportation barriers
- Other enhancements include but are not limited to:
  - Increase number of enhanced pedestrian crossings
  - Upgrade lighting to pedestrian scale lighting
  - Lowering speed limit (to 30, 25 in centers)
  - Transit improvements (e.g., faster, more reliable, more efficient)
- Next steps to develop conceptual design plan and holistic corridor-wide growth strategies

NORTH OF MARKET ST

SOUTH OF MARKET ST



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82nd Avenue Plan – Planning for a Future Civic Corridor

PBOT, 2019

- **Policy 3.48 Integrated land use and mobility:** Civic Corridors as models of ecological urban design, transit-support densities, prominent street trees, high-quality transit service and pedestrian and bike facilities
- **Policy 3.49 Design great places:** improve public streets and sidewalks, provide safe, healthy, and attractive pedestrian environment, contribute high quality of life for residents
- **Policy 3.50 Mobility corridors:** Civic Corridors as key mobility corridors that accommodate all modes of transportation
- **Policy 3.51 Freight:** maintain freight mobility and access on Civic Corridors that are also Major or Priority Truck Streets

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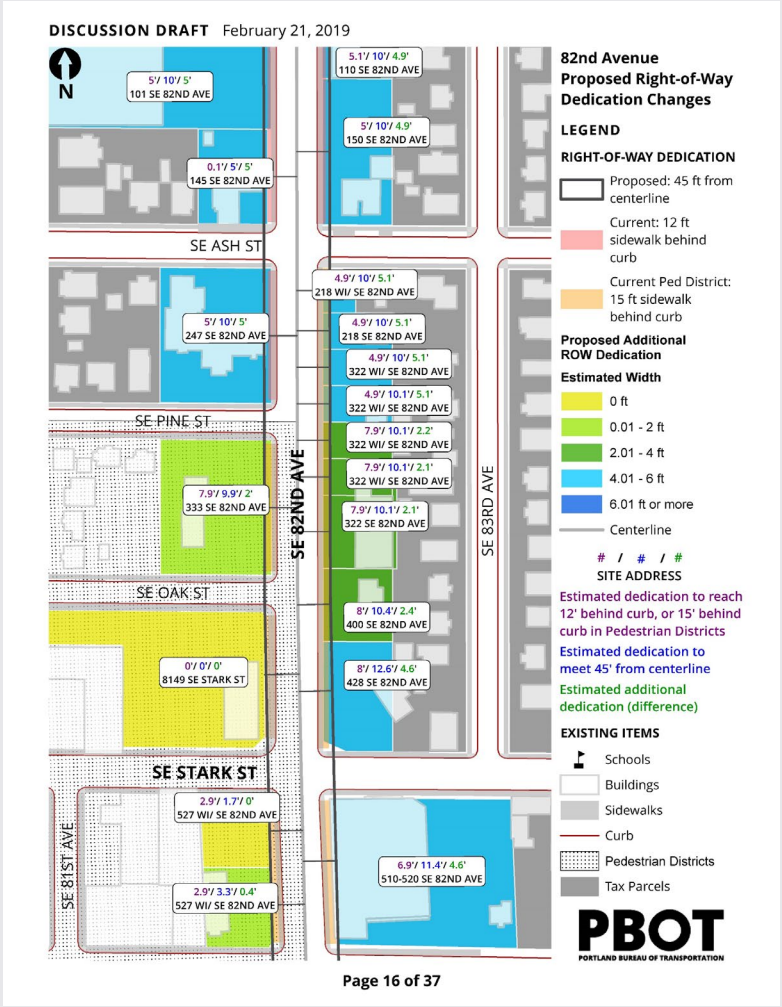
82nd Avenue Plan – Planning for a Future Civic Corridor

PBOT, 2019

- For redevelopment, shifts from setback to dedication as the tool to reach desired sidewalk width (12’ along corridor, 15’ in pedestrian districts/centers)



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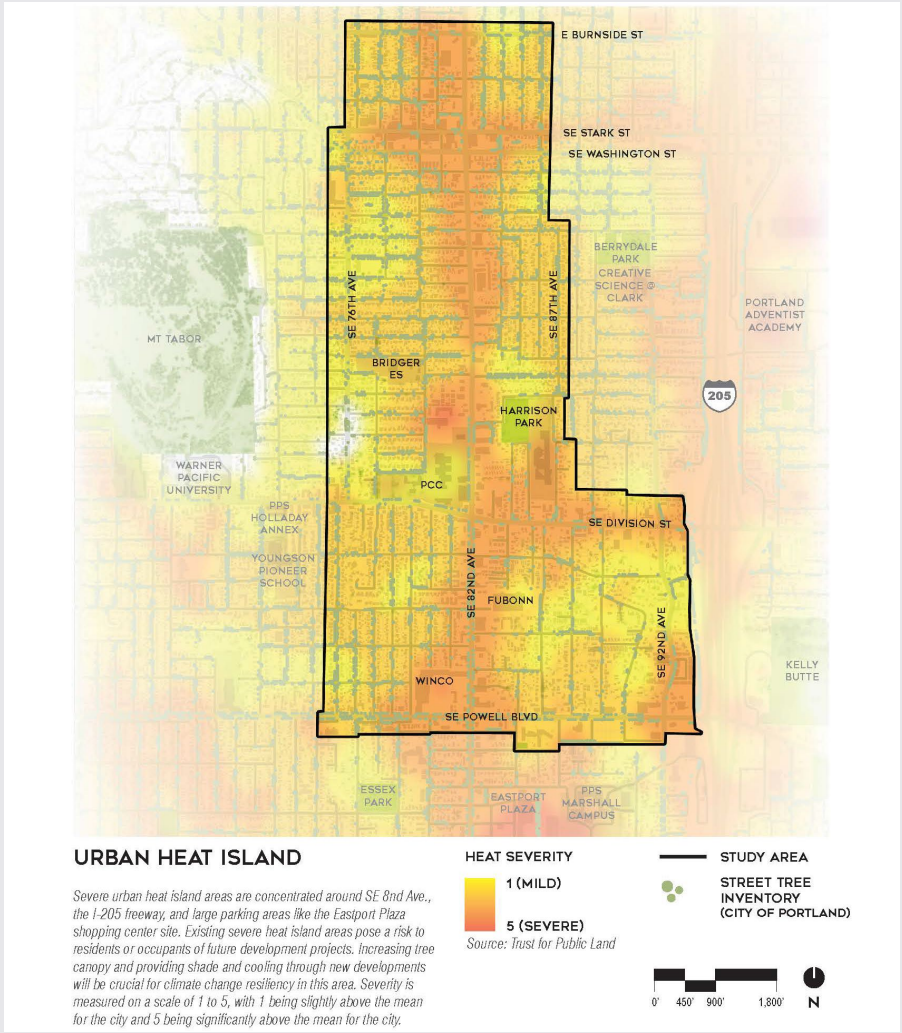
PBOT Civic Corridor Key Takeaways

- This document led to safety projects to be developed and constructed in Phase 1 (enhanced crossings, ADA upgrades)
- Many of the other enhancements from this plan will be developed in Phase 2/Transit project (e.g. improved bus stops, bus queue jumps, strategic sidewalk widening, bike lane gaps on intersecting and parallel routes)

APANO Equitable Real Estate Plan and Implementation Strategy

JULY 2022

- Vision of Jade District as a more equitable community in which diverse community members can build wealth
- Outlines priority strategies and actions for the Jade District focused on 3 areas: placemaking and belonging, economic empowerment and wealth generation, and real estate development
    - Many strategies within placemaking and belonging are related to 82nd CC/AA project and reference coordination
- Technical studies to inform the strategy (massing, zoning, market analysis, streetscape opportunities)



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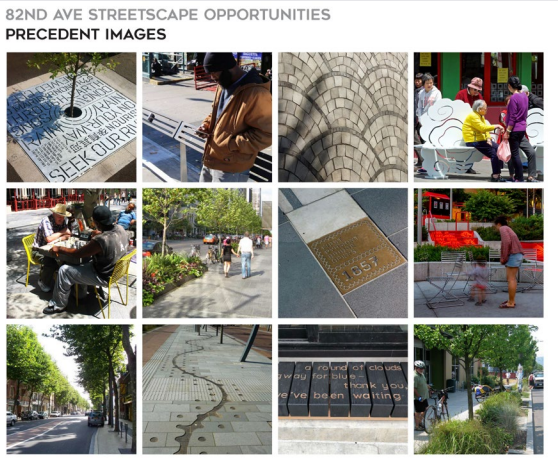
Equitable Real Estate Plan and Implementation Strategy

JULY 2022



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Equitable Real Estate Plan Key Takeaways

- Need for area-specific engagement with CBOs, business owners, major property owners and community members along 82nd to address different needs and vision of areas
- Close coordination needed among related 82nd Ave projects and clear messaging from project team

Exhibit 3. Summary of Strategies and Immediate Actions

Objective	Strategies	"Do Now" Actions
Placemaking and Belonging		
Improve access to parks and community gathering spaces	A.1 Work with PP&R to advocate for a neighborhood park A.2 Advocate for publicly accessible indoor and outdoor spaces with large development projects in the Jade District A.3 Work with PBOT to identify opportunities for public space in the ROW	▪ Communicate with PP&R to coordinate site search ▪ Meet with Cully Park partners ▪ Research potential uses of system development charge (SDC) funds ▪ Explore options for evaluating concepts for community-gathering space ▪ Conduct asset mapping of existing resources ▪ Consider submitting a proposal to the PSU MURP workshop program ▪ Explore options for zoning code assessment ▪ Establish relationships with neighborhood associations to participate in development review ▪ Inventory opportunities for small plazas in rights-of-way (ROWs) ▪ Explore how other areas have successfully converted ROWs ▪ Meet with PBOT staff working in placemaking and transportation
Promote sustainable improvements to transportation, safety, and infrastructure	B.1 Advocate for sustainable and resilient streetscape design B.2 Advocate for community goals in the street redesign for 82nd Avenue B.3 Identify and advocate for zoning code adjustments abutting the Civic Corridor that support community priorities	▪ Establish communication with PBOT project manager for the Civic Corridor ▪ Identify key properties with large surface parking lots ▪ Coordinate with Urban Forestry to leverage tree resources ▪ Coordinate with PBOT to discuss community engagement to inform the plan for SE 82nd Ave ▪ Meet with BPS and PBOT to clarify expectations around zoning or development standard changes from the Civic Corridor project ▪ Discuss how to ensure that development standards do not hinder wide sidewalks along SE 82nd Ave
Promote arts, culture, and community design	C.1 Update the Jade Midway District Art Plan	▪ Ensure that update includes connections to the SE 82nd Ave improvements and integrates community objectives ▪ Explore further community engagement as needed for specificity in the update

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Northern Termini Plans

3

Parkrose Community Plan

HISTORIC PARKROSE; PBOT; BPS, JUNE 2022

- Key issues and how they relate to plan goals:
  - Affordable Housing and Displacement Prevention
    - Issue: home prices rose 68% over last 10 years, only 55 out of 2,400 units are regulated affordable housing
    - Goal: Parkrose community can continue residency in healthy, affordable housing
  - Access to Jobs
    - Issue: only 5% of Parkrose residents work within Parkrose area of Columbia Corridor, no clear path connecting residents to jobs
    - Goal: connect youth to training and job opportunities, connect residents to opportunities in Columbia Corridor
  - Home-Based Businesses and Small Businesses
    - Issue: Parkrose AMI between $15,000 and $30,000 less than citywide AMI, residents want to grow home-based and small businesses
    - Goal: provide support to growing businesses and to entirety of Historic Parkrose business district
  - Sandy Boulevard Safety
    - Issue: over 30 crashes in past 5 years, three segments of gaps greater than 1,000 feet between signalized pedestrian crossings
    - Goal: transform Sandy into civic corridor
  - Neighborhood Transportation Needs
    - Issue: very limited safe active transportation infrastructure
    - Goal: enhance walking and biking infrastructure and plant street trees
  - Community Spaces and Access to Nature
    - Issue: half the community lives more than a half of a mile away from a public park, there are no public access points to Columbia Slough within neighborhood
    - Goal: install recreation and gathering spaces in neighborhood, open access Columbia Slough to Parkrose residents

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Parkrose Community Plan Key Takeaways

This plan identified community needs through engagement and created goals in response.

The Parkrose community needs safety enhancements along major corridors, more access to green space and gathering spaces, affordable housing options that cater to the residents, and support for job opportunities and business growth.

One of the few new Parkrose affordable housing developments

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PCP- Transportation Safety Solutions: Final Report

AGENCY, MAY 2022

- Community concerns:
  - Lack of safety (pedestrian, bicycle, personal, children's)
  - Lack of neighborhood character and businesses, especially on more industrial Sandy
- Many crashes along Sandy Boulevard and Killingsworth Ave
  - Common crash locations at NE 96th and Sandy and Sandy between NE 89th and NE 122nd
  - Most common crash types:
    - "Failure to Avoid" and "Not Yielding"
    - "Improper Lane Change" and "Improper Turn"
- Upgraded crossings, including midblock crossing additions, connections, and lighting are integral to creating a livable, healthy Parkrose

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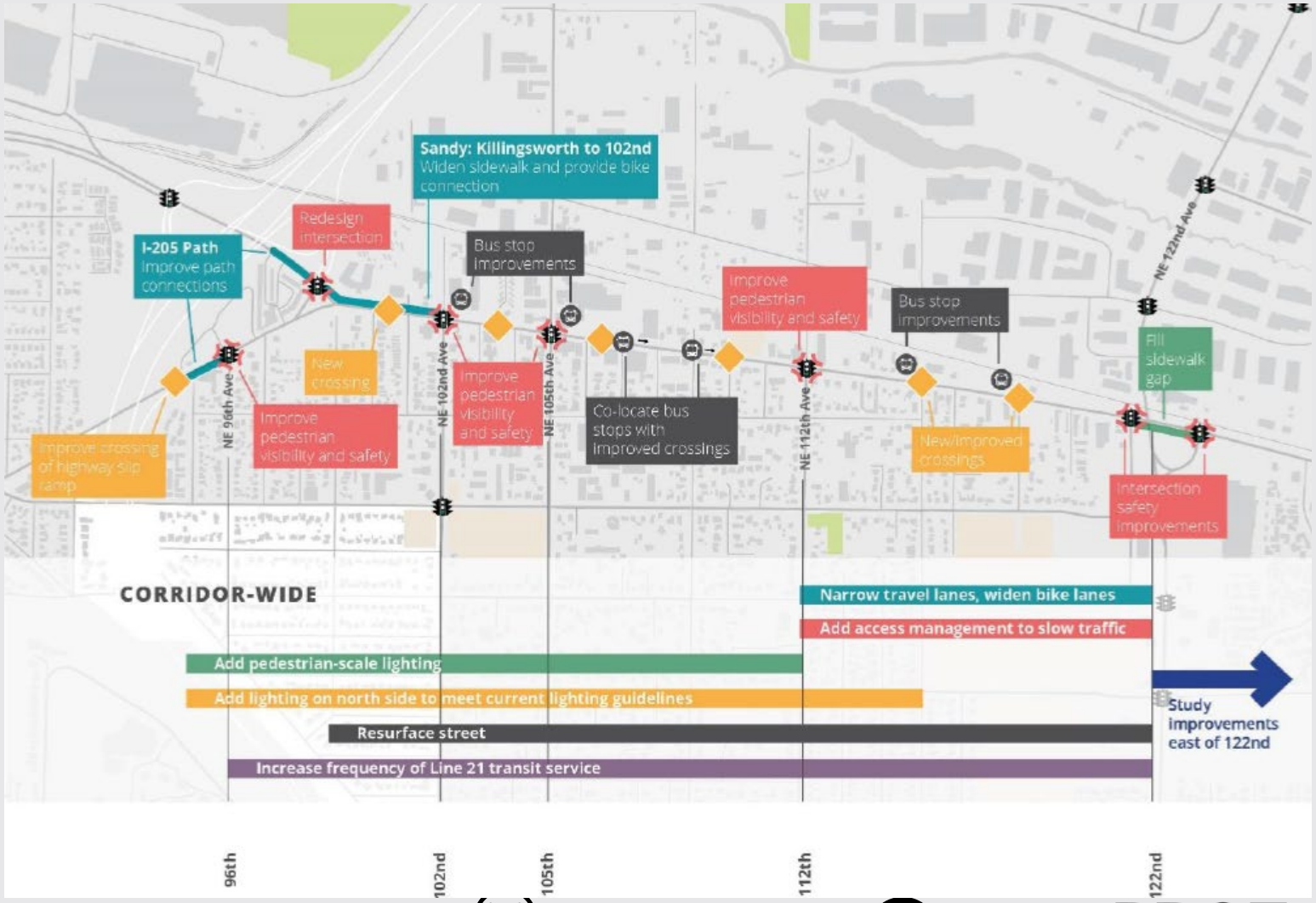
PCP TSS Key Takeaways

The Parkrose community is very concerned about the lack of safety conditions along Sandy. Recommended solutions:

- Midblock crossing between NE 87th and Sandy / Killingsworth
- Upgraded signalized crossings and intersections at NE 96th and Sandy, NE 97th and Killingsworth, Sandy between NE 100th and NE 101st (ODOT jurisdiction)
- Redesign Sandy and NE Killingsworth / I-205 intersection
- Upgrade / increase lighting along Sandy
- Improve transit access
- Widen I-205 MUP between NE 95th and NE 96th
- Improve connection to NE 96th and Parkrose TC



Source: ODOT Ave of Roses CAC Meeting 8 – presentation by BPS February 2018

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Cully TIF Preliminary Plan

PROSPER PORTLAND, 2022

- Cully neighborhood has poor walkability, limited transit access, few open spaces, and many brownfields
- Overarching goals for this plan are:
    1. Prevent displacement and support those previously displaced
    2. Amplify BIPOC community members to lead discussions and benefit from development
- To mitigate gentrification and displacement, community suggested:
    1. Housing
        - Expand and diversify affordable housing infrastructure, remove immigration status as a barrier to housing options, and implement affordable home repair, renovations, and weatherization
    2. Houseless Services and Infrastructure
        - Provide shelters and resources for human needs, adjust the definition of “affordable” housing, and remove misdemeanor and non-violent criminal status as a barrier to housing qualification
    3. Building Wealth, Jobs, and Businesses
        - Prioritize community members in TIF investments, remove barriers to business ownership, improve transit system around neighborhood (especially to/from Industrial Cully), create living wage opportunities, enhance walkability and bike safety, and build affordable, culturally relevant food options and affordable or free childcare
    4. Community Governance and Decision-Making
        - Hold the plan accountable for implementing actions, report status of actions to the community, inform everyone in the community about next steps, and continuously support and train members of decision-making committees
- Community asked for:
    1. Community and adult education centers
    2. Youth activities and youth gathering spaces
    3. Indoor recreation
    4. Safe space for community gathering and connection
    5. Gallery space, art studios, and other facilities to support local artists

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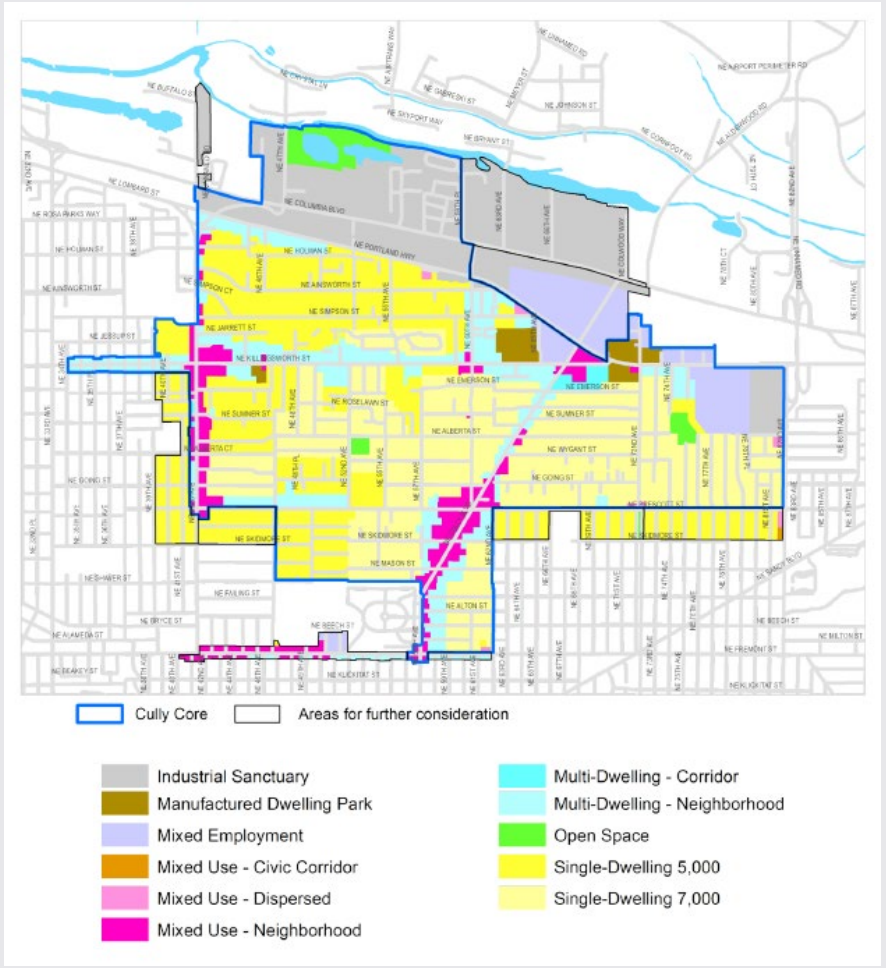
Cully TIF Key Takeaways

This plan describes strategies to **prevent** displacement for Priority Communities (BIPOC communities, communities that are historically marginalized, low-income communities), **mitigate** gentrification development, and **support** those already displaced.

Cully residents want to see greater representation of their community in development, businesses, and decisions being made in their neighborhood, especially greater representation of Priority Communities.

Possible TIF-funded programs and projects will only be successful when they create impactful benefits for the community and address the plan's implementation principles.



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Cully Commercial Corridor and Local St Plan

PBOT & BPS, 2012

- 3 community outreach events to gather information about vision for Main Street and neighborhood street system
- Worked with diverse stakeholders providing input and values that are critical to the community
- Outreach demonstrated a need for:
  - More neighborhood businesses
  - Safer streets and the ability to walk, bike, and ride transit safely
  - Community center and gathering space
  - Support for racial, economic, and cultural diversity
  - Increase in homes and mixed-use development
  - Developments only using parking minimums
  - Culturally relevant businesses
  - Preservation of low vehicle volumes and speeds
  - Increase in safe biking and walking infrastructure
  - Enhancing green spaces
  - Stormwater management

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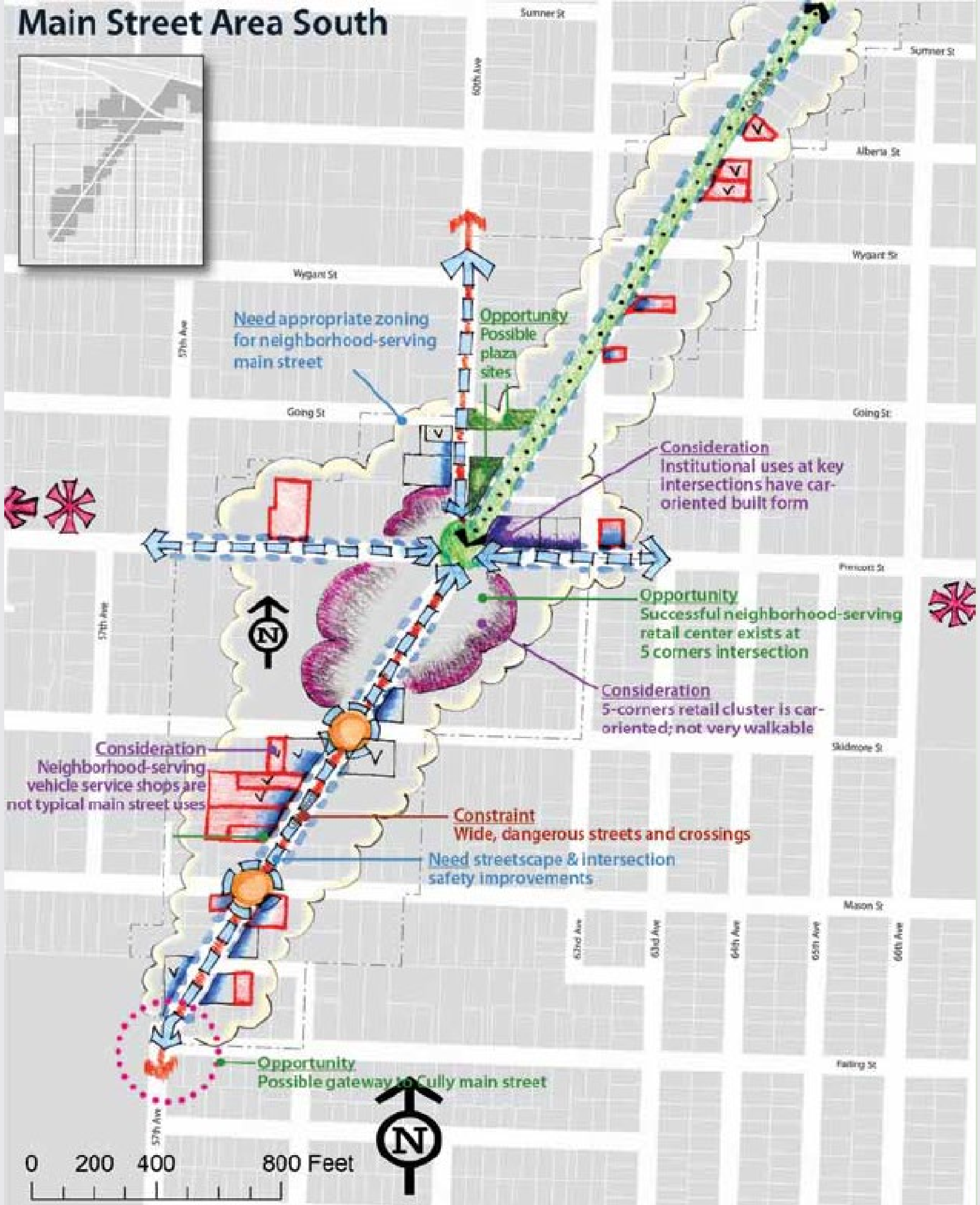
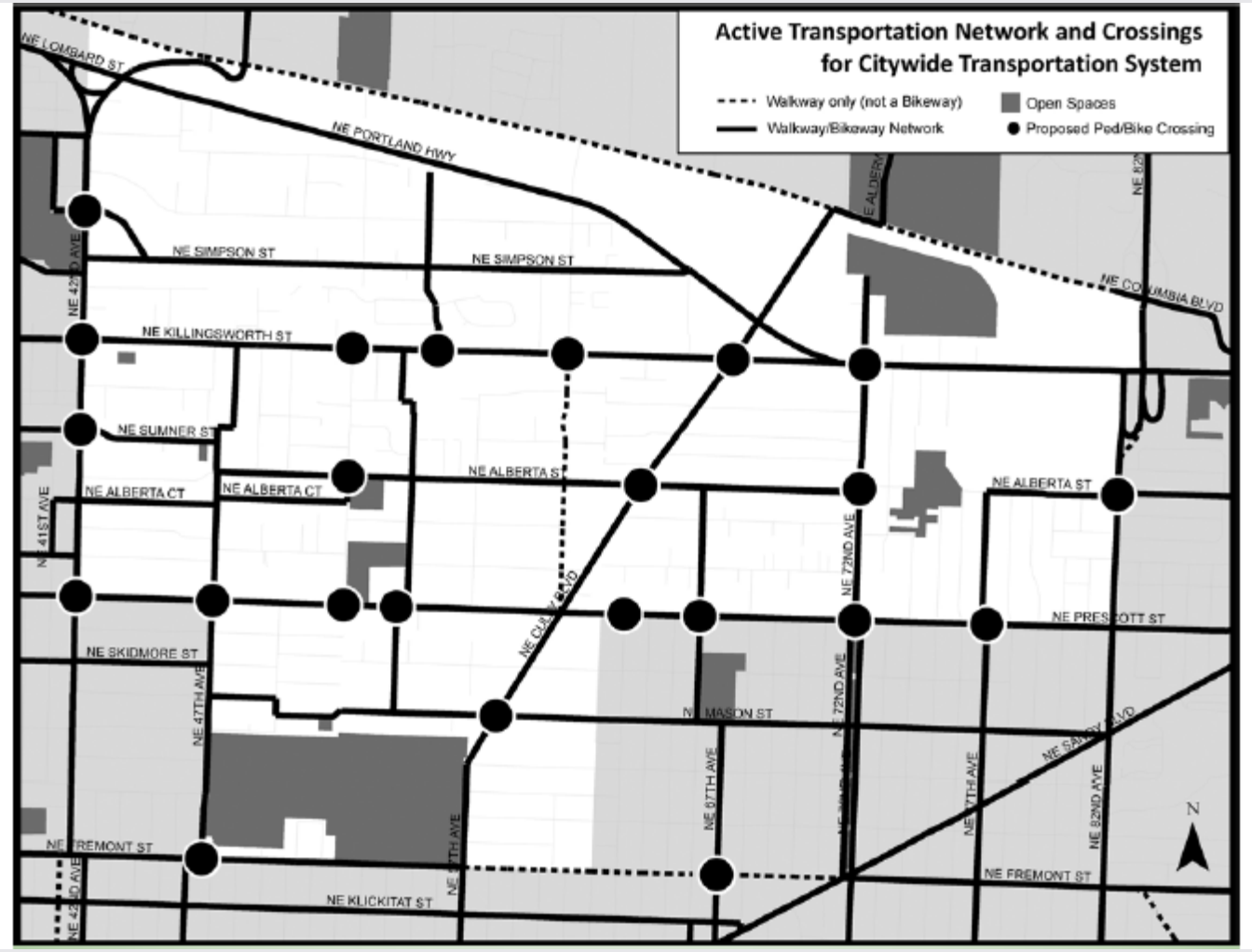

Main Street Area South
Need appropriate zoning for neighborhood-serving main street
Opportunity
Possible plaza sites
Consideration
Institutional uses at key intersections have car-oriented built form
Opportunity
Successful neighborhood-serving retail center exists at 5 corners intersection
Consideration
5-corners retail cluster is car-oriented; not very walkable
Consideration
Neighborhood-serving vehicle service shops are not typical main street uses
Constraint
Wide, dangerous streets and crossings
Need streetscape & intersection safety improvements
Opportunity
Possible gateway to Cully main street
0 200 400 800 Feet
Sumner St
Alberta St
Wygant St
Going St
Prescott St
Skidmore St
Mason St
Failing St
57th Ave
60th Ave
62nd Ave
63rd Ave
64th Ave
65th Ave
66th Ave


Main Street Area North
Opportunity
Possible gateway to Cully main street from Columbia Hwy
Need appropriate zoning for neighborhood-serving main street
Opportunity
Future Thomas Cully Park
Constraint
Employment zoning doesn't foster a main street environment
Consideration
Institutional uses at key intersections have car-oriented built form
Opportunity
Site for Mercado or other development
Consideration
Neighborhood-serving vehicle service shops are not typical main street uses
Ortiz Community Center
Constraint
Wide, dangerous streets and crossings
Need streetscape & intersection safety improvements
Opportunity
Cully green street fosters walking and cycling
Opportunity
Increasing housing density could help support businesses
Opportunity
Abundant on-street parking will support businesses
Need bus service along the length of Cully Blvd
Need to bring nonconforming uses into compliance
0 200 400 800 Feet
Legend
Area to consider zoning changes
Cluster of successful car-oriented businesses
Nonconforming commercial use
Institutional or affordable housing at key intersection
Existing pedestrian-scale development
Vehicle service businesses
Employment zoning
Cully Green Street
Fast, heavy traffic
Need streetscape & safety improvements
Underutilized on-street parking
Bus connection needed
Existing community asset
Development opportunity site
Open space opportunity site

Cully Commercial Corridor Key Takeaways

The Cully community wants the new zoning proposal to be more inclusive of their neighborhood make-up. They want to be able to walk, bike, and ride transit safely, which they are unable to do now.

To thrive, the community needs more housing and mixed-use development, stormwater management, and preservation of, and access to, more green space.



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Portland International Airport Bicycle & Pedestrian Master Plan

PORT OF PORTLAND, 2014

- Plan vision is for Port and City to “promote and improve” pedestrian access between Airport and nearby neighborhoods
- Corridors and crossings needing safety updates:
  - NE Cornfoot Rd
  - I-205 MUP
  - NE 82nd and NE Airport Way
  - Port employee exit Airport Way crossing
- Community feedback themes:
  - Safer crossings, Need for crossing enhancements, Increase in bike access and infrastructure
- Lots of existing infrastructure installed from previous work (i.e., terminal connector MUP, Marine Drive connector MUP, Mt. Hood Ave interchange, Columbia Slough trail, bicycle assembly area)
- Areas of concern:
  - Terminal infield access
  - NE 82nd and NE Airport Way intersection
  - I-205 / NE Airport Way SB on-ramp
  - Access from south

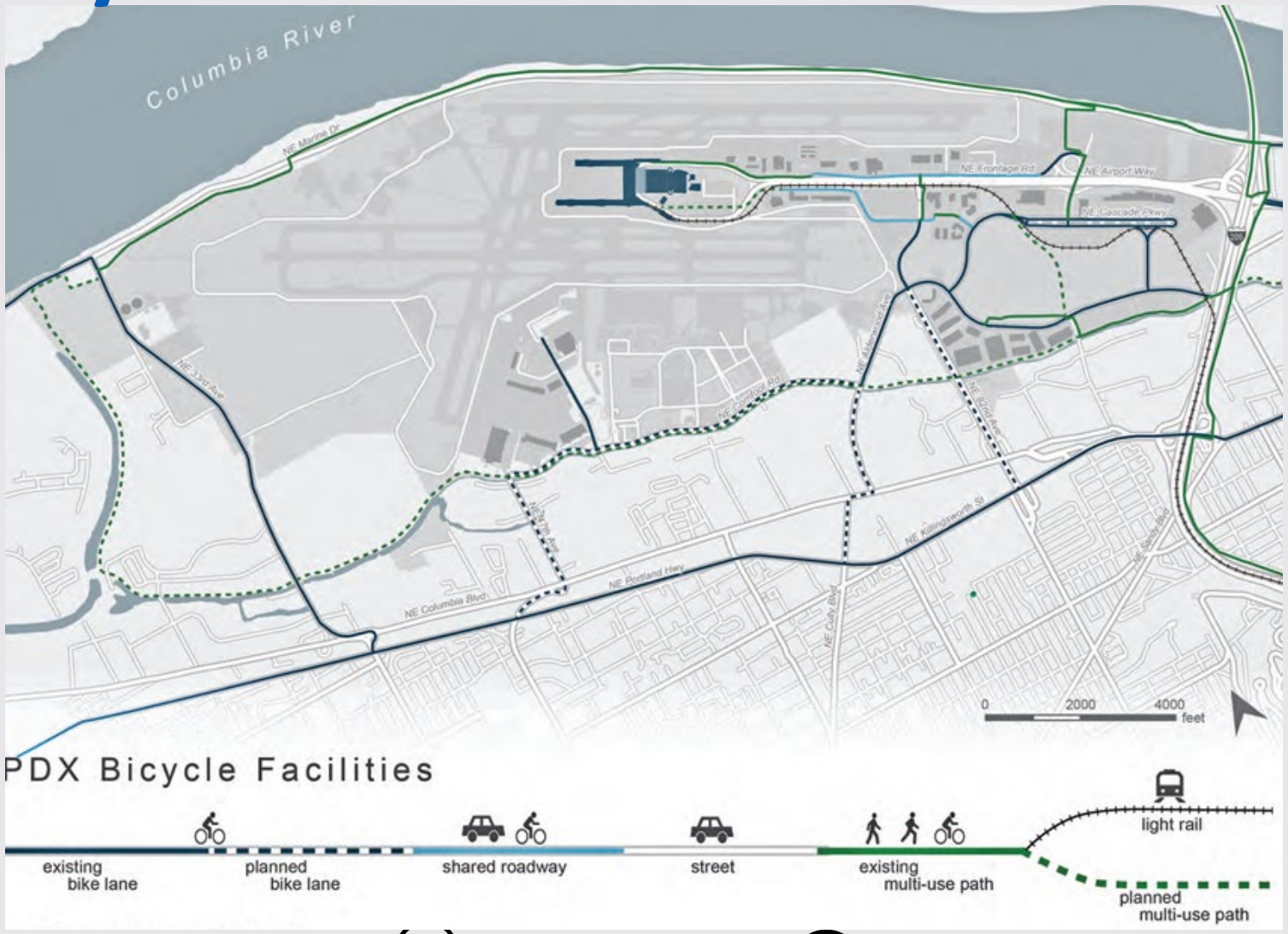
Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

ABPMP Key Takeaways

The Port's bicycle and pedestrian plan builds off five other Port and City initiatives to enhance safety access by active transportation modes.

However, there are still a few areas of concern and safety fears about walking and biking in the area. This plan lays out two key policies with several respective strategies to address these issues. These strategies include:

- Expanded bike and ped access
- Involvement in the City's and Metro's planning processes
- FAA regulations and requirements
- Creation and adherence to bike and pedestrian infrastructure guidelines



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Columbia Lombard Mobility Corridor Plan

PBOT, 2021

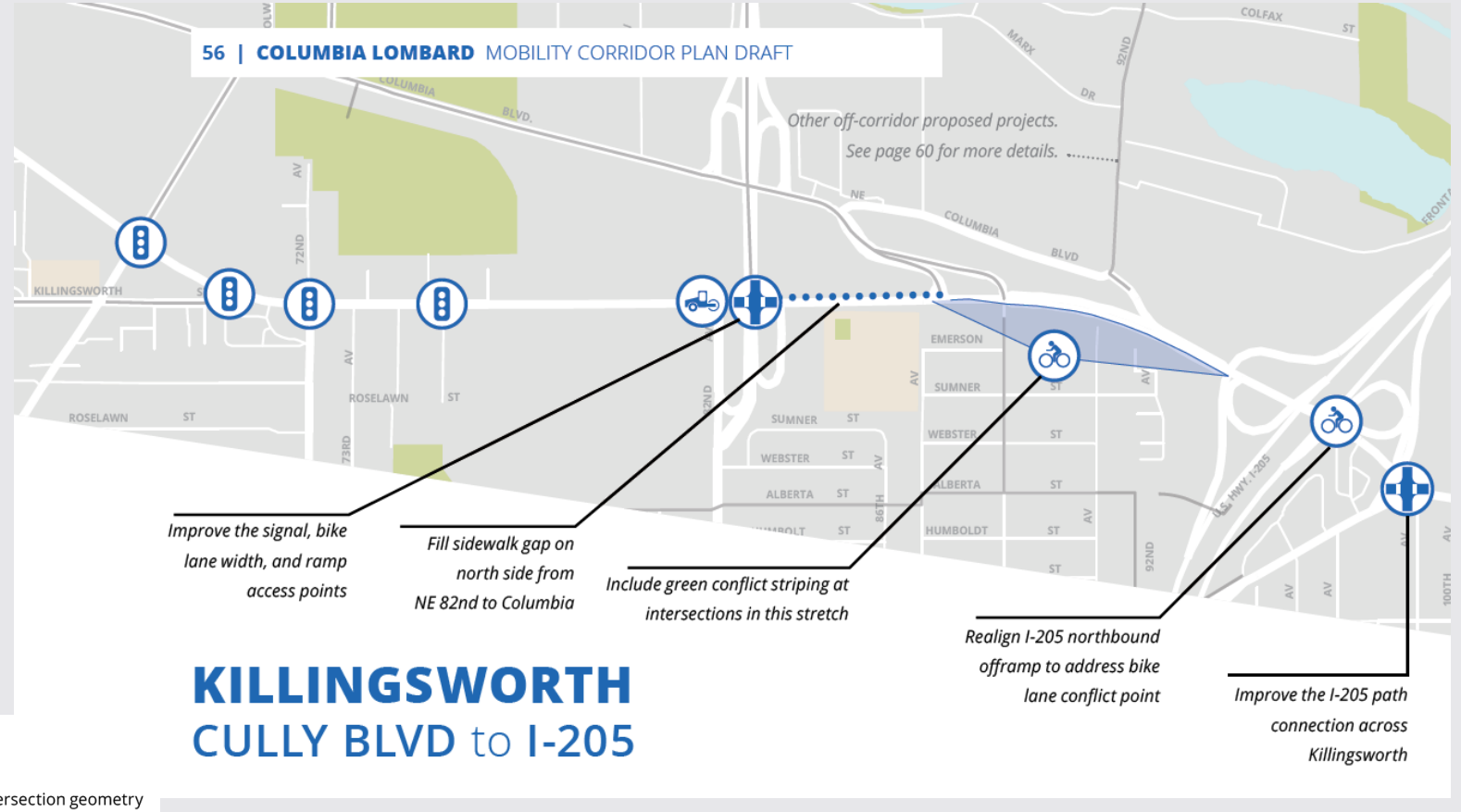
- Plan identified and prioritized projects to improve safety and access with a focus of walking, biking, and freight
- General community concerns
  - Need for better pedestrian, bicycle facilities and lighting
  - Need for better and more transit at off-peak times for non-traditional schedules
  - Need for better and more transit between Cully and industrial areas
  - High vehicle speeds and unsafe driver behavior
- Community concerns focused between Cully Triangle and Parkrose
  - Better access to Cully Park
  - Repaving
  - Better bike access to I-205 path
- Goal for segment on Killingsworth between Cully Blvd and I-205: improve pedestrian safety and crossing opportunities through the Cully neighborhood, and improve safety and predictability for people driving, walking, and biking near I-205
- Segment-wide improvements:
  - Use access management and medians to reduce head-on and left-turn collisions
  - Improve existing bike lanes to increase comfort and separation
  - Add enhanced crossings at bus stops
  - Add lighting to meet current guidelines for safe lighting levels

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

CLMCP Key Takeaways

The plan proposes specific improvements to improve safety for walking and. Solutions most applicable to the potential northern termini include:

- Adding a signal at Cully Triangle (Killingsworth and Lombard)
- Reconfiguring I-205 NB off-ramp to eliminate conflicts with WB bicyclists
- Improving connections to the I-205 path near Parkrose-Sumner Transit Center
- New bicycle and pedestrian bridge connecting Parkrose-Sumner Transit Center with neighborhoods west of I-205



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Clackamas County Plans

Clackamas Regional Center Pedestrian/Bicycle Plan

CLACKAMAS COUNTY, 2012

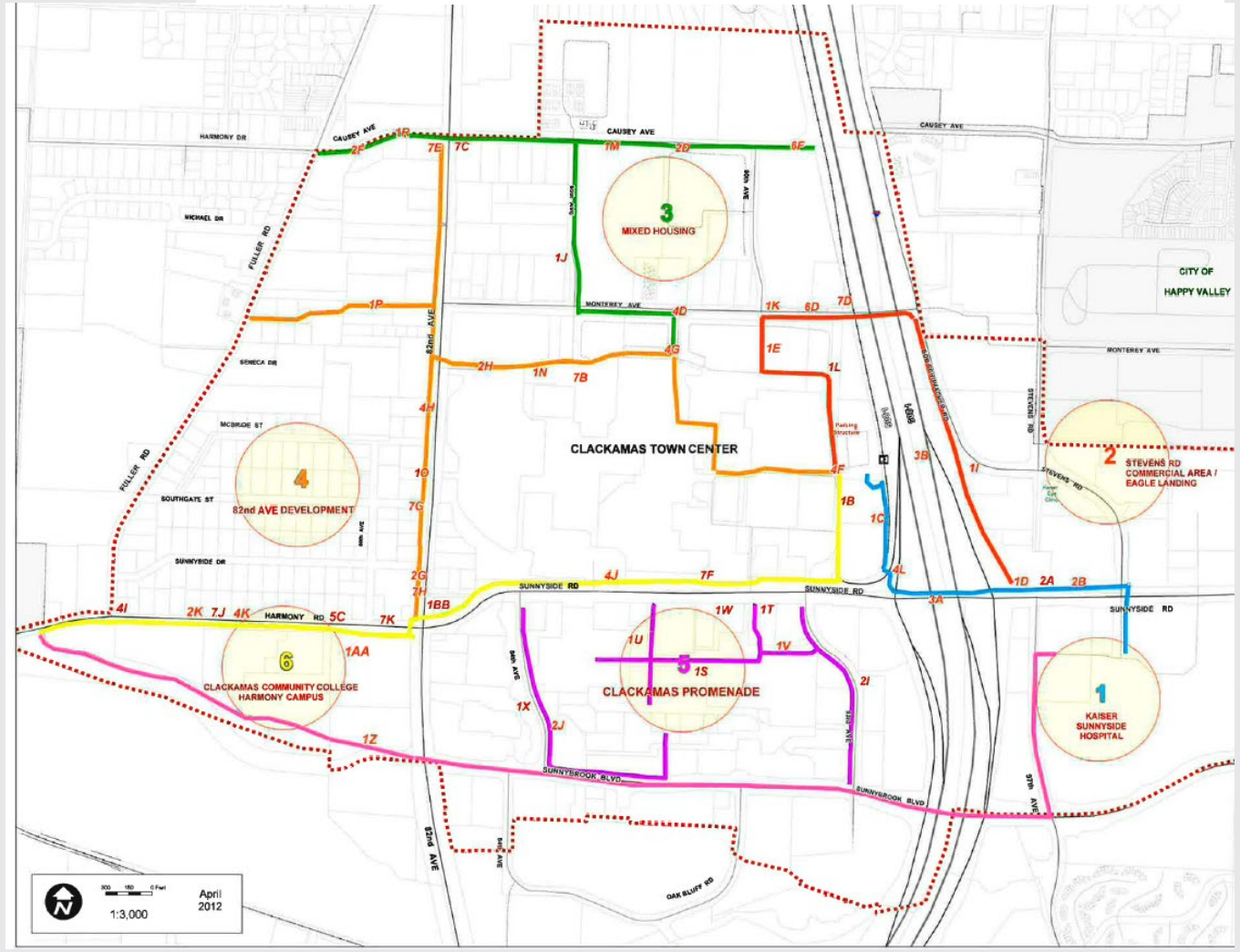
- The plan identified safe walking and bicycling connections from the Clackamas Town Center station to major area employers.
- Seven routes leading to major destinations in the study area were inventoried for system gaps, deficiencies, and obstacles:
  - Kaiser Permanente Sunnyside Hospital
  - Stevens Road Commercial Area/Eagle Landing Mixed Use Development
  - Mixed Housing North of Clackamas Town Center
  - 82nd Avenue Development/Housing
  - Clackamas Promenade Shopping Center
  - Clackamas Community College Harmony Campus/OIT/Aquatic Center
  - Clackamas Town Center

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

CRCPBP Key Takeaways

- Many priority projects from the plan have since been implemented, including a wayfinding system for the area and much of the proposed bike lanes along 82nd (2G – between Sunnyside and Causey)

	ROUTE 4: 82ND AVENUE DEVELOPMENT
4F	Install pedestrian safety devices (e.g. pedestrian signal, signage) for the crosswalk at the Max Green Line Park & Ride to JC Penney. (Needs Report 3.p.)
4G	Install pedestrian safety devices (e.g. pedestrian signal, signage) for the crosswalks leading to the Transit Center on the north side of the mall. (Needs Report 3.r.)
7B	Upgrade sidewalks and crosswalks on the north side of the mall to ADA standards. (Needs Report 3.f.)
1N	Construct a pedestrian connection through the north Clackamas Town Center parking area west to 82nd Avenue. Construct sidewalk between 82nd Avenue access driveway and the Transit Center north of the cinema. (Needs Report 4.a.)
2H	Install bike lane on Town Center driveway (northernmost access) from 82nd Avenue to the CTC North Mall Transit Center. (Needs Report 4.g.)
1P	Construct east/west connector street with sidewalk/bike boulevard treatment between 82nd Avenue and Fuller Road. (Needs Report 4.c.1.)
4H	Increase walk time at crosswalks along 82nd Avenue within project area. (Needs Report 4.k.)
1O	Construct sidewalk/landscape strip along both sides of 82nd Avenue from Sunnyside Road north to Causey Avenue as per boulevard standard. (Needs Report 4.b.)
7G	Install transit amenities along 82nd Avenue within project area. (Needs Report 4.i.)
2G	Install bike lanes on 82nd Avenue within the project area, if adequate right-of-way exists. If not, acquire right-of-way for bike lanes along 82nd Avenue. (Needs Report 4.d.)
7H	Analyze feasibility of decreasing number of driveways and implementing 82nd Avenue Access Management Targets (Map X-CRC-8). (Needs Report 4.l.)



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TriMet Bike Plan

TRIMET, 2016

- Plan evaluates existing conditions for bicycles, creates a response through new programs and policies, and provides guidance for implementation
- Community outreach themes:
  - Concerns about full bus bike racks and bus passing them by
  - Theft from bus bike racks
  - Theft of bikes at stops, need for secure bike parking
- TriMet Staff interview themes:
  - Close calls between buses and bikes in roadway
  - Need for more space for bikes on bus
  - Bike theft at stations and stops
- 3 goals:
  - Secure bike parking
  - Enhance bikes onboard transit vehicles
  - Bikeway improvements on connecting roadways and pathways

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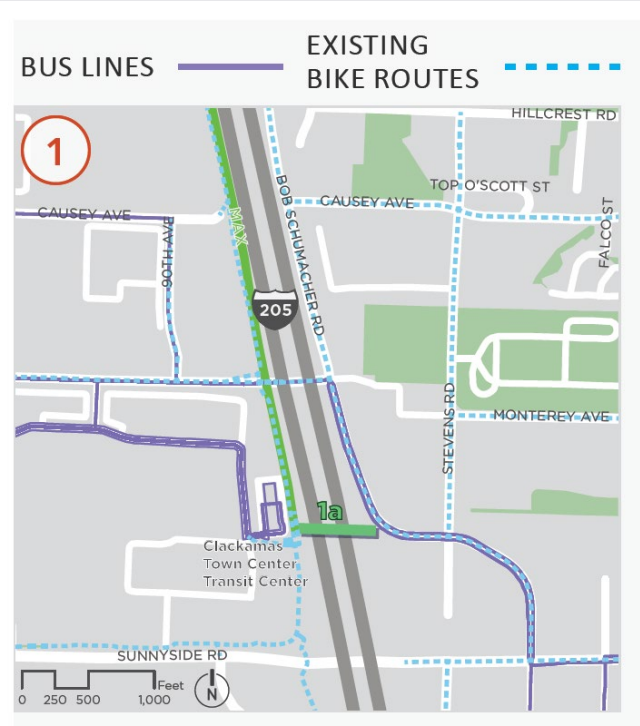
TriMet Bike Plan Key Takeaways

The plan prioritizes 2 areas along potential line 72 alignment to increase bike access and bike parking infrastructure: Clackamas Town Center and Parkrose/Sumner Transit Center. Specific projects include:

- A pedestrian/bicycle overpass over I-205 at the Clackamas Town Center
- Improved crossings for bicyclists at existing Monterey Ave bridge
- Support bicycle improvements at Sandy Blvd overpass over I-205 to the Parkrose/Sumner Transit Center



Source: ODOT Ave of Roses CAC Meeting 8 – presentation by BPS February 2018

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

Drive to Zero Safety Action Plan

CLACKAMAS COUNTY, 2019

- Eliminate fatal and serious injury crashes by 2035
- Inexperienced drivers, roadway departures, and aggressive driving are the top 3 contributing factors in crashes
- Local Road Safety Plan, Project Evaluation and Tracking, and Next Steps describe how the plan will be achieved
- This includes:
  - Location-Specific Safety Treatments
  - Systemic Safety Treatments
  - Funding-Constrained Plan

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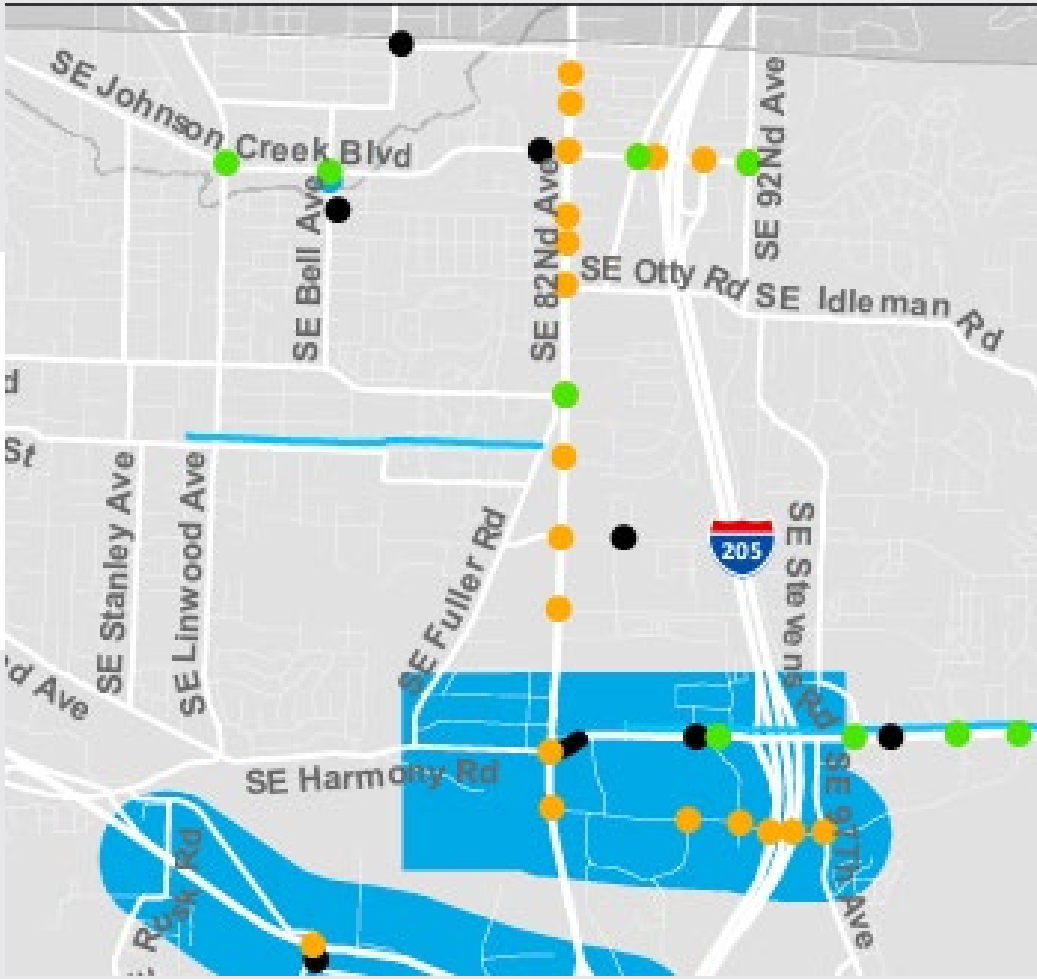
DTZSAP Key Takeaways

Plan demonstrates a series of action items and countywide programs that can be used to achieve zero fatal and serious injury crashes. There is a focus on identifying hot spot locations that create serious risk, including several planned and funded projects on 82nd.

- RSA Implementation Projects
- Near-Term SPIS Projects
- 5-Year CIP Projects
- ODOT ARTS Projects
- Long-Term SPIS Projects



Funded and Planned Safety Projects

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Clackamas County Comprehensive Plan

CLACKAMAS COUNTY, 2012

- Clackamas Regional Center Area Design Plan is chapter 10 of the comprehensive plan. It was amended to create “decision-making” framework for growth, an increase in access, and neighborhood enhancement (2017)
- Chapter 5 is the transportation element that provides a framework to help guide the County in its efforts to build and maintain a multimodal transportation system until 2033. The county acknowledges a backlog of projects due to limited funds for road maintenance and capital investments is a concern as part of this plan (2013)
- Relevant policies:
  - Enhance neighborhood character, pedestrian oriented spaces, streetscapes, and connectivity (10.X)
  - Encourage pedestrian and bicycle travel through increased access and connections on public easements or ROW (10.EE.4)
  - Create 45-55% non-drive alone target in regional centers, station communities, and corridors (5.E.6)
  - Prioritize roadway improvements to increase transit reliability (5.T.2)
  - Work with federal, state, and regional partners to implement HCT (5.T.12)
  - Increase bicycle and pedestrian connectivity between OR 224 and Clackamas Regional Center along 82nd (5.DD.2.5)

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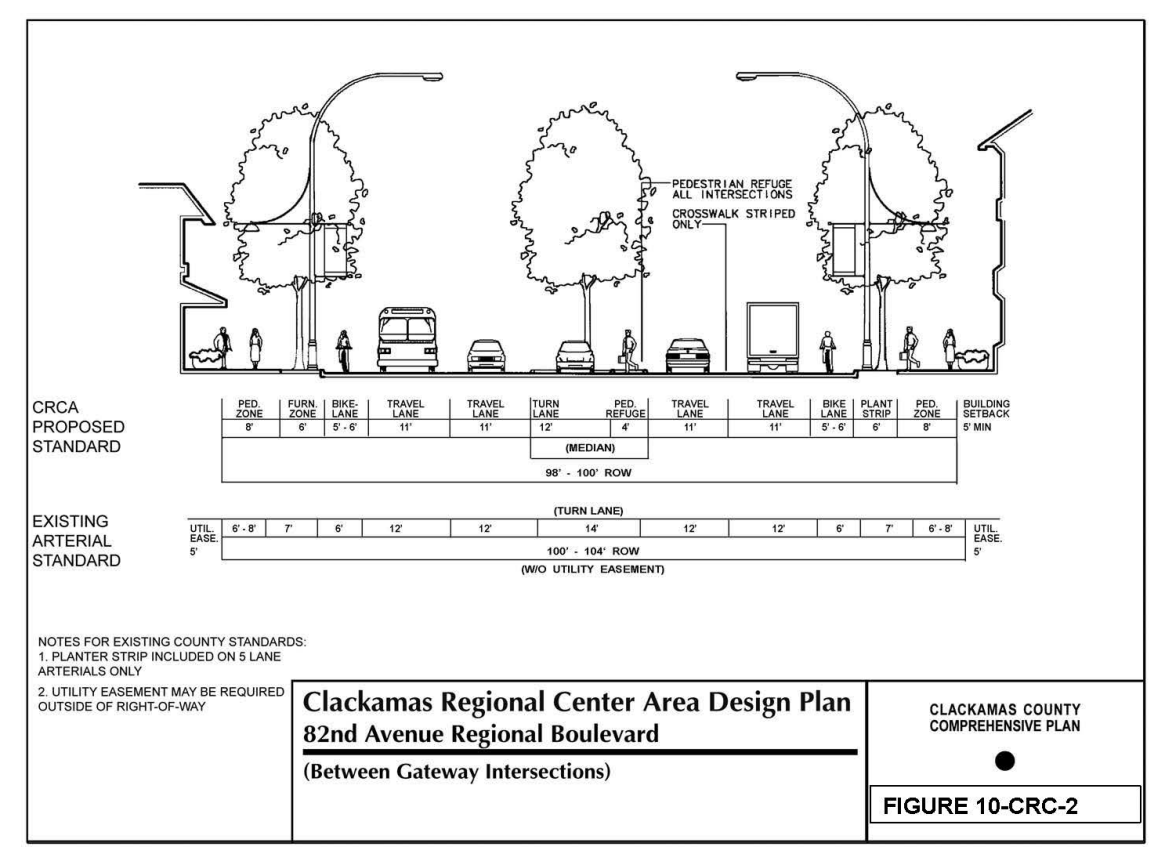
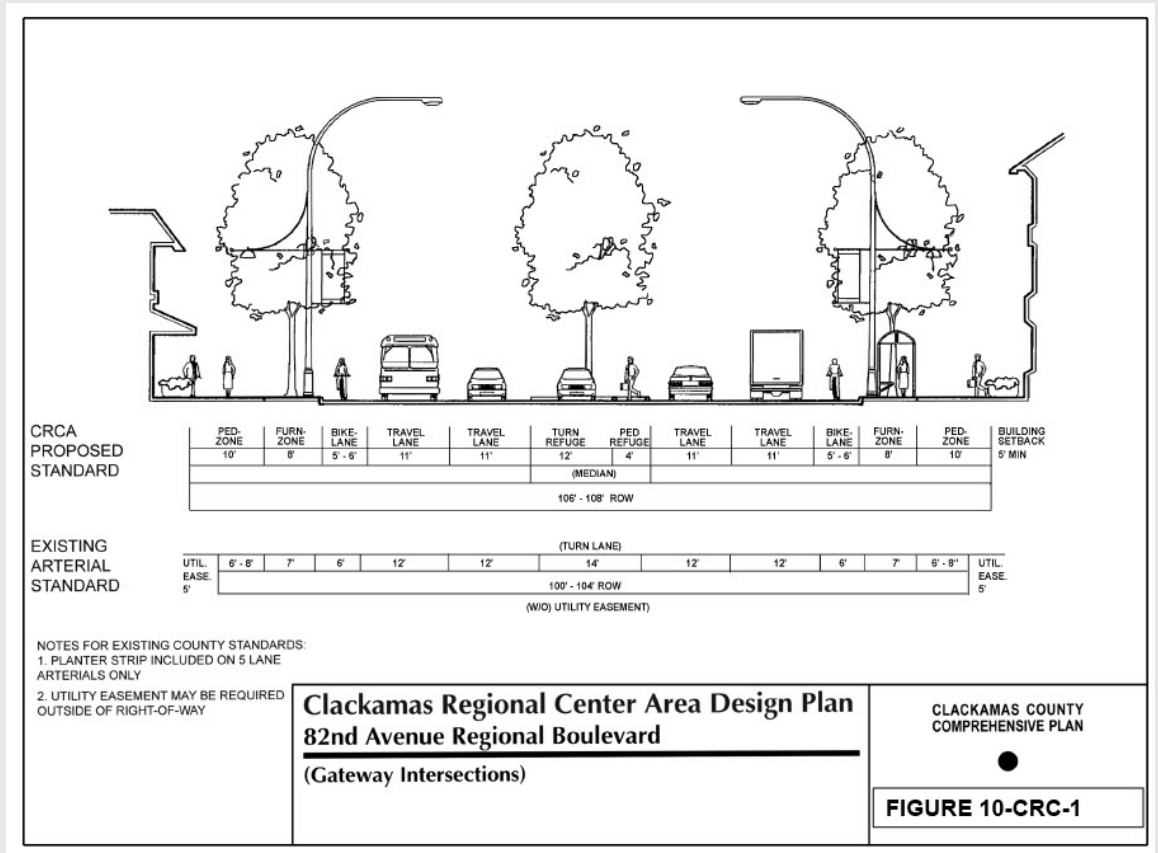
Clackamas County Comprehensive Plan





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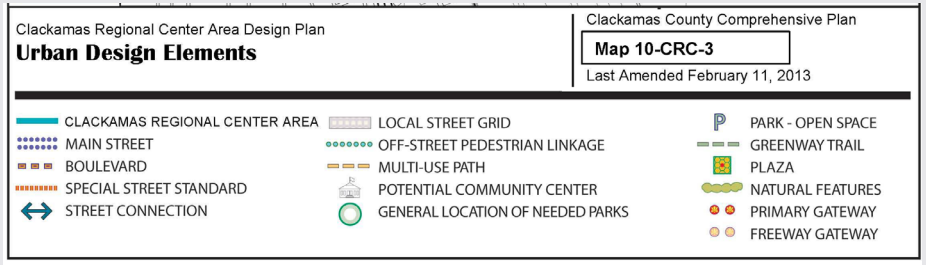
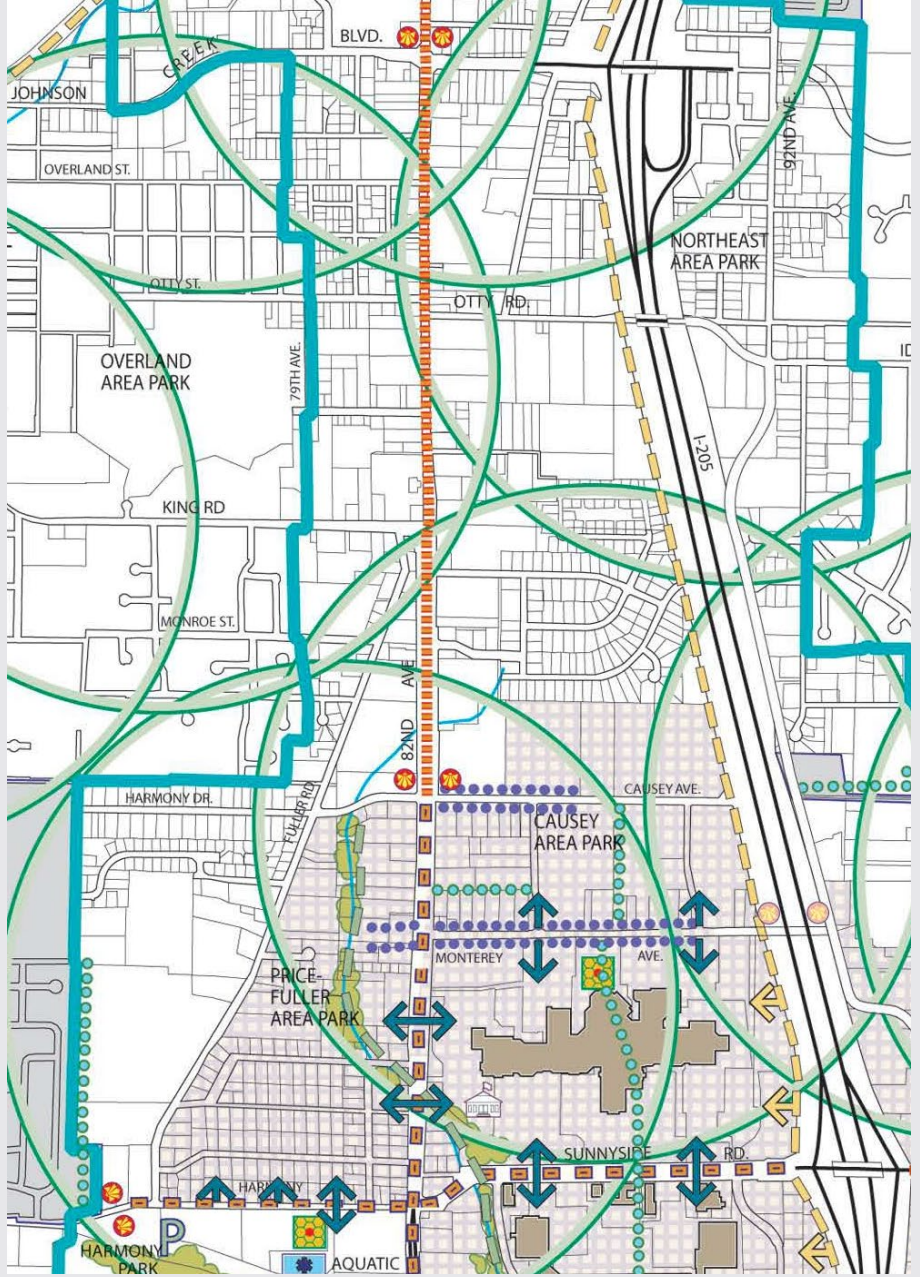
Comprehensive Plan Key Takeaways

Chapters 5 and 10 in the Comprehensive Plan outline the vision for more intensive and mixes of land use, better access for all modes of transportation, and visually attractive character, as the area is meant to be a hub within southeast Portland metro area.





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Fuller Road Station Area Plan

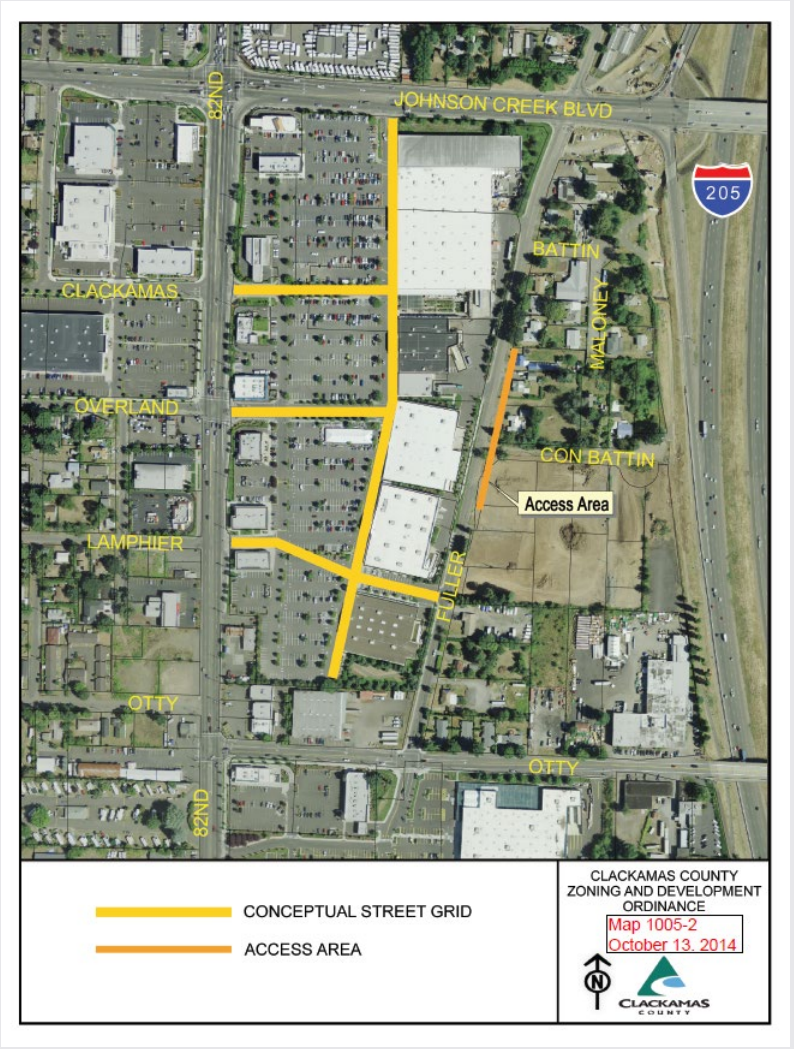
AGENCY, 2007

- Vision to create a transit-oriented development around the station
- Plan for the people who will work and live there
- Plan for business
- Plan for access and mobility to transit, biking, and pedestrian infrastructure
- Create community character
- Plan for urban renewal, property partnerships, and public acquisition
- Plan for transition
- Evaluate for clear zoning language, feasible funding processes, new development, and a transportation solution
- 82nd Ave in its current condition is a limitation to this success. To be redesigned for this plan, 82nd would need:
  - Wider sidewalks
  - Planting strips
  - Bicycle lanes
  - Landscaped center median
  - On-street parking for street fronting businesses

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

FRSAP Key Takeaways

Concept area plan that was developed in conjunction with the Green MAX line. The concept area does include a portion on 82nd Ave, and it was incorporated in the CRC Area Design Plan during the county's comprehensive plan update in 2013. This area is also part to of the North Clackamas Revitalization Area.



Source: ODOT Ave of Roses CAC Meeting 8 – presentation by BPS February 2018

Metro TRIMET PBOT PORTLAND BUREAU OF TRANSPORTATION

Transit Development Plan

CLACKAMAS COUNTY, 2021

- Guide Statewide Transportation Investment Fund (STIF) towards supporting an increase in transit ridership
  - Focus on areas lacking transit service in TriMet service areas and unincorporated areas outside
- Enhance connectivity
- Prioritize bicycle and pedestrian gaps
- Emphasize East/West connection

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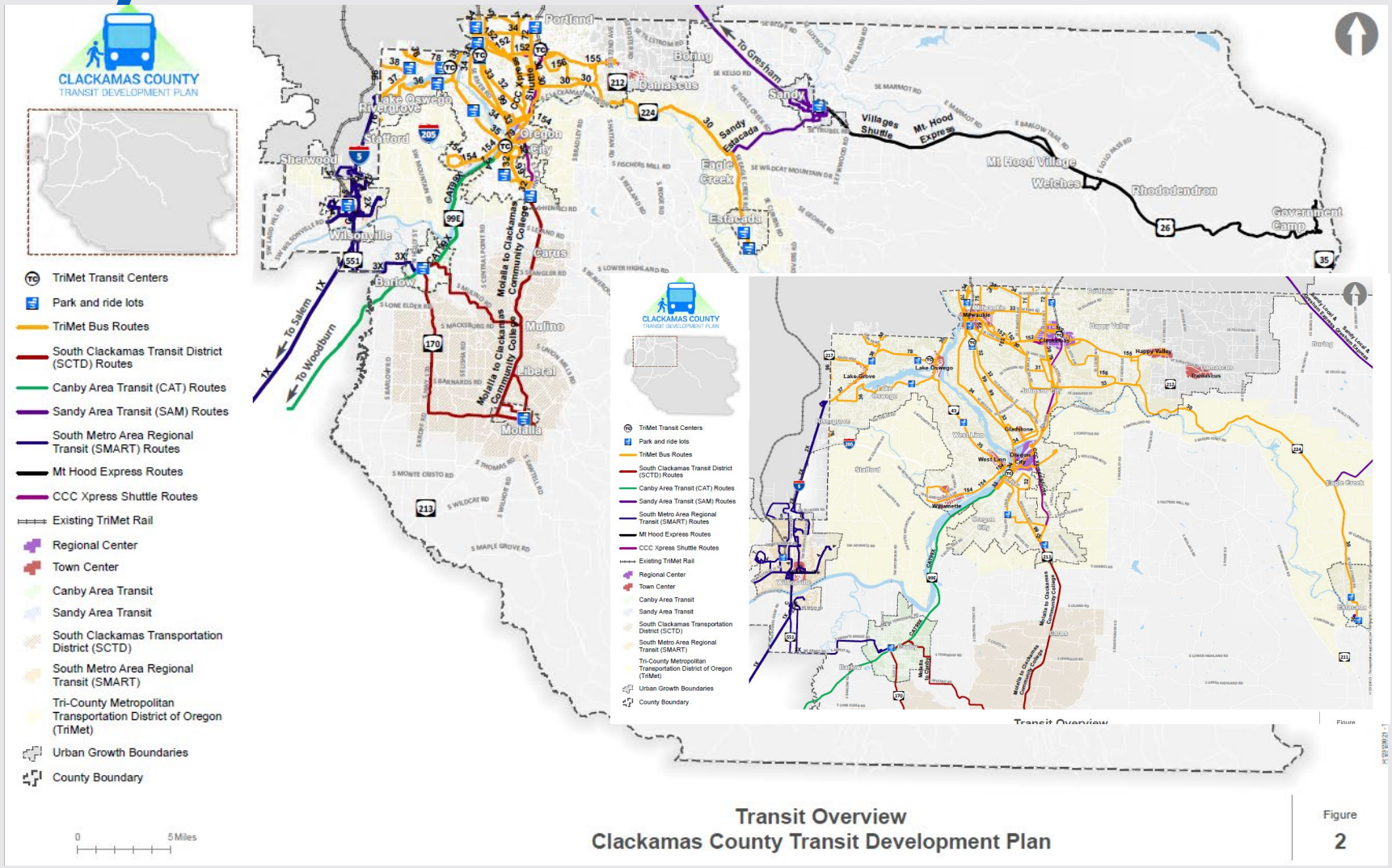
TDP Key Takeaways

The TDP provides a framework to help improve the transit network throughout Clackamas County.

The plan focuses on increasing access to transit through enhancing bike and pedestrian access and increasing areas served near jobs and regional corridors.



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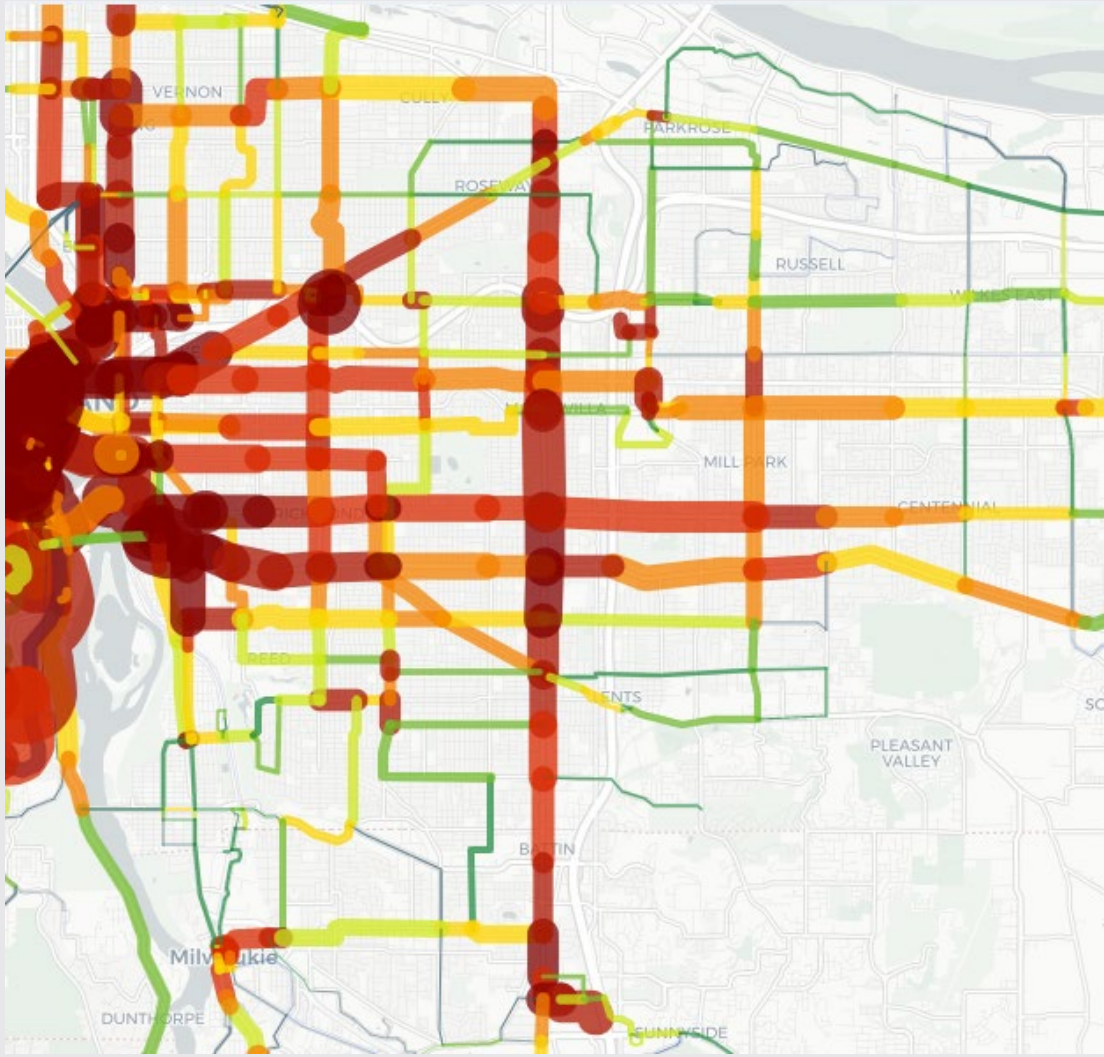
Transit Analysis

5

TriMet Delay Dashboard

TRIMET, 2020

- Interactive dashboard of systemwide delay developed based on run times from Fall 2019.
- 82nd Ave stands out from other corridors outside the Central City as having significant levels of delay (bus delay and passenger delay).
- Areas with the highest level of passenger delay along 82nd Avenue are between SE Division St and SE Holgate Blvd, and between NE Jonesmore St (I-84) and E Burnside St.



Daily passenger delay (color = passenger delay; line thickness = passenger load)
(daily passenger hours per mile; Fall 2019)

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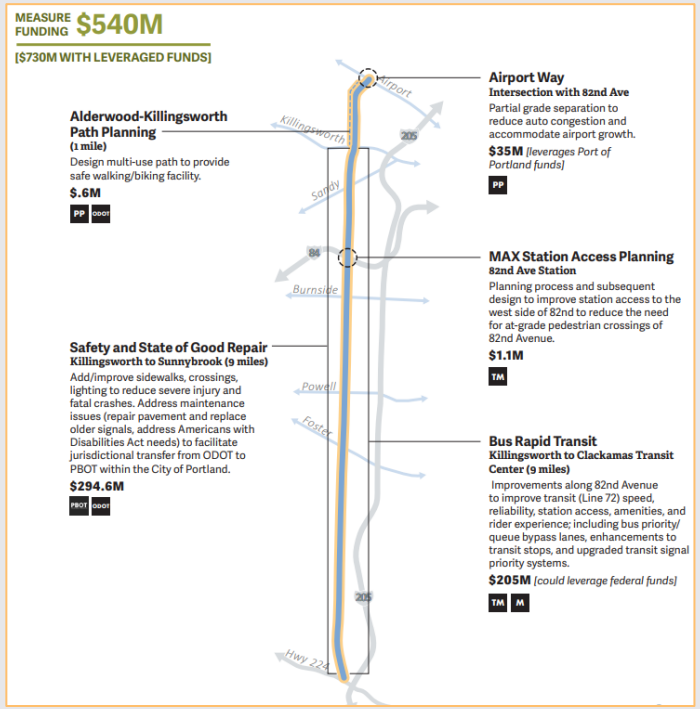
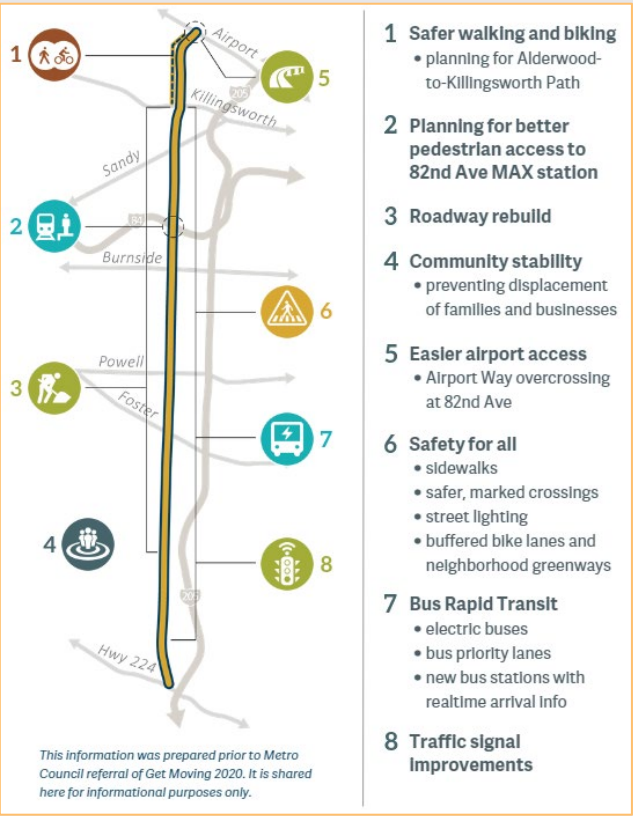
Get Moving 2020

METRO, 2020

- Would have invested in 17 corridors throughout the region, one of which was 82nd Avenue
- **Safety and State of Good Repair** between Killingsworth and Sunnybrook
  - Incorporated sidewalks, crossings, lighting, pavement maintenance, and ADA upgrades
- **BRT service** between Killingsworth and Clackamas Town Center
  - Included transit priority, upgraded signals, and passenger amenities
- Expected to cost $730 million - represents 10% of the entire Get Moving 2020 package





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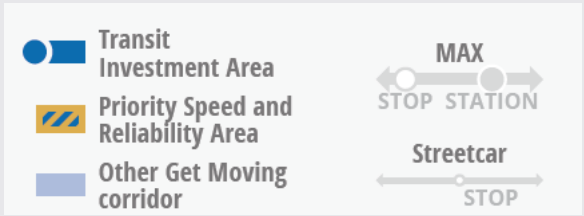
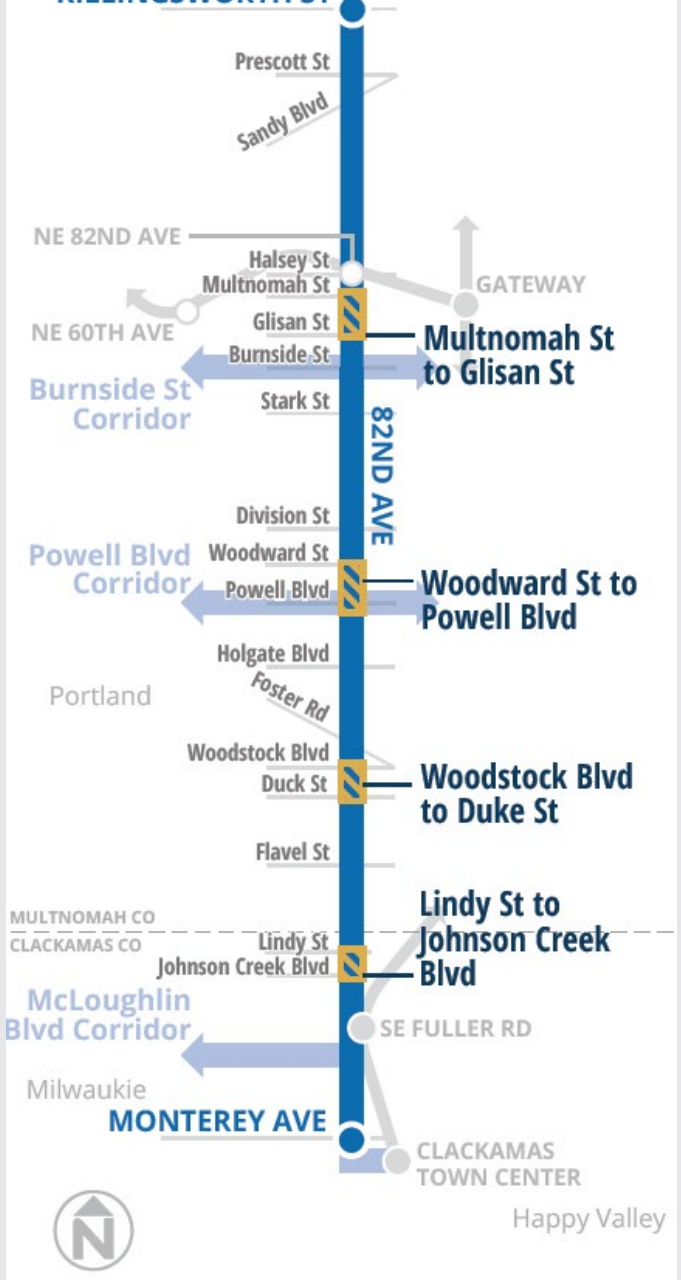
Get Moving 2020 (cont.)

- Speed & reliability improvements identified along the corridor
- Improvements included BAT lanes, queue jumps, queue bypasses and TSP
- Identification of Get Moving 2020 initial projects from earlier ETC Regional Pilot Program efforts





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Get Moving 2020 (cont.)

82ND AVENUE TRANSIT CORRIDOR

REGIONAL PILOT PROGRAM

NE Killingsworth St. to SE Monterey Ave.

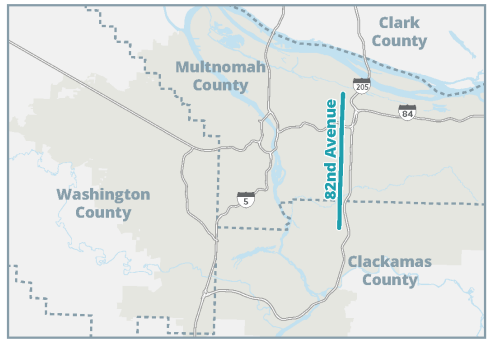
Several TriMet lines travel along 82nd Avenue. One of them, Line 72, has the highest ridership in the TriMet bus system.

Project: Spot improvements at 6 locations with high transit delay

Project length: 10 miles

Roadway ownership: ODOT

Project cost: $175 Million



13,400 people travel by transit through the corridor each day

Every day, passengers experience a combined **690 hours** of delay

During peak hours, buses that use 82nd run **every 5-8 minutes**

40% of the population within 1/4 mile of the corridor are people of color

Challenges

- **5 locations are responsible for 24% of delay:** NE Sandy Blvd., NE Glisan St., E Burnside St., SE Powell Blvd., SE King Rd., SE Johnson Creek Blvd.
- **Narrow roadway:** 56-60 feet between curbs and 5-7 foot sidewalks in Portland
- **Moderate to high traffic volumes:** 25-30k vehicles per day
- About **1 out of 4** trips on Line 72 are late in the PM peak
- High crash corridor

Potential Solutions

- Transit signal priority and queue bypasses (with strategic roadway widening) at high-delay locations
- BAT lanes (peak or all day) at spot locations with lower traffic volumes
- Coordinate with planned pedestrian crossings
- Articulated electric (60-ft) buses to add capacity
- Branded stations with passenger amenities
- Stop consolidation to reduce travel times

Benefits

- Reduces travel time by an average of 15%
- Saves passengers a combined 150 hours of delay each day

Risks

- Requires spot right-of-way acquisition
- Estimated design includes non-ODOT standard lane widths

A combination of federal and local funding may be available to increase overall project funds to up to $300 million. This funding could enable additional transit improvements that would further improve travel times and bus stop amenities.

Restriping of 82nd to provide continuous exclusive transit lanes (Rose Lanes) would reduce travel times by up to 35% depending on level of investment. Traffic diversion is expected in this scenario.

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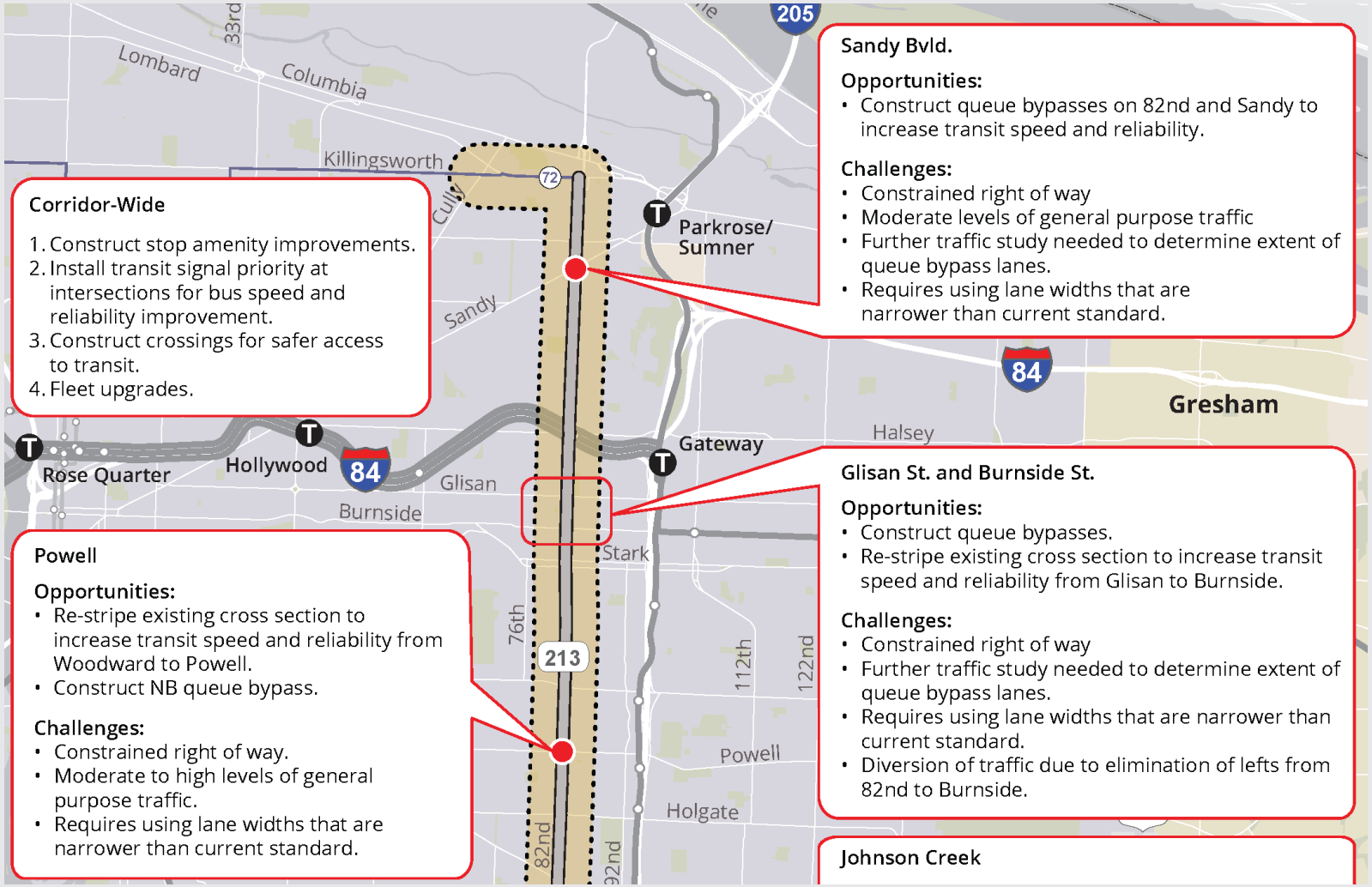
Get Moving 2020 (cont.)



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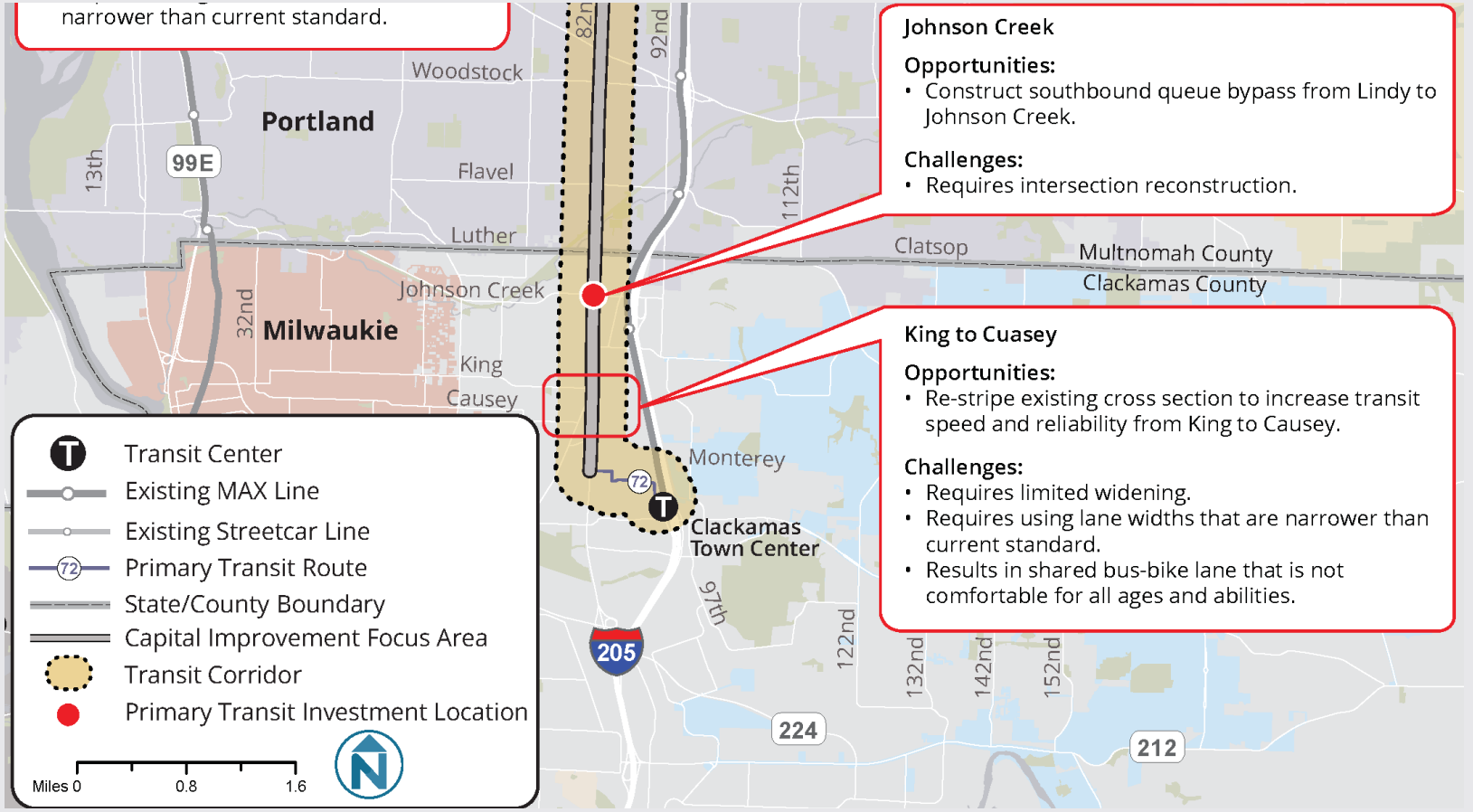
Get Moving 2020 (cont.)



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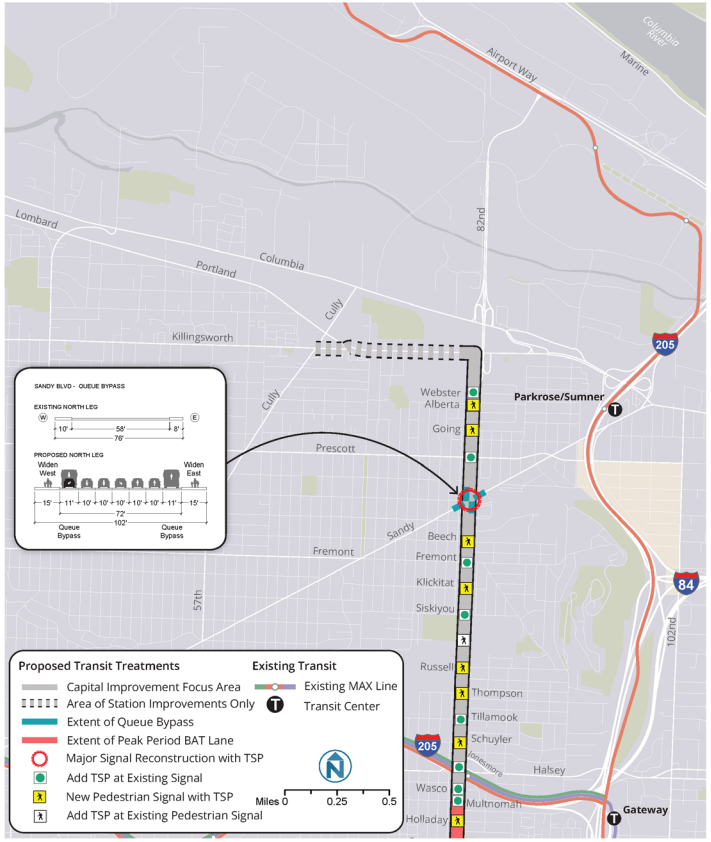
Get Moving 2020 (cont.)

82ND AVENUE TRANSIT CORRIDOR

NE Killingsworth St. to I-84

REGIONAL PILOT PROGRAM

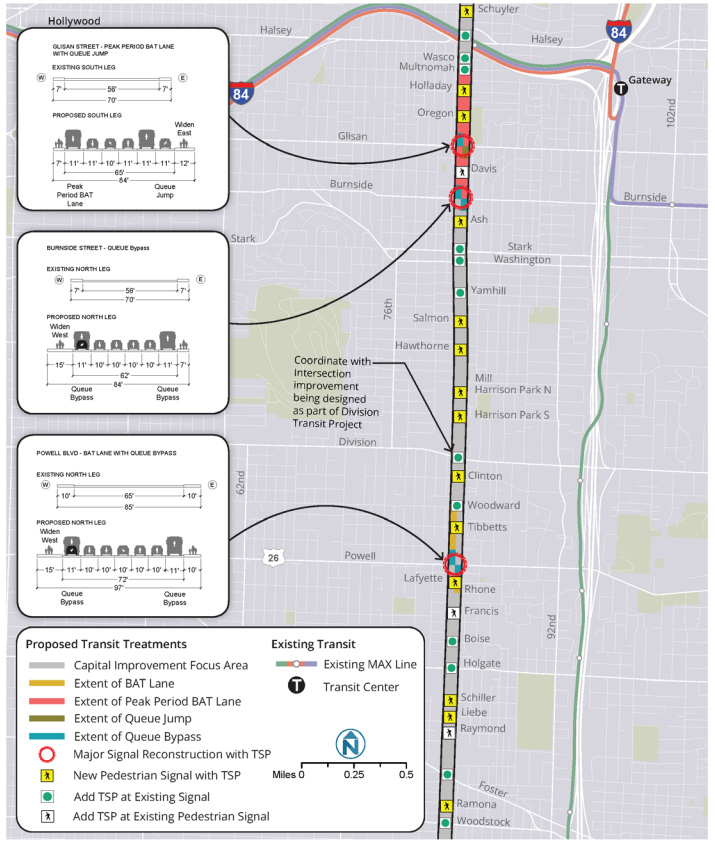


03

82ND AVENUE TRANSIT CORRIDOR

I-84 to SE Foster Rd.

REGIONAL PILOT PROGRAM

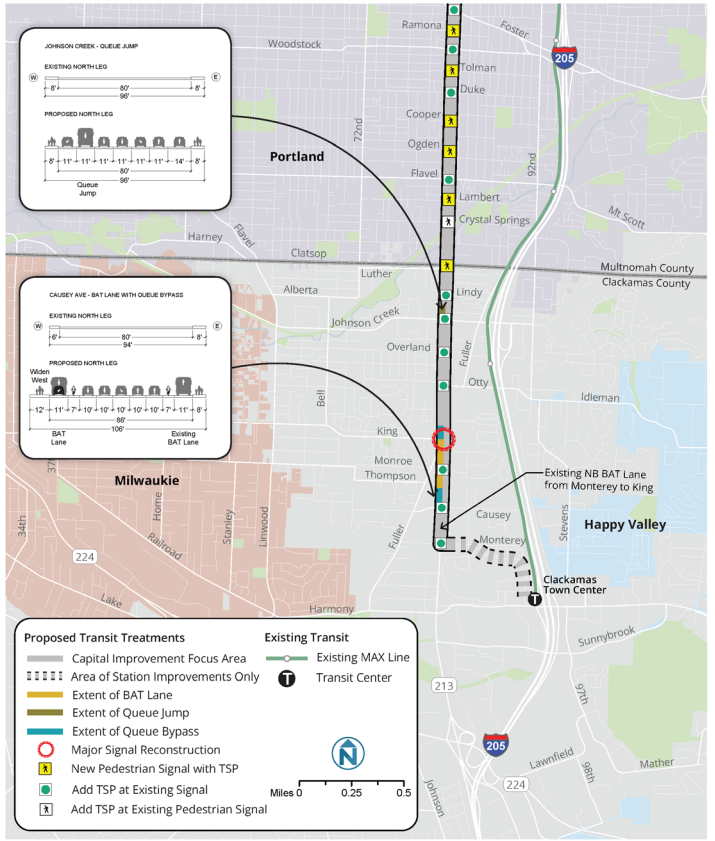


04

82ND AVENUE TRANSIT CORRIDOR

SE Foster Rd. to SE Montery Ave.

REGIONAL PILOT PROGRAM



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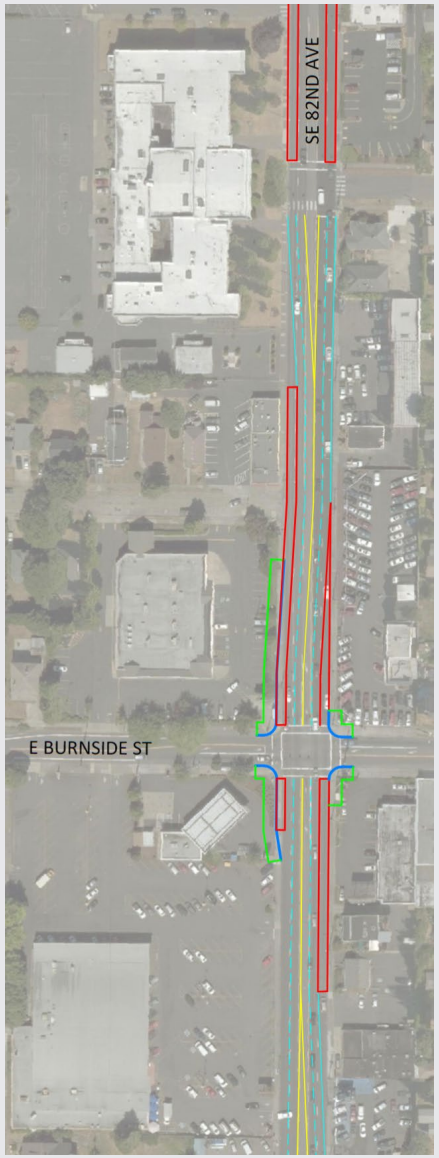
Get Moving 2020 (cont.)

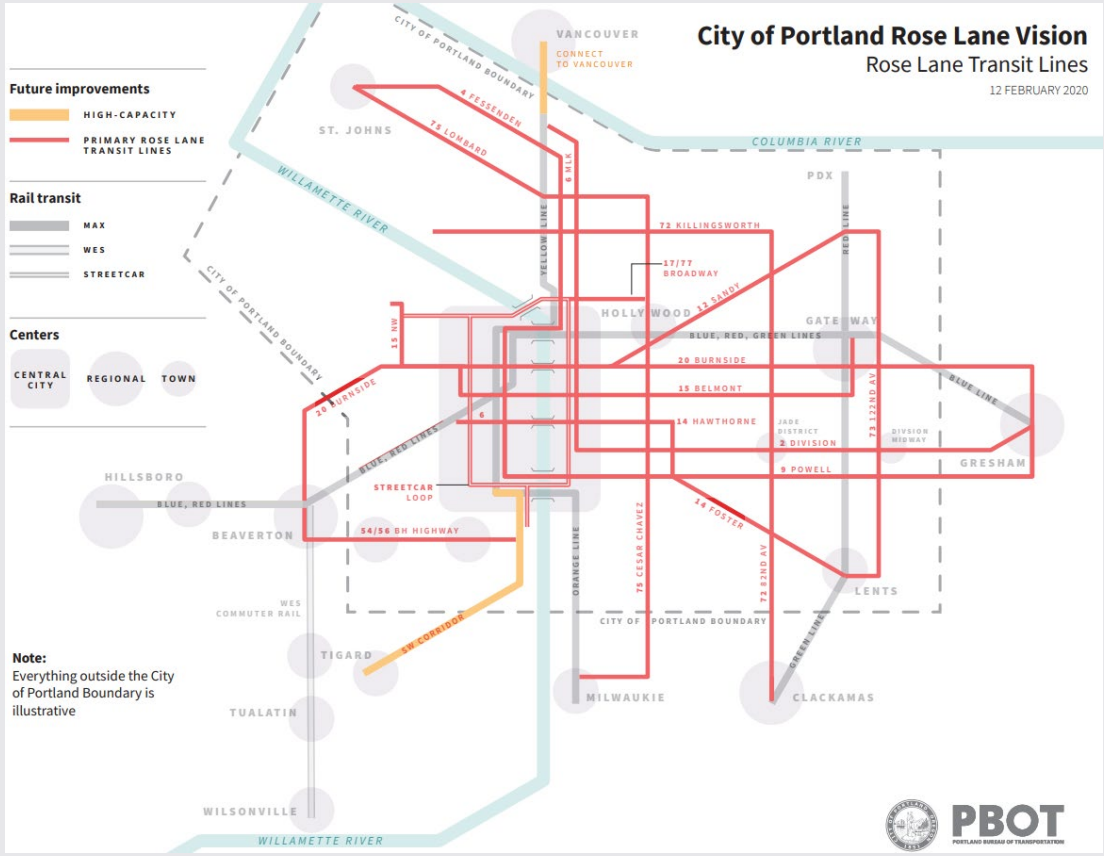


Conceptual designs were developed for each improvement. BAT lanes at Burnside are shown as an example.

Rose Lanes Project

PBOT, 2020

- 82nd Ave identified as part of the Rose Lane Transit Network
- Corridor not identified for project development as an ODOT-controlled roadway
  - Classified as a “potential future corridor in partnership with other agencies.”
  - Classification used for corridors where there was “a need for transit priority improvements” but where “more discussion, coordination and approval” with other agencies was needed



https://www.portland.gov/sites/default/files/2020-06/rose-lane-plan-final-2.13.2020-low-res.pdf

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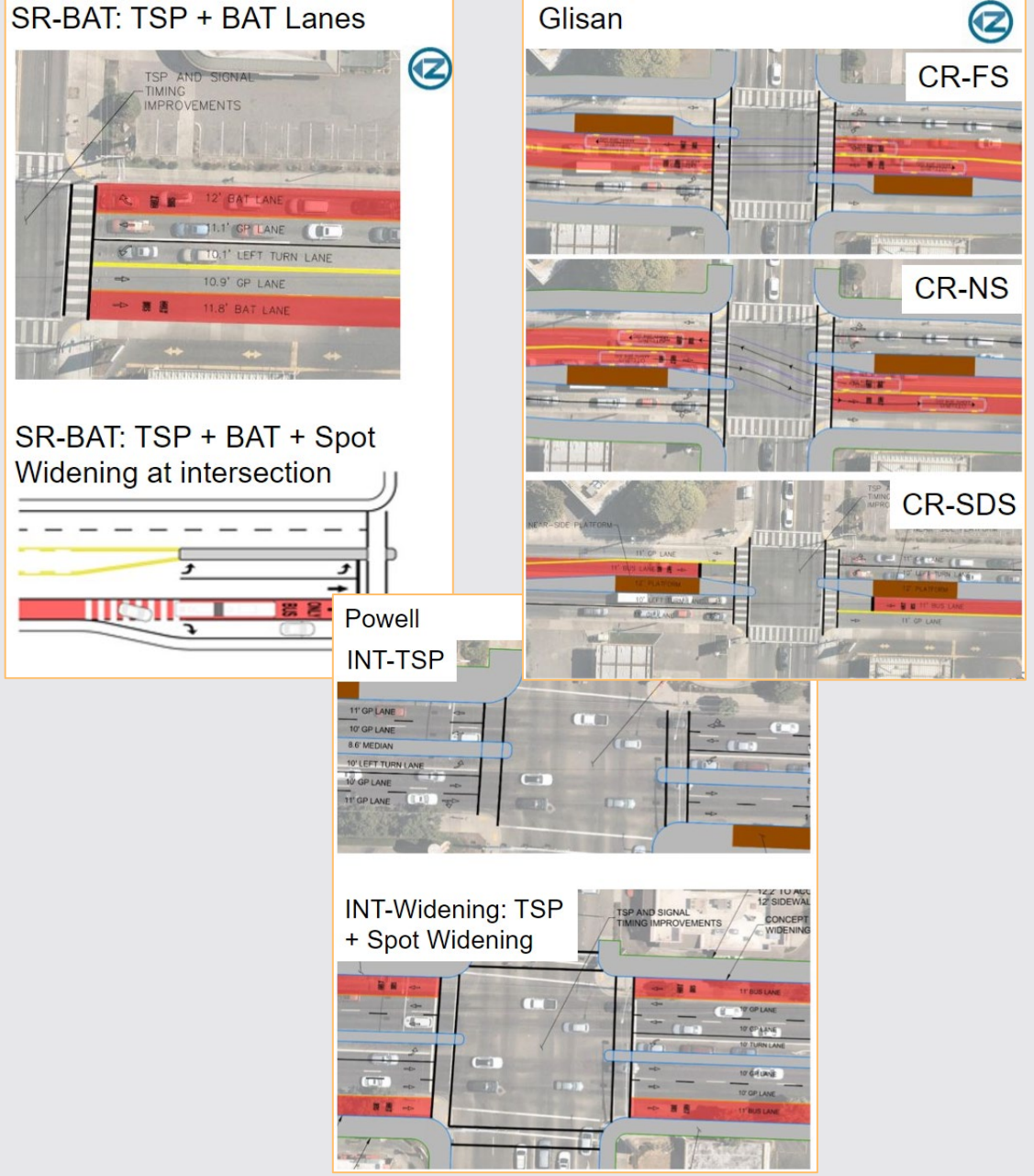
82nd Ave Transit Possibilities

PBOT, 2022

- Reviewed 82nd Avenue to understand potential interventions and tradeoffs for speed and reliability
- Design options included:
  - **Intersection Targeted Treatments** (spot improvements and TSP)
  - **Corridor Side-Running** (continuous bus lanes along the curb; spot widening and TSP)
  - **Corridor Center-Running** (continuous bus lanes in the median; spot widening and TSP, left-door boarding options were discarded)
- Results:
  - Side-running BAT lanes had greatest benefits and least impacts
  - Center-running (near and far side stops) should be analyzed further with signal coordination
  - Center-running (with single-dedicated swap) should be avoided



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Powell-Division Transit & Development Project

METRO, 2017

- Project included recommendations for:
  - Affordable housing at 82nd Ave & Division
  - Financial assistance to business owners in the Jade District to increase competitiveness
  - Pedestrian crossings on 82nd Ave at Ash, Salmon and PCC
  - Intersection safety improvements at Burnside, Stark, Washington, Yamhill, Mill and Division

https://www.oregonmetro.gov/sites/default/files/2017/07/26/PowellDivisionCorridorStrategy_final%2092816.pdf

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Powell-Division Transit & Development Project (cont.)

- Design open house held in January 2016
- Public chose 82nd Avenue as north-south corridor to transition from Division to Powell
- Demonstrated support for transit investments on 82nd Avenue
- Public stated desire for interventions that “make 82nd [Avenue] feel safer and more hospitable to road users and businesses alike”

https://www.oregonmetro.gov/sites/default/files/2017/07/26/82nd%20Ave%20open%20house%20summary.pdf

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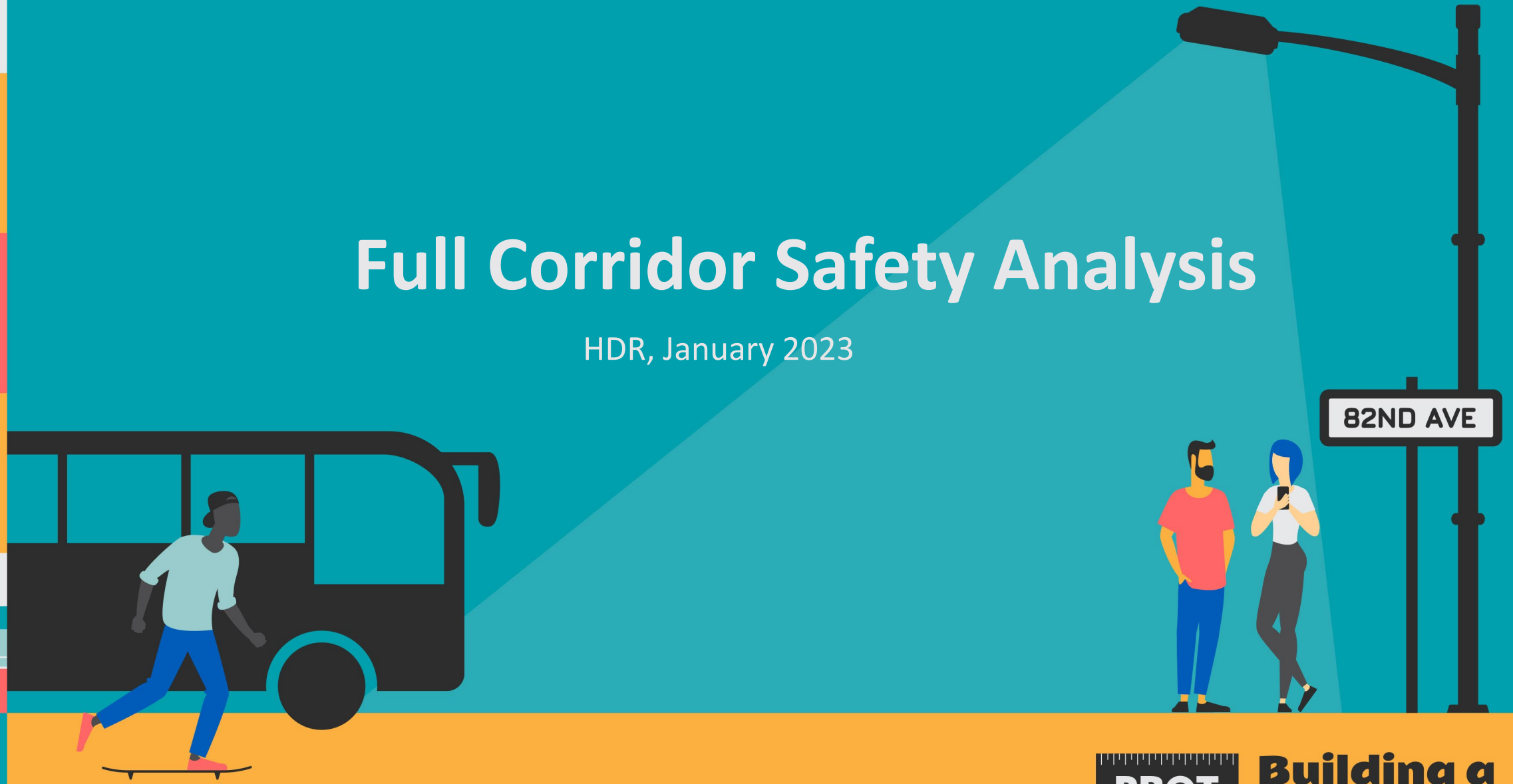
NELSON
NYGAARD

Full Corridor Safety Analysis

HDR, January 2023



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Building a Better 82nd

Overview of Overall Corridor Crashes (2015-2019)

- **2,757** crashes on 82nd Ave - approximately 1.5 crashes per day.
- **94** people were killed or seriously injured on 82nd during this period - **19** per year on average.
- **189 Vision Zero focus crashes*** occurred along the 82nd Ave - **1** out of every **14** crashes.
- **122 pedestrians** and **50 people biking** were hit on 82nd Ave - **more than 2** every month.

- **70%** of the crashes occurred on the City of Portland corridor, **30%** of them in the Clackamas County corridor
- Approximately **80%** of them occurred on the City of Portland corridor.
- **75%** occurred on the City of Portland corridor.
- Approximately **60%** of them occurred on the City of Portland corridor.

80% of total fatalities and **27%** of serious injuries on 82nd Ave constituted of **pedestrians and people biking.**

* Vision Zero focuses on Crashes that involve pedestrians, people biking, or people in motor vehicles who are seriously injured.

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Summary of All Crashes

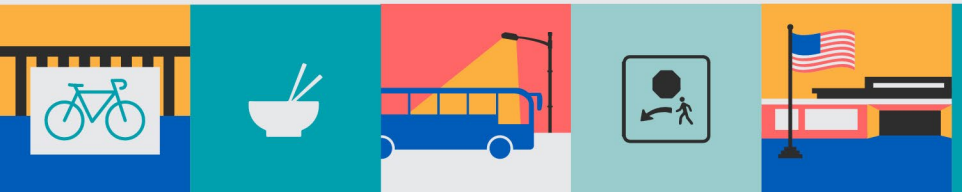
- **All Crashes: 2015-2019**

Crashes	City of Portland (7.23 Miles)			Clackamas County (1.62 Miles)			Total
	Fatal	Injury A	Other Injury/PDO	Fatal	Injury A	Other Injury/PDO	
Pedestrian	5	16	50	1	3	20	95
Bicyclist	2	3	25	0	0	10	40
Motorcycle	1	8	14	0	6	9	38
Vehicle	1	31	1832	0	7	713	2584
Total	9	58	1921	1	16	752	2757

- **Vision Zero Crashes: 2015-2019**

VZ Crashes	City of Portland (7.23 Miles)			Clackamas County (1.62 Miles)			Total
	Fatal	Injury A	Injury B-C	Fatal	Injury A	Injury B-C	
Pedestrian	5	16	50	1	3	20	95
Bicyclist	2	3	25	0	0	10	40
Motorcycle	1	8	-	0	6	-	15
Vehicle	1	31	-	0	7	-	39
Total	9	58	75	1	16	30	189

Proportionally there are more Vision Zero Motorcycle Crashes in the Clackamas Corridor than the City Corridor



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Summary of Number of Injuries

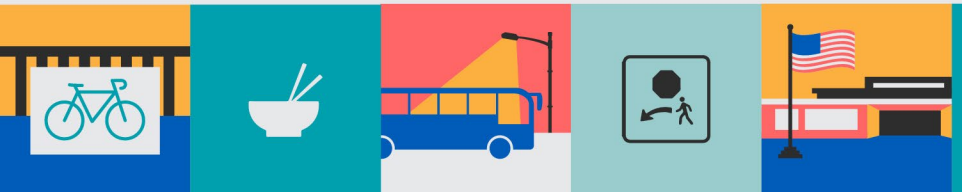
- **All Crash Injuries: 2015-2019**

Injuries	City of Portland (7.23 Miles)			Clackamas County (1.62 Miles)			Total
	Fatalities	A Injuries	Other Injuries	Fatalities	A Injuries	Other Injuries	
Pedestrian	5	17	52	1	3	44	122
Bicyclist	2	3	25	0	0	20	50
Motorcycle	1	8	14	0	6	25	54
Vehicle	1	39	4565	0	8	1684	6297
Total	9	67	4656	1	17	1773	6523

- **Vision Zero Crash Injuries: 2015-2019**

VZ Injuries	City of Portland (7.23 Miles)			Clackamas County (1.62 Miles)			Total
	Fatalities	A Injuries	Injuries B-C	Fatalities	A Injuries	Injuries B-C	
Pedestrian	5	17	52	1	3	21	99
Bicyclist	2	3	25	0	0	10	40
Motorcycle	1	8	-	0	6	-	15
Vehicle	1	39	-	0	8	-	48
Total	9	67	77	1	17	31	202

Proportionally there are slightly more Vision Zero Pedestrian injury crashes on the City Section of 82nd Avenue than the County section.



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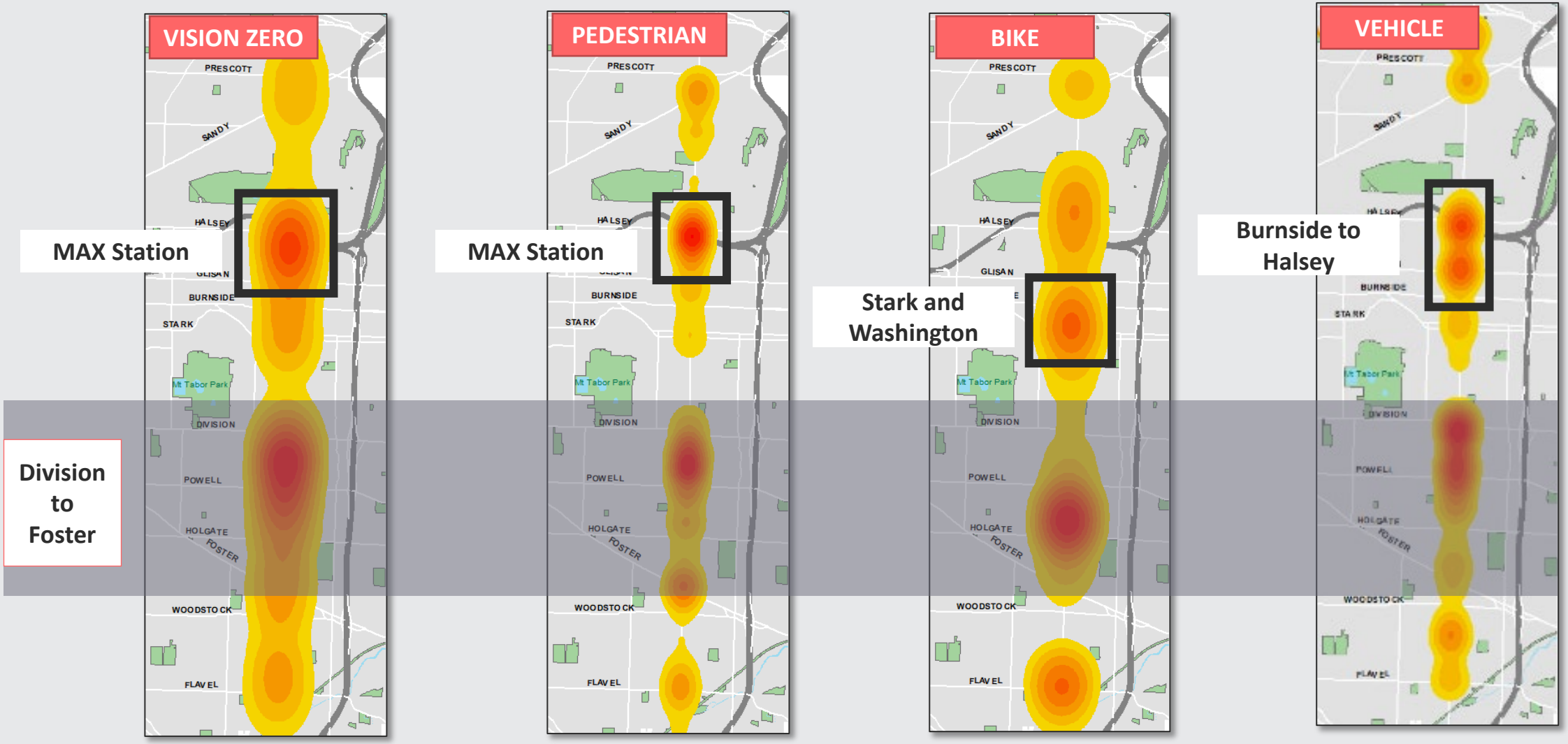
City of Portland Focus Areas*



* Source: City of Portland Safety Analysis Workshop #1, April 2022

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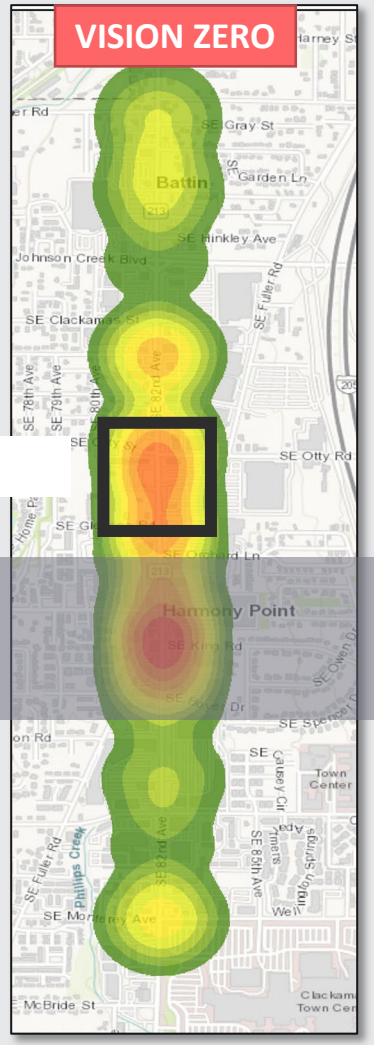
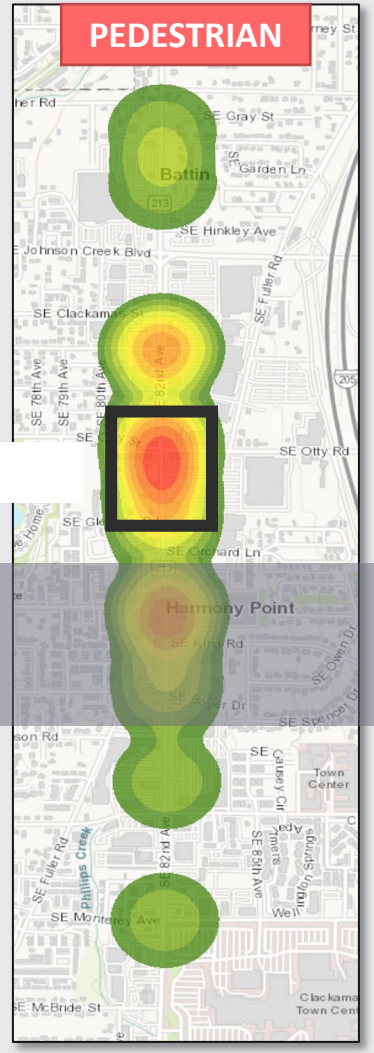
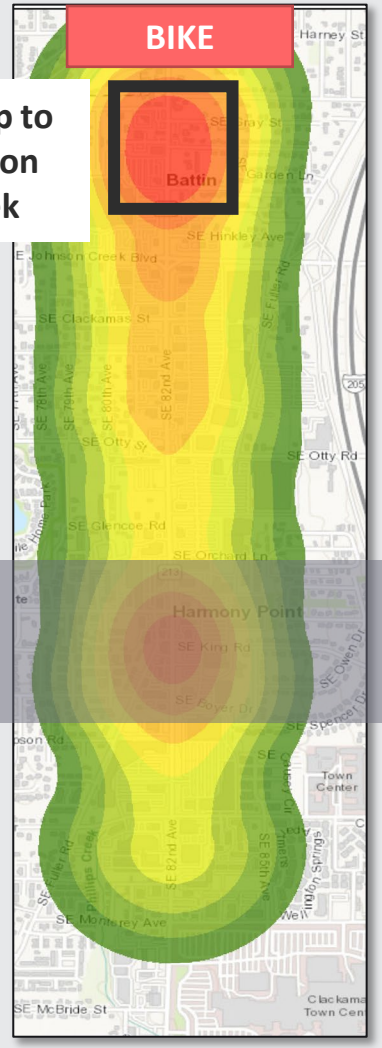
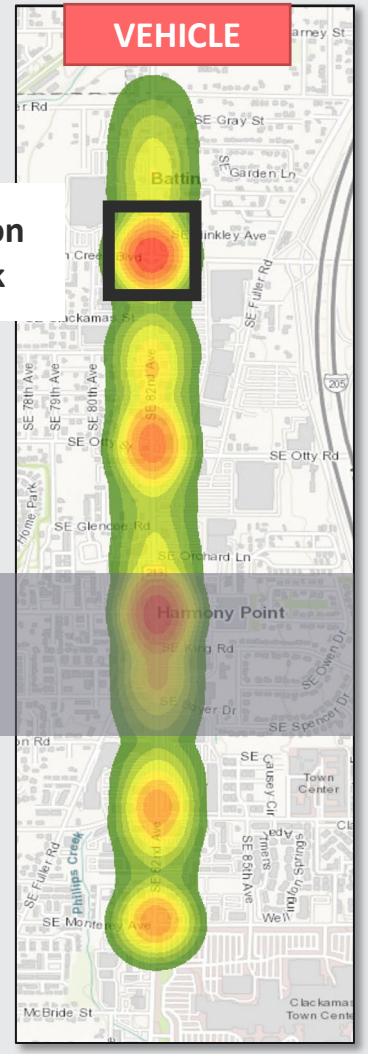
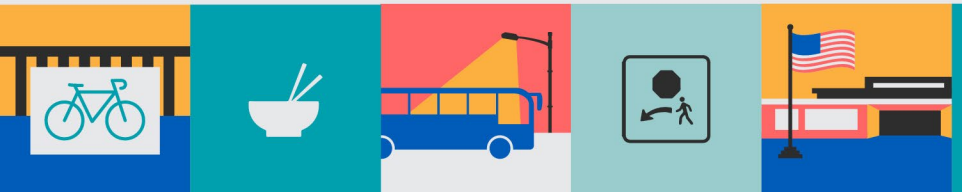
Clackamas County Focus Areas*











*Source: ODOT: https://tvc.odot.state.or.us/tvc/

From Clatsop Street to Clackamas Town Center

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Major Crash Contributing Factors: Driveways, Left Turns and Lighting

Driveways

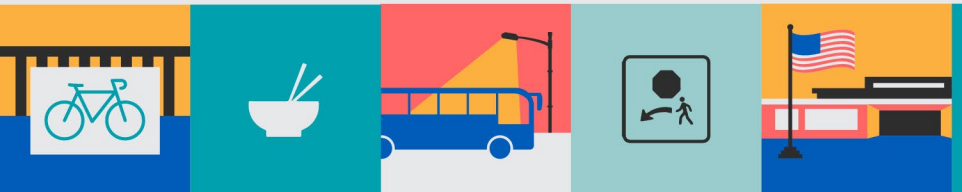
- **11%** of all crashes
- **14%** of total crashes involving **pedestrians and people biking were at driveways.**
- Vision zero focused driveway crashes concentrated between
  - **Division and Foster.**
  - **Otty Rd to Monroe St.**

Left Turns

- **20%** of all crashes
- Vision Zero focused left turn crashes concentrated between
  - **Division and Foster**
  - **Johnson Creek to Monroe**

Lighting

- **25%** of all in non-daylight
  - City of Portland involved **78%** of crashes and Clackamas County involved **22%** of Crashes.
- **50%** of the total pedestrian crashes in non-daylight condition
- Vision Zero focused crashes concentrated
  - near **Jonesmore**
  - between **Otty Rd and King Rd.**



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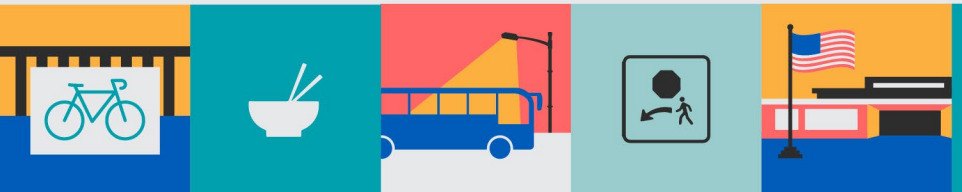
Summary

- **Most contributing factors**
  - Driveways
  - Left Turns
  - Lighting
- **Focus Areas**
  - City of Portland - Division to Foster
  - Clackamas County - Otty Rd to Monroe



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DKS 720 SW WASHINGTON STREET, SUITE 500, PORTLAND, OR 97205 • 503.243.3500 • DKSASSOCIATES.COM

TECHNICAL MEMORANDUM

DATE: January 12, 2023

TO: Elizabeth Mros-O'Hara | Metro; Michael Kiser | TriMet; Julia Reed | PBOT

FROM: Randy Johnson PE, PTOE, Kayla Fleskes-Lane PE, Alex Correa EIT, Anders Hart | DKS Associates

SUBJECT: Building a Better 82nd Avenue Transportation Investment Project and 82nd Avenue Transit Project: Existing Conditions and Future Baseline Traffic Operations Memorandum

Project #22248-000

INTRODUCTION

This memorandum details the existing and 2040 baseline traffic operations, queuing, and travel time results for the Building a Better 82nd Avenue Transportation Investment and 82nd Avenue Transit projects. It follows the Traffic Analysis Methodology Memorandum[1] previously prepared by DKS. This document sets a baseline for evaluating transit alternatives on 82nd Avenue.

This document consists of an introduction and project background followed by three chapters:

- The first chapter focuses on the Civic Corridor, which describes existing and 2040 baseline conditions on the section of 82nd Avenue within the City of Portland.
- The second chapter discusses existing and 2040 baseline conditions on the Clackamas County section of 82nd Avenue, immediately south of the Civic Corridor to the Clackamas Town Center (CTC).
- The third chapter outlines existing and 2040 baseline transit travel time conditions along the proposed alignment.

This memorandum will serve as a basis for comparison with 2040 build transit alternatives on the corridor, which will be analyzed in two rounds (preliminary and refined) before analyzing a preferred alternative.

[1] November 4, 2022

PROJECT BACKGROUND

METHODOLOGY

Consistent with the methodology memorandum, traffic operations were analyzed using Synchro software and Highway Capacity Manual (HCM) 2000 Edition methodology for the a.m. and p.m. peak traffic hours, except at the Lombard Street, SE Powell Boulevard, and Clackamas County intersections, where HCM 6th Edition methodology was used. HCM 2000 Edition methodology was used for most of the intersections because of non-standard traffic signal phasing and geometry required to accurately represent existing, future baseline, and future build intersection configuration using Synchro software, including leading pedestrian intervals and exclusive bus lanes. HCM 6th edition methodology was used at the NE Lombard Street and SE Powell Boulevard intersections and Clackamas County intersections along 82nd to comply with Oregon Department of Transportation (ODOT) Analysis Procedure Manual (APM) requirements.

Volume-to-capacity (v/c) ratios, intersection delay (in seconds), and level of service (LOS) were calculated for each intersection. The LOS is an A to F rating of the level of delay the average vehicle will experience at an intersection, similar to a report card, where LOS A indicates very little delay and LOS F indicates long delays. The v/c ratio is a proportion from zero to one that measures the approximate amount of an intersection's vehicle throughput capacity that is used. For example, a v/c ratio of 0.90 indicates that 90 percent of an intersection's capacity to move traffic is used. Intersection v/c ratios lower than the mobility standards indicate that intersections are operating at acceptable levels of mobility.

Regional mobility targets from the 2018 Regional Transportation Plan (RTP)[2] apply to the full project corridor with an intersection volume-to-capacity ratio of 1.10 within centers (Central City, Regional Centers, and Town Centers), Station Communities, and Main Streets, and 0.99 otherwise for the peak hour. The RPT lists the section of 82nd Avenue between NE Sandy Boulevard to SE Foster Road, inclusive, as a Main Street, meaning the intersections in that section have mobility targets of 1.10. One exception is SE Powell Boulevard, which falls under the jurisdiction of the Oregon Department of Transportation (ODOT) and has a target of 0.99[3]. In the Clackamas County section of 82nd Avenue, the four study intersections closest to the Clackamas Town Center (82nd Avenue/SE Monterey Avenue, SE Monterey Avenue/SE 85th Avenue, SE Monterey Avenue/CTC East Driveway, and 82nd Avenue/CTC North Driveway) are in a Regional Center and have mobility gargets of 1.10. The remaining study intersections all have mobility targets of 0.99.

SimTraffic was used to simulate existing and 2040 baseline motor vehicle travel time and queuing for the Civic Corridor segment, but not the Clackamas County section of 82nd Avenue, pursuant to the project scope.

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[2] Oregon Metro 2018 Regional Transportation Plan, https://www.oregonmetro.gov/sites/default/files/2018/07/02/draft2018RTP_publicreviewweb.pdf

[3] 1999 Oregon Highway Plan, Table 7, https://www.oregon.gov/odot/Planning/Documents/OHP.pdf

CHAPTER 1: CIVIC CORRIDOR SEGMENT TRAFFIC OPERATIONS

STUDY AREA

This section comprises 6.8 miles of 82nd Avenue from NE Lombard Street to just south of the Springwater Trail crossing in Portland, Oregon. This section is split into five segments: NE Lombard Street to NE Sandy Boulevard, NE Sandy Boulevard to NE Glisan Street, NE Glisan Street to SE Mill Street, SE Mill Street to SE Foster Road, and SE Foster Road to SE Clatsop Street. Study intersections and their respective segments are shown in Figure 1 below. The City of Portland classifies sections of 82nd Avenue as a Civic Main Street, Civic Corridor, and Regional Corridor[4]. Metro classifies 82nd Avenue as a Major Arterial[5]. This section of the corridor serves a mix of land uses, with the dominant ones being residential and commercial. The corridor provides connections to US 30BY (NE Lombard Street) and Airport Way at its northern terminus, Interstate 84 in its middle section, and connections to Interstate 205 which runs parallel to 82nd Avenue to the east. Intersection operations were evaluated for each of the signalized study intersections on this section of 82nd Avenue, grouped into five segments:

Segment 1: NE Lombard Street to NE Sandy Boulevard

1. NE 82nd Avenue and NE Lombard Street
2. NE 82nd Avenue and NE 82nd Avenue (OR 213, toward Airport Way)
3. NE 82nd Avenue and NE Prescott Street
4. NE 82nd Avenue and NE Sandy Boulevard

Segment 2: NE Sandy Boulevard to NE Glisan Street

5. NE 82nd Avenue and NE Fremont Street
6. NE 82nd Avenue and NE Siskiyou Street
7. NE 82nd Avenue and McDaniel High School
8. NE 82nd Avenue and NE Tillamook Street
9. NE 82nd Avenue and NE Jonesmore Street
10. NE 82nd Avenue and NE Wasco Street
11. NE 82nd Avenue and NE Multnomah Street
12. NE 82nd Avenue and NE Glisan Street

Segment 3: NE Glisan Street to SE Mill Street

13. NE 82nd Avenue and NE Davis Street

[4] Portland, OR Transportation System Plan, https://www.portland-tsp.com/#/streets

[5] Metro RLIS Discovery, https://rlisdiscovery.oregonmetro.gov/datasets/drcMetro::major-arterials-6/explore?location=45.530992%2C-122.594852%2C11.41

14. NE 82nd Avenue and E Burnside Street
15. SE 82nd Avenue and SE Stark Street
16. SE 82nd Avenue and SE Washington Street
17. SE 82nd Avenue and SE Yamhill Street
18. SE 82nd Avenue and SE Mill Street

Segment 4: SE Mill Street to SE Foster Road

19. SE 82nd Avenue and SE Harrison Street (Future models)
20. SE 82nd Avenue and SE Division Street
21. SE 82nd Avenue and SE Woodward Street
22. SE 82nd Avenue and SE Powell Boulevard
23. SE 82nd Avenue and SE Bush Street (Future models)
24. SE 82nd Avenue and SE Boise Street
25. SE 82nd Avenue and SE Holgate Boulevard
26. SE 82nd Avenue and SE Schiller Street (future models)
27. SE 82nd Avenue and SE Raymond Street
28. SE 82nd Avenue and SE Foster Road

Segment 5: SE Foster Road to SE Clatsop Street

29. SE 82nd Avenue and SE Woodstock Boulevard
30. SE 82nd Avenue and SE Duke Street
31. SE 82nd Avenue and SE Flavel Street

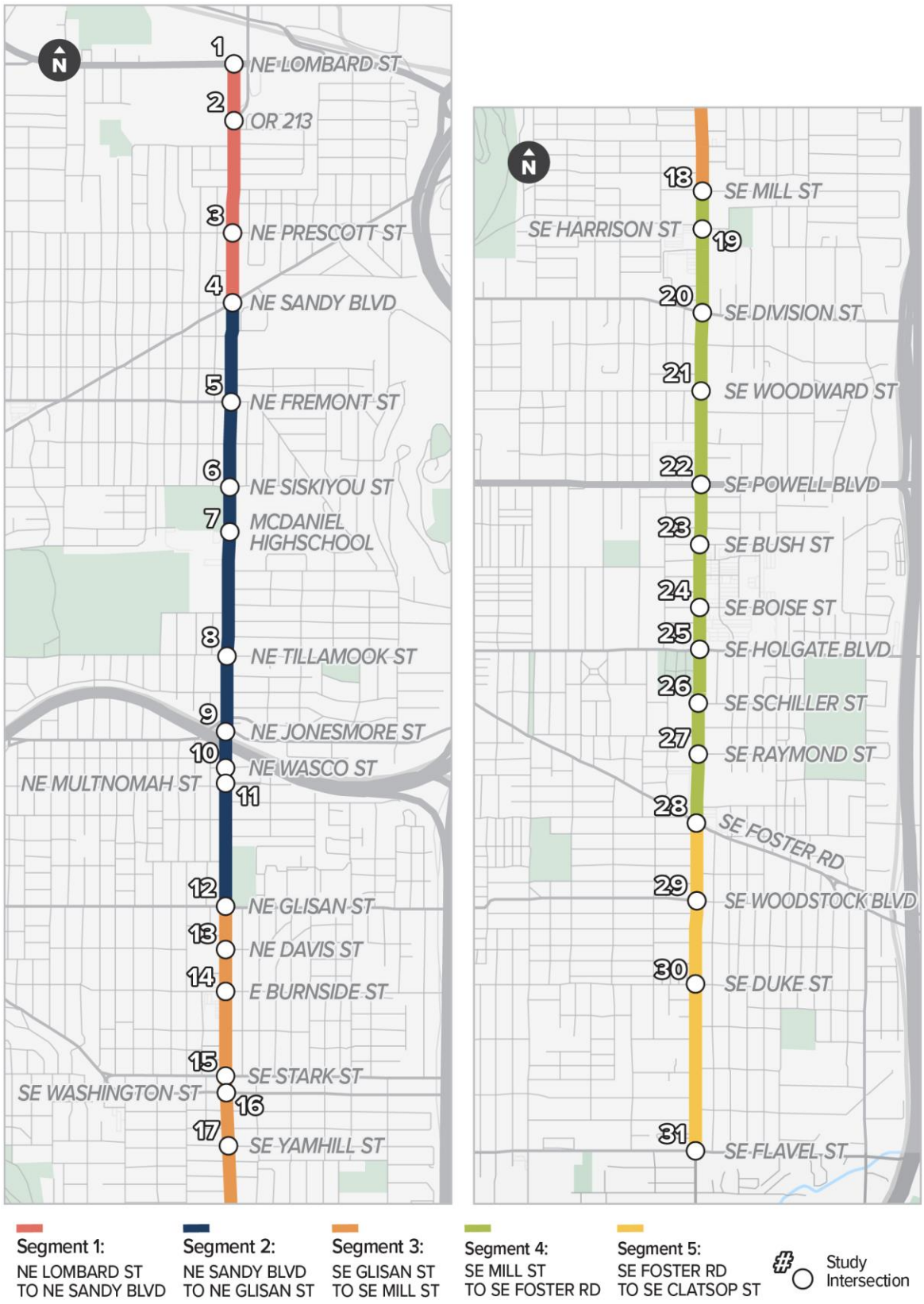

FIGURE 1: CIVIC CORRIDOR STUDY INTERSECTIONS

EXISTING TRAFFIC OPERATIONS

EXISTING TRAFFIC VOLUMES

Figures showing the existing morning and evening peak-hour volumes are found in the Appendix, Section 1A.

INTERSECTION OPERATIONS

Table 1 shows the a.m. and p.m. peak hour intersection operations at the signalized study intersections. All the intersections operate below their mobility targets in the a.m. peak hour. Additionally, no movement-level v/c ratios are above 0.99 in the a.m. peak hour. The highest a.m. peak-hour v/c ratios are seen at SE Powell Boulevard (0.71), SE Foster Road (0.80), SE Holgate Boulevard (0.72), and NE Glisan Street (0.78). All study intersections have lower intersection v/c ratios in the a.m. peak hour compared to the p.m. peak hour.

The intersections with the highest v/c ratios in the p.m. peak hour are at SE Division Street (0.85), SE Powell Boulevard (0.84), SE Holgate Boulevard (0.82), NE Lombard Street (0.79), NE Sandy Boulevard (0.78), and NE Glisan Street (0.79). However, these v/c ratios are lower than the regional mobility targets, indicating these intersections are still within acceptable operating conditions. Additionally, none of the approach v/c ratios are over 0.99 in the p.m. peak hour.

TABLE 1: CIVIC CORRIDOR EXISTING A.M. AND P.M. PEAK HOUR INTERSECTION OPERATIONS

NO.	INTERSECTION	MOBILITY TARGET (V/C)	AM V/C RATIO	AM DELAY (SEC)	AM LOS	PM V/C RATIO	PM DELAY (SEC)	PM LOS
SEGMENT 1								
1	82ND AVENUE/ LOMBARD ST	0.99	0.61	15	B	0.79	24	C
2	82ND AVENUE/ AIRPORT ACCESS (OR 213)	0.99	0.36	15	B	0.55	18	B
3	82ND AVENUE/ PRESCOTT ST	0.99	0.32	22	C	0.65	27	C
4	82ND AVENUE/ SANDY BLVD	1.10	0.62	22	C	0.78	33	C
SEGMENT 2								
5	82ND AVENUE/ FREMONT ST	1.10	0.55	29	C	0.61	28	C
6	82ND AVENUE/ SISKIYOU ST	1.10	0.40	10	B	0.49	11	B

NO.	INTERSECTION	MOBILITY TARGET (V/C)	AM V/C RATIO	AM DELAY (SEC)	AM LOS	PM V/C RATIO	PM DELAY (SEC)	PM LOS
7	82ND AVENUE/ ALAMEDA ST/ MCDANIEL HS	1.10	0.44	16	B	0.45	7	A
8	82ND AVENUE/ TILLAMOOK ST	1.10	0.39	6	A	0.52	12	B
9	82ND AVENUE/ JONESMORE ST	1.10	0.49	15	B	0.65	21	C
10	82ND AVENUE/ WASCO ST	1.10	0.39	19	B	0.51	14	B
11	82ND AVENUE/ MULTNOMAH ST	1.10	0.35	4	A	0.45	6	A
12	82ND AVENUE/ GLISAN ST	1.10	0.76	38	D	0.79	38	D
SEGMENT 3								
13	82ND AVENUE/ DAVIS ST	1.10	0.29	2	A	0.35	2	A
14	82ND AVENUE/ BURNSIDE ST	1.10	0.63	23	C	0.75	29	C
15	82ND AVENUE/ STARK ST	1.10	0.59	24	C	0.70	18	B
16	82ND AVENUE/ WASHINGTON ST	1.10	0.47	12	B	0.69	16	B
17	82ND AVENUE/ YAMHILL ST	1.10	0.33	4	A	0.43	4	A
18	82ND AVENUE/ MILL ST	1.10	0.33	6	A	0.41	5	A
SEGMENT 4								
20	82ND AVENUE/ DIVISION ST	1.10	0.67	33	C	0.85	39	D
21	82ND AVENUE/ WOODWARD ST	1.10	0.35	9	A	0.48	13	B
22	82ND AVENUE/ POWELL BLVD	0.99	0.71	54	D	0.84	59	E
24	82ND AVENUE/ BOISE ST	1.10	0.35	9	A	0.50	19	B

NO.	INTERSECTION	MOBILITY TARGET (V/C)	AM V/C RATIO	AM DELAY (SEC)	AM LOS	PM V/C RATIO	PM DELAY (SEC)	PM LOS
25	82ND AVENUE/ HOLGATE BLVD	1.10	0.72	30	C	0.82	36	D
27	82ND AVENUE/ RAYMOND ST	1.10	0.27	3	A	0.36	4	A
28	82ND AVENUE/ FOSTER RD	1.10	0.80	47	D	0.83	38	D
			SEGMENT 5					
29	82ND AVENUE/ WOODSTOCK BLVD	0.99	0.57	22	C	0.60	20	C
20	82ND AVENUE/ DUKE ST	0.99	0.40	20	C	0.43	14	B
31	82ND AVENUE/ FLAVEL ST	0.99	0.48	20	B	0.63	23	C

QUEUING ANALYSIS

A table of simulated average and 95th-percentile queue lengths on the Civic Corridor for the a.m. and p.m. peak hours is included in the Appendix, Section 3. This section includes a higher-level discussion of the locations where SimTraffic simulations indicate extensive 95th-percentile queues that contribute to motor-vehicle congestion at major study intersections in the p.m. peak hour, as that period sees heavier volumes and longer queues than the morning peak hour. The only major study intersections with 95th-percentile queues exceeding storage in the a.m. peak hour that are longer than in the p.m. peak hour are:

- NE Glisan Street westbound left: The 95th-percentile queue in the a.m. peak hour is 325 feet and 125 feet in the p.m. peak hour.
- SE Stark Street westbound right: The 95th-percentile queue in the a.m. peak hour is 325 feet and 225 feet in the p.m. peak hour.
- SE Powell Boulevard westbound left: The 95th-percentile queue in the a.m. peak hour is 450 feet and 350 feet in the p.m. peak hour.

The following is a summary of the major queuing impacts seen under existing conditions in the p.m. peak hour.

Segment 1

- NE Sandy Boulevard:
  - The eastbound-left movement (225 feet) exceeds storage (180 feet). Lane striping and the presence of NE 81st Ave preclude queuing beyond the storage length.

- NE Prescott Street
  - The eastbound-left queue (175 feet) exceeds the short storage length (100 feet) at the NE Prescott St intersection, largely because that movement does not have a protected signal phase.

Segment 2

- NE Jonesmore Street
  - Northbound-through 95th-percentile queuing spills back at the NE Jonesmore Street and NE Wasco Street intersections, though the average queues do not.
  - This northbound queue spills back from NE Wasco Street to NE Multnomah Street (a distance of 180 feet) and extends another 200 feet south of SE Multnomah Street but does not reach the next intersection (NE Hassalo Street, 225 feet to the south).

Segment 4

- SE Division Street
  - 95th-percentile queues exceed storage for the westbound-right, northbound-left, and northbound-through/right movements, indicating moderate congestion. However, none of the average queues for those movements exceed their respective storage lengths.

Table 2 summarizes the 95th-percentile queues that exceed storage or to the next intersection at SE Powell Boulevard. While the 95th percentile queue does exceed storage lengths for some movements that result in heaving queue conditions for those movements, the overall v/c ratio for the intersection is 0.84.

TABLE 2: MOVEMENTS WITH 95TH PERCENTILE QUEUES EXCEEDING STORAGE AT SE POWELL BLVD (P.M. PEAK HOUR)

MOVEMENT	STORAGE (FT)	AVERAGE QUEUE (FT)	95TH PERCENTILE QUEUE (FT)	NOTE
EASTBOUND LEFT	450*	275	450	Queue can spill back farther into two-way LT lane
EASTBOUND RIGHT	200	175	325	Storage constrained by curb
WESTBOUND LEFT	525**	200	350	Queue can spill back farther into two-way LT lane
SOUTHBOUND LEFT	350***	200	375	Next street to the north is SE Franklin St (350 ft)

* The striped left turn queue storage is 225' with the ability of the queue to extend to 450' using the two-way left turn lane.

** The striped left turn queue storage is 190' with the ability of the queue to extend to 525' using the two-way left turn lane.

*** The striped left turn queue storage is 225' with the ability of the queue to extend to 350' using the two-way left turn lane.

- SE Holgate Boulevard

- The 95th-percentile queue exceeds storage for the eastbound-left movement. The 95th percentile queue is 250 feet while the available storage is constrained at approximately 160 feet as the cross section narrows down to two lanes.

- SE Foster Road
  - The eastbound-left, eastbound-right, and westbound-right movements have 95th-percentile queues exceeding storage lengths. However, the total intersection v/c ratio is below 0.99 at 0.83.
  - The eastbound-left storage bay is constrained by striping at 125 feet (queue is 225 feet), while the eastbound-right storage bay is constrained by the presence of a bike facility west of SE Harold Street at 250 feet (queue is 275 feet).
  - The westbound-right storage at this intersection is constrained by lane striping at 175 feet (queue is 275 feet). The 95th-percentile southbound-through queue spills back to the next intersection (SE Insley St, which is about 200 feet to the north).

TRAVEL TIMES

Table 3 shows the existing observed motor vehicle travel times along the Civic Corridor taken from the Regional Integrated Transportation Information System (RITIS) database that uses INRIX traffic data. These are compared to simulated travel times using SimTraffic software. For all segments, the difference between observed travel times and simulated times falls within the Oregon Department of Transportation calibration requirement that simulated times be within 60 seconds of observed times for travel times less than seven minutes and within 15% for travel times over seven minutes[6]. However, these times only represent the a.m. and p.m. peak travel hours, and INRIX data indicates that congestion occurs on parts of the corridor during other times of day, especially the period between noon and 4 p.m. This pattern also arises during weekends due to a large number of commercial destinations on and near 82nd Avenue. Congestion plots based on RITIS/INRIX data are included in the Appendix, Section 6.

The observed and modeled travel times shown in Table 3 are consistent with the INRIX data showing that travel times are generally longer in the afternoon than in the morning. Chapter 3 includes information on bus travel times on the corridor.

[6] Oregon Department of Transportation Analysis Procedures Manual Version 2; Protocol for Vissim Simulation (2011), Table 6-3

TABLE 3: CIVIC CORRIDOR MOTOR VEHICLE TRAVEL TIMES

LOCATION (SEGMENT #)	AM RITIS TRAVEL TIME[1] (MIN)	AM SIMTRAFFIC TRAVEL TIME (MIN)	DIFFERENCE (SEC)	MEETS CALIBRATION CRITERION	PM RITIS TRAVEL TIME[1] (MIN)	PM SIMTRAFFIC TRAVEL TIME (MIN)	DIFFERENCE (SEC)	MEETS CALIBRATION CRITERION
SOUTHBOUND								
ALBERTA ST TO SANDY BLVD (SEGMENT 1)	1.4	1.5	5	Yes	1.7	1.8	3	Yes
SANDY BLVD TO GLISAN ST (SEGMENT 2)	4.6	5.3	46	Yes	5.5	5.4	-6	Yes
GLISAN ST TO MILL ST (SEGMENT 3)	2.8	2.7	-3	Yes	3.4	3.0	-27	Yes
MILL ST TO FOSTER RD (SEGMENT 4)	4.6	5.6	57	Yes	6.7	6.5	-14	Yes
FOSTER RD TO CLATOP ST (SEGMENT 5)	3.8	3.5	-17	Yes	4.3	3.7	-35	Yes
TOTAL	**17.1**	**18.6**	**87 (9%)**	**Yes**	**21.7**	**20.4**	**-80 (-6%)**	**Yes**

SEGMENT	AM RITIS TRAVEL TIME[1] (MIN)	AM SIMTRAFFIC TRAVEL TIME (MIN)	DIFFERENCE (SEC)	MEETS CALIBRATION CRITERION	PM RITIS TRAVEL TIME[1] (MIN)	PM SIMTRAFFIC TRAVEL TIME (MIN)	DIFFERENCE (SEC)	MEETS CALIBRATION CRITERION
NORTHBOUND								
SANDY BLVD TO ALBERTA ST (SEGMENT 1)	1.3	1.5	11	Yes	1.5	2.0	31	Yes
GLISAN ST TO SANDY BLVD (SEGMENT 2)	4.7	4.7	3	Yes	5.4	6.2	48	Yes
MILL ST TO GLISAN ST (SEGMENT 3)	2.8	2.6	-9	Yes	3.4	2.9	-29	Yes
FOSTER RD TO MILL ST (SEGMENT 4)	4.8	5.5	41	Yes	5.9	6.7	51	Yes
CLATOP ST TO FOSTER RD (SEGMENT 5)	4.2	3.4	-47	Yes	4.7	3.7	-59	Yes
TOTAL	**17.7**	**17.6**	**-1 (0%)**	**Yes**	**20.7**	**21.4**	**42.3 (3%)**	**Yes**

[1] Regional Integrated Transportation Information System/INRIX (2022)

Note: Totals do not add up due to rounding in table.

2040 FUTURE BASELINE TRAFFIC OPERATIONS

The 2040 future baseline scenario for the Civic Corridor includes several changes to the Synchro network to account for assumed improvements, including Phase 1 safety improvements, which are shown in a roll plot in the Appendix, Section 5). These changes include:

- No right turn on red allowed at NE Jonesmore Street, SE Duke Street, and SE Flavel Street.
- Protected right turn signal phasing at Washington Street.
- Pedestrian crossings at OR 213, NE Alberta Street, NE Beech Street, NE Street Klickitat, NE Street Russell, NE Thompson Street, NE Schuyler Street, NE Ash Street, SE Harrison Street, SE Clinton Street, SE Tibbetts Street, SE Lafayette Street, NE Bush Street, SE Center Street, SE Schiller Street, SE Mitchell Street, SE Ramona Street, SE Tolman Street, SE Cooper Street, SE Knapp Street, SE Lambert Street, and SE Clatsop Street.
- Signal phasing to accommodate pedestrian overlaps and the FX-2 bus line at SE Division Street (this phasing is not included in the existing conditions models as it was not in place at the time of the traffic counts)
- New leading pedestrian intervals at NE Prescott Street (E-W), NE Sandy Boulevard (all), NE Wasco Street (E-W), NE Multnomah Street (all), NE Davis Street (E-W), E Burnside Street (E-W), SE Stark Street (WBRT), SE Yamhill Street (E-W), SE Division Street (all), SE Woodward Street (all), SE Boise Street (E-W), and SE Holgate Boulevard (E-W).
- New traffic signals at SE Harrison Street, SE Bush Street, and SE Schiller Street, all of which are currently two-way stop controlled.

Cycle lengths were grouped and coordinated in several zones, with lengths ranging between 80 and 120 seconds, with the same lengths and zones used in the a.m. and p.m. peak-hour Synchro models. Cycle lengths were made as short as possible while still prioritizing acceptable intersection operations. However, actual future cycle lengths and coordination zones may be refined from the assumptions used in the analysis as the design process progresses. Table 4 below compares the a.m. existing, p.m. existing, and baseline (a.m. and p.m.) cycle lengths and intersection control types.

TABLE 4: EXISTING AND 2040 BASELINE CYCLE LENGTHS

NO	INTERSECTION	EXISTING CYCLE LENGTH (SEC)	EXISTING CONTROL TYPE	A.M. AND P.M. 2040 BASELINE CYCLE LENGTH (SEC)*
		SEGMENT 1		
1	82ND AVENUE/ LOMBARD ST	126.6	Semi-Actuated Uncoordinated	90
2	82ND AVENUE/ AIRPORT ACCESS (OR 213)	84.5	Semi-Actuated Uncoordinated	90
3	82ND AVENUE/ PRESCOTT ST	100	Actuated Coordinated	90

NO	INTERSECTION	EXISTING CYCLE LENGTH (SEC)	EXISTING CONTROL TYPE	A.M. AND P.M. 2040 BASELINE CYCLE LENGTH (SEC)*
4	82ND AVENUE/ SANDY BLVD	136.4	Semi-actuated Uncoordinated	130
		SEGMENT 2		
5	82ND AVENUE/ FREMONT ST	80	Actuated Coordinated	80
6	82ND AVENUE/ SISKIYOU ST	80	Actuated Coordinated	80
7	82ND AVENUE/ ALAMEDA ST/ MCDANIEL HS	80 (100 in a.m.)	Actuated Coordinated	80
8	82ND AVENUE/ TILLAMOOK ST	80	Actuated Coordinated	80
9	82ND AVENUE/ JONESMORE ST	80	Actuated Coordinated	100
10	82ND AVENUE/ WASCO ST	80	Actuated Coordinated	100
11	82ND AVENUE/ MULTNOMAH ST	80	Actuated Coordinated	100
12	82ND AVENUE/ GLISAN ST	100	Actuated Coordinated	110
		SEGMENT 3		
13	82ND AVENUE/ DAVIS ST	100	Actuated Coordinated	110
14	82ND AVENUE/ BURNSIDE ST	100	Actuated Coordinated	110
15	82ND AVENUE/ STARK ST	100	Actuated Coordinated	115
16	82ND AVENUE/ WASHINGTON ST	100	Actuated Coordinated	115
17	82ND AVENUE/ YAMHILL ST	100	Actuated Coordinated	115
18	82ND AVENUE/ MILL ST	100	Actuated Coordinated	115
		SEGMENT 4		

NO	INTERSECTION	EXISTING CYCLE LENGTH (SEC)	EXISTING CONTROL TYPE	A.M. AND P.M. 2040 BASELINE CYCLE LENGTH (SEC)*
19	82ND AVENUE/ HARRISON ST	N/A	Stop-controlled	115
20	82ND AVENUE/ DIVISION ST	100	Actuated Coordinated	115
21	82ND AVENUE/ WOODWARD ST	100	Actuated Coordinated	115
22	82ND AVENUE/ POWELL BLVD	179	Semi-actuated Uncoordinated	120
23	82ND AVENUE/ BUSH ST	N/A	Stop-controlled	120
24	82ND AVENUE/ BOISE ST	110 (85 in a.m.)	Actuated Coordinated	120
25	82ND AVENUE/ HOLGATE BLVD	110 (85 in a.m.)	Actuated Coordinated	120
26	82ND AVENUE/ SCHILLER ST	N/A	Stop-controlled	120
27	82ND AVENUE/ RAYMOND ST	110 (85 in a.m.)	Actuated Coordinated	120
28	82ND AVENUE/ FOSTER RD	110 (85 in a.m.)	Actuated Coordinated	120
SEGMENT 5				
29	82ND AVENUE/ WOODSTOCK BLVD	110 (85 in a.m.)	Actuated Coordinated	80
30	82ND AVENUE/ DUKE ST	110 (85 in a.m.)	Actuated Coordinated	80
31	82ND AVENUE/ FLAVEL ST	111	Actuated Uncoordinated	80

As the project progresses, additional refinements will be made to the 2040 future baseline assumptions in the upcoming Round 2 analysis. These refinements, which are not included in the model used for this memorandum and are not anticipated to significantly change the outcome of this analysis, are summarized below:

- Removing the eastbound right-turn lane at NE Fremont Avenue and adding eastbound and westbound right turn lanes with protected phasing;
- Removing the eastbound and westbound right turn lanes at NE Siskiyou Street;

- Adding a protected northbound left at SE Tibbetts Street;
- Adjusting signal phasing at SE Stark Street and SE Washington Street to more accurately represent future conditions;
- Making NE Schuyler, SE Tolman, and SE Tibbetts Streets full signals;
- Adjusting the coding of protected vs. permissive left turns for northbound/southbound traffic at study intersections.

These refinements will be in addition to potential changes in the Round 2 analysis that may impact volumes, such as changes to assumptions around tolling on Interstate 205.

TRAFFIC VOLUMES

The 2040 baseline scenario volumes were forecast based on Metro's 2040 RTP model. This scenario used the 2040 land use and network assumptions developed for the 2018 RTP Update. Raw link level volumes from the Metro model were post-processed for each of the study areas using methods consistent with the Oregon Department of Transportation (ODOT) Analysis and Procedures Manual. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 765 *Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. These forecast volumes were post-processed using NCHRP 765 methodology to account for planned projects set to be constructed before 2040 that will restrict turning movements at intersections and driveways along the corridor. These locations are summarized in a roll plot created by the 82nd Avenue project team that is attached in the Appendix. The following procedure was followed to re-allocate forecast volumes that were turning onto/off of 82nd Avenue in areas where turns would be restricted under future conditions:

1. Determine locations where new raised medians create a turn restriction

2. If there is a turn restriction at an intersection, one of the following scenarios was executed, depending on the type of restriction.

    a. For eastbound-left or westbound-left turn restrictions (i.e., left turning movements from the side streets that intersect 82nd Avenue), those trips become either eastbound rights/westbound rights. Then, those trips will continue downstream to the nearest intersection that allows U-turns, and then a U-turn is made.

    b. For eastbound-through or westbound-through turn restrictions (i.e., through movements from the side streets that intersect 82nd Avenue), those trips become either eastbound rights/westbound rights. Then, those trips will continue downstream to the nearest intersection that allows left turns, and a left turn is made. It is then assumed that these trips will circulate through the local street network to reach their original destination.

    c. For northbound-left or southbound-left turn restrictions (i.e., left turning movements from the mainline), those will instead continue through to the next downstream intersection that allows left turns, and then turn left or u-turn there. It is then assumed that these trips will circulate through the local street network, if necessary, to reach their original destination.

Figure 3 below illustrates each of these scenarios. This procedure adds volumes at the major study intersections to support the Round 1 analysis. PBOT will be doing a more detailed diversion analysis to understand how vehicles may route through the local street network and based on that analysis, this procedure may be refined during Round 2 analysis.

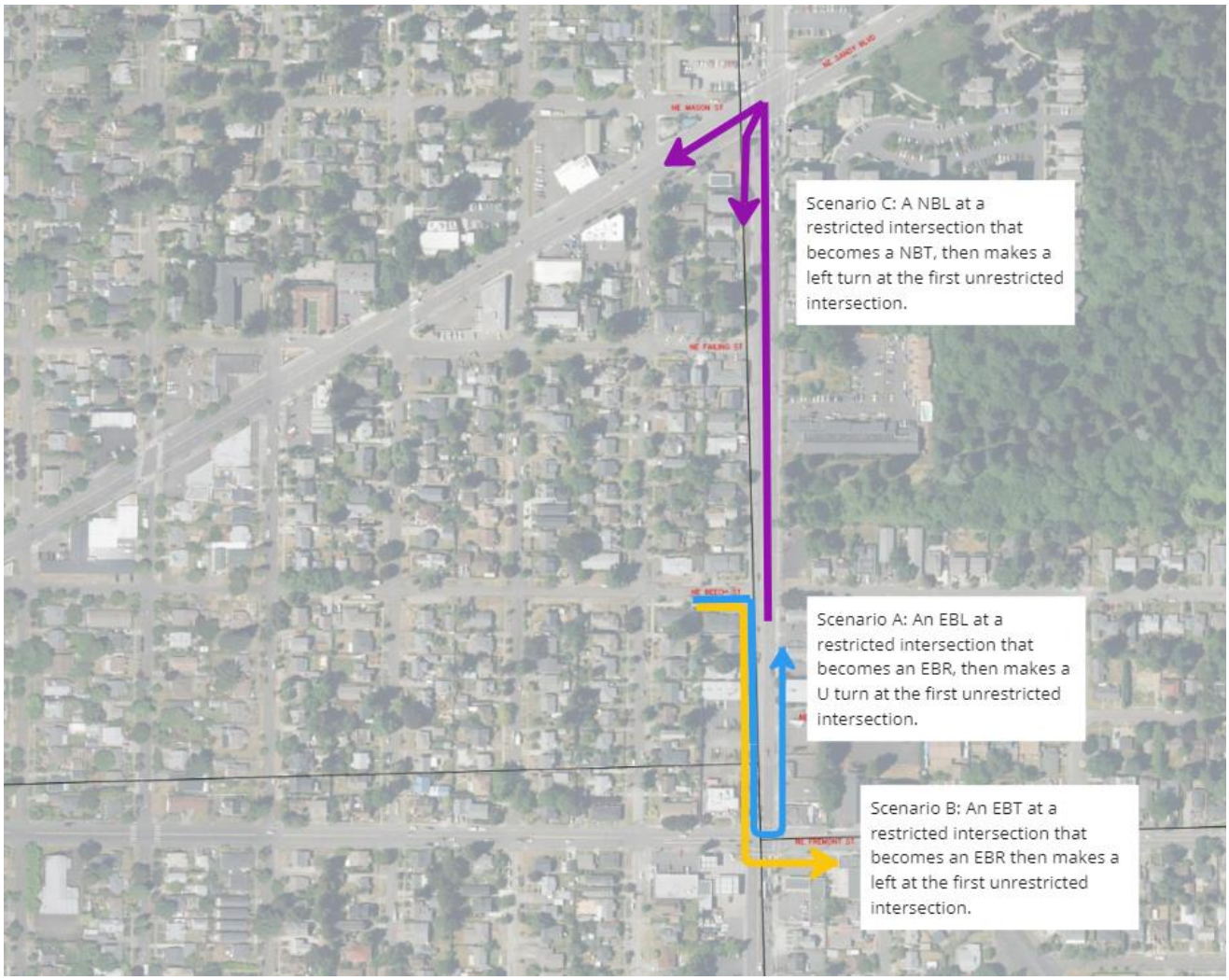

FIGURE 2: LEFT TURN POST-PROCESSING SCHEMATIC

Figures showing forecast 2040 a.m. and p.m. peak-hour traffic volumes (including the adjustments for left turn restrictions) are presented in the Appendix, Section 1B.

Forecast traffic volumes in the 2040 baseline scenario are about 20 percent higher in the p.m. peak hour compared to existing conditions. Northbound and southbound entering and exiting volumes increased by similar amounts (about 20 percent). Major p.m. peak-hour increases in the 2040 baseline side street entering/exiting volumes include:

- NE Siskiyou Street,
- NE Wasco Street,

- NE Multnomah Street,
- SE Yamhill Street, and
- SE Woodstock Boulevard.

In the a.m. peak hour, volumes in the 2040 baseline are about 25 percent higher than existing counts., with substantial side-street traffic growth on:

- NE Sandy Boulevard,
- NE Glisan Street,
- SE Washington Street,
- SE Division Street,
- SE Foster Road, and
- SE Woodstock Boulevard.

Entering northbound traffic is about 18 percent higher in the 2040 baseline compared to existing a.m. peak hour counts, while entering southbound traffic is about 40 percent higher compared to existing a.m. peak hour counts.

INTERSECTION OPERATIONS

Compared to existing conditions, intersection operations in the 2040 baseline all have higher v/c ratios in the p.m. peak hour. The only intersection with a v/c ratio that exceeds its mobility target is SE Powell Boulevard in the p.m. peak hour (v/c of 1.05). Movements at SE Powell Boulevard with v/c ratios at or above 0.99 (indicating a high probability for congestion and queuing) include:

- eastbound left (1.09),
- eastbound through (0.99),
- westbound through (1.14),
- westbound right (1.14),
- and northbound left (1.06).

Other intersections with high v/c ratios in the p.m. peak hour include:

- NE Lombard Street (0.90),
- NE Prescott Street (0.86),
- NE Sandy Boulevard (0.87),
- NE Glisan Street (0.86),
- SE Division Street (0.92),
- SE Holgate Boulevard (0.93), and
- SE Foster Road (0.94).

TABLE 5: P.M. PEAK HOUR 2022 EXISTING AND 2040 BASELINE INTERSECTION OPERATIONS

NO	INTERSECTION CROSS STREET	MOBILITY TARGET (V/C)	2022 EXISTING P.M. PEAK			2040 BASELINE P.M. PEAK		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
SEGMENT 1								
1	82ND AVENUE/ LOMBARD ST	0.99	0.79	24	C	0.90	31	C
2	82ND AVENUE/ AIRPORT ACCESS (OR 213)	0.99	0.55	18	B	0.70	21	C
3	82ND AVENUE/ PRESCOTT ST	0.99	0.65	27	C	0.86	31	C
4	82ND AVENUE/ SANDY BLVD	1.10	0.78	33	C	0.87	49	D
SEGMENT 2								
5	82ND AVENUE/ FREMONT ST	1.10	0.61	28	C	0.74	25	C
6	82ND AVENUE/ SISKIYOU ST	1.10	0.49	11	B	0.62	10	A
7	82ND AVENUE/MCDANIEL HS	1.10	0.45	7	A	0.54	5	A
8	82ND AVENUE/ TILLAMOOK ST	1.10	0.52	12	B	0.64	9	A
9	82ND AVENUE/ JONESMORE ST	1.10	0.65	21	C	0.67	22	C
10	82ND AVENUE/ WASCO ST	1.10	0.51	14	B	0.59	6	A
11	82ND AVENUE/ MULTNOMAH ST	1.10	0.45	6	A	0.49	7	A
12	82ND AVENUE/ GLISAN ST	1.10	0.79	38	D	0.86	42	D
SEGMENT 3								
13	82ND AVENUE/ DAVIS ST	1.10	0.35	2	A	0.41	2	A
14	82ND AVENUE/ BURNSIDE ST	1.10	0.75	29	C	0.82	40	D
15	82ND AVENUE/ STARK ST	1.10	0.70	18	B	0.80	27	C
16	82ND AVENUE/ WASHINGTON ST	1.10	0.69	16	B	0.81	21	C

NO	INTERSECTION CROSS STREET	MOBILITY TARGET (V/C)	2022 EXISTING P.M. PEAK			2040 BASELINE P.M. PEAK		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
17	82ND AVENUE/ YAMHILL ST	1.10	0.43	4	A	0.49	5	A
18	82ND AVENUE/ MILL ST	1.10	0.41	5	A	0.44	3	A
	SEGMENT 4							
19	82ND AVENUE/ HARRISON ST	1.10	N/A	N/A	N/A	0.43	6	A
20	82ND AVENUE/ DIVISION ST	1.10	0.85	39	D	0.92	63	E
21	82ND AVENUE/ WOODWARD ST	1.10	0.48	13	B	0.59	21	C
22	82ND AVENUE/ POWELL BLVD	0.99	0.84	59	E	**1.05**	**76**	**E**
23	82ND AVENUE/ BUSH ST	1.10	N/A	N/A	N/A	0.51	8	A
24	82ND AVENUE/ BOISE ST	1.10	0.50	19	B	0.83	32	C
25	82ND AVENUE/ HOLGATE BLVD	1.10	0.82	36	D	0.93	50	D
26	82ND AVENUE/ SCHILLER ST	1.10	N/A	N/A	N/A	0.46	6	A
27	82ND AVENUE/ RAYMOND ST	1.10	0.36	4	A	0.45	7	A
28	82ND AVENUE/ FOSTER RD	1.10	0.83	38	D	0.94	56	E
	SEGMENT 5							
29	82ND AVENUE/ WOODSTOCK BLVD	0.99	0.60	20	C	0.81	25	C
30	82ND AVENUE/ DUKE ST	0.99	0.43	14	B	0.56	17	B
31	82ND AVENUE/ FLAVEL ST	0.99	0.63	23	C	0.75	24	C

As in the p.m. peak hour, all intersections in the 2040 baseline scenario have higher v/c ratios than under existing conditions. In the 2040 baseline, the highest v/c ratios in the a.m. peak hour include:

- NE Glisan Street (0.85),
- SE Powell Boulevard (0.92), and
- SE Foster Road at (0.90).

Similar to existing conditions, the p.m. peak hour consistently sees more congestion than the a.m. peak hour.

TABLE 6: A.M. PEAK HOUR 2022 EXISTING AND 2040 BASELINE INTERSECTION OPERATIONS

NO	INTERSECTION	MOBILITY TARGET (V/C)	2040 EXISTING A.M. PEAK HOUR			2040 BASELINE A.M. PEAK HOUR		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
SEGMENT 1								
1	82ND AVENUE/ LOMBARD ST	0.99	0.61	15	B	0.72	21	C
2	82ND AVENUE/ AIRPORT ACCESS (OR 213)	0.99	0.36	15	B	0.49	17	B
3	82ND AVENUE/ PRESCOTT ST	0.99	0.32	22	C	0.48	17	B
4	82ND AVENUE/ SANDY BLVD	1.10	0.62	22	C	0.71	38	D
SEGMENT 2								
5	82ND AVENUE/ FREMONT ST	1.10	0.55	29	C	0.65	28	C
6	82ND AVENUE/ SISKIYOU ST	1.10	0.40	10	B	0.48	9	A
7	82ND AVENUE/ MCDANIEL HS	1.10	0.44	16	B	0.54	10	B
8	82ND AVENUE/ TILLAMOOK ST	1.10	0.39	6	A	0.51	9	A
9	82ND AVENUE/ JONESMORE ST	1.10	0.49	15	B	0.51	17	B
10	82ND AVENUE/ WASCO ST	1.10	0.39	19	B	0.44	7	A
11	82ND AVENUE/ MULTNOMAH ST	1.10	0.35	4	A	0.36	5	A
12	82ND AVENUE/ GLISAN ST	1.10	0.76	38	D	0.85	49	D
SEGMENT 3								
13	82ND AVENUE/ DAVIS ST	1.10	0.29	2	A	0.36	2	A
14	82ND AVENUE/ BURNSIDE ST	1.10	0.63	23	C	0.73	31	C

NO	INTERSECTION	MOBILITY TARGET (V/C)	2040 EXISTING A.M. PEAK HOUR			2040 BASELINE A.M. PEAK HOUR		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
15	82ND AVENUE/ STARK ST	1.10	0.59	24	C	0.68	25	C
16	82ND AVENUE/ WASHINGTON ST	1.10	0.47	12	B	0.67	18	B
17	82ND AVENUE/ YAMHILL ST	1.10	0.33	4	A	0.41	6	A
18	82ND AVENUE/ MILL ST	1.10	0.33	6	A	0.40	5	A
	SEGMENT 4							
19	82ND AVENUE/ HARRISON ST	1.10	N/A	N/A	N/A	0.37	4	A
20	82ND AVENUE/ DIVISION ST	1.10	0.67	33	C	0.75	41	D
21	82ND AVENUE/ WOODWARD ST	1.10	0.35	9	A	0.45	13	B
22	82ND AVENUE/ POWELL BLVD	1.10	0.71	54	D	0.92	83	F
23	82ND AVENUE/ BUSH ST	1.10	N/A	N/A	N/A	0.38	6	A
24	82ND AVENUE/ BOISE ST	1.10	0.35	9	A	0.44	8	A
25	82ND AVENUE/ HOLGATE BLVD	1.10	0.72	30	C	0.83	43	D
26	82ND AVENUE/ SCHILLER ST	1.10	N/A	N/A	N/A	0.37	6	A
27	82ND AVENUE/ RAYMOND ST	1.10	0.27	3	A	0.36	7	A
28	82ND AVENUE/ FOSTER RD	1.10	0.80	47	D	0.90	55	D
	SEGMENT 5							
29	82ND AVENUE/ WOODSTOCK BLVD	0.99	0.57	22	C	0.81	26	C
30	82ND AVENUE/ DUKE ST	0.99	0.40	20	C	0.51	16	B
31	82ND AVENUE/ FLAVEL ST	0.99	0.48	20	B	0.61	23	C

QUEUING ANALYSIS

Full queuing results for the a.m. and p.m. peak hours are included in the Appendix, Section 3B. This section includes a high-level discussion of the locations where SimTraffic simulations indicate significant 95th-percentile queues that contribute to motor-vehicle congestion at major study intersections in the p.m. peak hour. The only major study intersections with 95th-percentile queues exceeding storage in the a.m. peak hour that are longer than in the p.m. peak hour are:

- Westbound left at NE Glisan Street. The 95th-percentile queue in the a.m. peak hour is 400 feet and 275 feet in the p.m. peak hour.
- Westbound through SE Powell Boulevard. The 95th-percentile queue in the a.m. peak hour is 4,375 feet and 4,250 feet in the p.m. peak hour.

Extensive queuing is expected in the 2040 baseline scenario in the p.m. peak hour, primarily in Segment 4 between SE Mill Street and SE Foster Road. 95th-percentile queues are expected to exceed storage lengths or spill back to adjacent intersections at several study locations, including the ones with queuing issues under existing conditions. The following text describes the most significant queuing in the study area for each segment.

Segment 1

- Eastbound at NE Prescott Street (0.46 miles). This queuing is driven by the permissive left turn signal phasing, which causes left-turning vehicles to spill back into the through lane.

Segment 2 and Segment 3

- No significant queueing is expected in this segment.

Segment 4

The most extensive 95th-percentile queuing under p.m. peak hour conditions is expected in Segment 4, which are shown on Figure 3:

- Southbound between SE Mill Street and SE Division Street (0.36 miles)
- Northbound between SE Division Street and almost SE Boise Street (0.84 miles)
- Southbound between SE Powell Boulevard and SE Woodward Street (0.27 miles)
- Westbound between SE Powell Boulevard and east of Interstate 205 (0.78 miles)
- Eastbound between SE Powell Boulevard and SE 75th Avenue (0.33 miles)
- Eastbound at SE Holgate Boulevard (0.40 miles)
- Eastbound at SE Foster Road (0.45 miles, to about SE 73rd Avenue)
- Westbound at SE Foster Road (0.39 miles, to about SE 89th Avenue)

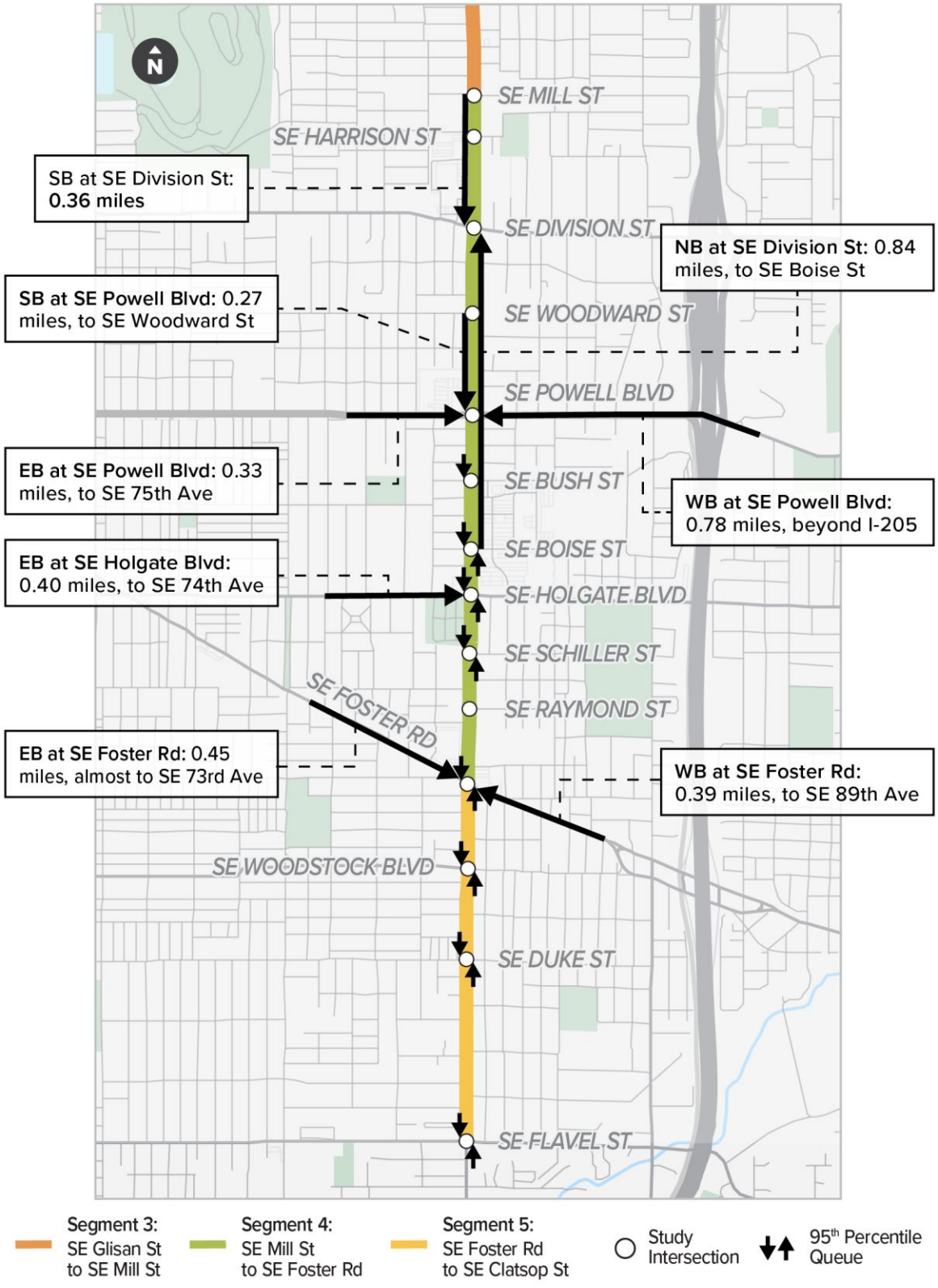

FIGURE 3: 2040 BASELINE P.M. PEAK HOUR 95TH-PERCENTILE QUEUES BETWEEN SE MILL ST AND SE FLAVEL ST (ONLY EB/WB QUEUES OVER 0.25 MILES SHOWN)

The southbound queuing between SE Mill Street and SE Division Street and the northbound queuing between SE Division Street and SE Boise Street is largely driven by poor intersection operations at the SE Division Street (p.m. v/c ratio: 0.92) and SE Powell Boulevard (p.m. v/c ratio: 1.05) intersections. At SE Division Street, the northbound-through (p.m. v/c: 1.11) and southbound through (p.m. v/c: 1.01) have v/c ratios over 0.99.

Queues in both peak periods reach beyond the Interstate 205 interchange at SE Powell Boulevard. The v/c ratio for the westbound through/right movement is 1.14 in the p.m. peak hour and 1.31 in the a.m. peak hour. Additionally, the northbound-left movement v/c ratio is 1.13 in the a.m. peak hour and 1.06 in the p.m. peak hour. This is due in part to a significant increase in traffic volumes on 82nd Avenue between existing and 2040 baseline conditions. In the a.m. peak hour, northbound-through volume increases by approximately 135 vehicles (23%) and southbound through volumes increases by approximately 270 vehicles (70%) between existing conditions and the 2040 baseline. In the p.m. peak hour, northbound-through volumes are 14% higher and southbound-through volume is 24% higher in the 2040 baseline compared to existing conditions. This results in more green time for northbound and southbound traffic while less green time for the westbound approaches (lower green to cycle, or g/C, ratios).

The high p.m. v/c ratios at SE Holgate Boulevard (0.93) and SE Foster Road (0.94) contribute to the long eastbound queues seen at those intersections. However, none of the movement-level v/c ratios is over 0.99 at those intersections in the p.m. peak hour.

Segment 5

- No significant queueing is expected in this segment.

TRAVEL TIMES

Motor vehicle travel times are considerably longer in the 2040 baseline scenario compared to existing conditions in both the a.m. and p.m. peak hours. Comparing existing and 2040 baseline SimTraffic travel times, the southbound time is expected to increase by 3.5 minutes in the a.m. peak hour (a 19% increase) and 8.3 minutes in the p.m. peak hour (an 8% increase). Northbound travel times are expected to rise by 3.5 minutes in the a.m. peak hour (a 20% increase) and by 10.8 minutes in the p.m. peak hour (a 50% increase).

TABLE 7: 2040 FUTURE BASELINE MOTOR-VEHICLE TRAVEL TIMES FROM SIMTRAFFIC

SEGMENT	EXISTING A.M. SIMTRAFFIC TRAVEL TIME (MIN)	2040 A.M. BASELINE TRAVEL TIME (MIN)	CHANGE IN TRAVEL TIME (MIN)	EXSISTING P.M. SIMTRAFFIC TRAVEL TIME (MIN)	2040 P.M. BASELINE TRAVEL TIME (MIN)	CHANGE IN TRAVEL TIME (MIN)
SOUTHBOUND						
ALBERTA ST TO SANDY BLVD (SEGMENT 1)	1.5	1.8	0.3	1.8	1.3	-0.5
SANDY BLVD TO GLISAN ST (SEGMENT 2)	5.3	4.9	-0.4	5.4	6.0	0.6
GLISAN ST TO MILL ST (SEGMENT 3)	2.7	3.1	0.4	3.0	4.2	1.2
MILL ST TO FOSTER RD (SEGMENT 4)	5.6	8.2	2.6	6.5	12.4	5.9
FOSTER RD TO CLATOP ST (SEGMENT 5)	3.5	3.8	0.3	3.7	4.8	1.1
TOTAL	**18.6**	**21.8**	**3.5**	**20.4**	**28.7**	**8.3**
NORTHBOUND						
SANDY BLVD TO ALBERTA ST (SEGMENT 1)	1.5	0.9	-0.6	2.0	2.6	0.6
GLISAN ST TO SANDY BLVD (SEGMENT 2)	4.7	5.1	0.4	6.2	5.9	-0.3
MILL ST TO GLISAN ST (SEGMENT 3)	2.6	3.6	1.0	2.9	3.4	0.5
FOSTER RD TO MILL ST (SEGMENT 4)	5.5	3.4	-2.1	6.7	16.1	9.7
CLATOP ST TO FOSTER RD (SEGMENT 5)	3.4	4.3	0.9	3.7	4.2	0.5
TOTAL	**17.7**	**21.2**	**3.5**	**21.5**	**32.3**	**10.8**

MITIGATIONS

Several mitigation measures could improve intersection operations under baseline traffic conditions. While potential mitigations may be explored in more detail during the Round 2 analysis, some preliminary intersection capacity mitigation measures were investigated as part of the Round 1 analysis. These measures, summarized below, include physical changes as well as optimizing signal timing and offsets to better balance mainline and side-street movements.

- Making the eastbound and westbound left turns protected at NE Prescott Street would increase the p.m. intersection v/c ratio from 0.86 to 0.88, but substantially decrease eastbound queuing from left turn spillback (discussed below).
- At SE Division Street, adding northbound and southbound right-turn lanes would reduce the p.m. v/c ratio from 0.92 to 0.84. However, widening to add the turn lanes could be difficult given the current placement of FX bus stations on the southeast and northeast corners of the intersection and the proximity of buildings to the road.
- At SE Powell Boulevard, widening for exclusive southbound and northbound right-turn lanes and lengthening the eastbound left-turn bay would reduce the p.m. v/c ratio from 1.05 to 0.98.
- At SE Holgate Boulevard, adding a southbound right-turn lane would reduce the p.m. v/c ratio from 0.93 to 0.91 and could be accomplished using the existing bus pullout with the addition of a bus queue jump phase at the signal.
- At SE Foster Rd, widening to add a northbound right turn lane would reduce the p.m. v/c ratio from 0.94 to 0.91. However, this would create right-of-way impacts to the gas station on the southeast corner of the intersection. This small decrease in the v/c ratio would not provide a large benefit to queuing at this intersection, especially relative to the queuing improvements seen from the potential mitigations at SE Division Street and SE Powell Boulevard.

Collectively, the mitigation measures described above would significantly reduce these queuing issues observed along the corridor. For example, the mitigations significantly reduce the northbound queuing seen between SE Division Street and SE Boise Street seen under unmitigated conditions. Additionally, the mitigations would reduce the westbound 95th-percentile queue at SE Powell Boulevard from 0.78 to 0.47 miles. Under unmitigated conditions, the 95th-percentile queue stretches beyond the Interstate 205 interchange, but with these mitigations, the 95th-percentile queue only reaches to about SE 92nd Avenue.

CHAPTER 2: CLACKAMAS COUNTY SEGMENT TRAFFIC OPERATIONS

STUDY AREA

The study area consists of a 1.5-mile section of 82nd Ave (OR 213) and a quarter-mile section of SE Monterey Avenue in Clackamas County. 82nd Ave is an urban principal arterial road[7]. The predominant land uses in the study area are commercial, with the Clackamas Town Center (CTC) serving as a major destination. The CTC is designated as Regional Center by Metro[8]. Access to I-205 is available at SE Johnson Creek Boulevard a quarter mile east of 82nd Avenue.

The study intersections for this project (shown in Figure 4 below) are:

C1. 82nd Avenue/ SE Lindy Street
C2. 82nd Avenue/ SE Johnson Creek Blvd
C3. 82nd Avenue / SE Overland Street
C4. 82nd Avenue/ SE Otty Street
C5. 82nd Avenue/ SE King Road
C6. 82nd Avenue/ SE Monroe Street/Boyer Drive
C7. 82nd Avenue/ SE Causey Avenue
C8. 82nd Avenue/ SE Monterey Avenue
C9. SE Monterey Avenue/ SE 85th Avenue
C10. SE Monterey Avenue/ CTC East Driveway (analyzed for p.m. peak only)
C11. 82nd Avenue/ CTC North Driveway (analyzed for p.m. peak only)

All the study intersections are signalized except for SE Monterey Avenue/ CTC East Driveway, which is one-way stop controlled (the driveway has a stop sign while SE Monterey Avenue is free).

EXISTING INTERSECTION OPERATIONS

TRAFFIC VOLUMES

Figures showing the existing morning and evening peak hour volumes are found in the Appendix.

[7] Oregon Department of Transportation (ODOT) TransGIS, https://gis.odot.state.or.us/transgis/

[8] Metro 2040 Growth Concept, https://www.oregonmetro.gov/2040-growth-concept#:~:text=Policies%20in%20the%202040%20Growth,generates%20jobs%20and%20business%20opportunities

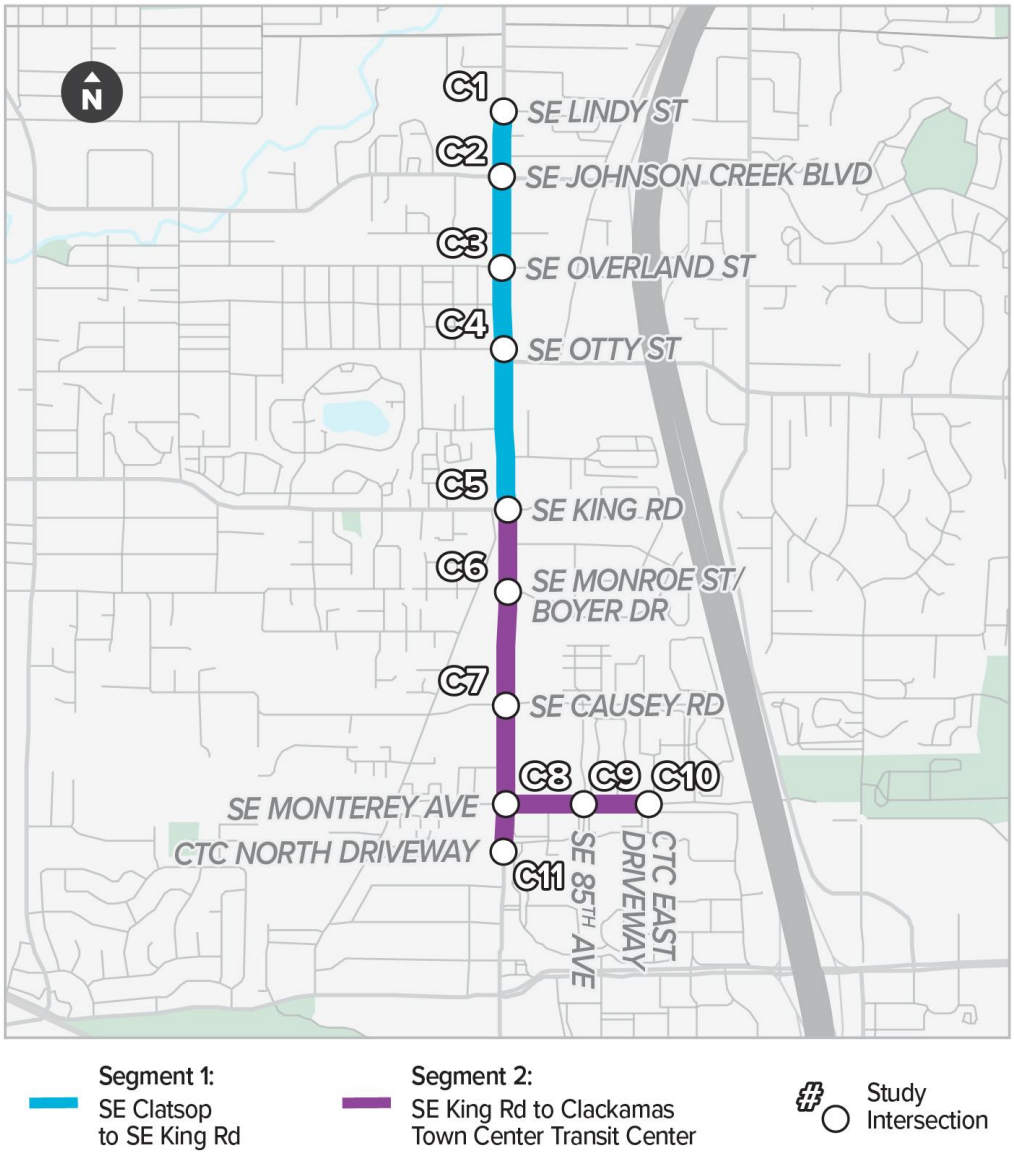

FIGURE 4: CLACKAMAS COUNTY STUDY INTERSECTIONS

INTERSECTION OPERATIONS

Table 8 shows the a.m. and p.m. peak hour intersection operations at the study intersections. Currently, all study intersections meet their respective mobility targets. The worst-performing intersection in the a.m. peak hour is 82nd Avenue/ SE Johnson Creek Boulevard (0.71 v/c ratio). All other intersections have v/c ratios below 0.70 in the morning peak hour.

In the p.m. peak hour, three intersections have v/c ratios at or over 0.75: 82nd Avenue/ SE Lindy Street (0.84), 82nd Avenue/ Johnson Creek Boulevard (0.78), and 82nd Avenue/ SE Overland Street (0.75). SE Lindy Street is a local street on the east leg of the intersection and a driveway to a Fred Meyer supermarket on the intersection's west leg. SE Johnson Creek Boulevard is a major arterial road providing access to I-205 a quarter mile east of 82nd Avenue. SE Overland Street is classified

as a collector west of 82nd Avenue, while the right-of-way at that intersection's east leg is a driveway providing access to several retail stores[9].

TABLE 8: CLACKAMAS COUNTY EXISTING PEAK HOUR INTERSECTION OPERATIONS

NO.	INTERSECTION	MOBILITY TARGET (V/C)	A.M. V/C RATIO	A.M. DELAY (SEC)	A.M. LOS	P.M. V/C RATIO	P.M. DELAY	P.M. LOS
CLACKAMAS COUNTY SEGMENT 1								
C1	82ND AVE/ LINDY ST	0.99	0.45	8	A	0.84	28	C
C2	82ND AVE/ JOHNSON CREEK BLVD	0.99	0.71	29	C	0.78	49	D
C3	82ND AVE/ OVERLAND ST	0.99	0.41	20	C	0.75	15	B
C4	82ND AVE/ OTTY ST	0.99	0.42	17	B	0.57	31	C
C5	82ND AVE/ KING RD	0.99	0.48	28	C	0.64	35	D
CLACKAMAS COUNTY SEGMENT 2								
C6	82ND AVE/ MONROE ST/BOYER DR	0.99	0.39	26	C	0.56	8	A
C7	82ND AVE/ CAUSEY AVE	0.99	0.38	20	C	0.58	13	B
C8	82ND AVE/ MONTEREY AVE	1.10	0.45	28	C	0.62	24	C
C9	MONTEREY AVE/ 85TH AVE	1.10	0.46	6	A	0.53	7	A
C10	MONTEREY AVE/ CTC EAST DRIVEWAY	1.10	N/A	N/A	N/A	0.18/0.17*	8/15	A/C
C11	82ND AVE/ CTC NORTH DRIVEWAY	1.10	N/A	N/A	N/A	0.44	12	B

*Major/minor approach

[9] Clackamas County Transportation System Plan (2022), https://www.clackamas.us/planning/maptoc.html

TRAVEL TIMES

Table 9 shows the motor vehicle travel times for the corridor using data from RITIS. Congestion plots showing the RITIS/INRIX data are found in the Appendix, Section 6 These results indicate that for the southbound and northbound directions, travel times are slightly higher in the p.m. peak hour than in the a.m. peak hour.

TABLE 9: CLACKAMAS COUNTY MOTOR VEHICLE TRAVEL TIMES

SEGMENT	A.M. TRAVEL TIME (MINS)	P.M. TRAVEL TIME (MINS)
SOUTHBOUND		
CLATSOP ST TO OVERLAND ST	1.0	1.1
OVERLAND ST TO KING RD	1.2	1.5
KING RD TO CAUSEY AVE	0.9	1.2
CAUSEY AVE TO MONTEREY AVE	0.5	0.6
SB TOTAL	3.6	4.3
NORTHBOUND		
MONTEREY AVE TO CAUSEY AVE	0.5	0.5
CAUSEY AVE TO KING RD	0.9	1.1
KING RD TO OVERLAND ST	1.2	1.5
OVERLAND ST TO CLATSOP ST	1.0	1.0
NB TOTAL	3.5	4.1

FUTURE BASELINE TRAFFIC OPERATIONS

TRAFFIC VOLUMES

The 2040 baseline scenario volumes were forecast based on Metro's 2040 RTP model. This scenario used the 2040 land use and network assumptions developed for the 2018 RTP Update. Raw link level volumes from the Metro model were post-processed for each of the study areas using methods consistent with the Oregon Department of Transportation (ODOT) Analysis and Procedures Manual. This approach is derived from methodologies outlined in the National Cooperative Highway Research Program (NCHRP) Report 765 *Analytical Travel Forecasting Approaches for Project-Level Planning and Design*.

Total traffic volumes (on all approaches) are forecast to increase by about 13% in the 2040 baseline compared to existing conditions in the p.m. peak hour, with northbound and southbound volume increasing by 12%. Substantial side-street traffic growth is forecast at SE Otty Street and SE Boyer Road in the p.m. peak hour. Entering southbound traffic is forecast to increase 14% over existing counts, while entering northbound traffic is forecast to increase 9% over existing counts.

In the a.m. peak hour, traffic volumes are forecast to increase by about 20% in the 2040 baseline compared to existing conditions. Substantial side-street traffic growth is also forecast at SE Otty Street and SE Boyer Road in the a.m. peak hour. Entering southbound traffic is forecast to increase 28% over existing counts, while entering northbound traffic is forecast to increase 14% over existing counts.

Figures showing forecasted 2040 future baseline volumes are found in the Appendix, Section 1D.

INTERSECTION OPERATIONS

Tables 10 and 11 show the intersection operations for forecast 2040 baseline volumes on the Clackamas County segment. The results indicate modest increases in v/c ratios compared to existing conditions, with all intersections expected to meet their respective mobility targets in both the a.m. and p.m. peak hours. The only intersections expected to operate with v/c ratios over 0.75 but below 0.99 under 2040 baseline connections are at SE Lindy Street in the p.m. peak hour and SE Johnson Creek Boulevard in both peak hours. V/c ratios are higher under 2040 baseline conditions at all intersections in both peak hours except at SE Lindy Street, which has a higher v/c ratio under existing conditions compared to 2040 baseline conditions in the p.m. peak hour.

TABLE 10: P.M. PEAK HOUR 2022 EXISTING AND 2040 BASELINE CLACKAMAS COUNTY INTERSECTION OPERATIONS

NO.	INTERSECTION CROSS STREET	MOBILITY TARGET (V/C)	2022 EXISTING P.M. PEAK			2040 BASELINE P.M. PEAK		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
CLACKAMAS COUNTY SEGMENT 1								
C1	82ND AVE/ LINDY ST	0.99	0.84	28	C	0.76	21	C
C2	82ND AVE/ JOHNSON CREEK BLVD	0.99	0.78	49	D	0.89	54	D
C3	82ND AVE/ OVERLAND ST	0.99	0.75	15	B	0.72	24	C
C4	82ND AVE/ OTTY ST	0.99	0.57	31	C	0.67	32	C
C5	82ND AVE/ KING RD	0.99	0.64	35	D	0.74	35	C
CLACKAMAS COUNTY SEGMENT 2								
C6	82ND AVE/ MONROE ST/ BOYER DR	0.99	0.56	8	A	0.65	13	B
C7	82ND AVE/ CAUSEY AVE	0.99	0.58	13	B	0.66	13	B
C8	82ND AVE/ MONTEREY AVE	1.10	0.62	24	C	0.67	19	B
C9	MONTEREY AVE/ 85TH AVE	1.10	0.53	7	A	0.56	8	A
C10	MONTEREY AVE/ CTC EAST DRIVEWAY	1.10	0.18/0.17*	8/15	A/C	0.19/0.18*	8/16	A/C
C11	82ND AVE/ CTC NORTH DRIVEWAY	1.10	0.44	12	B	0.48	12	B

*Major/minor approach

TABLE 11: A.M. PEAK HOUR CLACKAMAS COUNTY EXISTING AND 2040 BASELINE INTERSECTION OPERATIONS

NO.	INTERSECTION CROSS STREET	MOBILTIY TARGET (V/C)	2022 EXISTING A.M. PEAK			2040 BASELINE A.M. PEAK		
			V/C RATIO	DELAY (SEC)	LOS	V/C RATIO	DELAY (SEC)	LOS
SEGMENT 1								
C1	82ND AVE/ LINDY ST	0.99	0.45	8	A	0.53	9	A
C2	82ND AVE/ JOHNSON CREEK BLVD	0.99	0.71	29	C	0.83	44	D
C3	82ND AVE/ OVERLAND ST	0.99	0.41	20	C	0.49	20	C
C4	82ND AVE/ OTTY ST	0.99	0.42	17	B	0.50	19	B
C5	82ND AVE/ KING RD	0.99	0.48	28	C	0.57	28	C
SEGMENT 2								
C6	82ND AVE/ MONROE ST/ BOYER DR	0.99	0.39	26	C	0.45	28	C
C7	82ND AVE/ CAUSEY AVE	0.99	0.38	20	C	0.44	21	C
C8	82ND AVE/ MONTEREY AVE	1.10	0.45	28	C	0.50	29	C
C9	MONTEREY AVE/ 85TH AVE	1.10	0.46	6	A	0.5	7	A

CHAPTER 3: TRANSIT TRAVEL TIMES

This chapter presents bus travel times under existing and 2040 baseline conditions for the Civic Corridor and Clackamas County segments of 82nd Avenue. TriMet's Line 72 bus route currently runs along 82nd Avenue from the northern terminus at NE Lombard Street to the southern terminus at the Clackamas Town Center (CTC) Transit Center. This line operates with 15-minute headways today.

Base year transit travel time data was obtained from TriMet for eight distinct segments. The travel time data was obtained for each day from September 1st - November 30th in 2019 and 2021[10]. This raw data was then aggregated by day of week (Tuesdays, Wednesdays, and Thursdays) and time of day (a.m. or p.m. peak periods) to develop a set of existing conditions transit travel times.

Existing transit travel times were forecast to 2040 based on projected growth in either vehicle travel time or delay between existing conditions and the 2040 horizon. For the Civic Corridor segment of 82nd Avenue, the existing conditions and future baseline SimTraffic models developed were used to output travel times between study intersections. The ratio of future to existing travel times was summarized by segment and used to scale the existing transit travel times to 2040 transit travel times.

For the Clackamas County segment, the same process for forecasting 2040 baseline transit travel times was followed, except rather than using SimTraffic travel time output, HCM approach delay was used to create the scaling factors. This is because for this segment, no SimTraffic model was created. This methodology assumes buses will continue to use their existing route to and from the CTC Transit Center.

CIVIC CORRIDOR TRANSIT TRAVEL TIMES

Tables 12 and 13 show the existing conditions and 2040 baseline travel times for buses on the Civic Corridor based on 2021 data from TriMet. Travel times are only shown between NE Alberta St and SE Clatsop St because TriMet data for the section of the corridor north of Alberta includes an east-west section of Lombard St that is not part of the study corridor. These travel times include dwell time at stops.

Similar to the motor vehicle travel times discussed in Chapter 1, travel times are higher in the p.m. peak period than in the a.m. period. The p.m. peak-hour southbound 2040 baseline bus travel times are expected to increase by 22% (7.5 minutes) relative to existing conditions, while they are expected to increase by 24% (8.8 minutes) in the northbound direction. In the p.m. peak hour, the largest increases between existing conditions and the 2040 baseline are between SE Mill Street and SE Foster Road in both directions (+36% southbound and +53% northbound). This section of the corridor includes the congested SE Division Street and SE Powell Boulevard intersections that are expected to see extensive queuing, as noted above.

[10] 2019 data was used only as a means for comparison. 2021 data is what is used to represent all existing conditions.

TABLE 12: P.M. PEAK HOUR CIVIC CORRIDOR PEAK HOUR EXISTING AND 2040 BASELINE TRANSIT TRAVEL TIMES

SEGMENT	EXISTING TRAVEL TIME (MIN)	BASELINE TRAVEL TIME (MIN)	DIFFERENCE (MIN)	DIFFERENCE (%)
ALBERTA ST TO SANDY BLVD (SEGMENT 1)	2.2	2.4	+0.2	+10%
SANDY BLVD TO GLISAN ST (SEGMENT 2)	8.7	9.3	+0.6	+7%
GLISAN ST TO MILL ST (SEGMENT 3)	5.1	6.0	+0.9	+18%
MILL ST TO FOSTER RD (SEGMENT 4)	11.7	15.9	+4.3	+36%
FOSTER RD TO CLATSOP ST (SEGMENT 5)	6.7	8.1	+1.5	+22%
SB TOTAL	**34.4**	**41.8**	**7.5**	**+22%**
CLATSOP ST TO FOSTER RD (SEGMENT 5)	6.9	7.8	+0.9	+13%
FOSTER RD TO MILL ST (SEGMENT 4)	12.1	18.6	+6.5	+53%
MILL ST TO GILSAN ST (SEGMENT 3)	5.4	5.4	0.0	0%
GLISAN ST TO SANDY BLVD (SEGMENT 2)	10.0	11.1	+1.2	+12%
SANDY BLVD TO ALBERTA ST (SEGMENT 1)	1.5	1.7	+0.2	+16%
NB TOTAL	**35.8**	**44.6**	**+8.8**	**+24%**

In the a.m. peak hour, transit travel times are expected to increase by 12% (3.5 minutes) in the southbound direction and 8% (2.4 minutes) in the northbound direction in the 2040 baseline compared to comparing existing conditions. Larger increases are expected in the segment between SE Glisan Street and SE Foster Road in the southbound direction, and the SE Foster Road-SE Mill Street and NE Sandy Boulevard-NE Alberta Street segments in the northbound direction.

TABLE 13: A.M. PEAK HOUR CIVIC CORRIDOR EXISITNG AND 2040 BASELINE TRANSIT TRAVEL TIMES

SEGMENT	EXISTING TRAVEL TIME (MIN)	BASELINE TRAVEL TIME (MIN)	DIFFERENCE (MIN)	DIFFERENCE (%)
ALBERTA ST TO SANDY BLVD (SEGMENT 1)	1.8	2.1	0.3	16%
SANDY BLVD TO GLISAN ST (SEGMENT 2)	8.4	9.4	1.0	12%
GLISAN ST TO MILL ST (SEGMENT 3)	4.5	5.2	0.7	15%
MILL ST TO FOSTER RD (SEGMENT 4)	8.3	9.6	1.3	16%
FOSTER RD TO CLATSOP ST (SEGMENT 5)	5.6	5.9	0.3	5%
SB TOTAL	**28.6**	**32.1**	**3.5**	**12%**
CLATSOP ST TO FOSTER RD (SEGMENT 5)	6.6	7.1	0.5	7%
FOSTER RD TO MILL ST (SEGMENT 4)	9.0	10.3	1.3	14%
MILL ST TO GILSAN ST (SEGMENT 3)	4.7	5.1	0.4	8%
GLISAN ST TO SANDY BLVD (SEGMENT 2)	8.4	8.5	0.0	0%
SANDY BLVD TO ALBERTA ST (SEGMENT 1)	1.3	1.6	0.3	19%
NB TOTAL	**30.1**	**32.5**	**2.4**	**8%**

CLACKAMAS COUNTY TRANSIT TRAVEL TIMES

For the p.m. peak hour (shown in Table 14), transit travel times are expected to increase by 49% (6.2 minutes) in the southbound direction and 63% (8.3 minutes) in the northbound direction under 2040 baseline conditions relative to existing conditions. Travel times are expected to increase by larger margins in the southern segment (between SE King Road and the CTC Transit Center) in both directions.

TABLE 14: P.M. PEAK HOUR CLACKAMAS COUNTY EXISTING AND 2040 BASELINE TRANSIT TRAVEL TIMES

SEGMENT	EXISTING TRAVEL TIME (MIN)	BASELINE TRAVEL TIME (MIN)	DIFFERENCE (MIN)	DIFFERENCE (%)
CLATOP ST TO KING RD	4.9	5.6	+0.8	+16%
KING RD TO CTC TRANSIT CENTER	7.7	13.1	+5.4	+71%
SB TOTAL	**12.5**	**18.7**	**+6.2**	**+49%**
CTC TRANSIT CENTER TO KING RD	7.5	14.0	+6.5	+86%
KING RD TO CLATSOP ST	5.6	7.3	+1.8	+32%
NB TOTAL	**13.1**	**21.4**	**+8.3**	**+63%**

In the a.m. peak hour, southbound bus travel times are expected to increase by much smaller margins (4% or 0.4 minutes southbound and 2% or 0.1 minutes northbound) between 2040 baseline and existing conditions. Both segments of the Clackamas County section of 82nd Avenue are expected to increase by similar amounts between those periods. These results reinforce the findings demonstrated in this memorandum that the p.m. peak hour traffic operations are worse on 82nd Avenue and will be the controlling factor in future analyses.

TABLE 15: CLACKAMAS COUNTY EXISTING AND 2040 BASELINE A.M. TRANSIT TRAVEL TIMES

SEGMENT	EXISTING TRAVEL TIME (MIN)	BASELINE TRAVEL TIME (MIN)	DIFFERENCE (MIN)	DIFFERENCE (%)
CLATOP ST TO KING RD	3.9	4.1	0.2	5%
KING RD TO CTC TRANSIT CENTER	5.2	5.4	0.2	3%
SB TOTAL	**9.1**	**9.4**	**0.4**	**4%**
CTC TRANSIT CENTER TO KING RD	6.1	6.2	0.0	1%
KING RD TO CLATSOP ST	3.7	3.8	0.1	3%
NB TOTAL	**9.8**	**10.0**	**0.1**	**2%**

While not explicitly modeled here, bus reliability is expected to significantly worsen in the future on both the Civic Corridor and Clackamas County segments of 82nd Avenue as motor vehicle congestion increases. Transit build alternatives, such as exclusive bus lanes, that will be evaluated in future rounds of analysis are expected to improve bus travel times and reliability relative to the 2040 baseline conditions presented here.