



PLANNING COMMISSION

WEDNESDAY, APRIL 12, 2023

WORK SESSION

2. Transit Master Plan (Lewis) (30 minutes)



**PLANNING COMMISSION
STAFF REPORT**

Meeting Date: April 12, 2023		Subject: Transit Master Plan- Draft Master Plan	
		Staff Member: Kelsey Lewis, Grants & Programs Manager	
		Department: SMART	
Action Required		Advisory Board/Commission Recommendation	
<input type="checkbox"/> Motion <input type="checkbox"/> Public Hearing Date: <input type="checkbox"/> Ordinance 1 st Reading Date: <input type="checkbox"/> Ordinance 2 nd Reading Date: <input type="checkbox"/> Resolution <input checked="" type="checkbox"/> Information or Direction <input type="checkbox"/> Information Only <input type="checkbox"/> Council Direction <input type="checkbox"/> Consent Agenda		<input type="checkbox"/> Approval <input type="checkbox"/> Denial <input type="checkbox"/> None Forwarded <input checked="" type="checkbox"/> Not Applicable	
		Comments: N/A	
Staff Recommendation: Review and provide comment on the 2023 draft Transit Master Plan.			
Recommended Language for Motion: N/A			
Project / Issue Relates To:			
<input type="checkbox"/> Council Goals/Priorities:	<input checked="" type="checkbox"/> Adopted Master Plan(s): Transit Master Plan	<input type="checkbox"/> Not Applicable	

ISSUE BEFORE PLANNING COMMISSION:

Staff and consultants will present the draft 2023 Transit Master Plan.

EXECUTIVE SUMMARY:

In Spring 2022, and while navigating the lingering effects of the COVID – 19 pandemic, the City began updating the 2017 Transit Master Plan to address changing conditions and engage with the community to consider transit service enhancements and new projects.

In the summer and fall of 2022, staff and consultants conducted community outreach including providing an updated project webpage on Let’s Talk Wilsonville, tabling at many community events, conducting a survey in English and Spanish, and holding a stakeholder workshop. The main themes we heard in public involvement include:

- Improving weekend service, especially Sundays
- Adding more early morning and late evening service
- Making better regional connections
- Maintaining coverage of Wilsonville neighborhoods

Through the winter of 2022/23 we developed service plans and new project ideas to draft the new Transit Master Plan for review, additional public engagement, and adoption. The core proposals in this master plan include:

- More frequency of service
- Better regional connections
- Improved customer service through a regional customer service center
- New connection points on the east side in or near Town Center
- Improved weekend service
- Bus fleet recommendations regarding low and no emissions buses

This draft Plan outlines specific capital projects and personnel requirements needed to support the new service recommendations. There is also a focus throughout the Plan on identifying how these service changes will be accessible to more members of the Wilsonville community.

EXPECTED RESULTS:

Presentation of the draft Transit Master Plan and feedback from the Planning Commission.

TIMELINE:

This is the third presentation of the Transit Master Plan Update to the Planning Commission. Staff introduced this project in August 2022 and tentatively plans to return for public hearing on May 10, 2023 for the adoption of the plan.

CURRENT YEAR BUDGET IMPACTS:

The development of this Transit Master Plan update is primarily funded by two State grants through the Oregon Department of Transportation. The remainder is funded by transit tax revenue.

COMMUNITY INVOLVEMENT PROCESS:

To ensure that the final document represents the diverse interests of the Wilsonville community, this Transit Master Plan process is intended to have an extensive and inclusive public engagement process. Outreach efforts are tailored to reach people in practical and convenient ways to reflect the perspectives of a wide spectrum of current and potential system users, the business community, and residents.

The draft Plan is now posted and open for public comment. There is a short survey about the draft Plan on Let’s Talk Wilsonville to engage the community in this discussion.

POTENTIAL IMPACTS OR BENEFIT TO THE COMMUNITY:

When implemented, the new plan is expected to improve efficiencies, increase travel independence, and to reduce traffic congestion by providing travelers an alternative to travel in single-occupancy vehicles. A successful outreach strategy is a large part of a successful master plan.

ALTERNATIVES:

N/A

ATTACHMENTS:

1. Draft Transit Master Plan for Public Comment



DRAFT TRANSIT MASTER PLAN

Prepared by JARRETT WALKER + ASSOCIATES

2023 UPDATE

Draft for Public Review

Contents

1. Introduction	5	New Transfer Points Inside Wilsonville.....	29
About SMART.....	6	Better Weekend Service.....	31
SMART Vision & Mission.....	6	Saturday Service	31
An Ambitious Plan	6	Sunday Service	31
Recent Changes.....	7	Route Details	33
Priorities from Public Input.....	8	Route A - Salem	33
Highlights of this Plan.....	9	Route B - Tigard/Tualatin.....	34
Document Guide	9	Route C - Canby.....	36
2. Public Involvement	10	Route D - Legacy Meridian/ Oregon City/Clackamas.....	37
Overview.....	11	Route E - Woodburn/Keizer.....	38
Survey Respondent Demographics.....	12	Route F - Villebois/Wilsonville Rd/ Frog Pond	39
Survey Results.....	13	Route G - Parkway/95th St./Villebois	40
Stakeholder Workshop	15	Residents' Proximity to Service	42
How important are rush hours?	16	Fixed Route Operating Increases.....	43
Weekend Service.....	16	Shared Operations with Cherriots	43
Ridership or coverage?	17	Sample Trips	45
Tabling Events.....	18	City Growth Areas	50
Operator survey results	19	4. Demand-Response Services.....	52
Key Takeaways.....	19	Background.....	53
3. Fixed-Route Services	20	Minimum Required Paratransit Area	54
Better Frequencies, Close to More People	22	"Express" Routes and Segments.....	55
Better Regional Connections	25	Required Paratransit Days and Times.....	55
Less Reliance on WES for Regional Connectivity.....	27	Recommended Paratransit Service Increases	56
Regional Routes Near Residents and Businesses	28		

Contents

5. Capital Infrastructure, Programs and Operations.....	57
Overview.....	58
Transit Vehicles	58
Existing Fleet	58
Fixed-Route Vehicles	59
Demand-Response Vehicles.....	59
General Fleet Recommendations	59
Bus Procurement	60
Compressed Natural Gas (CNG).....	61
Battery Electric Buses (BEB).....	61
Hydrogen Fuel Cell.....	61
Fleet to Support 2028 Service.....	62
Vehicle Type Considerations	62
Vehicle Fuel Type Recommendations	62
Battery Electric or Compressed Natural Gas Vehicles.....	63
Compressed Natural Gas Vehicles	64
Current Vehicle Prices.....	64
Vehicle Delivery Delays.....	65
Charging Infrastructure	65
Administrative Investments.....	65
Longer Spans of Service	65
Operations Personnel.....	66
Administrative Personnel & Facility	66
Maintenance Personnel	66

Regional Customer Service Center	67
Maintenance Yard	68
Technology and Public Information	68
Real Time Bus Tracking.....	69
Small Terminal Facility in Town Center	69
Site Guidelines	70
Two Centers.....	71
Where in the Town Center?	71
Off-Street Facility Near Park Place & Courtside Drive	72
On-Street Facility on Wilsonville Road.....	73
Modular Building	74
Future Town Center Redevelopment.....	75
Transportation Options, Marketing & Information	76
Vanpool	76
Safe Routes to School (SRTS).....	76
Travel Training.....	76
Transit Service Marketing	76
Safety and Enforcement	76
6. Financial Context and Project Costs.....	78
Federal Funding (Discretionary Grant Programs)	79
Local Wilsonville Funding	83
Transit Fund Forecast 2023-2028.....	83
Statewide Funding.....	83
Service and Capital Projects.....	85
Table 1: Service Increases	86

Contents

Table 2: Assumed Costs per Service Revenue Hour..... 88

Table 3: Costs for New Overhead Personnel 89

Table 4: Capital Projects and Investments..... 90

Appendix.....91

Resources for Vehicle and Fuel Comparison92

2022 Existing Conditions Report93

Public Involvement Summary93

1. Introduction

This document is the first draft of an updated Transit Master Plan (TMP) for the City of Wilsonville. It lays out a set of improvements to the City's public transit system that respond to changes in demand brought on by the COVID-19 pandemic; City goals for mobility, economic opportunity and the environment; and priorities expressed by the public during outreach conducted in 2022.

About SMART

South Metro Area Regional Transit (SMART) is the City of Wilsonville's public transportation system. SMART is a department of the City that provides fixed-route and demand responsive transit service, both within Wilsonville and making connections to neighboring communities.

In addition to fixed-route and demand-response service, the SMART Options Program provides businesses, residents and visitors of Wilsonville with the resources to participate in various transportation options such as vanpooling, carpooling, bicycling, walking, and telework. This program promotes a robust set of travel options to give people more choices in how they travel while reducing the number of single-occupancy vehicles on the road.

SMART Vision & Mission

SMART's mission is to provide convenient, safe, and reliable transportation services in

a fiscally responsible manner to meet the needs of Wilsonville residents, employees, and visitors of all ages, ethnicities, and income levels.

SMART is dedicated to providing mobility for those who do not have access to a personal car, and to creating an attractive transportation option for those who do.

An Ambitious Plan

Public transit providers around the U.S. are in a period of great change. The lingering impacts of the COVID-19 pandemic have dramatically reshaped ridership, travel patterns, and expectations from the public about what transit service should do. Yet SMART's mission to provide an attractive mobility option and meet the needs of the community remain important guidance even as conditions change. This Transit Master Plan (TMP) update provides a roadmap for the development of SMART's network between 2023 and 2028, expressing the priorities of Wilsonville residents and workers for better connections within town and to other nearby cities.

This is a growth plan. This document describes an aspirational network for 2028 that would result in a bigger, more extensive fixed-route network, doubling-down on SMART's role as a regional mobility provider for the south metro area and the north Willamette valley. SMART is the largest transit provider in this part of the region, and located in a fairly central place

relative to other smaller providers. As such, SMART has a unique opportunity to knit together south metro area communities and serve trips among them that are not well-served by either TriMet's network to the north or the statewide POINT and Amtrak networks. This is a role no transit provider currently occupies.

Increases in state funding for transit are a major opportunity, and sure to make some of the service expansion described in this Plan possible. A major limitation is currently imposed by the difficulty in purchasing new transit buses, and the difficulty in hiring additional bus drivers. SMART is actively working around and through these two shortages.

Recent Changes

The past three years have presented major challenges for all transit agencies. Ridership declined at virtually all U.S. transit agencies, and many were forced to make service cuts as a result of either budget cuts or a shortage of drivers.

SMART was able to weather this period with more of its service intact than many other transit agencies.

Figure 1 shows how the amount of service and ridership on SMART services changed from January 2020 to December 2022. While ridership on SMART fell in March 2020, it has been steadily recovering since that time.

The fixed-route service level (at bottom) was held steady from early 2020 through December 2022, though in early 2023 some temporary service cuts were made due to the driver shortage. Because demand-response service is deployed in response to trip requests, the demand-response service level has tracked closely with demand-response ridership, which also fell early in the pandemic and has slowly recovered in the years since.

SMART has not made major changes to services in the past three years. It did limit the use of the demand-response services by non-ADA passengers for certain types of trips, and suspended the medical shuttle between Wilsonville and Legacy Meridian Medical Center.

SMART Ridership and Service 2019-2022
Demand-Response and Fixed-Route Service

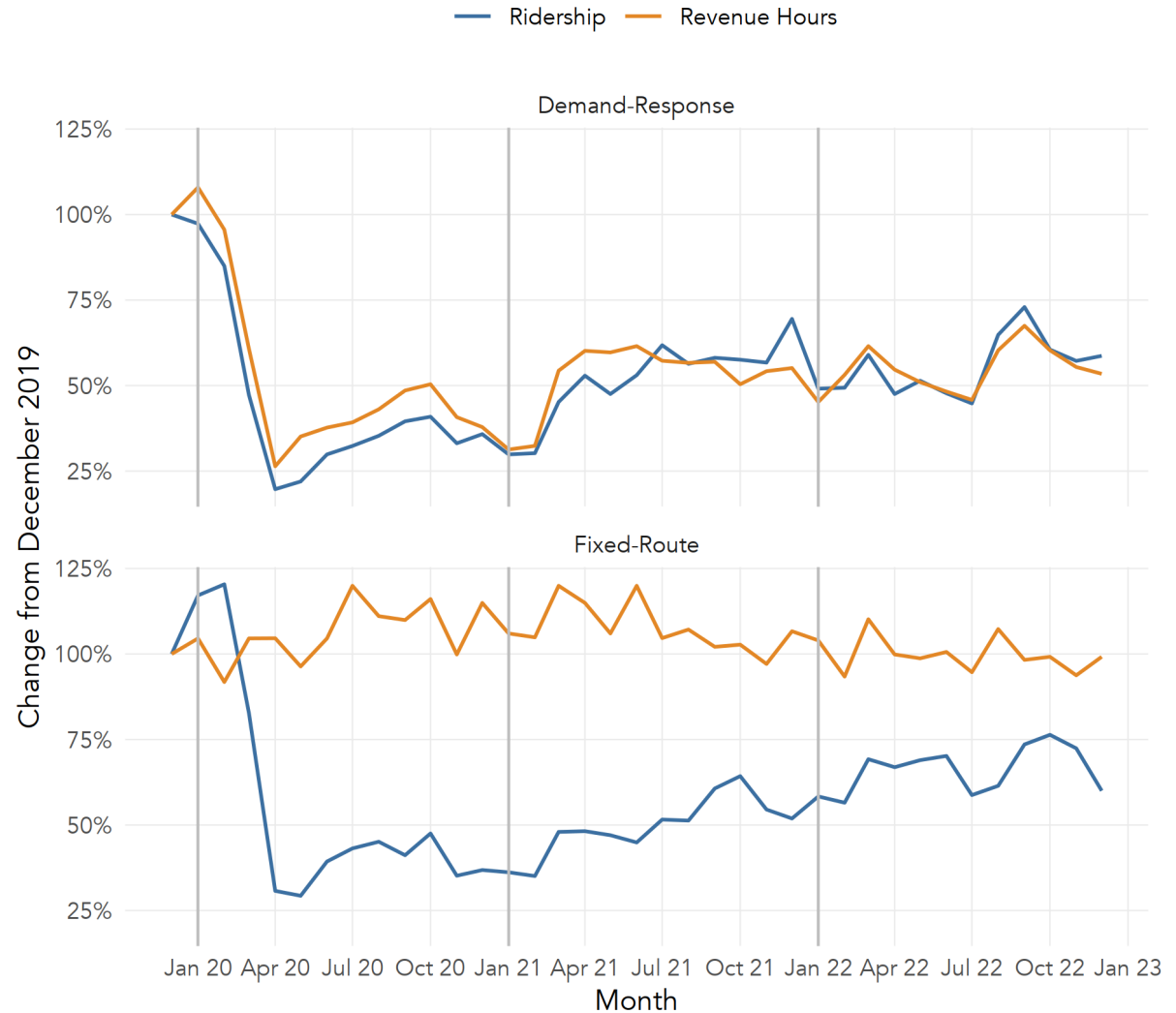


Figure 1: SMART ridership and service levels on fixed-route and demand-response services, 2020 - 2022.

Priorities from Public Input

The outreach process for this Plan shaped the recommended service and infrastructure improvements. Chapter 2 describes the public involvement process. Some of the priorities that emerged from public input are:

- **Improve weekend service, especially Sundays.** Both the survey and stakeholder input suggested that SMART should prioritize adding Sunday service, as well as making Saturday service available on more routes. The 2028 Network proposed in this Plan update would do both of these things.
- **Add more early morning and late evening service.**
- **Make better regional connections.** The top response in the community survey for where SMART should focus on improving its services was to bolster connections to neighboring cities. The 2028 Network would improve existing routes to Salem, Canby and Tualatin; and establish new connections to Tigard, West Linn, Oregon City, Clackamas Town Center and Woodburn.
- **Maintaining coverage of city neighborhoods.** Many people who provided input to this Plan expressed that maintaining all existing coverage inside the

City of Wilsonville was a high priority. The 2028 Network slightly increases service coverage within 1/2 mile by adding service along Canyon Creek and in Villebois, getting transit close to more residents and jobs.

Highlights of this Plan

The core of this Plan is a recommendation to improve SMART's fixed-route network by adding routes to new places and by adding service at new times. Related recommendations are also made for improvements to demand-response service, staffing, infrastructure and amenities.

There are several "big moves" in the 2028 Network that would work together to make the network more useful for a variety of trips:

- **More frequency.** Today, the only route that runs every 30 minutes all weekday long is Route 4 on Wilsonville Rd. The 2028 Network would add an additional all-day 30-minute route connecting the west side Transit Center, east side Town Center, Canyon Creek Road, Tualatin and Tigard.
- **Better regional connections.** In addition to the existing connections to Salem and Canby, the 2028 Network would have the all-day connection to Tigard described above, plus service every 60 minutes to West Linn, Oregon City and Clackamas Town Center all day long, with better frequencies during rush hours. Additional service would be added to Woodburn, Salem and Keizer as well.
- **Improved customer service.** A regional customer service center,

related electronic information and additional personnel will help people living and working in Wilsonville take advantage of improved routes connecting to neighboring cities.

- **New connection points.** Instead of all services connecting only at the existing Transit Center near the WES station, some routes would also connect at Wilsonville Town Center east of I-5. This would protect some routes and riders from delays associated with congestion around I-5, make Wilsonville Road service more direct, and support redevelopment of the Town Center area.
- **Improved weekend service.** With the 2028 Network, SMART fixed-route and demand-response services would run on Sundays for the first time, and more routes would operate on Saturdays.
- **Low- and no-emissions buses.** As the SMART fleet grows to support added service, low- and no-emissions buses will be added while the flexibility and resilience of the fleet is maintained.

Growing the SMART transit system to the degree foreseen by this Plan update will trigger increases in staffing, maintenance facilities, fleet and other infrastructure, which are described in this Plan.

Document Guide

The rest of this document is organized into six chapters.

- Chapter 2 provides a summary of public involvement in this Plan and how public input informed the Plan.
- Chapter 3 describes the 2028 Network and outcomes that relate to City goals.
- Chapter 4 describes the role of demand-response in the Plan. Changes to the fixed-route network will trigger additional needs for demand-response service.
- Chapter 5 describes the supporting physical infrastructure and fleet investments that would be needed to meet the goals of the Plan. It also covers some of the operational changes that would accompany the 2028 Network, and the non-transit programs SMART administers.
- Chapter 6 summarizes SMART's current financial forecast and describes the federal, state and local funding sources available for enhancing services and investing in infrastructure.

2. Public Involvement

Overview

SMART and the consulting team led an inclusive process to engage a diverse group of existing and potential transit users. This included historically underserved communities, seniors, people with disabilities and others who live in Wilsonville, people who travel for work, appointments, shopping, or to visit family and friends.

Outreach activities in 2022 included:

- Consistent, reliable, accessible information with an identified SMART contact person.
- Sharing information on the Let's Talk Wilsonville website.
- A Public Involvement Plan.
- Representative stakeholders individually invited to participate in a variety of ways.
- Special efforts to reach people in senior facilities, apartment complexes, schools, lower income residents & workers, and people who speak predominantly Spanish.
- Emails to an Interested Parties List to keep people informed about project updates.
- Updates to the Planning Commission and City Council.



Figure 2: Wilsonville community members attend an interactive stakeholder workshop in September 2022.

SMART conducted the following community engagement processes:

- **Project website development.** An inviting and accessible page on the Let's Talk Wilsonville website was provided for the SMART Plan update. It gave community members a way to learn about the project, see upcoming events, participate in the survey, and sign up for the Interested Parties List. The project page was published and updated in English and Spanish.
- **Community Survey.** An online survey was launched on August 12, 2022 and was available on the Let's Talk Wilsonville website for one month. A total of 210 responses were collected, 185 in English and 25 in Spanish.
- **Stakeholder Workshop.** Project staff hosted a workshop on September 20, 2022 to walk participants through the service planning decisions being considered in the Plan update. Staff invited around 150 participants by email or phone calls. A total of 18 people joined

the workshop held at the Wilsonville Library.

- **Tabling Events.** During the Summer of 2022 SMART staff attended eight community events to invite participation in the Plan update. They collected feedback using a dot exercise on maps which asked people where they thought SMART service should go at the regional and local levels. The dot map activity from a total of 32 participants resulting in 99 dots on maps.
- **Operator Survey.** A survey was offered to SMART operators to ask them what they had been hearing from riders about transit service and what ideas they had that could help the community. A total of 7 operators shared thoughts through the survey.

Survey Respondent Demographics

The survey was the vehicle through which the majority of participants shared input into the Plan.

In total, 210 people took the survey. The table in this page provides a summary of their demographics. While respondents were not required to complete a set of demographic questions, most did.

Most of the respondents (85%) live or work in Wilsonville, while 21% neither live nor work in Wilsonville but visit the city for

other reasons.

The largest response groups by age were people born between 1980 - 1999 (23-42 years old) and 1960 - 1979 (43 - 62), who made up 35% and 32% respectively.

91% of respondents provided their gender. 49% responded "female", 39% responded "male", 2% responded "non-binary" and 1% responded "transgender".

The survey also asked respondents to share their household income. About 76% of respondents answered this question. 21% of respondents reported an income at least 200% of the federal poverty level (\$26,500 for a four-person household).

Not shown in the table at right are responses related to transit use. About 30% of respondents had been regular transit riders over the last year (August 2021 - August 2022). A total of 26% of respondents said they were occasional riders.

Figure 3: Plan survey respondent characteristics

All responses	210	100%
By Connection to Wilsonville		
Resident	113	54%
Worker	66	31%
Business owner	7	3%
Visitor	45	21%
By Age (what decade were you born?)		
Before 1960	39	19%
1960-1979	67	32%
1980-1999	74	35%
2000 and After	16	8%
By Gender		
Female	103	49%
Male	81	39%
Transgender	2	1%
Non-binary	4	2%
By Race/Ethnicity		
People of Color	86	41%
White	117	56%
By Primary Language at home		
English	153	73%
Spanish	27	13%
Other	9	4%
By Income		
Less than \$25,000	44	21%
\$25,000 - \$49,999	35	17%
\$50,000 - \$99,999	32	16%
\$100,000 - \$149,999	20	10%
\$150,000 or more	25	12%

Survey Results

The survey asked respondents to share their views on a variety of future priorities for the development of SMART's network. These questions addressed topics about where and when service should be available. The survey was administered through the City of Wilsonville's "Let's Talk Wilsonville" online platform.

What do you think are the highest priorities for the TIMES when new service could be added to the SMART transit network?

This first asked respondents to share how they thought SMART should improve in terms of the days and hours that service is available. Respondents were able to select

from options for more service at midday, during rush hours, later in the evening, or on weekends. Respondents could also select an option for more frequency.

Figure 4 shows the breakdown of responses to this question. The top three priorities for new service added to the SMART transit network among community survey respondents were "More Saturday or Sunday service", "Longer hours of service each day – earlier morning and later evening", and "Better frequencies".

What do you think are the highest priorities for the PLACES where new service could be added to the SMART transit network?

This question was designed to discover whether respondents want SMART to invest in even more service inside Wilsonville, or in improving connections to other communities.

Figure 5 shows the responses to this question. A majority of respondents asked for more regional service for long trips to other cities, as opposed to short local trips within Wilsonville. The regional connections identified in open-ended comments were: Canby, Tualatin, Downtown Portland, Woodburn, Sherwood, Tigard, and Oregon City.

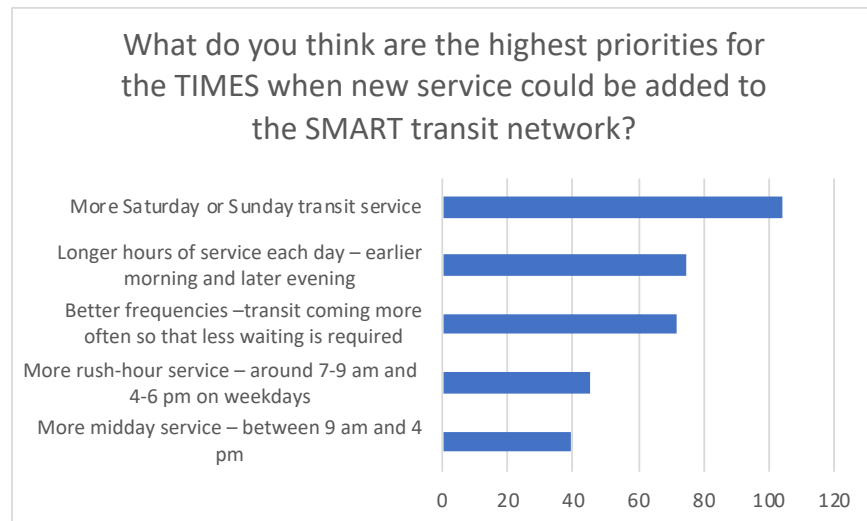


Figure 4: Plan Community Survey - Question 1

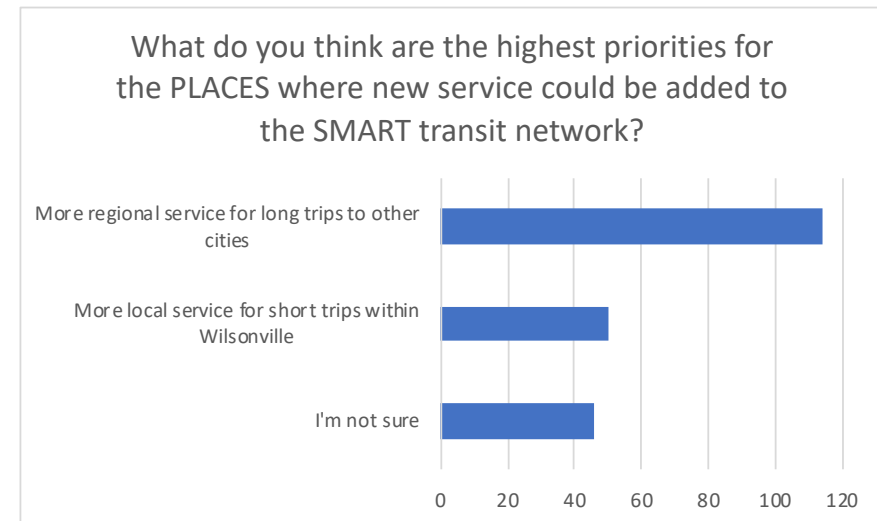


Figure 5: Plan Community Survey - Question 2

In general, INSIDE Wilsonville, what should SMART prioritize when adding new transit service over the next five years?

The third question asked respondents to share whether they think SMART should prioritize getting service close to more of the city, or invest more in the busy places within the city where people are already using transit.

Figure 6 shows the responses to question 3. The largest group of people (88 respondents) said it was more important for SMART to add service in new areas than to add more frequent service to areas already served. Sixty-nine respondents said SMART should add service to places where many people are using transit. Both goals were important to this group, but adding new coverage was slightly more important.

What places inside Wilsonville do you think are most important for SMART to serve?

The last survey question asked respondents to share their priorities for which types of places in Wilsonville SMART should focus on. Figure 7 shows the responses to question 4. The top four responses, each garnering over 100 responses, were “transit connections to other cities”, “shopping centers”, “places with many jobs”, and “places with many residents”.

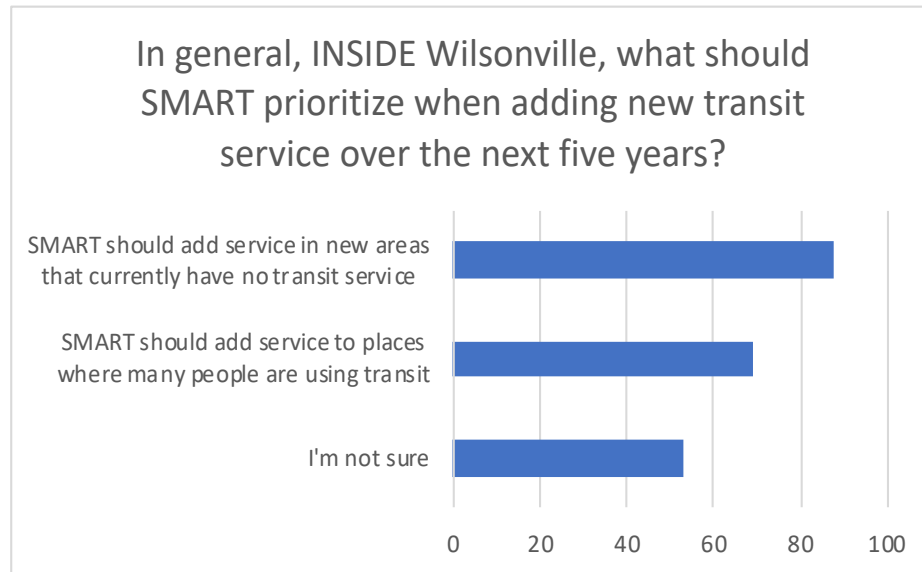


Figure 6: Plan Community Survey - Question 3

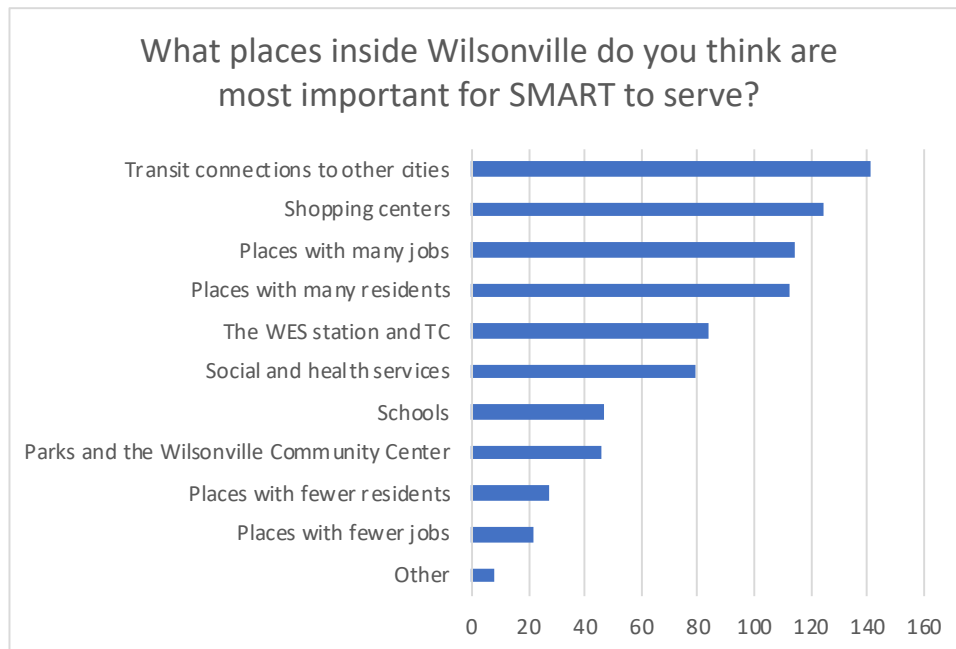


Figure 7: Plan Community Survey - Question 4

Stakeholder Workshop

In September 2022, SMART held a workshop focused on key questions about how future transit should be planned, both within Wilsonville and around our part of the region. The workshop was held in-person from 4:00 p.m. to 7:00 p.m. at the Wilsonville Library. Staff and consultants reached out to 150 stakeholders by email or phone to recruit them to this workshop. A total of 18 people attended.

The workshop included:

- A fun, interactive transit planning game introducing trade-offs and service considerations in and around Wilsonville
- Live polling about key questions
- A presentation about existing Wilsonville transit services and how they're performing.
- Questions and discussion.

The images on this page show some results of the first activity, an game where stakeholders worked in groups to design their own transit networks for Wilsonville. SMART staff and consultants assisted participants, and engaged in conversations about what types of trips and services participants hope to see in future SMART improvements.

After the planning game, the group discussed future priorities for SMART using a set of anonymous polling questions.

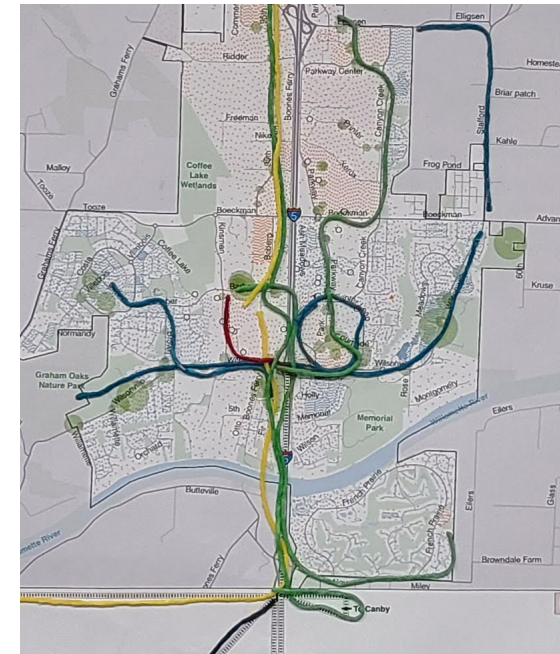
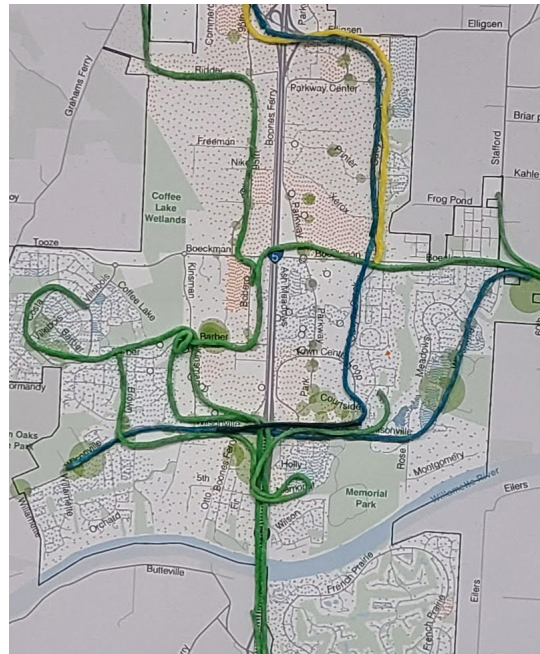


Figure 8: A close-up of two networks designed by participants in the stakeholder workshop. Different colors stand for different frequencies of service. This exercise gave participants a way to discuss and show their desired improvements to SMART service.

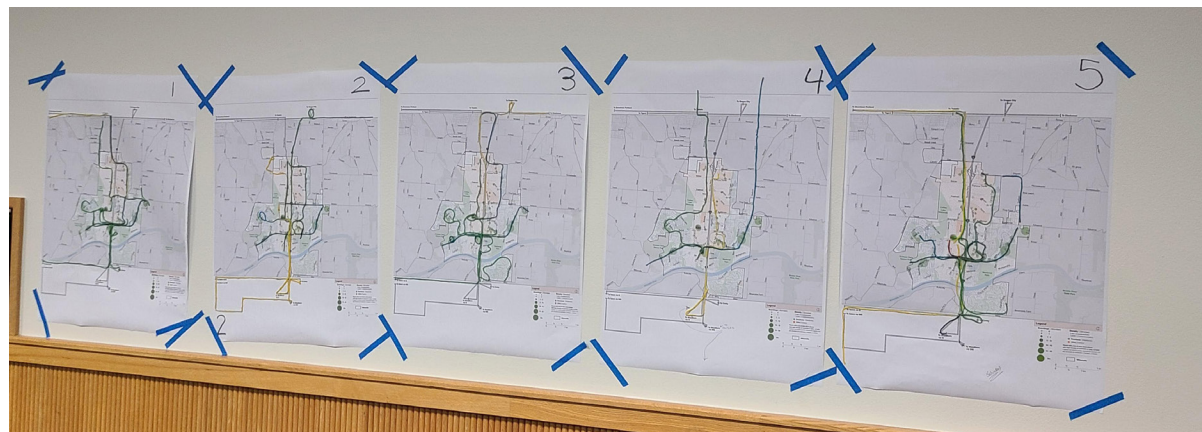


Figure 9: At the end of the exercise, stakeholders were able to compare and contrast the transit networks each group designed for Wilsonville.

Participants were able to respond to questions displayed on a screen using their phones (via text message or a web app).

The images on this page show the results of each of the polling questions asked to the stakeholders.

How important are rush hours?

Today, SMART's network is very oriented towards rush hour trips, in three senses:

- Routes are designed to focus on the station for the WES train, but WES only operates during weekday rush hours.
- Some routes only operate during rush hours.
- Other routes offer better frequencies at rush hours than at midday.

A majority of stakeholders at the workshop said that rush hours should not be the main priority, but that a little extra service made sense during those periods.

Weekend Service

The next two questions were about weekend service. The first was about the importance of weekends. Stakeholders split evenly on whether weekend service should be improved only with new funding, or whether some service should be taken from weekdays to improve weekends. Nobody said "weekends aren't very important".

Figure 10: Stakeholder workshop - Question 1

Poll: On weekdays, how important are rush hours?

017

Rush hours should be the priority.

12 %

A little extra service at rush hour makes sense.

59 %

Having consistent schedules all day long should be the priority.

29 %

Figure 11: Stakeholder workshop - Question 2

Poll: How important are weekends?

018

Weekends are so important that we should cut some weekday frequencies to offer more weekend service.

50 %

We should add weekend service only when new funding is available.

50 %

Weekends aren't very important.

0 %

Figure 12: Stakeholder workshop - Question 3

Poll: If you could add weekend service, what would you add first?

018

Longer Saturday hours for routes that already run on Saturdays.

28 %

More routes running on Saturdays.

28 %

Start running some routes on Sundays (as well as Saturdays).

44 %

The next question asked more specifically about when on the weekend should be the priority for new service. All three options garnered at least 1/4 of responses, but the top option with 44% was to start running some routes on Sunday (even before adding more service to Saturdays). Currently no SMART service operates on Sunday and adding Sunday fixed-route service would trigger numerous requirements and costs, which were discussed by the group.

Ridership or coverage?

The final polling question asked stakeholders to weigh the competing goals of attracting high ridership or providing wide (but minimal) service coverage.

Many people want service to run more often, and for more hours of the day and week. High frequency, all-week service is a proven way of increasing ridership, but it requires focusing buses into fewer routes on fewer streets. At the same time, many people want transit service to be available to as many people as possible, on all of the main streets in a city. This requires spreading service out into more routes, which means poorer frequencies and shorter hours of service. With a fixed budget, a transit agency cannot do both things at once: focus service to make it more frequent, and spread it out to cover more places.

A majority of stakeholders said that SMART should balance these goals about

Figure 13: Stakeholder workshop - Question 4

Poll: How should SMART balance the goals of high ridership and wide coverage?

017

The top priority is to run routes that many people use.

18 %

Use about half of SMART's budget on busy routes, and the other half covering areas that area important even if few people ride.

76 %

Spread service evenly across the entire city, so that every street has a little bit of service on it.

6 %

I'm not sure.

0 %

evenly. Currently, SMART provides extensive coverage within Wilsonville; there are only a few areas that are more than a short walk from service.

Only 6% of the stakeholders said that coverage should be prioritized more, while about 18% said that the top priority should be on running service that are used by many people.

The existing service standard for coverage, cited in SMART's 2020 Title VI policy, is that 85% of the city's residents should be within 1/3 mile walk of a bus stop.

For both the existing 2022 and proposed 2028 SMART networks, only 54% of residents are within a 1/3 mile walk of a bus stop at midday on weekdays, and 59%

during rush hours.

As a coverage standard, "85% within a 1/3 mile walk" is a very hard to meet, especially for a low-density city. With many residents living down cul de sacs or against barriers like the Willamette River and the I-5 freeway, for transit to be within 1/3 mile of so many people, buses would have to go down small neighborhood streets and cul de sacs. Adding this coverage – even if it were desired by those neighborhoods – would require either new funding, or cutting service on high-ridership routes like Wilsonville Road or Salem.

Tabling Events

SMART staff tabled at eight community events in summer 2022. At these events, people were able to place dots on a pair of maps to indicate which connections they thought SMART should focus on. There was one map focused on Wilsonville for local destinations, and a second map showing a range of regional destinations.

The top regional destinations in this activity were Sherwood, Tualatin, and Canby. The top three local destinations for SMART to serve were Argyle Square Shopping Center, Villebois, and the Town Center Loop area, Memorial Park area, & Old Town Square.

The events where this input was gathered were:

- Wilsonville Farmers Market on Thursday July 14th.
- Rotary Concert in the Park event Thursday July 21st.
- Wilsonville Farmers Market on Thursday August 4th.
- WLWV Family Empowerment Open House on August 17th, 2022.
- Bridging Cultures events on July 30th, 2022 and Saturday August 27th, 2022.
- City of Wilsonville's Community Block Party on August 25th, 2022.

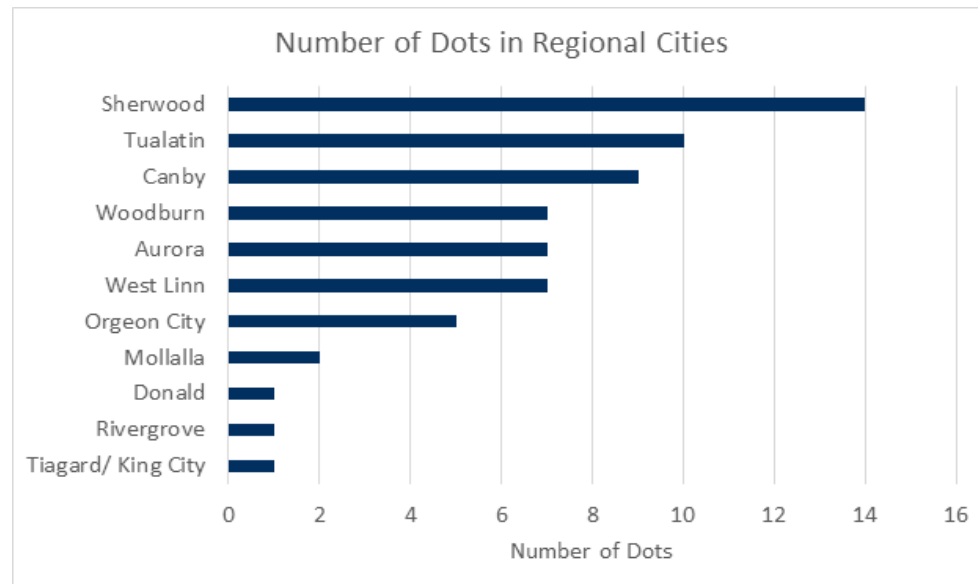


Figure 14: Results of Tabling Dot Exercise - Regional Destinations

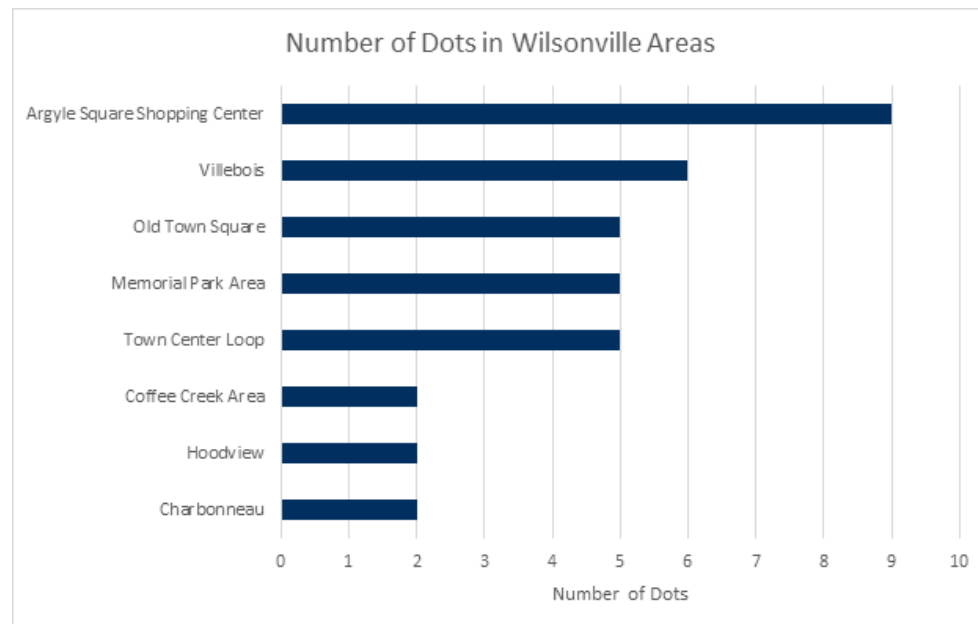


Figure 15: Results of Tabling Dot Exercise - Local Destinations

- Heart of the City's Gear Up 4 School on August 13th, 2022, from 9 a.m. to 12 p.m.

The dot map activity ended with a total of 32 participants and 99 total dots.

Operator survey results

Seven SMART bus drivers completed a short survey asking similar questions about which destinations the agency should prioritize for future service improvements. Drivers were asked to respond based on what they have heard from riders. They reported having heard from riders that SMART should serve Woodburn, Barbur Transit Center, Clackamas, Oregon City, East Portland and Canby.

Key Takeaways

The Plan outreach process shaped the future network improvements that have been included in the plan. The 2028 Network described in this document is oriented towards these major priorities.

- **Adding weekend service, especially Sundays.** Both the community survey and stakeholder input suggested that SMART should prioritize adding Sunday service, as well as making Saturday service available on more routes. The 2028 Network would do both of these things.
- **Adding early morning and late evening service.** This was the second highest priority, and is reflected in the 2028 Network as earlier starts and later ends to service on existing routes, and long hours of service on proposed new routes.
- **Better regional connections.** The top response in the community survey for **where** SMART should focus on improving its services was to bolster connections to neighboring communities. The 2028 Network enhances services to Salem and Tualatin, establishes new routes to Tigard, Oregon City and Clackamas Town Center, and retains the existing connection to Canby.
 - o Sherwood, the most-often requested location from the map-dot exercise, would be reachable via multiple TriMet routes from Tigard, as would Beaverton, downtown Portland and SW Portland.
- **Maintaining coverage.** Survey-respondents and stakeholders expressed that maintaining coverage within Wilsonville was important. The 2028 Network keeps the same number of residents within 1/2 mile of service, while improving slightly the number of lower-income and minority residents near service. The 2028 Network also provides shorter walks to service for residents along Canyon Creek Road and in Villebois.

3. Fixed-Route Services

This plan lays out a network of future SMART services oriented around the top priorities from public input:

- Additional regional connections.
- Higher frequency for regional and local routes.
- Weekend service, and longer hours of service.

The network described here is intended to make transit more useful to more people, for a greater variety of trips. It would give people more choice in when to travel within Wilsonville and between Wilsonville and neighboring cities.

Figure 16 maps how the proposed SMART network could look in 2028. On this map, the color of each route represents how frequently it would run:

- **Dark blue lines** (Routes B and F) would run every 30 minutes all weekday.
- **Light blue lines** (Routes A, C and D) would run every hour all weekday.
- The dashed line (Route G) would only run during rush hour.
- The **yellow line** (Route E) would offer trips every two hours, all day on weekdays.

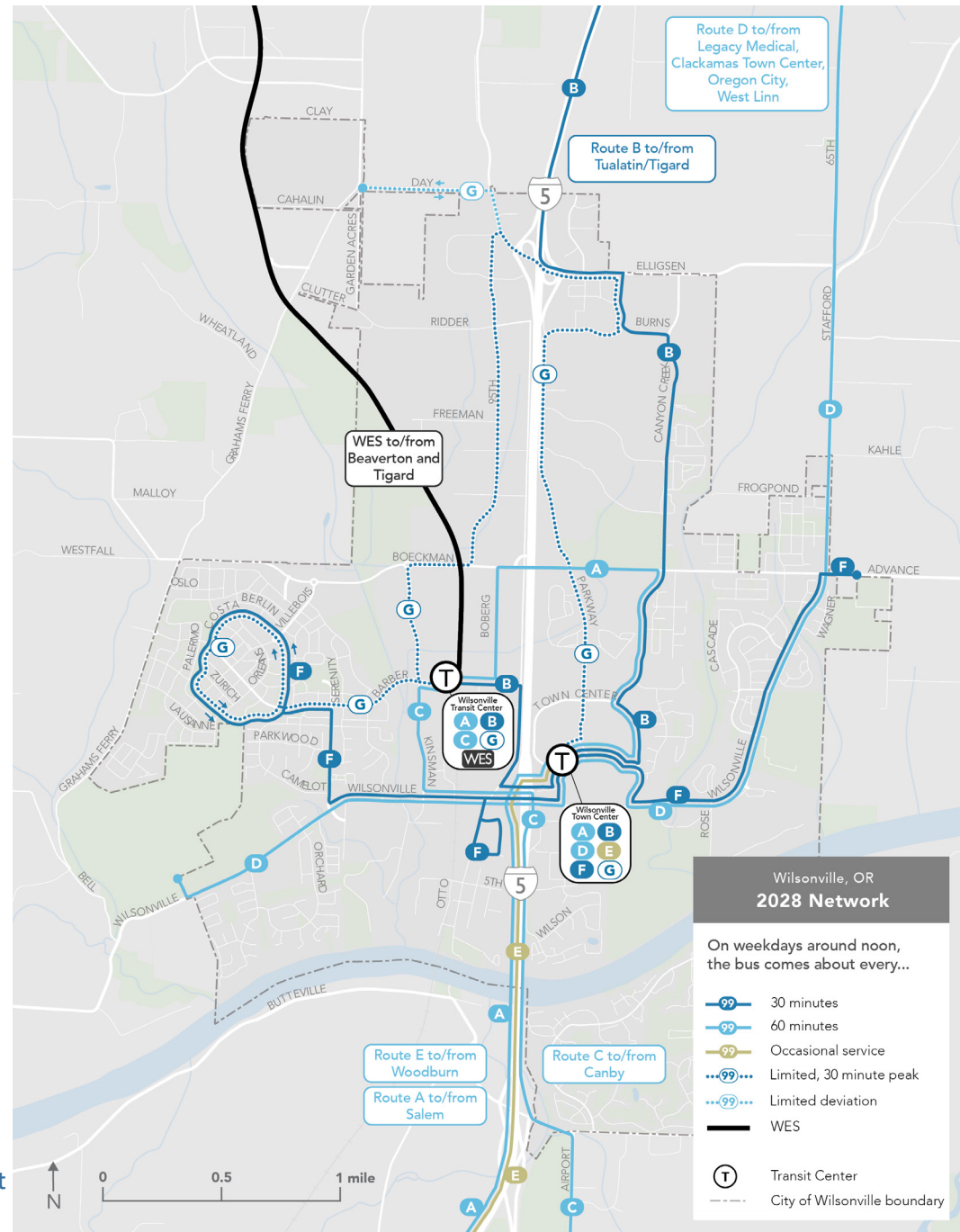


Figure 16: 2028 Transit Network - Wilsonville

There are several “big moves” in the 2028 Network that together make it more useful to more people, for more trips:

- Shorter waits.** Today, the only route that runs every 30 minutes is Route 4 on Wilsonville Rd. The 2028 network would add a new 30 minute service (Route B) that would serve the Wilsonville Transit Center, Wilsonville Town Center, Canyon Creek Rd, and then continue north to Tualatin and Tigard via I-5.
- Better regional connections.** In addition to the existing connections to Salem and Canby, the 2028 network would have service every 30 minutes to Tualatin and Tigard, and every 60 minutes to West Linn, Oregon City and Clackamas Town Center. Many of these places offer transfers to other transit routes going further. For example:
 - Sherwood, Beaverton and Portland can be reached through Tigard;
 - Milwaukie can be reached through Oregon City; and
 - East Portland can be reached through Clackamas Town Center.
- New connection points.** Instead of all services connecting only at the west side Transit Center / WES station, some routes would connect at the Town Center east of I-5.
- Improved weekend service.** With the

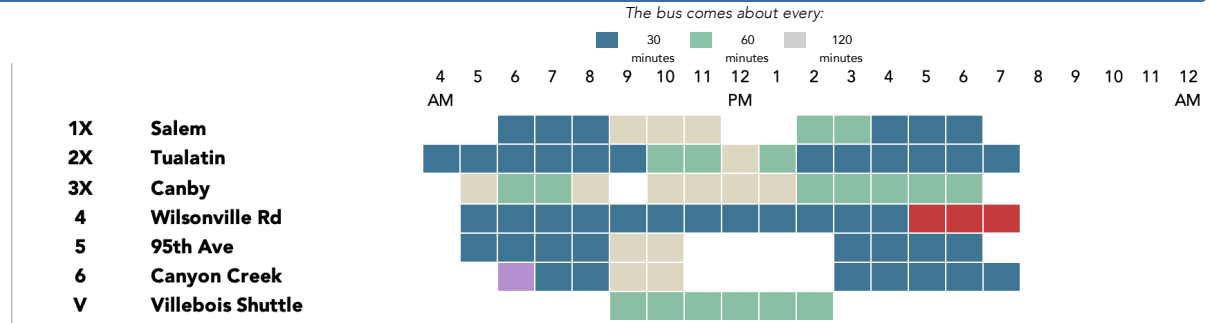


Figure 17: Weekday Frequency by Hour by Route - 2022 SMART Network

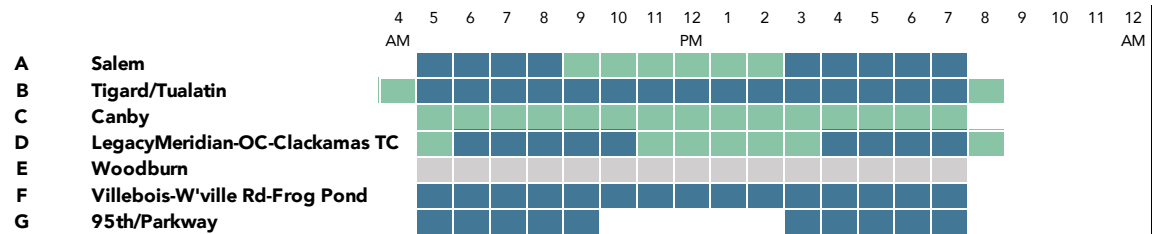


Figure 18: Weekday Frequency by Hour by Route - 2028 Network

2028 network, SMART service would run on Sundays for the first time, and more routes would operate on Saturdays.

This network plan is not achievable with SMART’s current resources, and especially not until constraints on the number of bus drivers and the number of transit buses are relieved. It is a ambitious plan, with the maps and tables here showing the end state of a five-year process of network improvement.

Better Frequencies, Close to More People

With today’s SMART network, the only route that runs every 30 minutes all day long is Route 4, the line serving Wilsonville Road. Most other routes run only every hour, but many have gaps in their schedule during the middle of the day that makes actual waiting times even longer.

Thirty-minute frequency throughout the whole day means that people traveling along Wilsonville Rd have more opportunities to make trips by transit, which makes it more likely that a transit trip will be an option that works for their daily schedule. It is therefore no surprise that Route 4 on

Wilsonville Road is SMART's most productive route.

Figure 17 shows the frequency on weekdays for SMART's 2022 routes, while **Figure 18** shows weekday frequencies for the 2028 Network.

In the 2028 Network, there would be two all-day 30-minute routes for local trips within Wilsonville.

- Route F would be an east-west service, running mostly on Wilsonville Road. Route F would connect Villebois, Fred Meyer, the Town Center and Frog Pond.
- Route B would be a north-south service. It would connect the west side Transit Center / WES station, the Town Center, Canyon Creek Road and Argyle Square. It would then continue north to Tualatin and Tigard.

Most other routes would offer consistent hourly frequencies all weekdays long, with extra rush-hour frequency on Routes A (Salem) and D (Legacy Medical-Oregon City-Clackamas).

Two routes would be nearly identical to existing routes:

- Route C, similar to the existing 3X (Canby), would offer a consistent hourly frequency all day, Monday-Saturday.
- Route A, similar to the existing 1X (Salem) would also offer a consistent

all-day hourly frequency Monday-Sunday, with extra frequency during weekday rush hours.

The increases in frequency on local and regional routes represented in the 2028 Network would address two important limitations of the existing network.

- First, more routes would run through the entire midday, making them useful for a wider range of trips than rush-hour commutes, especially the commutes of people working service, retail, hospitality or industrial jobs, and the commutes of people going to school or college.
- Second, the better frequencies would make many trips faster by reducing the waiting time required to use service.

SMART provides real-time arrival information about its routes, but frequency still has a big effect on how much time it takes to use transit, especially for local trips.

For example, a person wishing to travel from Villebois to an appointment at Wilsonville Town Center today would use the Villebois Shuttle, which runs every hour during weekday middays. Since they have to be on time for their appointment, they have to take the last bus that will get there early enough to be on time – which will often be painfully early. An hourly bus sometimes makes people arrive 50 minutes early to their destination. If a route offers just one opportunity to travel per hour,

then someone will wait an average of half an hour to use it – if not at the bus stop, then at their destination because they were forced to arrive too early.

In this example, in the 2028 Network, Route F would serve Villebois every 30 minutes. The average wait to use it would be just 15 minutes, with two opportunities to depart per hour. Saving people an average of 15 minutes waiting per one-way trip makes a big difference in busy people's days. By focusing on frequency with this Plan, SMART can reduce people's travel times and make its network much more useful to more people.

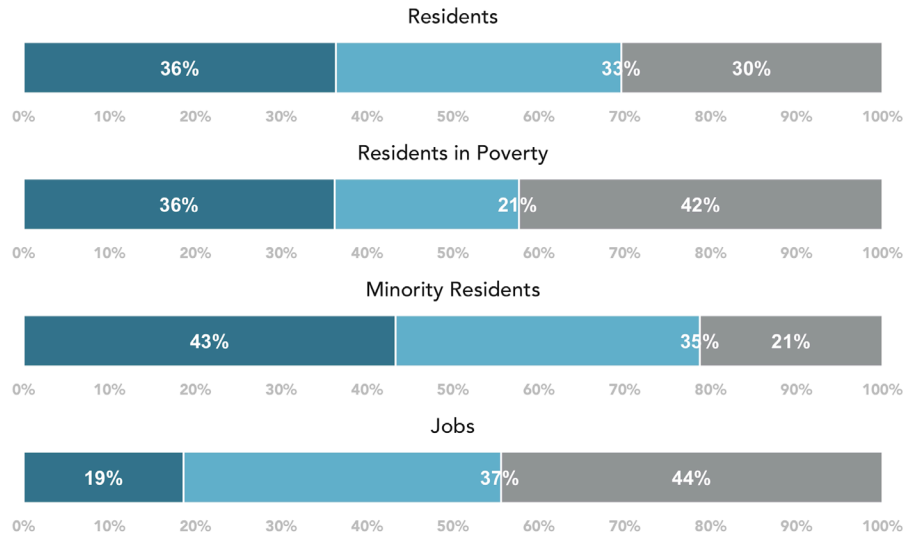
Note that the frequencies recommended in this Plan, as shown in the graphic on the previous page, are approximate. There is a value to providing a consistent frequency (for example, a bus that comes at 8:10, 8:40, 9:10, 9:40 and so on) as opposed to an ever-changing schedule (such as 8:10, 8:35, 9:05, 9:45, and so on). The frequencies that recur in memorable patterns are 15-, 20-, 30- and 60-minutes, and they are called "clockface."

However, in scheduling bus routes, there are also valuable reasons to deviate slightly from a "clockface" frequency. For example, a slight change to timing may allow for a connection to another bus route or train line. Changes to timing are also sometimes necessary to provide drivers with meal breaks, or adapt the schedule to afternoon congestion.

SMART 2022 - Weekday at noon

What percentage of the SMART service area is near transit that comes every

30 minutes 60 minutes Not within 1/2 mile



Note: Proximity is measured as being located within 1/2 mile of a bus stop.

Figure 19: Proximity to Transit Service - SMART 2022 Network

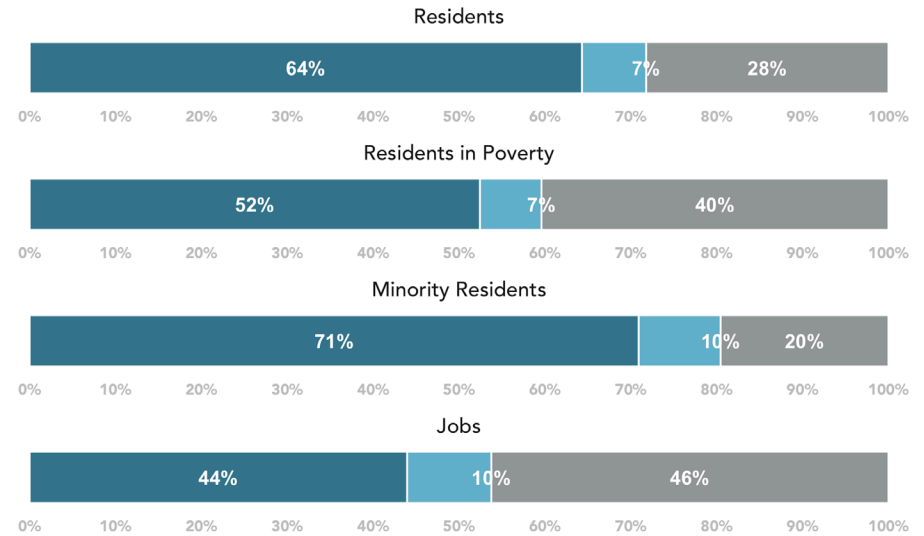
The 2028 Network would put more residents near routes running all day, from early morning to late evening. It would especially put more Wilsonville residents near more frequent service.

Today, only about 36% of Wilsonville residents are within a 1/2-mile walk of Route 4, the only 30 minute service, while about 33% are near a 60-minute service.

SMART 2028 - Weekday at noon

What percentage of the SMART service area is near transit that comes every

30 minutes 60 minutes Not within 1/2 mile



Note: Proximity is measured as being located within 1/2 mile of a bus stop.

Figure 20: Proximity to Transit Service - SMART 2028 Network

With 30-minute service extended to Brown Road, Villebois and Canyon Creek Road, the 2028 Network would put more people near a route coming more often. About 64% of residents would be near a 30-minute route.

Better Regional Connections

One of the priorities expressed by the public in 2022 was improving connections between Wilsonville and other communities. The 2028 Network includes three new routes designed that will make it easier to travel to or from other cities:

- Route B, a new service running every 30 minutes among Wilsonville, Tualatin and Tigard.
- Route D, a new service running every 60 minutes among Wilsonville, Legacy Meridian Medical Center (Tualatin), West Linn, Oregon City and Clackamas Town Center.
- Route E, a new service running every two hours among Wilsonville, Woodburn and Keizer.

These new routes would supplement SMART’s existing regional connections to Salem (Route A) and Canby (Route C). The routes to Salem and Canby would both be improved with additional trips for a more consistent frequency throughout the day.

These routes are also designed around the principle that there need not be a categorical separation between “local” and “regional” or “express” routes. Rather, regional routes should enter Wilsonville along paths that get the service close to many residents, jobs and businesses. This

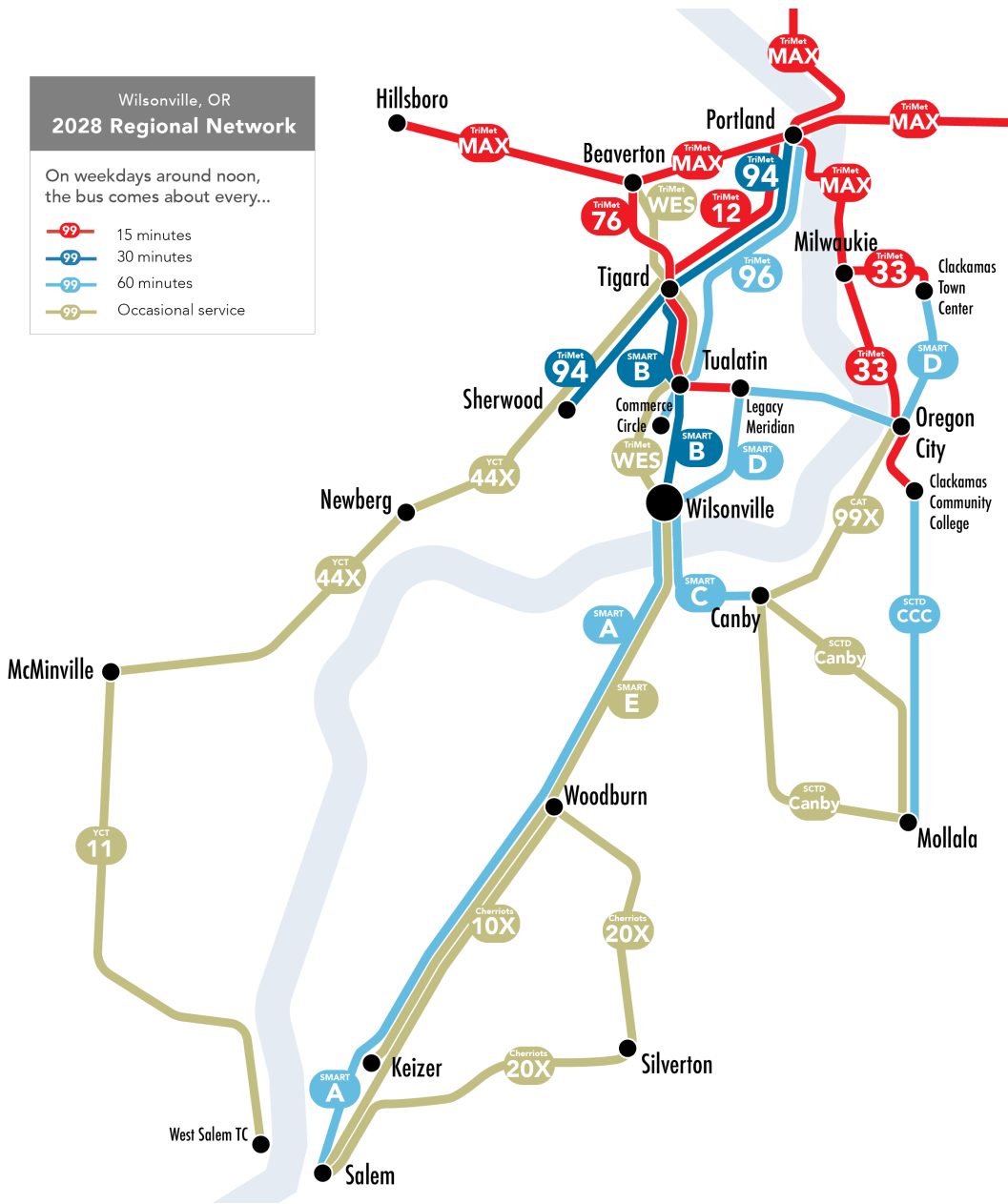


Figure 21: Regional Transit Network Operated by All Transit Agencies, with 2028 Recommended SMART Routes

is reflected in the existing SMART network, on which Route 2X provides both regional service (to Tualatin) and local service (in Wilsonville west of I-5). However Route 2X is the only existing route to combine regional and local service in this way. In the recommended 2028 network, Routes A, B and D would offer at least 1 mile of local stops in addition to regional connections. This will enable more people to use SMART to reach neighboring cities without having to make a transfer in Wilsonville, making SMART more useful for several different types of trips.

First, transit connections for the most common commute patterns would be improved. **Figure 22** charts the south metro area cities by the number of workers traveling between them each day (based on 2018 LEHD data). The largest south metro commuting partners with Wilsonville are Tualatin, Tigard, Woodburn, Canby and Oregon City.

The **yellow highlights** on the table in **Figure 22** show the cities that would be directly connected to Wilsonville by routes in the 2028 network, making it easier or residents and workers to travel between Wilsonville and these other cities during more of the day and week.

Commuting trips only tell part of the story, because people travel for many other reasons. Prior to the pandemic, national research suggested that only 1 in 5 trips by Americans was a trip to work.

In Tualatin, Route B would serve Bridgeport Village and Nyberg Woods. By ending in Tigard, Route B would also connect to many TriMet and Yamhill County bus routes, making it easier to continue trips to Beaverton, Hillsboro, Sherwood, Newberg, or into Portland.

In fact, the trip to Portland would be very similar to the trip available years ago,

via the Barbur Transit Center: Wilsonville residents would ride a SMART bus north and transfer to TriMet’s Line 12. By making that connection in Tigard instead of at Barbur TC, SMART can offer many other connections to more lines and places compared to what’s available at Barbur TC.

South Metro Area Job Flows
Number of workers with paired home-work location by city

	Aurora	Barlow	Beavercreek	Butteville	Canby	Dayton	Donald	Dundee	Hubbard	Keizer	McMinnville	Molalla	Mulino	Newberg	Oregon City	Sherwood	St. Paul	Tigard	Tualatin	Wilsonville	Woodburn
Aurora	7				39		7	1	28	11	6	12	2	12	10	9	2	22	21	46	51
Barlow		0			4										1	4		4	4	10	2
Beavercreek			67		54		4		4	13	7	48	19	14	314	10		80	67	48	18
Butteville		1		2	15		4		2	6	3	5		5	4	3	1	6	7	15	7
Canby	39	4	54	15	1378		29	12	127	94	68	260	54	118	595	131	4	396	455	722	383
Dayton			1	1	3	61	2	10	1	4	267		1	96	11	13	5	34	37	17	16
Donald	7	0		4	29		12		18	18	22	13	2	40	21	16	4	22	28	45	41
Dundee			1		12	10	2	31	1	10	335	3		270	9	48	2	74	92	57	27
Hubbard	28	0	4	2	127		18	1	67	43	31	39	7	33	40	21	7	80	103	161	265
Keizer	11		13	6	94	4	18	10	43	1450	243	40	4	118	92	47	19	266	221	247	466
McMinnville	6		7	3	68	267	22	335	31	243	5894	28	3	1132	117	140	6	358	333	176	195
Molalla	12	1	48	5	260		13		39	40	28	572	82	51	304	32	2	152	138	158	162
Mulino	2		19	1	54		2		7	4	3	82	31	8	105	10	1	42	22	37	14
Newberg	12	3	14	5	118	96	40	270	33	118	1132	51	8	2226	156	537	24	822	887	509	181
Oregon City	10	1	314	4	595	11	21	9	40	92	117	304	105	156	2411	184	4	963	780	619	167
Sherwood	9	4	10	3	131	13	16	48	21	47	140	32	10	537	184	834	10	1022	1115	575	155
St. Paul				1	4		4		7	19	6			24	4	10	9	5	9	6	24
Tigard	22	4	80		396	34	22	74	80	266	358	152	42	822	963	1022	5	3587	2911	1364	432
Tualatin	21	4	67		455	37	28	92	103	221	333	138	22	887	780	1115	9	2911	2081	1560	736
Wilsonville	46	10	48	15	722	17	45	57	161	247	176	158	37	509	619	575	6	1364	1560	803	718
Woodburn	51	2	18	7	383	16	41	27	265	466	195	162	14	181	167	155	24	432	736	718	1866

Figure 22: South Metro Area cities by number of workers commuting

Route D would connect to Clackamas Town Center, a major employment and social destination, and also a hub for transit connections to many parts of Portland, Gresham and even (in the future) Sandy.

Rather than proceeding “express” all the way to Clackamas, Route D would stop at other busy places, in order to be useful for large numbers of people and justify the high frequency offered on the route. It would stop at Legacy Meridian Medical Center, West Linn and Oregon City.

Oregon City is important not only because it’s dense with residents and jobs, but also because as the county seat of Clackamas County, it is the location of important public and medical services. It is also where connections are available to the main Clackamas Community College (CCC) campus. From the envisioned Route D stop in downtown Oregon City, both CCC and the Providence Willamette Falls Medical Center would be reachable with a transfer to TriMet lines.

Less Reliance on WES for Regional Connectivity

One regional connection that would be de-prioritized in the 2028 Network is the timed connection between SMART bus routes and WES. All of the recommended routes in the 2028 Network have been presented here with “clockface” frequencies, which are frequencies that people can easily remember because they repeat their

pattern from one hour to the next. For example, a 30-minute route would pass someone’s bus stop at 7:07 a.m., 7:37 a.m., 8:07 a.m., and so on.

Clockface frequencies are easy for people to learn and remember. However, they trade-off against other scheduling details that can be valuable, such as scheduling buses to arrive at the right time for connections with other buses (for example in Canby or Salem) or with trains. In the past, when WES ridership was higher, there was an obvious value to making bus schedules time buses to meet WES trains.

However, WES trains are scheduled to come every 45 minutes. If local routes are scheduled to meet WES trains, then they must operate every 15-, 45- or 90- minutes (multiples of 45). But 15- or 90-minute frequencies are often wrong for local Wilsonville routes (unaffordably high or inadequately low), while a 45-minute frequency is not clockface and makes the schedule throughout the day hard to remember.

In addition, ridership on WES has been extremely low for many years, even predating the pandemic.

For these reasons, the frequencies and routes in the 2028 Network have been set to depend less on WES and operate more as a complete regional and local network. WES is one element of the regional network, but not the only and not the overriding priority.

Some route details that result from this decreased emphasis on WES are:

- Route frequencies of 30- or 60- minutes, rather than every 45 minutes.
- The terminating of a few routes (D, E and F) in the proposed east side Town Center facility rather than at the west side Transit Center / WES station.
- No deviation off of Wilsonville Road north to the WES station by the regional Route D or local Route F, making them more linear routes for people not traveling to or from WES.

Regional Routes Near Residents and Businesses

In public input, regional services were given high priority for SMART’s future network. Today, only a minority of residents live near one of SMART’s services that can take them beyond the Wilsonville city boundary. **Figure 23** shows that about 40% of residents live within a 1/2-mile walk of a regional route.

With the 2028 Network, not only would the range of destinations available via SMART regional services increase, but so would

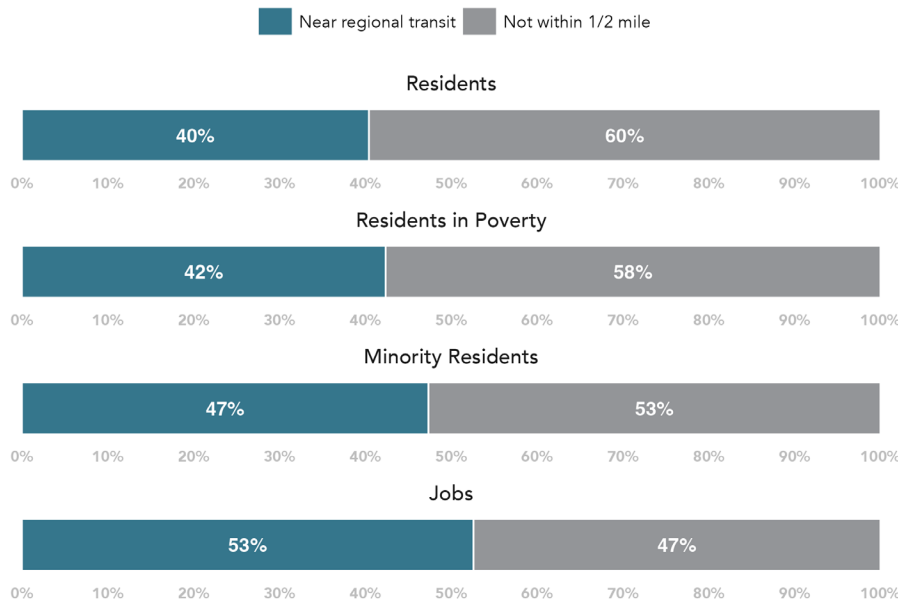
the number of residents living near those routes. As **Figure 24** shows, the percent of Wilsonville residents living near a regional route would increase to 53%. This is mainly a result of the new Routes B and D.

Route D would replace SMART’s temporarily suspended Medical Shuttle with a regular hourly route from Wilsonville to Clackamas Town Center. Within the City, it would run on Stafford Rd and Wilsonville Rd, and would terminate at Graham Oaks Park. That means that a large portion of the River Fox and Mayfield neighborhoods at the west end of Wilsonville Rd would

now be within walking distance of a route to Legacy Meridian, West Linn, Oregon City and Clackamas.

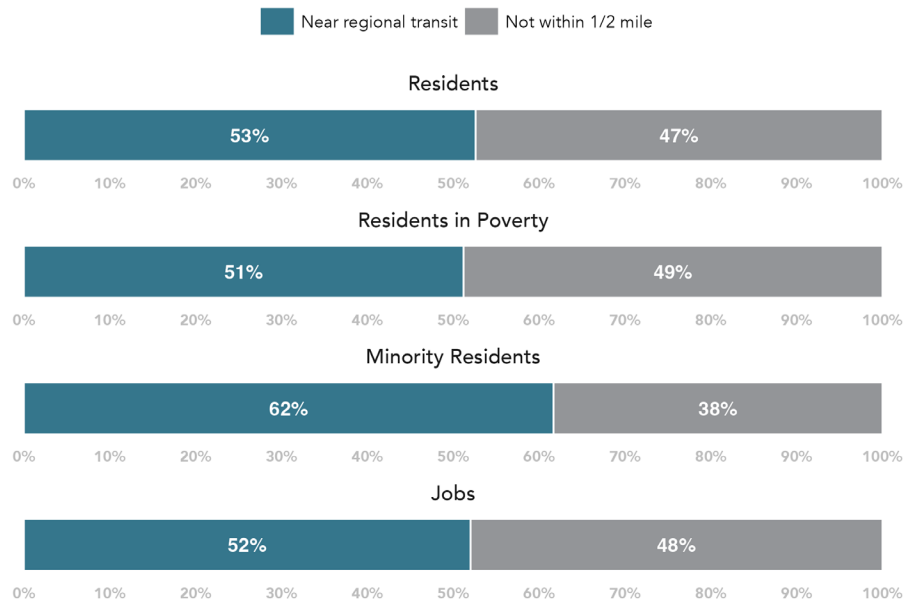
Route B would replace the existing 2X, but it would also serve a longer segment of Canyon Creek Rd. Canyon Creek Road has some dense apartment neighborhoods along it, as well as low-density employment campuses. South of Boeckman Road Canyon Creek Road is separated from Wilsonville Road by the creek, making walks for some residents to existing service rather long.

Proximity to Regional Transit
2022 - Weekday at noon



te: Proximity to a regional route is measured as being located within 1/2 mile of a bus stop along Routes 1x, 2x, 3x, 80x, and M.

Proximity to Regional Transit
2028 - Weekday at noon



te: Proximity to a regional route is measured as being located within 1/2 mile of a bus stop along Routes A, B, C, D, and E.

Figure 23: Proximity to Transit Service - SMART 2022 Network

Figure 24: Proximity to Transit Service - SMART 2028 Network

Adding service on Canyon Creek Road, and all-day regional service, would put many more residents and jobs in Wilsonville one bus away from Tualatin and Tigard.

New Transfer Points Inside Wilsonville

In the existing SMART network, most routes come together at the Wilsonville Transit Center on the west side, adjacent to the TriMet WES station. WES connects to Tualatin and Tigard, but since its inception it has only operated during rush hours, and its high cost of operation and low ridership has made it difficult for TriMet to justify longer hours of service. Mixed use development is being added near the Transit Center, but the area surrounding it is foreseen to be fairly low-density industrial and open space for years to come, land uses that don't generate much transportation demand.

On the other hand, Wilsonville Town Center east of I-5 has a combination of retail and service businesses, a community college campus, public services and offices, and nearby apartments. The City of Wilsonville has an ambitious plan to redevelop portions of this area in the future. In this Plan, the Town Center is foreseen as an important node with fairly high demand for transit. Establishing a small transit center there would also help SMART avoid some congestion around I-5, and make some bus

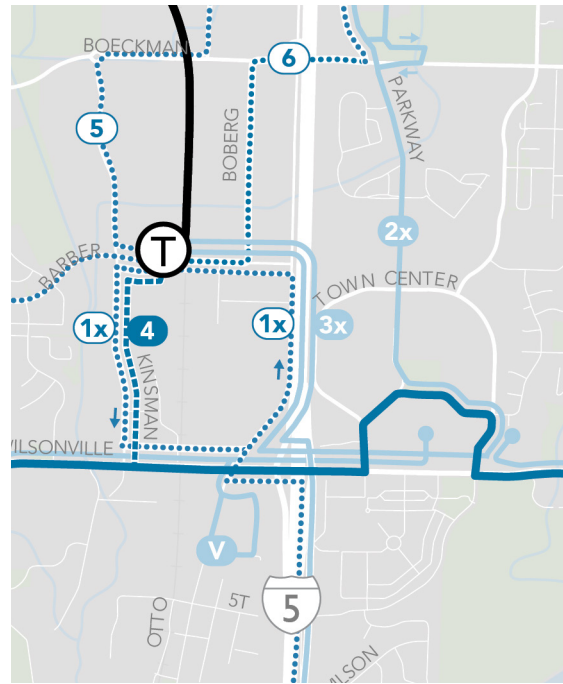


Figure 25: SMART Existing Network - Central Wilsonville

routes more linear and direct by relieving them of the need to deviate north to the west side Transit Center.

Figure 25 and Figure 26 compare the existing and 2028 networks in the central area of Wilsonville. In the existing network, every route goes to the Wilsonville Transit Center. In the 2028 network, this will work a little differently. Of the two connection points:

- Routes A, B, and G will serve both the west side Transit Center and the east side Town Center. Route B will connect the two centers every 30 minutes.

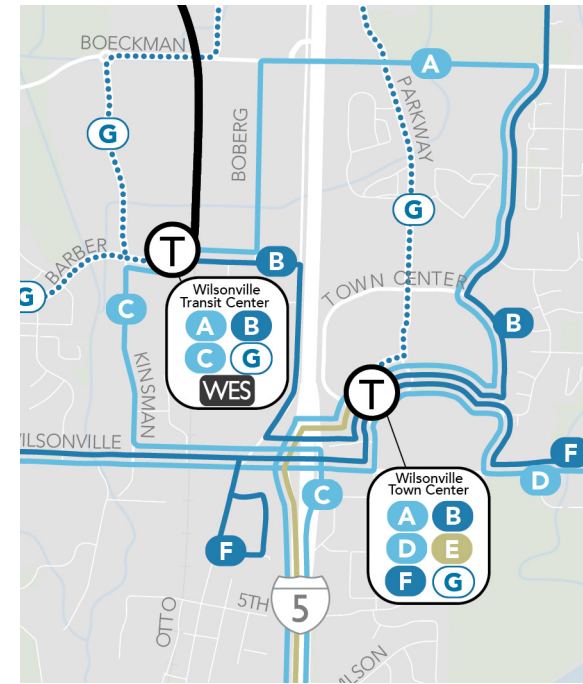


Figure 26: SMART 2028 Network - Central Wilsonville

- Routes D, E and F will only serve the east side Town Center.
- Route C will only serve the west side Transit Center.

Both locations are important as places where riders can transfer between routes, and as places where layover can take place. However, these centers are not the only places where transfers can be made – transfers between most routes will still be possible elsewhere in the city.

Transfer from route...

	A	B	C	D	E	F	G
A		Both	W. TC	E. TC	E. TC	E. TC	Both
B	Both		Both	E. TC	E. TC	E. TC	Both
C	W. TC	Both		OS		OS	W. TC
D	E. TC	E. TC	OS		E. TC	E. TC	E. TC
E	E. TC	E. TC		E. TC		E. TC	E. TC
F	E. TC	E. TC	OS	E. TC	E. TC		E. TC
G	Both	Both	W. TC	E. TC	E. TC	E. TC	

Road. **Figure 28** shows an example of a potential transfer using Routes C and D.

Because some routes would pass through the east side Town Center before terminating at the west side Transit Center, more transfers would be possible at the east side location than the west side location. However, depending on scheduling, the timing of transfers might mean that some

passengers prefer to use one transit center or the other, when they have the option to use either.

The only routes that wouldn't connect easily with one another would be Route C (Canby) and Route E (Woodburn/Keizer). However, the towns of Woodburn and Canby are already connected to one another by CAT's Route 99 service on Highway 99E, so there is unlikely to be much demand for this transfer in Wilsonville.

Figure 27: Locations for potential transfers among routes in the 2028 Network

Figure 27 shows where transfers between pairs of routes could take place.

- "W. TC" means a rider could transfer at the west side Transit Center (also known as Wilsonville Transit Center or the WES station).
- "E. TC" means a rider could transfer at the new east side Town Center facility, which will be on or near Park Place.
- "Both" means that a transfer would be possible in either place.
- The transfers marked "OS" would take place on-street away from either facility.

Connections between Routes C and D, and between Routes C and F, would happen along Wilsonville Road, at stops at either Boones Ferry Road or Kinsman

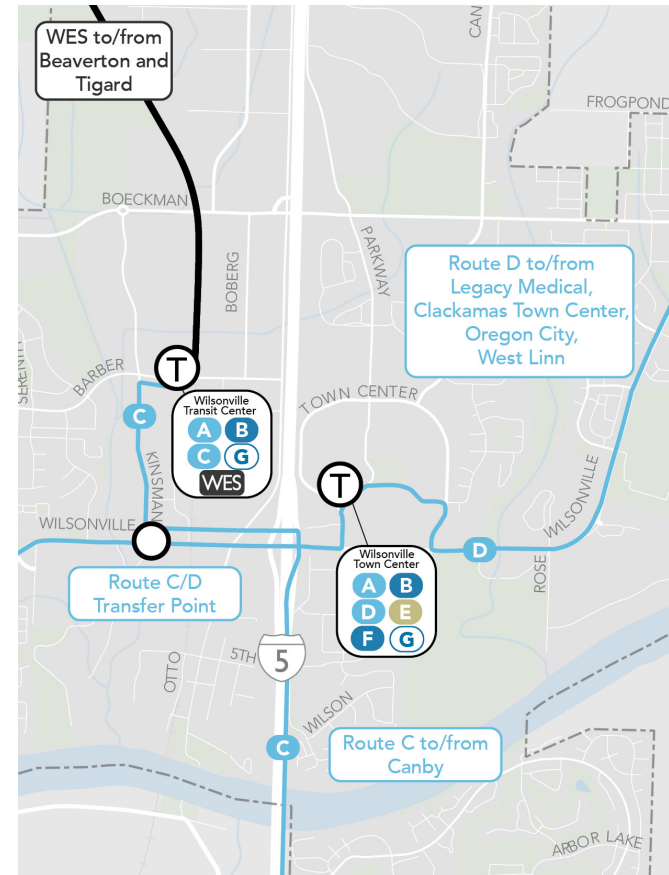


Figure 28: Example of a transfer between Routes C and D along Wilsonville Road in the 2028 Network.

Better Weekend Service

Saturday Service

Figure 29 and Figure 30 compare the frequency of each route on Saturdays between the 2022 and proposed 2028 networks.

As of 2022, only three routes were running on Saturdays:

- Route 4 on Wilsonville Road, every 30 minutes with some longer waits at midday.
- Route 2X between Wilsonville and Tualatin, every 30 minutes with some longer waits at midday.
- The Villebois Shuttle, which made just three trips per Saturday.

Demand-response service (“Dial-a-ride”) is currently offered on Saturdays over the same hours as fixed-routes.

Limited weekend service severely limits the usefulness of transit for most people. A person who works on weekends can’t chose transit if it is barely there or not there at all on Saturdays.

With the 2028 network, the amount of service available on Saturdays would increase dramatically. All of the regional routes would run on Saturdays, making it possible to travel among Wilsonville

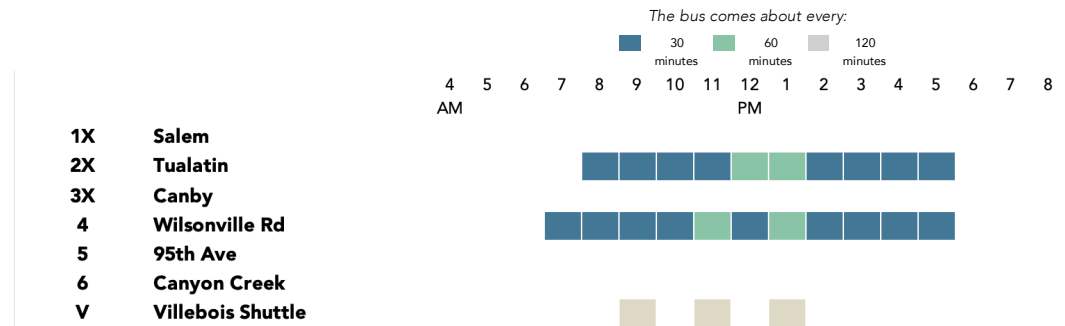


Figure 29: Saturday Frequency by Hour by Route - Existing SMART Network

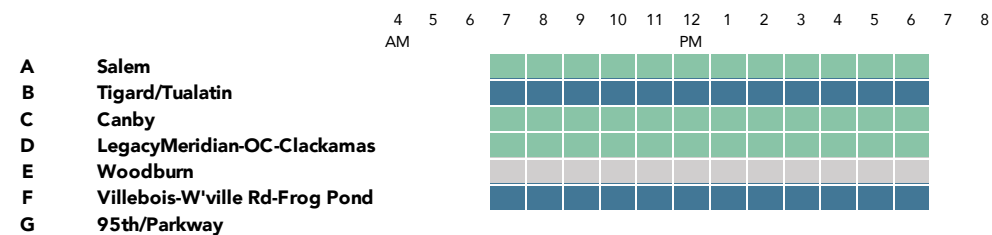


Figure 30: Saturday Frequency by Hour by Route - 2028 Network

and Salem, Tualatin, Tigard, Canby and Woodburn 6 days of the week. Except for Route E to Woodburn, all of these routes would run at least every hour, with the Tigard/Tualatin and Wilsonville Rd routes running every 30 minutes.

The only parts of Wilsonville that would not have Saturday service with the 2028 network are those served by Route G at rush hour only; these are also mainly employment and industrial areas, and service designed for them is particularly adapted for a 9-5 commute.

Sunday Service

Today, no SMART routes run on Sundays. That means that transit is not an option for

people in Wilsonville who need to travel on Sundays, and once someone purchases a car to solve their Sunday transportation problem they are likely to use it for the rest of their week.

The 2028 Network establishes a basic level of SMART service on Sundays. This service level would actually exceed what is currently provided on Saturdays by the existing network. The Sunday network would be:

- Route F - Wilsonville Rd would run every 60 minutes.
- Route A - Salem would run every 60 minutes.
- Route B - Tigard / Tualatin would run

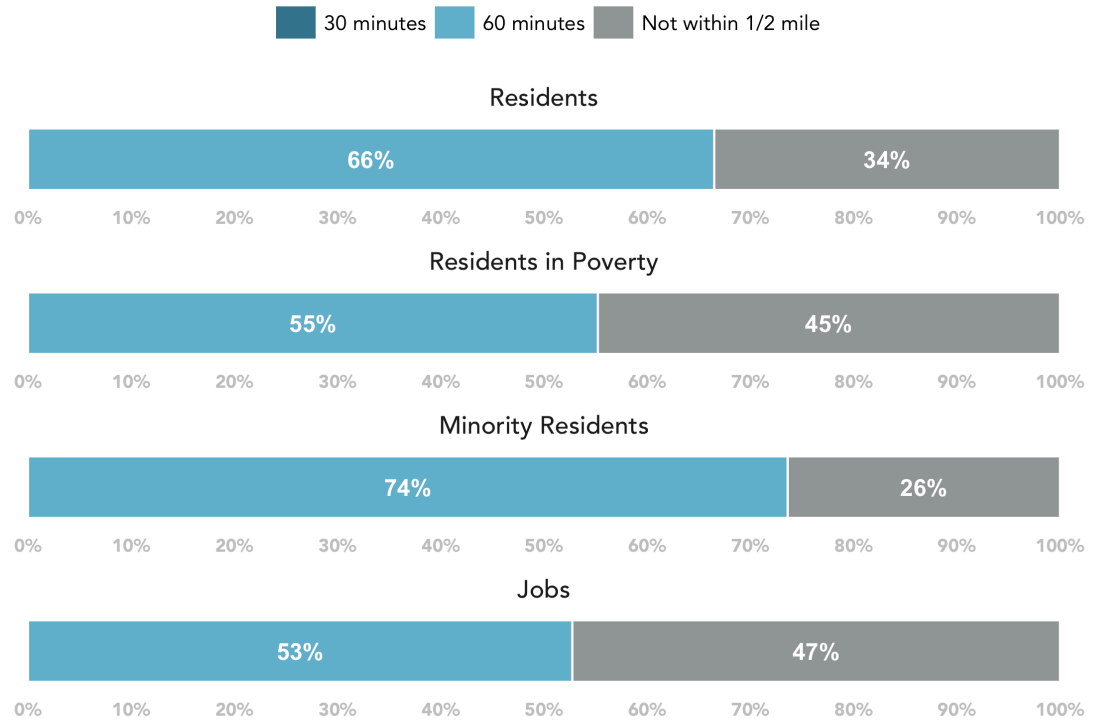
every 60 minutes.

With this structure, the most productive local and regional services (based on recent and historical ridership) would be available every day of the week. That means that a person who wants to travel from a home along the east end of Wilsonville Rd to Fred Meyer could do that by transit every day. Similarly, a person who lives along Canyon Creek Rd and works at Bridgeport Village could easily make that trip by transit every day with Route B. A resident of Tigard who wants to work at a Wilsonville business could accept a weekend shift.

Figure 31 shows how many residents in Wilsonville would be near transit with the 2028 Network’s Sunday service. A majority (66%) of all residents would be within a 1/2 -mile walk of a route running all seven days of the week.

SMART 2028 - Sunday at noon

What percentage of the SMART service area is near transit that comes every



Note: Proximity is measured as being located within 1/2 mile of a bus stop.

Figure 31: Wilsonville residents and jobs near SMART service on Sundays in the 2028 Network

Route Details

This section describes each route in the 2028 Network in detail.

Route A - Salem

Route A is the 2028 Network’s new version of SMART’s existing Route 1X between Wilsonville and Salem. This is a very important connection and would be maintained similar to today’s route, but with added trips during the midday.

The main change with Route A is in how the route would circulate through Wilsonville. Today, coming from Salem, Route 1X gets off I-5 at the Wilsonville Rd exit and makes a one-way loop of Boones Ferry Rd and Kinsman to reach the Wilsonville Transit Center. This is an industrial area, which means that almost no Wilsonville residents actually live near the 1X. Most people wishing to use it will need to reach the west side Transit Center first, which adds to their journey time.

In the 2028 Network, the new Route A would instead travel east from the I-5 through Wilsonville Town Center, and then continue along Canyon Creek, Boeckman and Boberg to end at the west side TC. This routing would bring the bus to Salem within a 10 minute walk of about 4,600 residents. Today’s Route 1X service to Salem is walking distance from only about 400 Wilsonville residents.

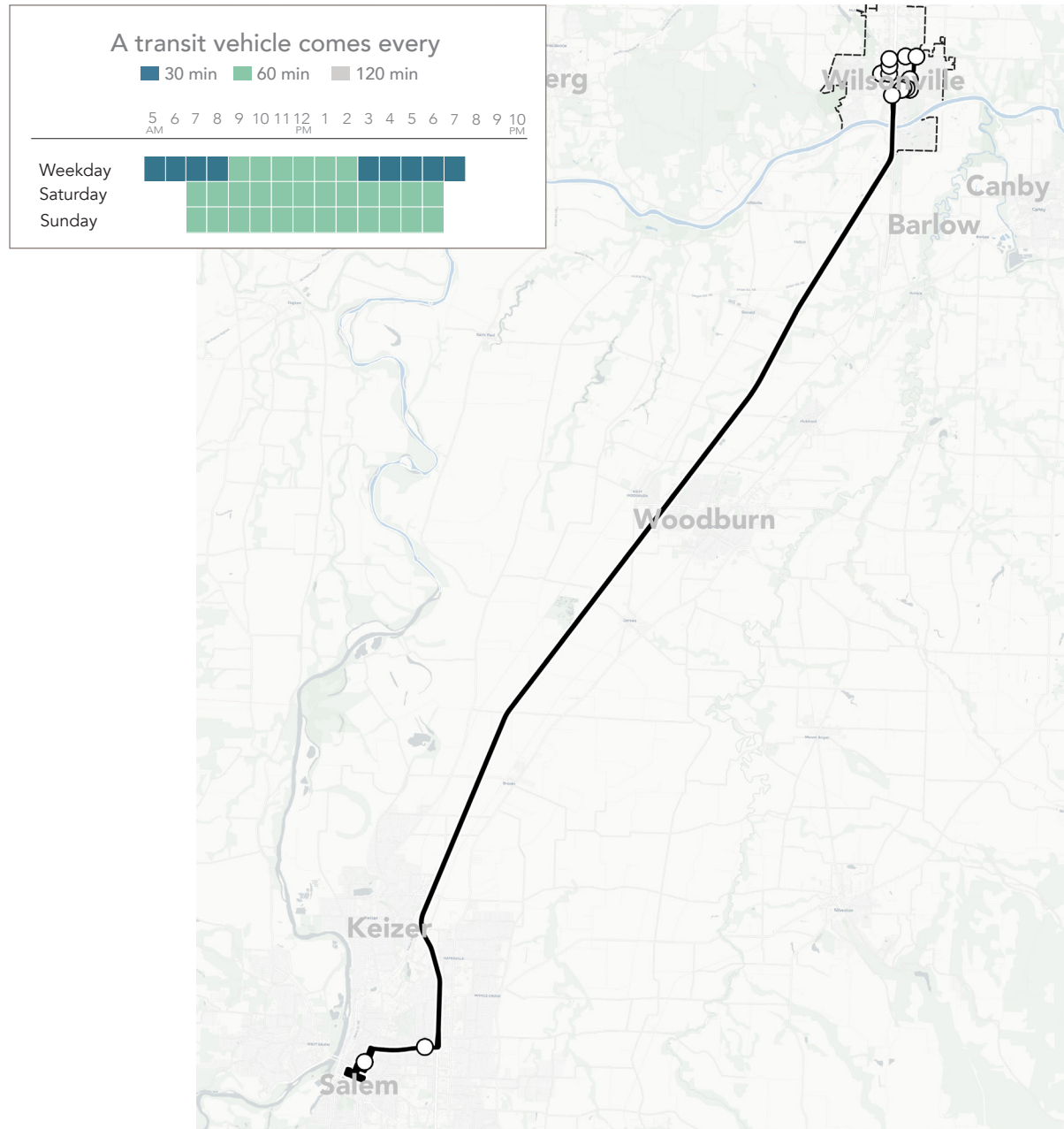


Figure 32: 2028 Network - Route A

Route B - Tigard/Tualatin

Route B replaces SMART’s current 2X service to Tualatin, with a route that continues north to Tigard.

Running every 30 minutes, Route B effectively plugs SMART into one of the most important connection points in the metro area’s west side network, the Tigard Transit Center. Today, Tigard can be reached using WES during weekday rush hours only, or with an additional transfer between SMART’s 2X and TriMet routes in Tualatin.

Tigard is served by routes running every 15 minutes that continue to Downtown Portland and Beaverton, as well as other routes to most parts of the west side of the metro area and Yamhill County. **By bringing people to (or from) Tigard, SMART can connect Wilsonville to numerous places that are also connected to Tigard - such as Beaverton, Washington Square Mall, Sherwood, Tualatin and Portland.**

The existing SMART Route 2X ends at the Tualatin Park & Ride near Bridgeport Village, missing an important activity center near the Nyberg Road I-5 exit. There are two major grocery stores, retailers and apartments located in this development area, known as Nyberg Rivers. Route B would get off I-5 at Nyberg (rather than at the Lower Boones Ferry Rd exit as 2X does today), and then use Nyberg, Martinazzi, Boones Ferry and Lower Boones Ferry to reach Bridgeport

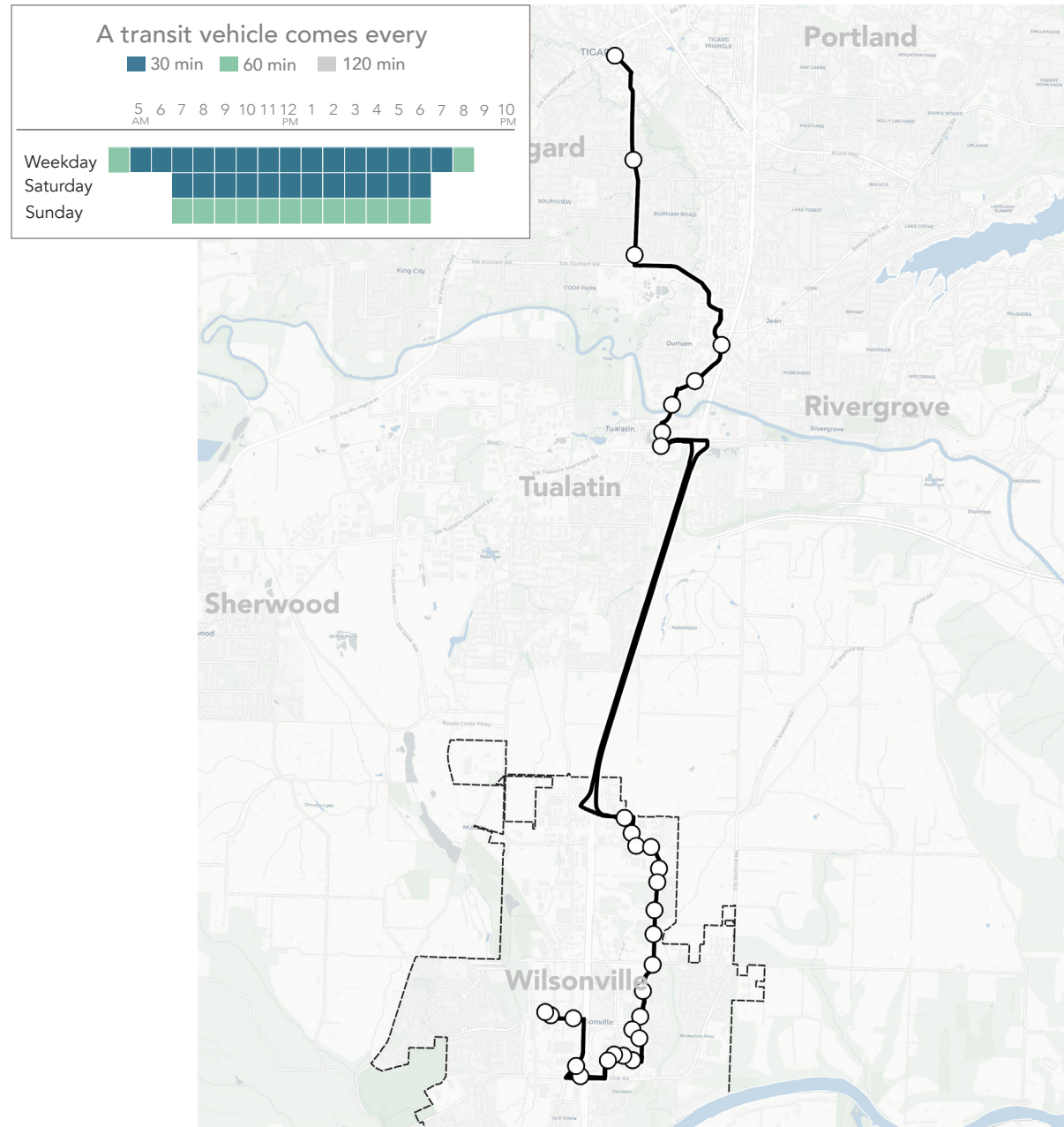


Figure 33: 2028 Network - Route B

Village.

Instead of ending at Tualatin Park & Ride, Route B would then continue north to Tigard via 72nd, Durham Rd and Hall Blvd. It would not make all local (TriMet) stops along the way, instead making widely-spaced stops in order to avoid competing with TriMet services for any trips that are not leaving the TriMet service area. Since this is TriMet's service territory, the details of this arrangement will need to be worked out with TriMet.

Route C - Canby

The 2028 Network's Route C is the new version of the existing Route 3X between Wilsonville and Canby. This route would change very little from the existing design. The only change to routing compared to the existing 3X is that Route C would use Airport Rd rather than Highway 551 between Charbonneau and the Aurora State Airport.

The most meaningful improvement to Route C compared to the existing 3X is that it would operate more frequently throughout the day. Route C would run every 60 minutes all day long; today's 3X runs about this often during the morning and afternoon, but with long gaps in the middle of the day that make waiting times longer and connections to CAT's 99X service difficult. Hourly service would also be offered on Saturdays.

Connections would be available in downtown Canby to CAT's 99X route going south and north on Highway 99E, to Salem in the south and Oregon City in the north.

Route 3X buses are affected by unpredictable delays and regular congestion on I-5 across the Willamette River. ODOT and Wilsonville have studied improvements to the I-5 bridge, and rulemaking for bus use on shoulders is underway. In the future, SMART could consider using the Canby Ferry or applying to use the shoulders of I-5 in order to improve reliability and shorten transit travel times on this route.

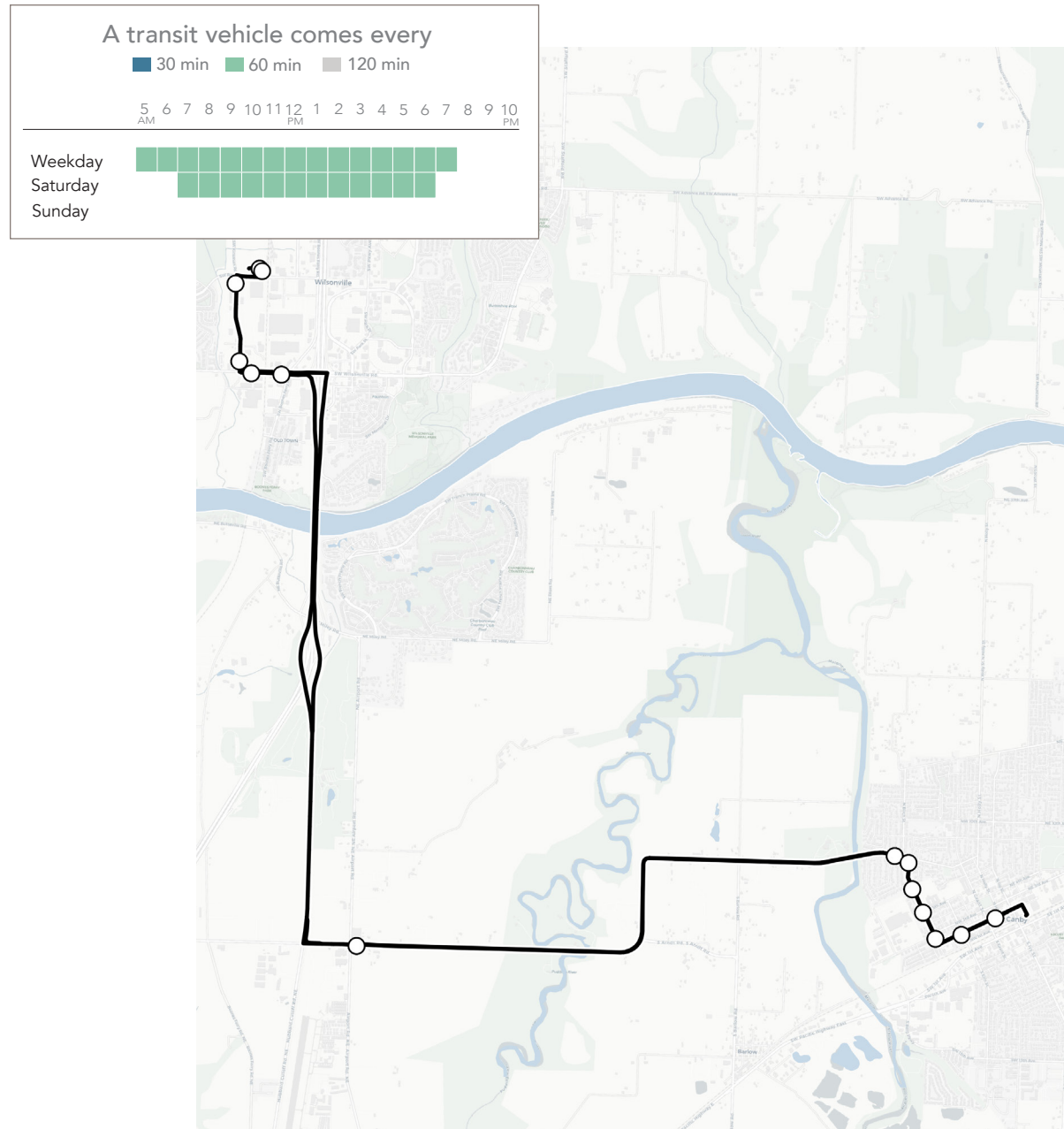


Figure 34: 2028 Network - Route C

Route D - Legacy Meridian/ Oregon City/Clackamas

Route D is an important new regional connection for SMART that fills an gap in connectivity in the south metro area. Today, trips across the Willamette River are not possible without either going through Downtown Portland or Canby. Traveling through Downtown Portland involves copious out-of-direction miles, and while traveling through Canby is more direct the route frequencies mean a fairly long wait is required to transfer in Canby.

Route D would establish a new service from Wilsonville to Clackamas Town Center (TC) using I-205, stopping along the way in West Linn and Oregon City. It would operate at least once per hour, all day long, weekdays and Saturdays, with some additional frequency during rush hours. It would take advantage of SMART’s ability to run buses on the shoulders of I-205 to get around congestion.

Connections to TriMet services would be available at Legacy Meridian, Oregon City Transit Center, and Clackamas TC. Connections to shuttles operated by RideConnection would be available at Legacy Meridian as well. Sandy Area Metro plans to serve Clackamas TC in the future.

Route D would enter Wilsonville via Stafford Rd in the east, and use Wilsonville Rd to reach its western terminus at Graham Oaks. (Example trips involving Route D are shown starting on page 45.)

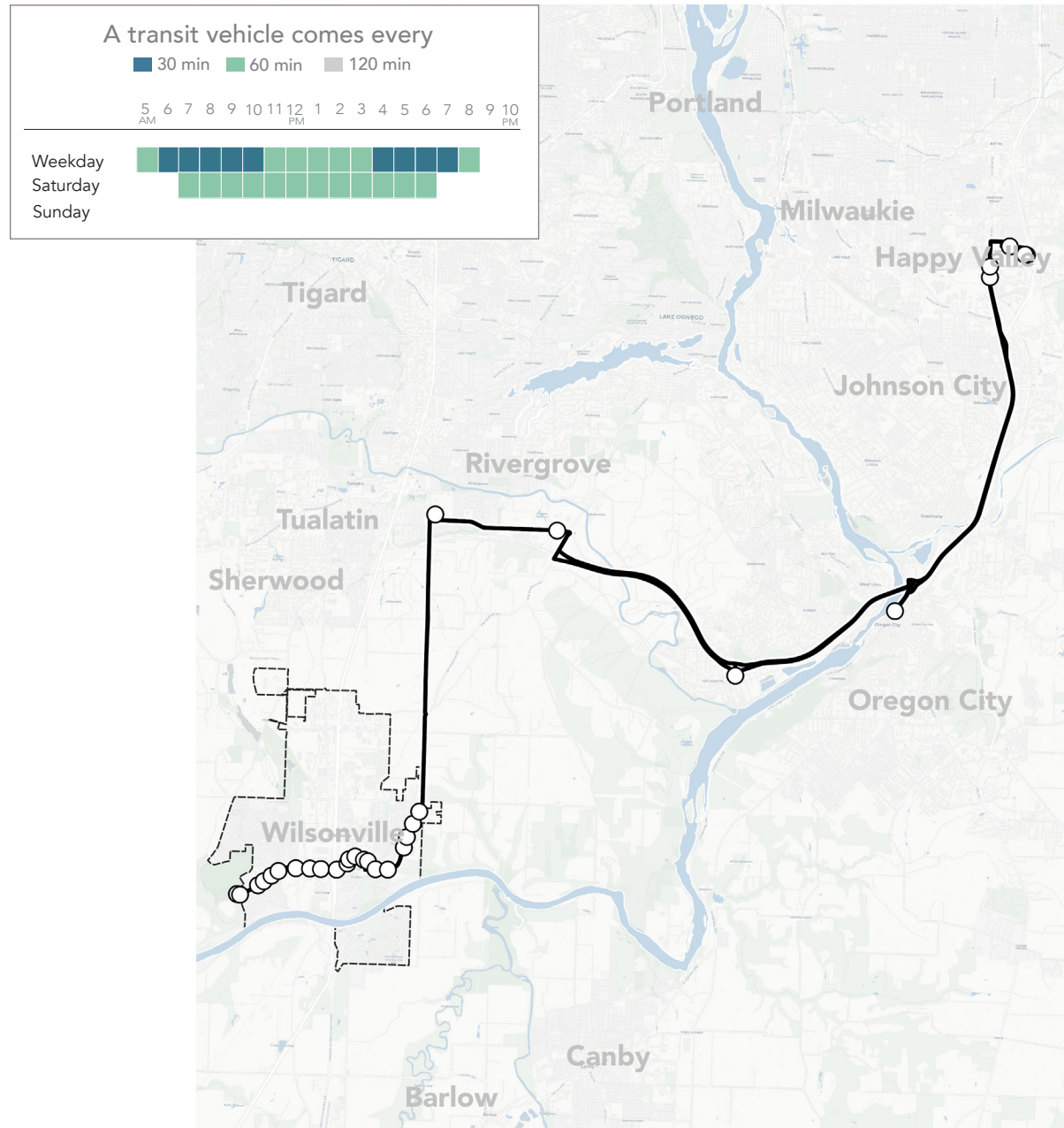


Figure 35: 2028 Network - Route D

Route E - Woodburn/Keizer

As of 2018, Woodburn was comparable to Canby in terms of the number of people commuting between Woodburn and Wilsonville (per the table on page 24). And yet, as of 2023 reaching Woodburn by transit is quite difficult. While it is possible via a connection to CAT's 99E route, this route deposits riders on the east edge of the city, and misses both the downtown core and the outlet mall to the west of I-5.

The 2028 Network would establish a connection between Wilsonville and the eastern side of Woodburn with Route E. Route E would run from Wilsonville to Keizer (benefiting from any potential bus priority treatments on I-5, like Route C).

It would stop at the Memorial Transit Center in Woodburn just east of I-5. Connections to Woodburn's local bus route are available at the transit center, to help riders continue on to the developments west of I-5 (some are a 15-20 minute walk away, and some are farther) or to downtown Woodburn and other parts of the city to east of the transit center.

Route E would be operated as a shared service with Cherriot's Route 80x. However, at the frequency shown above (every two hours) the route would cycle efficiently with one bus, which means that SMART could operate it independently, or could skip some trips when the Cherriots vehicle is scheduled to make the trip.

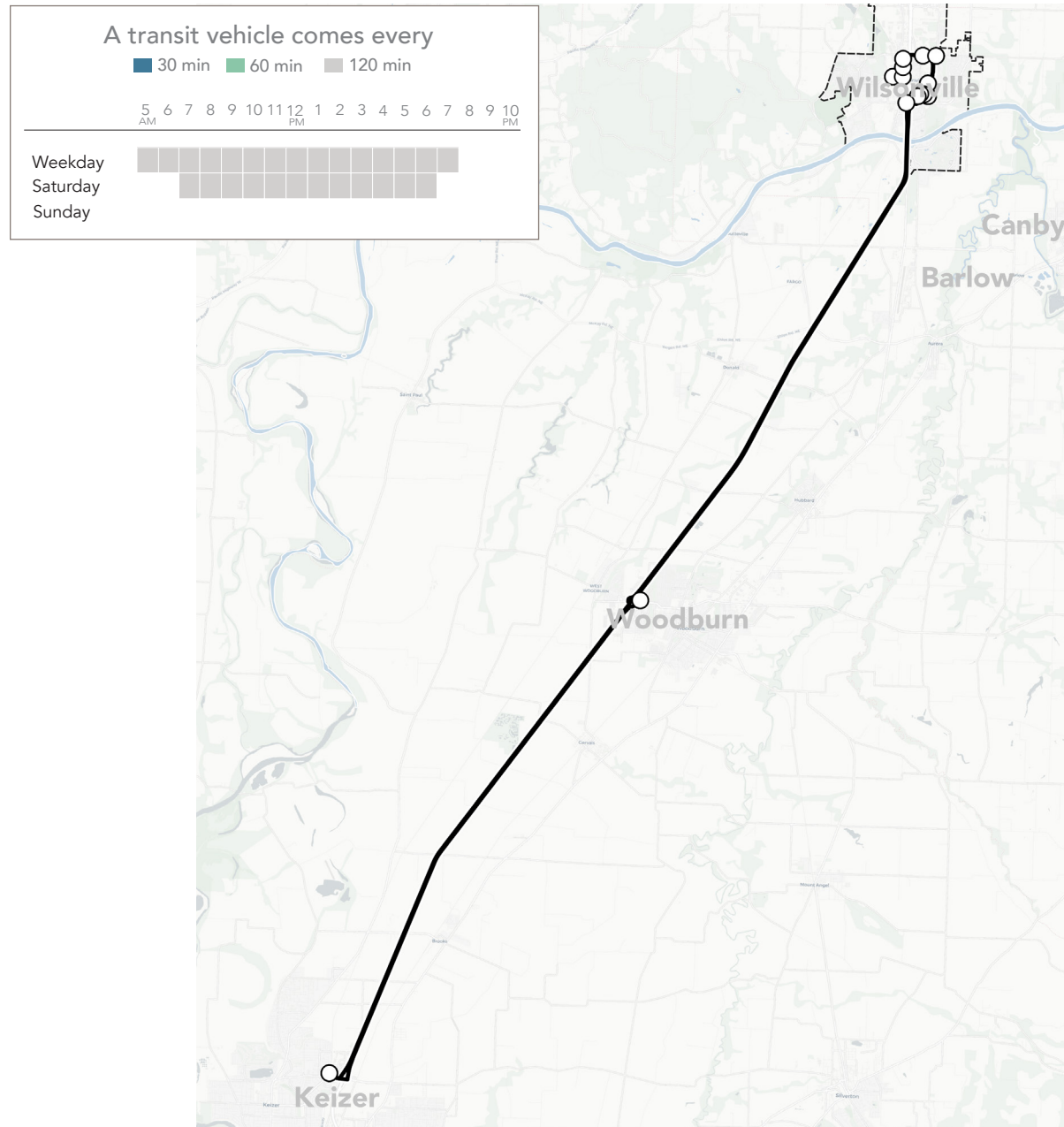


Figure 36: 2028 Network - Route E

Route F - Villebois/Wilsonville Rd/ Frog Pond

Route F has some similarities to the existing Route 4 and the existing Villebois Shuttle, also known as Route V.

Like Route 4, Route F would serve a long section of Wilsonville Road, which is SMART's busiest corridor due to its concentration of shopping, commercial buildings, apartment housing and multiple schools.

Route F would connect Villebois, Brown Road, the Fred Meyer, the eastern Town Center, and new residential development in Frog Pond. It would be more direct than the existing Route 4 due to the elimination of the deviation north to the west side Transit Center / WES station. (Most of the areas connected to the WES station by the existing Route 4 would, in the 2028 network, be connected by other routes, allowing Routes D and F to be more linear.) Route F would be longer, and much more frequent, than the existing Villebois Shuttle which offers quite minimal frequencies in the existing network.

Meanwhile, residents on Wilsonville Road west of Brown Road who are *not* on this new Route F would instead be on the new regional Route D, enjoying a more linear route along Wilsonville Road and a one-seat-ride to Legacy Meridian Medical Center, West Linn, Oregon City and Clackamas TC.

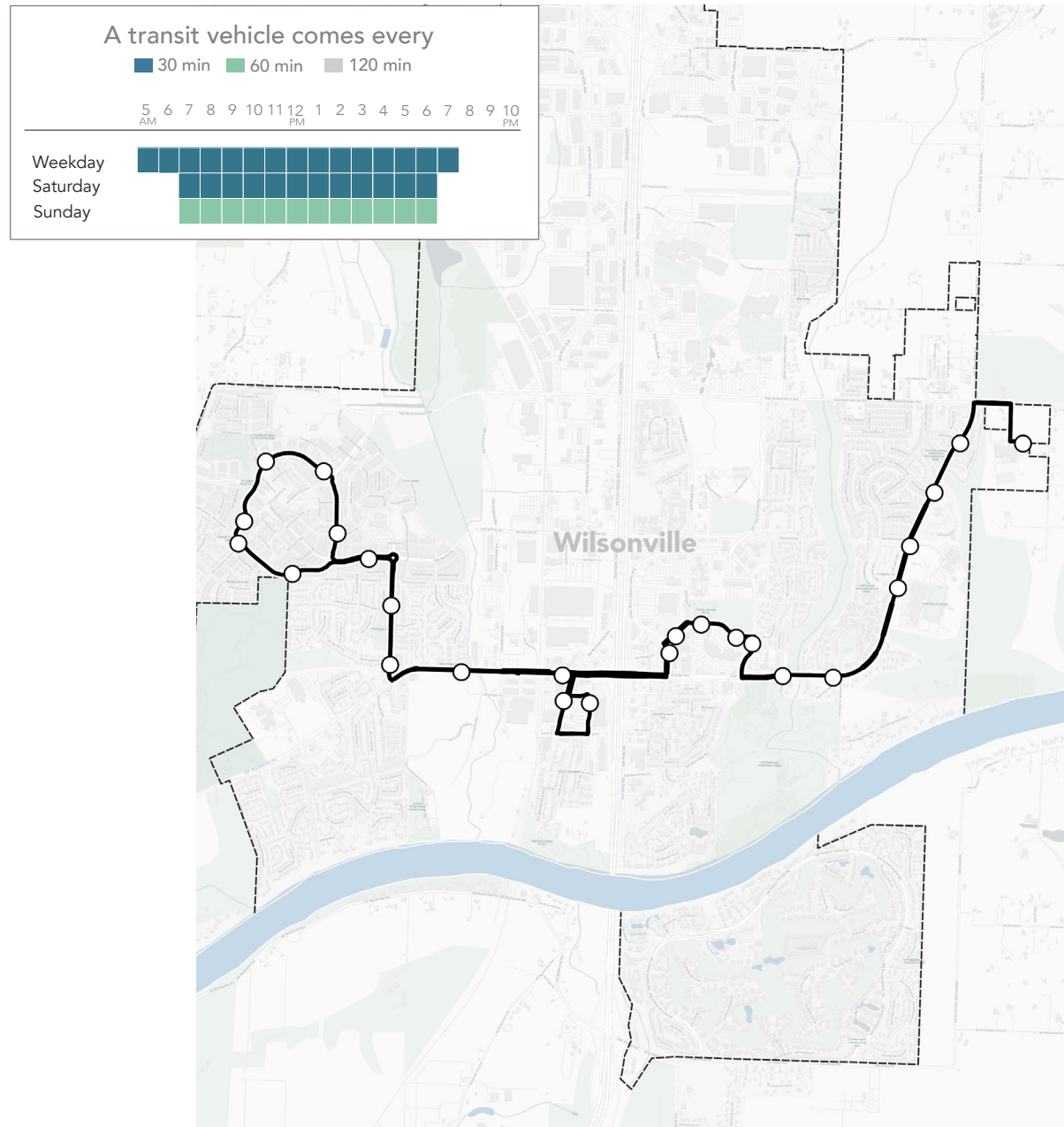


Figure 37: 2028 Network - Route F

Route G - Parkway/95th St./ Villebois

Route G is designed to serve employment areas east and west of I-5 in the northern portions of Wilsonville and connect them to the west side Transit Center / WES station and the east side Town Center.

Today, the areas Route G would serve are on Routes 5 and 6, both of which run only during rush hours (while WES is operating). Route G would maintain a similar schedule, operating only during the morning and afternoon rush hours on weekdays, but with a consistent 30-minute frequency.

Route G differs from SMART’s existing 6 and 5 in that it is designed to serve a wider variety of trip purposes, and make it easier to access jobs in the industrial areas of Wilsonville from more places. Unlike the existing routes, Route G’s east end is at the Town Center, where it would connect to many other regional routes besides WES, and be within walking distance to nearby residents.

In the west, Route G would end in Villebois, and act as the rush-hour service connecting Villebois to WES. However, because Villebois is fairly close to the WES station (about 1.1 miles from the center), and the biking and walking conditions are very good, an alternative plan could be to instead send this “tail” of Route G down Brown Road to the western end of Wilsonville Road instead, where residents are 1/2 mile farther and a more difficult

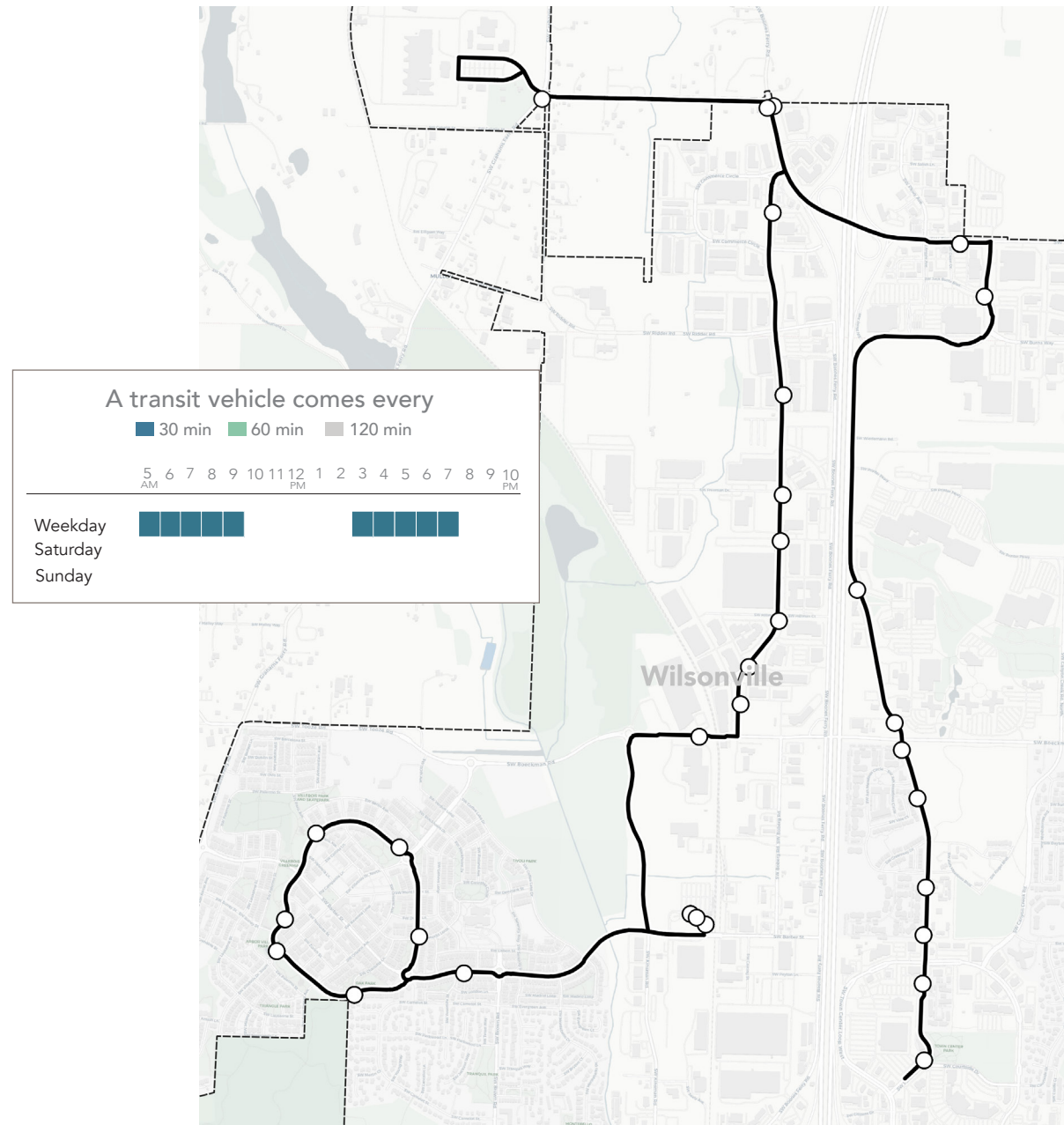


Figure 38: 2028 Network - Route G

bike ride away from the WES station.

To the north, Route G would serve Commerce Circle in both directions. Existing Route 5 serves Commerce Circle only southbound, so people coming from the south have to ride around the loop of Ridder, Grahams Ferry and Day in order to reach their Commerce Circle destination. This would improve the legibility of the service and save people some travel time.

Route G would stop at the Coffee Creek Correctional Facility when requested in advance, and consistently on the first trips of the morning when inmates are released and need transit to return home. By making that stop request-only for most of the day, SMART would avoid hauling passengers a long distance out of their way to pick up or drop off no one, while still providing an essential connection when it is needed.

Residents' Proximity to Service

The number of residents within 1/2 mile of transit would increase slightly with the 2028 Network. Where would coverage change?

The map on the left in **Figure 39** shows the existing SMART service extent in Wilsonville. Each dot represents 5 people. Blue dots are within a 1/2-mile walk of transit (transit that is operating at noon on weekdays), red dots are outside of that distance. The 1/2-mile walking buffer from each SMART stop is shown as a blue line.

In the existing network, a few places with lots of residents stand out as lacking access to transit. The most notable gap in the central area of Wilsonville is the cluster of dots along Canyon Creek Road south of Boeckman.

The entirety of Charbonneau, as well as some areas immediately north of the Willamette River, are also far from transit, but they are much less transit-oriented in their design than Canyon Creek Road, and much more costly for SMART to reach with transit service. There are no viable transit routes through the neighborhoods near Memorial Park or along the Willamette River (where a bus would have to wiggle down small streets and then turn around in cul de sacs), and these were not areas that public input suggested as high priorities

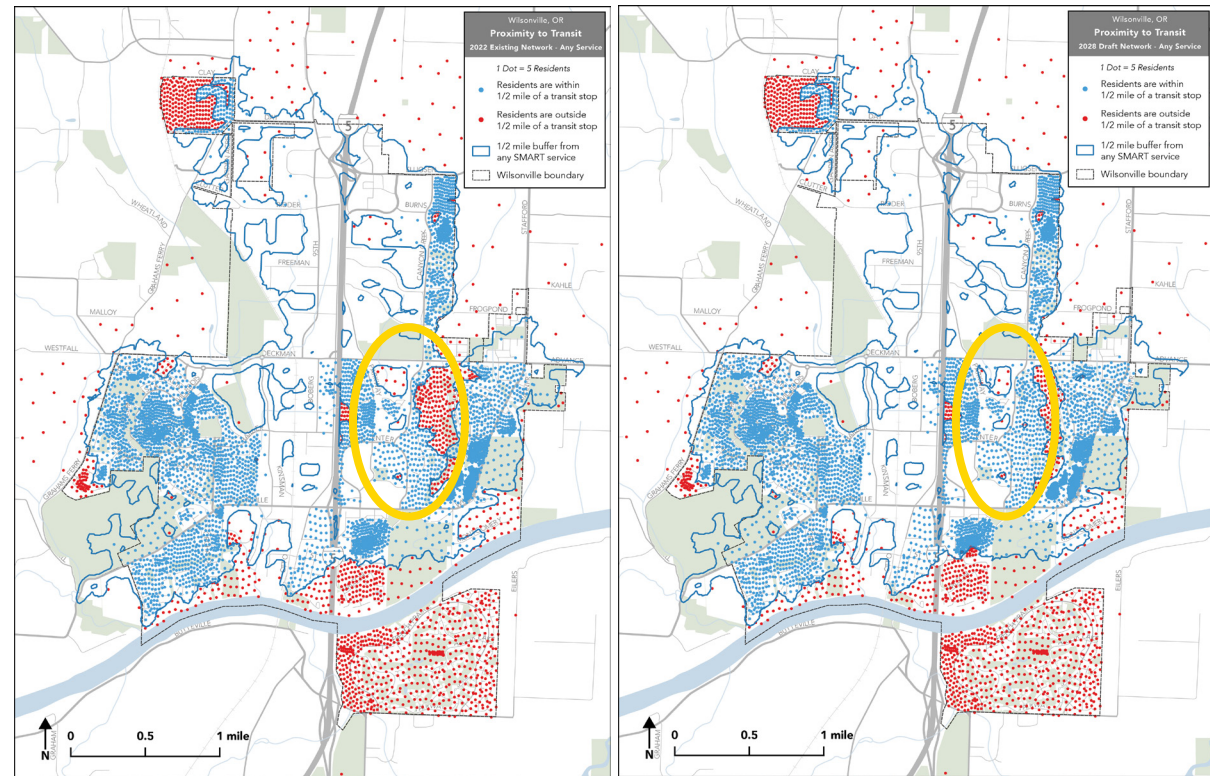


Figure 39: Residents within 1/2 mile walk of a bus stop in the 2022 network (at left) and in the 2028 Network (at right).

for network expansion. The 2028 Network does not reach any more people near the river.

Canyon Creek Road is on the way to other destinations, and can be served by SMART buses on their way north to Argyle Square without requiring them to deviate or discourage through-riding passengers. In the 2028 Network, it is served by Route B that continues on beyond Argyle Square to Tualatin and Tigard.

The area circled in yellow on these maps would be newly covered by Route B.¹

¹ In fact, the remaining red dots west of Canyon Creek Road are an artifact of the way the U.S. Census draws the Census blocks to in the Boeckman Creek area. Those red dots represent residents who actually live within 1/2 mile of Canyon Creek Road, not in the creek, and they would therefore be covered thanks to the new Route B.

Fixed Route Operating Increases

Using the frequencies, spans, lengths and assumed speeds of each of the proposed routes, we can estimate the number of vehicles and drivers required in-service, and the number of hours of each, required for each route. We can also estimate the miles of distance vehicles will have to travel to deliver each route. These are the basic components of operating cost: Revenue Hours in service, Revenue Miles in service, and Peak Vehicles required to deliver the service at its peak frequency.

(A “revenue hour” is one hour of a bus and driver on the road, providing service to passengers. A “revenue mile” is a mile driven on a route, in service. “Peak vehicles” are the greatest number of vehicles required at any one time to deliver service during the week, which is normally during rush hours. Revenue hours, revenue miles and peak vehicles define most of an agency’s costs to provide fixed-route transit.)

Figure 40 on the next page reports these cost elements along with the proposed frequency of each 2028 route.

These cost elements are used to generate dollar estimates of operating cost starting on page 85.

The 2028 Network represents a substantial expansion in service above the existing SMART network, befitting its role as the

endpoint of an ambitious 5-year improvement program. The 2028 Network would require about 252 revenue hours of service each weekday, approximately 71% more than SMART’s current weekday service.

However, the more substantial ongoing expenditure would come from the expansion of weekend service. The 2028 network would improve Saturday service on most routes, more than tripling Saturday service. It would also turn on three routes on Sunday for the first time.

As a result, the total annual cost of fixed-route service in the 2028 Network is about 75,000 revenue hours, an 89% increase compared to the existing service level. This does not account for the cost of adding demand-response service and other personnel on weekends as well. The nature of those costs are described in chapter 5, and estimated costs are presented starting on page 85.

Shared Operations with Cherriots

Today SMART and Cherriots (the transit provider for Salem, Keizer, and Marion and Polk Counties) share the cost of providing Route 1X. The cost share is simple: each agency runs some of the daily trips using its own vehicles.

In calculating the costs of future services on Route A, which would replace Route 1X, and on Route E, a new connection among Wilsonville, Woodburn and Keizer, we have assumed that this arrangement

would continue on weekdays. The Revenue Hours, Revenue Miles and Peak Vehicles given in the table on the next page only include one-half of those cost elements on weekdays.

However, we have not assumed that this cost sharing would apply on weekends (when Route 1X does not run today). All of the costs that arise from Saturday and Sunday service, for Routes A and E, have been included in the table on the next page.

Route E (Wilsonville-Woodburn-Keizer) would require only one bus to operate at the recommended frequency (120 mins). In practice, this means that the two agencies could not split costs by alternating trips with their own buses. A different method of cost sharing could be developed for this route alone, or perhaps for both of the routes (A and E) that the two agencies would be scheduling, marketing and operating together.

		Frequency		Two way length (miles)	Round-trip cycle time with layover		Layover time (including excess time)		Weekday Revenue Hours	Saturday Revenue Hours	Sunday & Holiday Revenue Hours	Revenue Hours per year	Revenue Miles per year	Peak vehicles required
		a.m. peak	mid-day		a.m. peak	mid-day	a.m. peak	mid-day						
A	Salem ¹	30	60	68	120	120	20	40	24 ¹	24 ¹	24 ¹	7,428	231,345	2
B	Tigard-Tualatin	30	30	25	120	120	29	28	64	36	24	19,556	233,823	4
C	Canby	60	60	17	60	60	22	22	15	12		4,446	77,271	1
D	Legacy Meridian-OC-Clackamas TC	30	60	50	210	240	30	57	91	36		24,006	334,109	7
E	Woodburn-Keizer ¹	120	120	56	120	120	29	34	8 ¹	12 ¹		2,223	56,687	1
F	Villebois-Frog Pond	30	30	11	60	60	13	12	30	24	12	9,588	99,236	2
G	95th/Parkway	30		14	60		19		20			5,080	70,409	2
Total - all proposed 2028 fixed routes									252	144	60	75,000	1,481,000	19
Total - 2021 ² fixed routes									147	44	0	39,600 ²	557,000 ³	15
Ratio of 2028 to 2021 Fixed Route service									171%	327%		189%	266%	

1 For Routes A and E we assume that weekday service would be split equally between SMART and Cherriots (with RH divided equally), but that Saturday and Sunday service would be provided entirely by SMART.

2 2021 annual Revenue Hours is an annualized number calculated based on the typical weekly schedule of service in 2021. This is a slightly lower number than the Revenue Hours that were actually delivered in calendar year 2021.

3 2021 annual Revenue Miles is taken from the National Transit Database.

Figure 40: Recommended 2028 fixed route operating parameters and estimated Revenue Hours, Revenue Miles and Peak Vehicles.

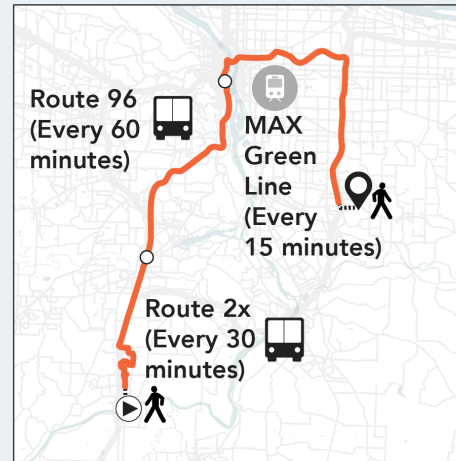
Sample Trips

On this and the following pages, example trips are described as they would be made using the best combination of transit services in 2022 compared to in the proposed 2028 Network.




In most cases, the 2028 Network results in shorter travel times. This is generally due to the shorter waits required to use routes (or, put another way, the more times that people can choose to start their trip). In some cases it is also due to a more linear and direct route which saves people in-vehicle riding time.

When SMART implements elements of the 2028 Network, comparisons like these can help communicate the value of service changes. Service changes are normally disruptive to at least a small number of existing riders, even when they are beneficial to a large number of potential future riders. Demonstrating travel time savings for trips that many people make can help overcome the bias against change and inertia that tend to discourage or prevent service changes.

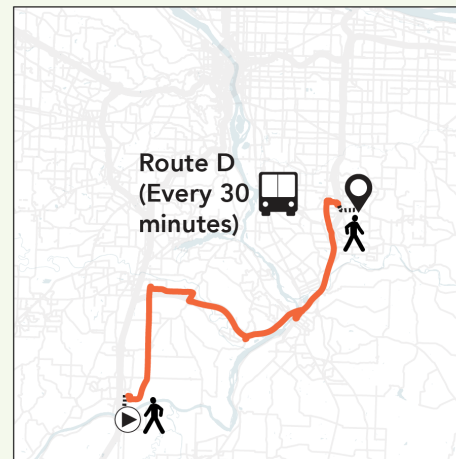
On the 2022 Existing Network, what is the trip like from an apartment on Park Place to a medical appointment at Sunnyside Medical Center at noon on a weekday?



Total Travel Time: 2 hours 41 minutes

-  16 minutes walking
 -  53 minutes average wait
 -  1 hour 32 minutes riding
- Depart at 9:00 am.
Arrive at 11:41 am.
Use Routes 2x, 96, and MAX
2 Transfers.

On the 2028 Network, what is the trip like from an apartment on Park Place to a medical appointment at Sunnyside Medical Center at noon on a weekday?



Total Travel Time: 1 hour 57 minutes




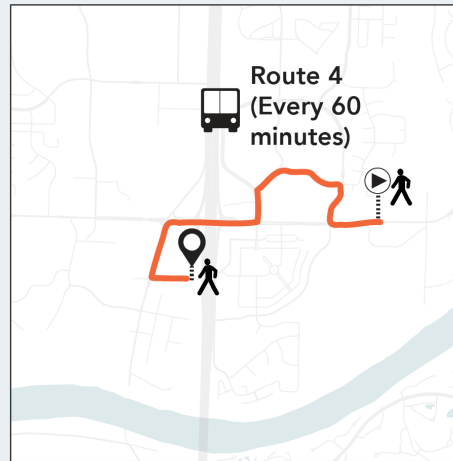



-  19 minutes walking
 -  15 minutes average wait
 -  1 hour 23 minutes riding
- Depart at 10:00 am.
Arrive at 11:57 am.
Use Route D.
No Transfers.

Figure 41: Comparing a trip between Wilsonville and Sunnyside Medical Center, on the 2022 network (at top) and the 2028 Network (at bottom).

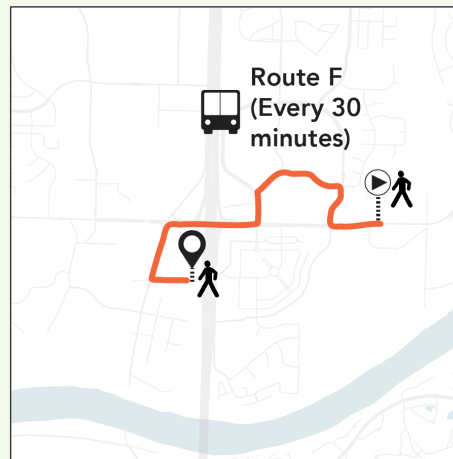
On the 2022 Existing Network, what is the trip like from an apartment near the Wilsonville Community Center to Fred Meyer on a Saturday afternoon?



Total Travel Time: 42 minutes

-  5 minutes walking
 -  30 minutes average wait
 -  7 minutes riding
- Depart at 12:34 pm.
 Arrive at 1:16 pm.
 Use Route 4.
 No Transfers.

On the 2028 Network, what is the trip like from an apartment near the Wilsonville Community Center to Fred Meyer on a Saturday afternoon?



Total Travel Time: 27 minutes




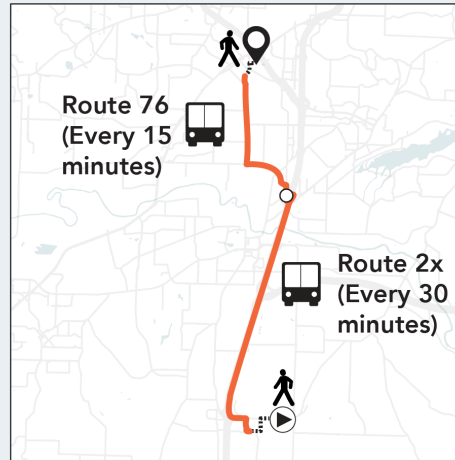
-  5 minutes walking
 -  15 minutes average wait
 -  7 minutes riding
- Depart at 12:30 pm.
 Arrive at 12:57 pm.
 Use Route F.
 No Transfers.

Figure 42: Comparing a trip between an east side residence and Fred Meyer on the 2022 network (at top) and the 2028 Network (at bottom).

On the 2022 Existing Network, what is the trip like from an industrial job on Burns Way to an apartment in Tigard on a weekday evening?



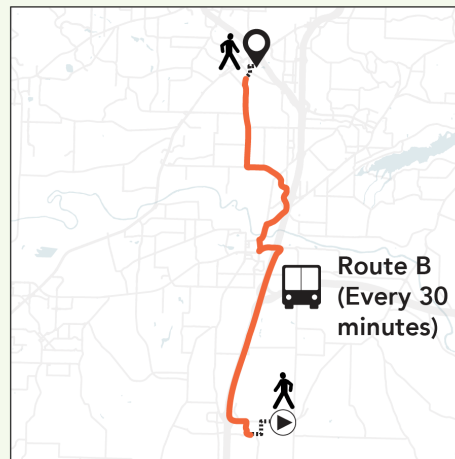
Total Travel Time: 58 minutes

- 8 minutes walking
- 23 minutes average wait
- 27 minutes riding

Depart at 4:45 pm.
 Arrive at 5:43 pm.
 Use Route 2x and Route 76.*
 1 Transfer.

* This trip is also possible using WES, but on average it would take 26 more minutes to complete, compared to this trip.

On the 2028 Network, what is the trip like from an industrial job on Burns Way to an apartment in Tigard on a weekday evening?



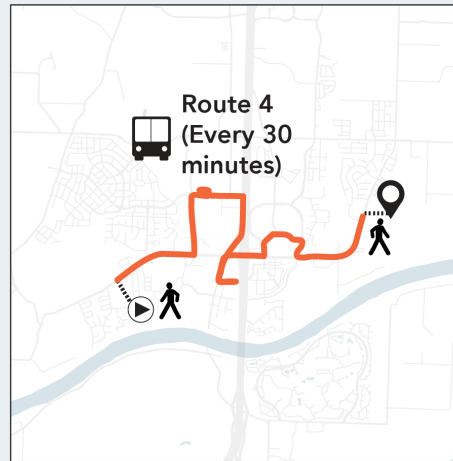
Total Travel Time: 55 minutes

- 8 minutes walking
- 15 minutes average wait
- 32 minutes riding




Depart at 4:45 pm.
 Arrive at 5:40 pm.
 Use Route B.
 No Transfers.

Figure 43: Comparing a trip between a Wilsonville job and a Tigard residence, on the 2022 network (at top) and the 2028 Network (at bottom).

On the 2022 Existing Network, what is the trip like from an apartment on Wilsonville Road to Wilsonville High School on a weekday morning?

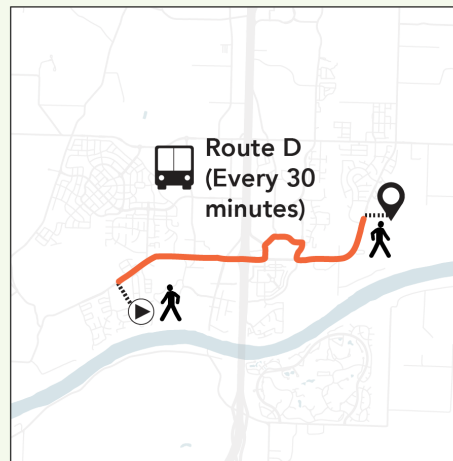


Total Travel Time: 41 minutes




-  3 minutes walking
-  15 minutes average wait
-  23 minutes riding

Depart at 7:40 am.
 Arrive at 8:21 pm.
 Use Route 4.
 No Transfers.

On the 2028 Network, what is the trip like from an apartment on Wilsonville Road to Wilsonville High School on a weekday morning?



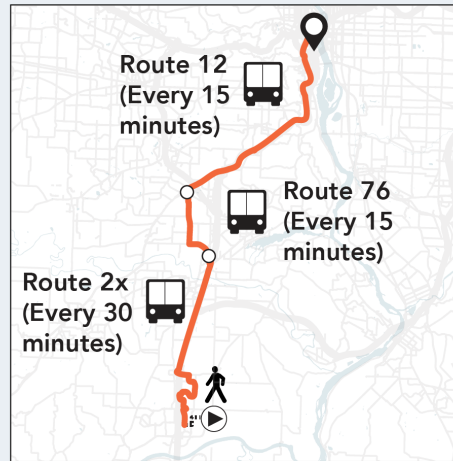
Total Travel Time: 28 minutes

-  3 minutes walking
-  15 minutes average wait
-  10 minutes riding

Depart at 8:00 am.
 Arrive at 8:28 am.
 Use Route D.
 No Transfers.

Figure 44: Comparing a trip between a west side residence and Wilsonville High School, on the 2022 network (at top) and the 2028 Network (at bottom).

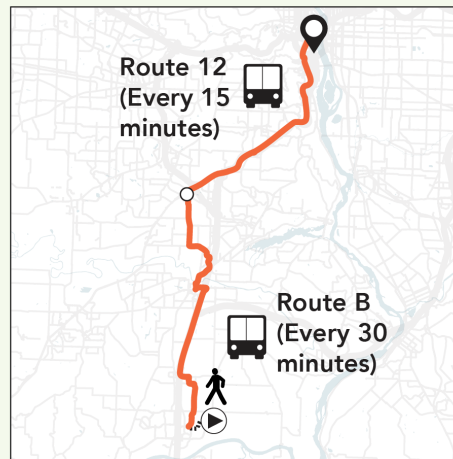
On the 2022 Existing Network, what is the trip like from an apartment near Canyon Creek to downtown Portland on a Saturday afternoon?



Total Travel Time: 1 hour 53 minutes

- 12 minutes walking
 - 30 minutes average wait
 - 1 hour 11 minutes riding
- Depart at 12:18 pm.
 Arrive at 2:11 pm.
 Use Routes 2x, 76, and 12.
 2 Transfers.

On the 2028 Network, what is the trip like from an apartment near Canyon Creek to downtown Portland on a Saturday afternoon?



Total Travel Time: 1 hour 42 minutes

- 7 minutes walking
 - 23 minutes average wait
 - 1 hour 12 minutes riding
- Depart at 12:00 pm.
 Arrive at 1:42 pm.
 Use Routes B and 12.
 1 Transfer.

Figure 45: Comparing a Saturday trip from Wilsonville to downtown Portland on the 2022 network (at top) and the 2028 Network (at bottom).

City Growth Areas

The map at right highlights the areas where the City of Wilsonville will eventually expand and grow at urban densities.

The 2028 Network was drawn with an awareness of the growth that will happen in the next five years, which is located in Frog Pond.

Routes F and D can be lengthened northwards along Stafford Road to new stops adjacent to Frog Pond developments. They could also branch away from one another, with one turning east to end at Meridian Creek Middle School while the other continues north on Stafford Road. Sidewalks must be added to both sides of Stafford Road to allow residents of new developments to walk out to and along Stafford Road to reach a bus stop.

Once Basalt Creek, in the northwest of the city, is developed, a reasonable transit route could run on either Grahams Ferry or Boones Ferry Roads. Detail of the street network in the area is shown on the next page.

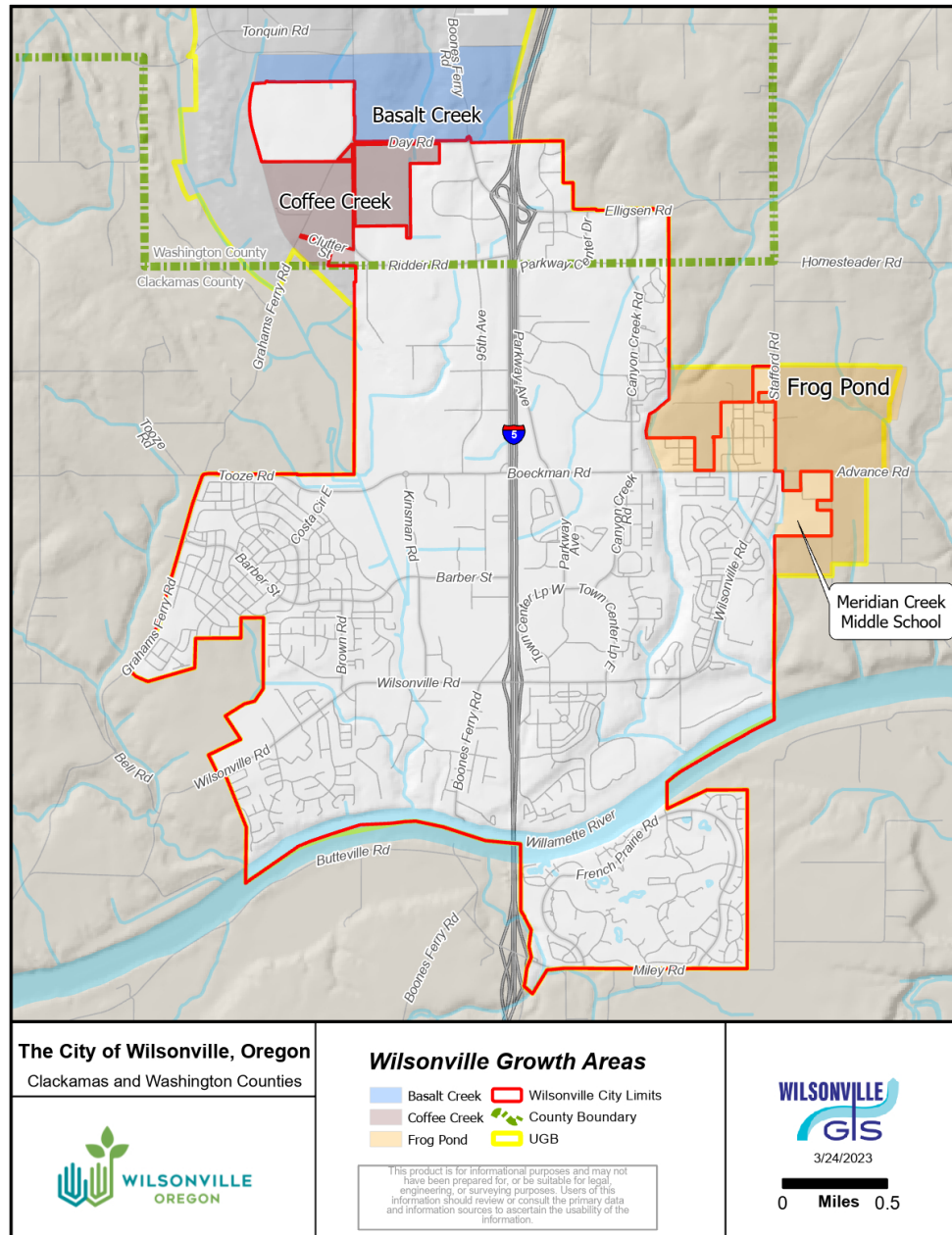


Figure 46: The next anticipated growth areas in the City of Wilsonville are Frog Pond, Coffee Creek and Basalt Creek.

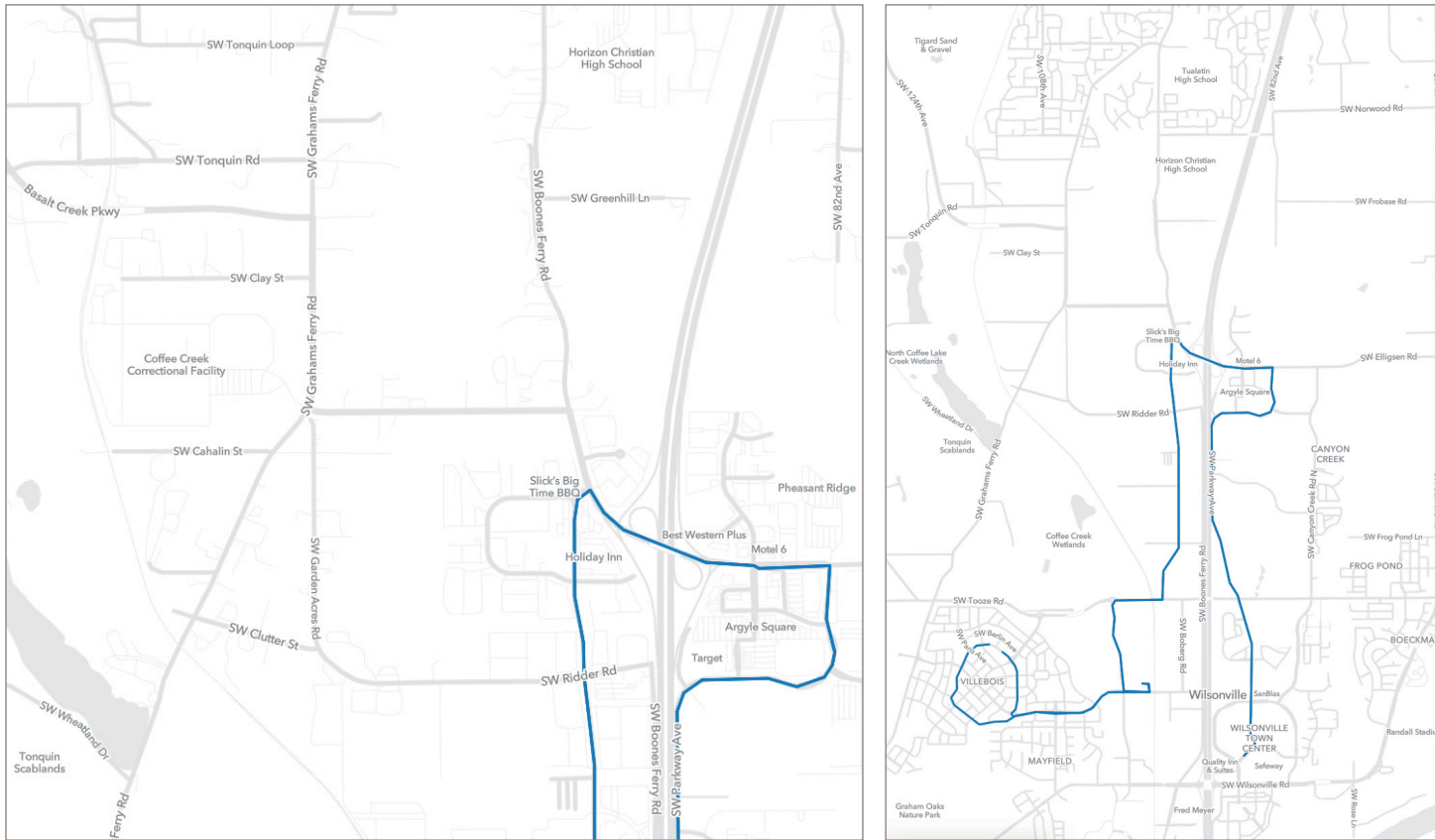


Figure 47: The City is expected to grow into the Basalt Creek area, along Grahams Ferry and Boones Ferry Roads, as shown in the street map at left. It will be important to concentrate transit-appropriate development along one, but not both, of these roads, as the Route G loop (shown in blue) could not be stretched any further north without making trips between the east and west sides of the city terribly circuitous.

Existing streets in the Basalt Creek area are shown above. The two main roads heading north from the existing developed area of Wilsonville into the new development areas are Grahams Ferry and Boones Ferry Roads.

We recommend that the City identify **one** of these roads as the priority for transit, and organize denser development around it, rather than expect that transit service can be provided on both roads in the near future. If development is planned with an

expectation of service on **both** roads, then the provided frequencies will be one-half as good as they could be if all of the transit-oriented and transit-needing developments were organized along one of the roads. It will also be essential to provide good pedestrian connections between the two roads, so that transit on one road is reachable from the other road.

Also, the simplest way to serve Basalt Creek – and to get service on both roads – would be to stretch northwards the loop

made by Route G. However, the further north that loop is stretched, the less useful Route G is for connecting people and destinations on the east and west sides of I-5, since most passengers would be taken very far out of direction. A different service design would need to be developed. One possibility is that Route G could be broken into two routes, one that stays on the west side of the city and continues north into Basalt Creek, and the other that connects the east side to a terminus at or near Commerce Circle.

4. Demand-Response Services

Dial-a-Ride (DAR) is a door-to-door demand-response transportation service for passengers within the City of Wilsonville. People who are eligible based on the Americans with Disabilities Act (ADA) are given priority scheduling, but Wilsonville residents and workers of all ages are also welcome to utilize the Dial-a-Ride program. This Plan update does not recommend any substantial changes to the existing structure or delivery of SMART’s demand-response programs.

Background

SMART is required by the Americans with Disabilities Act (ADA) of 1990 to provide a paratransit service to persons who are unable to use fixed-route transit, as a complement to local (non-express) fixed-routes, in the places and at the times when local fixed-routes are operating.

SMART offers this complementary paratransit through its Dial-a-Ride program, which includes 4 separate service categories:

- ADA Complementary Paratransit.
- General Public. Provides in-town transportation for anyone under 60.
- Seniors. Provides in-town transportation for people ages 60 and older.
- Out-of-Town. Provides trips to destinations outside of the City of Wilsonville for ADA enrolled residents or people

	ADA	Senior	General Public	Out-of-Town
Eligibility	Limited to persons with disabilities, as determined by SMART’s Eligibility Committee.	Anyone age 60+.	Anyone.	Anyone enrolled in ADA, or anyone age 60+.
Cost	No fare.	No fare.	No fare.	\$3.00 per one-way trip.
Hours of Operation	All hours during which SMART fixed-route network operates.	M-F, 8:00 am - 5:00pm.	M-F, 8:00 am - 5:00pm.	M-F, 8:00 am - 5:00pm.
Trip purpose restrictions	None.	None.	None.	Medical appointments only.
Scheduling Principle	Priority.	Space-available basis.	Space-available basis.	Space-available basis.
% of SMART Demand-Response Ridership	54%	29%	<1%	16%

Figure 48: SMART Demand-Response Program Categories

age 60 or older, with a higher required fare payment and allowing a reservation be made further in advance.

Figure 48 summarizes the key attributes of each program category.

Minimum Required Paratransit Area

SMART is required by law to provide paratransit service within 3/4-mile of all local fixed-route lines (not stops), during times when fixed-route service is operating. Any time an agency makes major changes to routes, it is changing the area in which it must offer paratransit.

Figure 49 compares the required minimum paratransit service for the 2022 network and the proposed 2028 Network. The area that is 3/4 mile from local bus routes in both networks is shown in dark green; the light blue area would be added to the paratransit service area with the 2028 Network, while the light green area would drop out of the paratransit service area.

The blue area that would be newly included in the minimum required paratransit area is around the intersection of SW 14th and Tonkin Roads.

The green area that would no longer be within the paratransit service envelope covers the area outside of Wilsonville City limits, along Coffee Creek from Wheatland Drive and continuing about 1/3-mile south. This is mainly a natural area with only a few residents. In the review of April 2022 demand-response trips included in this Plan's Existing Conditions analysis, no demand-response trips began or ended

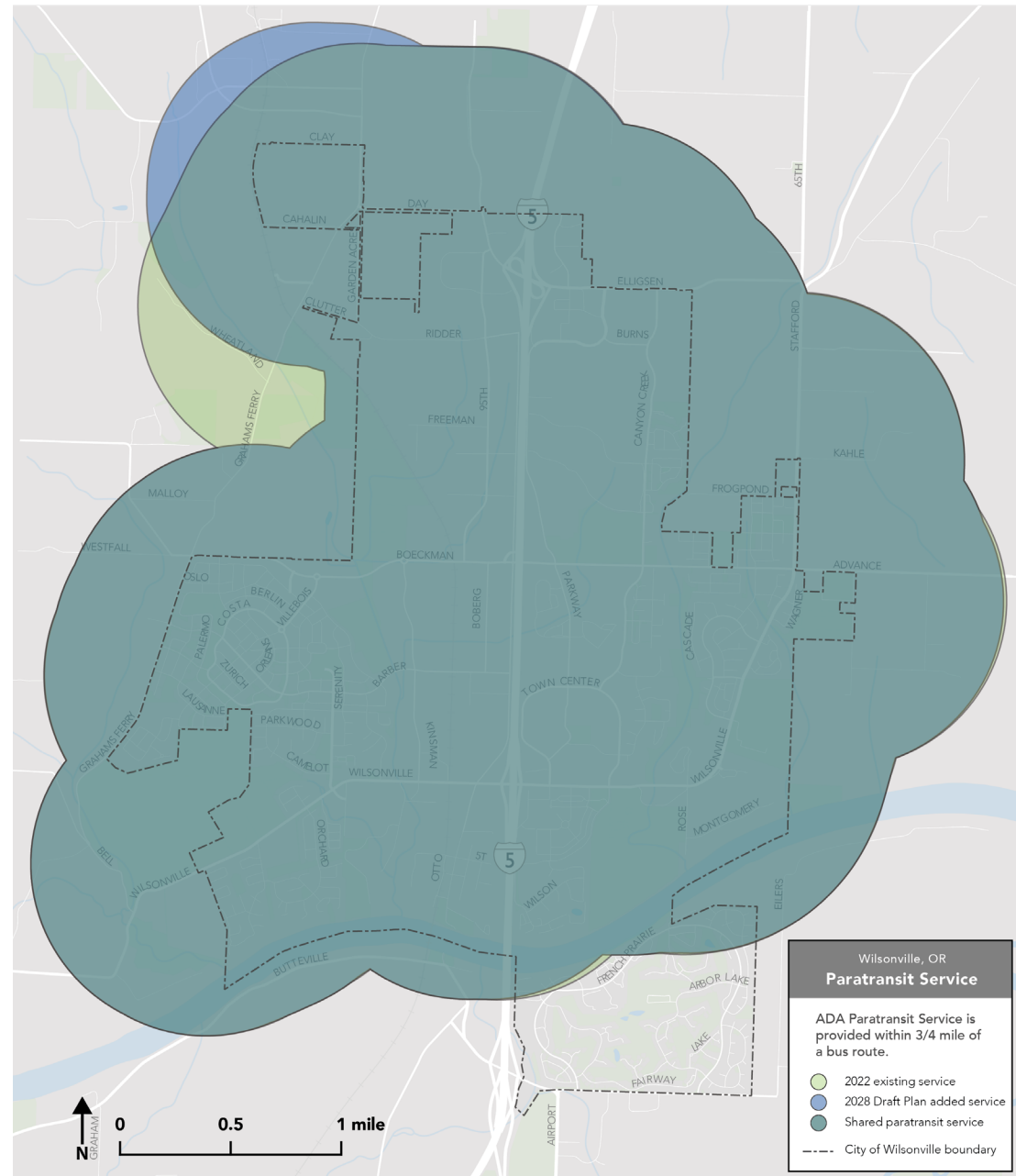


Figure 49: Required ADA Paratransit Areas for the 2022 and 2028 Networks

within this light green area.

“Express” Routes and Segments

Express routes, which generally have long distances between stops and travel long distances, do not trigger a paratransit requirement. This is also true of express segments of routes that may also have a local segment.

Because the 2028 Network is explicitly designed to integrate local and regional service, many routes have local segments and express segments. For example, Route D would be a local route along Wilsonville Road but would run express along Stafford Road from the City boundary (at Frog Pond) to Legacy Meridian Medical Center). SMART would not be required to provide paratransit service to residents within 3/4 mile of this segment of Stafford Road. As another example, the existing Route 2X has a local segment within Wilsonville and an express segment between Wilsonville and Tualatin.

SMART has an established practice for helping ADA paratransit passengers transfer to TriMet’s paratransit service if they are traveling between the two service areas. Regardless of the “express” or “local” nature of the routes connecting the SMART and TriMet service areas, which may change over time, SMART intends to continue facilitating paratransit transfers between them.

Required Paratransit Days and Times

Because ADA paratransit must be offered on the days and at the times when local fixed-routes are operating, the schedules of fixed-routes govern the minimum size and operating cost of the ADA paratransit program.

The actual size and shape of the paratransit service area can grow and shrink throughout a day or week, as the obligation to complement a fixed-route with paratransit begins when that fixed-route begins service, and ends when that fixed-route ends service.

For the purposes of the map shown on the previous page, the paratransit service area was defined using the maximum network in service in 2028, which would be the network offered at rush hours. The minimum paratransit area at nights or on weekends could be smaller, when fewer local fixed-routes would be operating.

A transit provider can define the paratransit service area with this degree of precision by time of day and day of week. Because paratransit has a very high operating cost per ride, there is a reasonable motivation for adhering strictly to the minimum required service area. However, most agencies find that it is both too frustrating for their ADA passengers and too complex for their staff to administer a

dynamically-changing paratransit service area throughout each day. More often, agencies define a small set paratransit areas, such as one for weekdays, one for Saturdays and one for Sundays. The span (hours) of paratransit in those areas must match the span of time from the earliest to the latest local fixed-route bus service.

The required span of paratransit service would change greatly within Wilsonville with the implementation of the 2028 Network, compared to the minimum requirement in 2022:

- On weekdays, the span of paratransit service would be required to increase by one hour at night (until 9 p.m).
- On Saturdays, the span would be required to increase by one hour at night (until 7 p.m.).
 - The minimum required paratransit area would also increase slightly.
- On Sundays, no paratransit is required or offered today. In the 2028 Network, the span would be 12 hours.
 - The minimum required area would be similar to what is required today on Saturdays, chiefly the places within 3/4 mile of Wilsonville Road and Canyon Creek Road.

Adding fixed-route and demand-response services on Sundays would require “turning on” the entire SMART operation for an additional day per week.

Recommended Paratransit Service Increases

The service increases described on the previous page are the minimum required by law in order to match paratransit availability to local fixed route availability.

In addition, we recommend that SMART be prepared to fund more paratransit capacity during times when paratransit is offered today, as growth in Wilsonville's population, and particularly its senior population, are likely to increase demand for the service.

Improved frequencies on SMART intercity fixed routes may also increase demand for paratransit as the intercity routes become more appealing and useful to customers with disabilities. Some of these customers may be able to use the intercity routes but unable to use a local route due to their disability and they will be entitled use paratransit for their local connection.

The cost estimates for service increases presented on [page X] include an assumed increase in SMART's paratransit (Dial-a-Ride) capacity at these times:

- A DAR vehicle and driver available two hours earlier and three hours later than DAR is currently offered on weekdays.
- One additional DAR vehicle and driver

in service during the 12 hours DAR is offered today, on weekdays.

- A DAR vehicle and driver available one hour earlier and one hour later than DAR is currently offered on Saturdays.
- One to two additional DAR vehicles and drivers in service during the times DAR is offered today, on Saturdays.
- One to two DAR vehicles and drivers available for 12 hours on Sundays (when no DAR or fixed route service is offered today).

These additions would sum to 117 additional hours when DAR vehicles and drivers are in service per week, over what is provided today. The actual labor hours for DAR drivers may be higher, depending on how efficiently work schedules can be created around the DAR and fixed route transit schedule.

These increases in paratransit service come with costs not only for direct operation of the vehicles and for employing drivers to provide service for those 117 hours a week, but also for dispatchers who communicate with customers and drivers; staff who supervise the service; and staff who maintain the vehicles.

5. Capital Infrastructure, Programs and Operations

Overview

This chapter provides an outline of key capital investments necessary to deliver the Transit Master Plan. There are three types of major investments that would be required:

- Transit Vehicles
- Maintenance
- Town Center Terminal Facility

In addition to these capital investments, there are ongoing operational needs – especially increases in personnel – that

would be required to implement and support the larger system described in this Plan. These operating and personnel needs are also summarized in this chapter.

The end of this chapter describes some of the existing SMART programs that will continue in the future, which support the City’s transportation-related goals and complement the transit services described in this Plan.

Transit Vehicles

Existing Fleet

As of 2022 (before temporary service reductions due to an operator shortage) there were 18 peak vehicles in revenue service, for fixed route and demand response services combined. **Figure 50** shows that the morning rush-hour pullout (18) is larger than the afternoon rush-hour (15). In the midday, 12-13 vehicles are in service. More than a quarter of the vehicles in service each day (five of 18) are required only for one or the other rush hour periods.

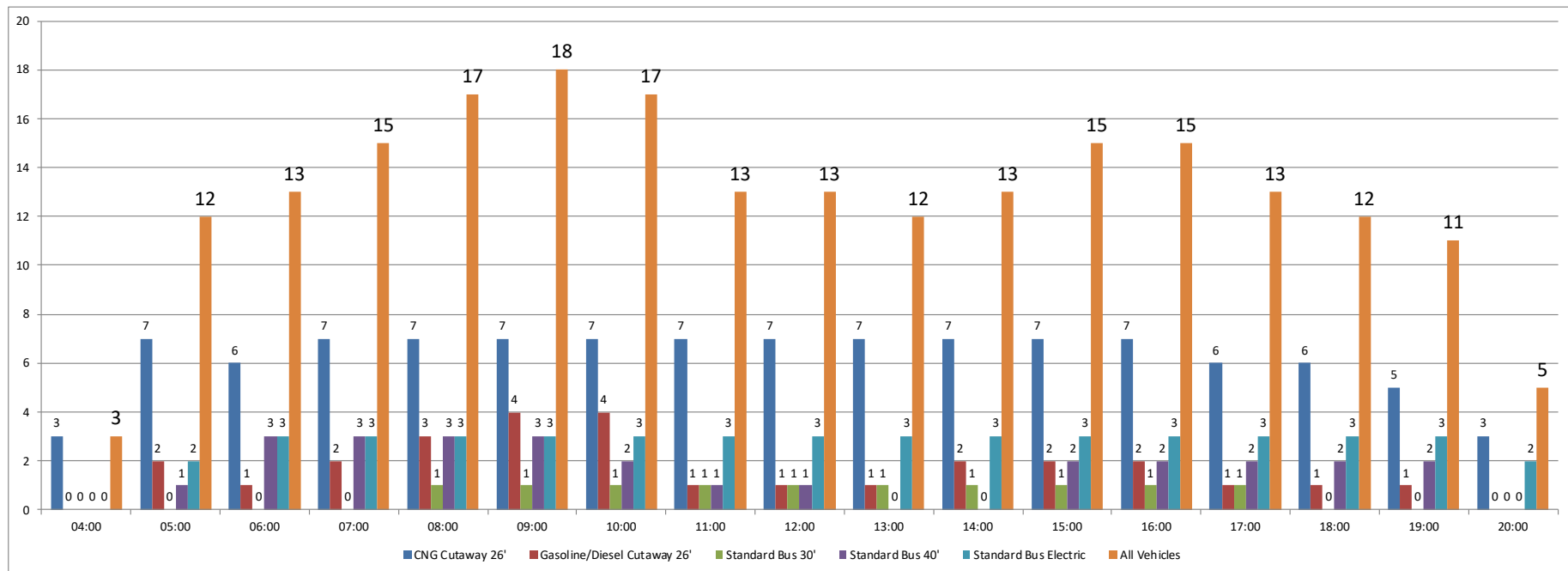


Figure 50: 2022 vehicle requirement by hour on weekdays. Orange bars represent all vehicle types, for both fixed route and Dial-a-Ride.

SMART uses five fuel types for revenue service: CNG, diesel, diesel/hybrid, gasoline, and electric. Most of the vehicles in service at most times of day are 26 foot long compressed natural gas (CNG) buses. They carry 21 seated passengers when the wheelchair positions are not in use, or 15 when both are deployed. Larger 30- and 40-foot buses are a mix of diesel, diesel hybrid, and electric.

Fixed-Route Vehicles

Growing the transit fleet is currently constrained by delayed delivery times for vehicles and parts from manufacturers. As a demonstration, at time of writing SMART is still waiting on delivery of three vehicles ordered before the pandemic.

Due to uncertainty in the transit vehicle supply chain over recent years, SMART has kept more spare vehicles than are required by regulation. However, even with those extra spare vehicles, growth in transit service would be constrained by fleet size (as well as a driver shortage).

The variety of bus types in the SMART fleet, and the fact that SMART has chosen to avoid relying on a single technology or fuel type, has allowed for flexibility while the supply chain is unreliable. For example, when a part needed to be replaced on an electric bus charging station in 2022, the charging station was out of service for 75 days. But transit service was not disrupted because SMART was able to deploy spare vehicles that did not require charging.

At time of writing, ridership has been and continues to be low since the Covid-19 pandemic. Crowding is not currently a recurring problem on any route, and so SMART has had the flexibility to assign buses with various seating capacity and fuel types to any route or type of service. Length of route or length of block (the amount of time a bus is out on the road, between visits to the garage) can inform the type of fuel or propulsion used by the vehicles – for example, if a bus can only run so many miles before needing a charge or a refueling, it may not be possible to use it on longer routes. This may be a limitation around which SMART needs to work in the future, especially with the longer routes included in the 2028 Network, but SMART has been able to manage this limitation without difficulty so far.

Prior to the Covid-19 pandemic, Routes 2X, 4, and 1X had the highest ridership and were therefore the most likely to become crowded and require or benefit from larger vehicles. Route 2X is currently using cut-aways, and Route 4 is using larger buses at rush hours and smaller vehicles outside of rush hours. Ridership on the 1X has not rebounded, for a variety of reasons: since the route was introduced, State workers in Salem offices have a hybrid-remote work schedule, car ownership and fuel costs are low, and parking cost and supply remain ample in Salem. Route 1X has therefore been operable with a 35-foot bus.

Thus with neither a requirement to put

larger buses on any routes due to crowding, nor a requirement to avoid putting certain buses on longer routes, SMART has had maximum flexibility in vehicle assignments in recent years. This could change between now and 2028 if ridership increases, and if SMART introduces longer (or slower) routes with more time between charging/fueling buses.

Demand-Response Vehicles

SMART's demand-response service uses four dedicated vehicles today and another four as spares. Eight additional vehicles used for regular fixed-route service are also used at times for demand-response. Ultimately, SMART staff intend to separate vehicle assignments to the fixed-route and demand-response modes for more transparency and easier reporting.

General Fleet Recommendations

The recommendations of this Plan, if implemented in full by 2028, would increase the peak vehicles in-service for both fixed routes and demand response to 23 (from 18 in 2022). In addition to the growth in the size of the fleet to accomplish the service increases shown in this Plan, SMART would need to add at least one spare vehicle, and continue to replace aging vehicles in the existing fleet.

Today, SMART operates compressed

natural gas (CNG), battery-electric buses (BEB), diesel-electric hybrid, gasoline, and diesel buses. SMART's goal is for its fleet to be free of diesel- or gasoline-powered vehicles by 2028. The diesel, gas and hybrid vehicles in the fleet will be used until the ends of their lives but they will not be replaced with the same types of vehicles.

The emergence of major economic, environmental, social, and other disruptive events outside of SMART's control will likely continue to create challenges to maintaining capital assets in the years to come. Although using multiple fuels (CNG, diesel, gasoline, electric) creates redundancy and flexibility for the agency, variety in a fleet typically also increases operational complexity. For example, if a route experiences crowding and only a subset of buses in the fleet are large enough to handle it, that subset of buses almost needs its own spare ratio to ensure that the route can reliably be assigned a large-enough bus. This has not been the case recently because there have not been pressures from either high ridership (crowding) or from route length (due to electrical charging), but as those constraints appear in the future the fleet variety may become a hindrance more than a help.

It may be worth exploring what has worked best over the past decade, consider what routes are likely to be changed or added in the next decade, and then narrow

down the variety of the SMART fleet to the fewest different types of vehicles that could reliably operate most of SMART's fixed-routes. This simplification of the fleet could be implemented slowly, as vehicles are replaced at the end of their useful lives. For example, if the decision is made to plan on delivering fixed-route services all with 30- to 35-foot buses in the future, SMART could continue reduce its spare parts inventory, minimize the amount of training for staff to stay current, and reduce its spare ratio over time. Unfortunately, an additional limitation on this decision is what types of vehicles can be purchased, as manufacturing is highly limited and wait times for new vehicles extremely long.

Bus Procurement

As SMART has diversified its fleet over the past decade, it has gained experience working through the trade-offs of purchasing, operating and maintaining different types of vehicles. Technology continues to advance in vehicles of all fuel and propulsion types. Many transit agencies around the country are transitioning to cleaner fuel types to reduce emissions, and as part of that transition there are costs beyond vehicle price that must be clearly understood. Considering start up investments, maintenance, and how the operating environment might affect the stated lifespan of a vehicle are key to understanding the true cost.

SMART should focus on its own goals in order to prioritize the most important features of a bus. Environmental impact, fuel efficiency, operating and staffing resources needed, driver and customer comfort, space needs, and capital infrastructure needs are all important considerations.

Because bus propulsion technology has changed so rapidly in the past 20 years, many of the currently-available data about fuel efficiency, emissions reductions, and costs (operating, maintenance, capital, total) are conflicting. Published studies from the U.S. Department of Energy and transit agencies around the country over the past 15 years show a wide range of outcomes across a variety of metrics and vehicle fuel types. Some information about lifecycle costs and maintenance challenges is still evolving, as new vehicle technologies remain on the roads for enough years to be well-understood by transit agencies. SMART already has years of experience purchasing and maintaining alternative-fueled vehicles. The Wilsonville fleet manager, as well as fleet managers at peer agencies in Oregon, will be key people to rely on for knowledge about how emerging and improving technologies have worked in the recent past.

SMART aims to replace diesel, diesel hybrid, electric and CNG vehicles over the next five years. Here is some guidance to consider during future vehicle purchases.

Compressed Natural Gas (CNG)

CNG-powered buses can reduce emissions by up to 90 percent compared to diesel-powered buses. CNG buses may also provide lower operational costs per mile compared to diesel buses and fuel costs can be much lower. CNG requires significant initial investments in fueling infrastructure and upgrades to maintenance facilities, such as natural gas detectors and ventilation systems, but SMART already has what it needs and can accommodate growth in this equipment in its maintenance yard.

SMART has experience maintaining diesel-hybrid buses, which will not be replaced as they come to the ends of their useful lives. CNG vehicles have been found to have higher or lower maintenance costs than diesel-hybrids, depending on the study.

Range between refueling: Around 220 miles

Battery Electric Buses (BEB)

Electric buses operate solely on electric power from a lithium-ion battery pack. Charging can occur either at route termini or on-route. Currently, all SMART charging occurs at the maintenance yard. Electric buses can be zero-emissions (depending on the source of the electricity) and their fueling costs depend on electricity costs. Both carbon emissions and costs from electricity have been lower in the Pacific

Northwest than in other parts of the U.S. due to our abundant hydro power.

Despite recent improvements in battery capacity, electric buses have shorter ranges than diesel or gasoline vehicles. And despite improvements in charging speeds, electric buses generally still require more time to reach a full charge than diesel vehicles require to refuel. Vehicle ranges and vehicle charging/refueling time can affect the design and efficiency of routes, or constrain which vehicles can operate which routes. Deployment of electric buses therefore requires careful consideration of charging needs, route lengths and speeds, and operating conditions including weather. Air conditioning and heating can reduce an electric bus' battery span by as much as 30%.

SMART will soon have four charging stations at the maintenance yard. Technology continues to evolve with electric buses and charging capabilities, but many agencies have found that the limited range between charges has caused an increase in the number of buses and operators needed to provide the same level of service, compared to the number of vehicles previously required with other fuel types. Though we can imagine a role for electric buses in the SMART fleet, growing this type of fuel system at SMART will require a realistic look at the implied operating and capital cost increases over the life of the vehicle.

Electric cutaway vehicles are less tested

than full-sized electric transit buses. Though smaller vehicles have now been Altoona tested and FTA approved, there is far less peer experience and fewer long-term takeaways that SMART can use to make educated decisions for bus purchases. In addition, some important features such as easy and fast wheelchair boarding may be compromised in electric cutaway buses. In the coming years, it will be best to keep any electric bus purchases to more standard 35- and 40-foot buses that have more vendor support and that require SMART to stock fewer unique parts and supplies for maintenance.

Range between charges: 70 – 300 miles between depot charges

Hydrogen Fuel Cell

Hydrogen fuel cell electric buses (FCEBs) are hybrid vehicles powered by hydrogen fuel cells and an electric battery, providing flexibility to be deployed on longer routes. FCEBs can be zero-emission (depending on the energy source for the creation of the hydrogen fuel) and have a better fuel economy compared to conventional buses. However, fueling costs are high for hydrogen and it is not yet readily available as a vehicle fuel. Transitioning to FCEBs would therefore require investments in new fueling infrastructure and updates to SMART's maintenance yard.

SMART does not currently have any FCEBs and they are not currently recommended for SMART, based on the size of the

agency, the amount and type of service operated, and considering the other types of vehicles available in the fleet.

Range between refueling: Typically between 200 and 325 miles

Fleet to Support 2028 Service

As noted above, the number of vehicles required at peak times in-service would increase by 5 with implementation of this Plan. As SMART continues following its existing fleet replacement plan, these additional acquisitions will need to be accounted for.

The question arises what types of vehicles to add to maintain some flexibility in the fleet (with regards to route assignment); resilience in case of disruptions to fuels, supplies or parts; and to meet SMART's goal of phasing-out all gas and diesel vehicles by 2028. Major delays in the manufacture of vehicles also need to be taken into account.

Vehicle Type Considerations

This Plan calls for services in 2028 that would require an increase of 5 peak in-service buses, going from the 18 buses that were required to operate maximum fixed route and DAR service in 2021, to 23 buses

required in 2028. During the peak in fixed route operations (6-9 a.m. and 4-8 p.m.) 19 vehicles would be needed to operate fixed routes. During the peak in DAR operations (11 a.m. to 3 p.m.) 7 vehicles would be needed to operate DAR.

Some vehicles could perform both functions, if they are suitable for both. However:

- A vehicle that provides DAR may be too small to handle the passenger load on a fixed route (especially if it passes a school).
- A vehicle that is large enough to support a fixed route's passenger loads may be too small to drive down and turn around on every residential street in the city, in order to provide the door-to-door service required for some DAR customers with disabilities.

Every size and type of vehicle are not available with every fuel type, and not with the same quality of design, comfort for passengers, reliability and availability for purchase.

Given the types of services the SMART fleet would need to operate in 2028 according to this Plan, we recommend that buses purchased primarily to operate fixed routes be battery-electric (BEBs), and that buses purchased primarily to operate Dial-a-Ride service or very low-ridership fixed routes be CNG.

Vehicle Fuel Type Recommendations

For fixed routes, we recommend that SMART purchase the largest vehicles that will be needed to accommodate potential passenger loads and wheelchair boardings per trip.

Understanding that today ridership is very low, it is possible and likely that it will increase by 2028.

The investments recommended on inter-city routes will increase their usefulness and therefore are likely to increase their ridership.

Fixed routes that pass by middle and high schools can experience high passenger loads twice a day, and if a too-small vehicle is assigned to the route it can cause passengers to be left behind at stops, or force SMART to deploy a second bus and driver during that period.

For long fixed routes, especially those traveling on I-5 and I-205, it is valuable for comfort and safety that all passengers have seats.

Wheelchair boardings are faster and more comfortable on some bus designs than on others. In general, larger and low-floor vehicles offer a better wheelchair loading and unloading experience than smaller and high-floor vehicles. However, the quality and reliability of designs for smaller

vehicles may improve in this regard in future years.

For all of these reasons, SMART should err on the side of procuring larger rather than smaller fixed route vehicles.

Battery Electric or Compressed Natural Gas Vehicles

Large fixed route vehicles, 35- or 40 feet long, are available with Battery Electric (BEB) or Compressed Natural Gas (CNG) propulsion. (SMART's 35' and 40' buses are currently a mix of BEB, diesel and diesel-hybrid.) BEBs are appealing given their potential for lower carbon impacts, depending on the source of the electricity that powers them (which in the Pacific Northwest consists partly of hydropower and is therefore relatively low in carbon emissions).

However, BEBs increase operational complexity. The increase in peak vehicle requirement for implementing the 2028 recommended services was calculated based on needed layover time for driver breaks and reliability, but no additional layover time for battery charging or for deadheading buses to a site where the battery can be charged. The current rule-of-thumb among transportation planners and schedulers working on fleet electrification is that a purely BEB fleet would need to be 20-50% larger than a fleet using diesel, gas or CNG, because of the added cycle time and deadhead (time spent

driving to and from the maintenance yard, without passengers) required for charging.

The 2028 fixed routes as described in this Plan include some schedule inefficiencies, meaning extra time that the vehicle is not on the road, in excess of the time needed for the driver's break and as padding to protect reliability. There are multiple ways this extra time can be used in scheduling:

- It can allow for the route to arrive a little earlier or later in order to make a timed connection with another route.
- It can be used for driver meal breaks or driver shift changes.
- It can be eliminated by interlining multiple routes which have extra time, so as to require one fewer buses over the set of interlined routes.
- It can be used to charge BEBs.

With an increase in BEBs in the SMART fleet, more of this extra time will be needed for charging. Overall, with a large enough increase in BEBs within the fleet, SMART should expect a related increase in its peak fleet requirement.

For routes on which BEBs would replace standard diesel or diesel-hybrid buses, an iterative planning-scheduling step should be taken before detailed scheduling is performed and a final vehicle requirement is calculated. In that process schedulers would identify inefficiencies caused by the need to charge vehicles between trips.

Planners would identify available charging locations and charging locations that are not available but that would decrease deadhead time to charge. Fast on-route charging might be considered as an alternative, representing an increased capital expense but a decreased operating

Depending on the location and availability of chargers, the lengths of routes, and the speeds of routes, this planning-scheduling exercise might result in a higher vehicle requirement than we have estimated in this Plan. It could also contribute to longer-range planning to invest in on-route charging, rather than at the SMART maintenance yard, for example at the recommended Town Center terminal facility where some routes are recommended to terminate.

Additional factors can affect the time and distance that BEBs can be driven between charges. One of the biggest factors is hills, which are not a major issue in the Wilsonville or north valley topography. Weather, heating and air conditioning use, the age of the battery, and operating conditions could all affect the peak fleet requirement if the proportion of BEBs are increased in the fleet.

We also recommend that SMART not eliminate the possibility purchasing large CNG vehicles for its fixed routes. While CNG vehicles have a higher carbon impact than BEBs, they are simpler to operate and do not increase the overall required fleet size as BEBs do. There are also

unanswered questions about the durability and environmental sustainability of the batteries that power BEBs, which may be better understood in the coming years as widespread global use of electric vehicles puts pressure on battery manufacturing and disposal. The lifecycle durability and environmental impacts of CNG buses, on the other hand, are well-understood as they have been in use for thirty years.

Compressed Natural Gas Vehicles

Local DAR vehicles can be smaller than most fixed route vehicles. This is because only a few passengers' trips can be delivered by one vehicle in an hour while still being reasonably direct for the passengers. Thus DAR vehicles rarely need to fit more than a few passengers.

40' and 35' BEBs have a longer track-record and a more robust market in the United States compared to 30' and smaller BEBs, which are new to the market. Purchasing smaller BEB vehicles for its DAR service would put SMART in the position of being a "guinea pig" for a relatively new and complex product.

Smaller CNG transit vehicles are available with better designs and a longer track record than small BEB vehicles. Therefore while we recommend BEBs for larger fixed route vehicles, we do not recommend them for the small vehicles that can be used (or are in some cases required) for DAR.

SMART has been using CNG propulsion as well as diesel and gasoline propulsion for smaller DAR vehicles (mostly 26' "cut-aways," which are high-floor buses built on a truck chassis). We recommend that SMART continue to use CNG for smaller vehicles rather than BEB. These new, small CNG vehicles are likely to be used mostly on DAR but could also be used on low-ridership fixed routes or on certain fixed routes at times of day when ridership (and wheelchair boardings) are reliably low.

By 2028, the market for smaller BEBs may be more established, and the appropriateness of then-available small BEB transit vehicles, either on lower-ridership fixed routes or DAR, can be reevaluated.

Current Vehicle Prices

The most recent vehicle cost estimates available in the Pacific Northwest are from the State of Washington price agreement which applied through March 2023. The table in **Figure 51** gives average prices for each size and fuel category, plus 10% for contract and delivery related costs.

These prices are only valid through the end of March 2023, and prices are likely to increase in the next State price agreement. (The State of Oregon offers similar guidance on prices, but it dates to 2020.) Actual purchase prices will depend on contract terms, timing of the purchase and the specifications of the vehicle.

For smaller buses (such as 26' long),

appropriate to SMART's DAR service and low-ridership fixed routes, the State of Oregon has negotiated a base price range \$107,990 to \$181,129 depending on the fuel type. The lowest-cost options in this size are diesel, and so SMART should expect to pay higher prices for CNG.

The state of Oregon offers a [Transit Vehicle Lifecycle Cost Analysis Tool](#), developed by the Oregon Department of Energy, the Department of Environmental Quality, and Zero Emission Vehicle Interagency Working Group, to help agencies predict the total life cost of a vehicle by fuel type and operating conditions. The tool is focused on 35- and 40-foot buses. SMART could use this tool to tailor inputs such as fully burdened labor costs, inflation rate, fuel costs, annual vehicle miles traveled per bus, infrastructure, and operations and maintenance inputs. However, SMART already has experience purchasing, operating and maintaining both BEB and CNG vehicles, and may find its own local

Length	CNG	BEB
30'	\$467,047	\$524,305
35'	\$547,904	\$680,397
40'	\$614,277	\$878,567

Average prices for heavy- and medium-duty buses in each length category, plus 10% for delivery and other small charges, taken from the Washington State vehicle price agreement, which is valid through March 2023.

Figure 51: Sample prices for CNG and BEB vehicles.

data and experience to be as good a basis for future planning as any statewide tool.

Vehicle Delivery Delays

Price is but one barrier to procuring new buses. Wait times are, at time of writing, a bigger barrier. Some types and sizes of buses are in very short supply due to the shuttering of some manufacturers, consolidation of others, and supply chain disruptions. Transit agencies are waiting years to take delivery of ordered vehicles.

This is one of the reasons that SMART has kept some of its older vehicles in operation longer, and kept a diverse fleet in terms of fuel and body types. With so much uncertainty about how long it will take to procure replacement vehicles, it is important that SMART keep in its fleet vehicles that can operate its longest routes reliably and efficiently, and that can handle its peak passenger loads comfortably. This may result in some older, diesel, or diesel-hybrid vehicles being kept in the fleet for longer than they otherwise would given SMART's goal of having a 100% alternative-fueled fleet by 2028.

Given that SMART is likely to maintain some diesel and diesel-hybrid vehicles in its fleet for additional years, it may be worth considering using renewable diesel to fuel those vehicles.

Charging Infrastructure

SMART needs one electrical charger per BEB vehicle, as all BEB vehicles are currently charged overnight. SMART also needs a spare charger, as the chargers occasionally go out of service or require maintenance.

SMART currently has three chargers installed in its maintenance yard and will install a fourth in 2023 at the cost of approximately \$80,000. This will meet the minimum requirement for charging the three BEBs currently in SMART's fleet.

The cost of installing chargers depends greatly on the state of the electrical system to which the charger is connected. If a new transformer is required then the cost for electrical upgrades can be many times the cost of the charger itself. For the 2023 installation, the electrical system is already up to standards. Future installations in the maintenance yard may require additional electrical work and therefore cost more than \$80,000.

In the future SMART can consider the addition of one or more fast chargers. Fast chargers are used on routes so that BEB buses running long routes do not necessarily have to return to the maintenance yard to be charged during the day. The recommended Town Center terminal facility is a place where a fast charger could be

installed to support electric operations of Routes D, E and F, which are not designed to serve the west side Transit Center adjacent to the maintenance yard.

Fast chargers themselves currently cost between \$65,000 and \$150,000, depending on the number of vehicles to be charged. However the electrical upgrades necessary to install any charger at a new facility would be considerable, likely far more than the cost of the fast charger itself. Fast chargers can also be installed at depots to allow for a higher ratio of buses-to-chargers and this may be worth considering in the design of SMART's expanded maintenance yard.

Administrative Investments

The improvements in the 2028 Network will require a set of accompanying changes to SMART's operation, maintenance and administration.

Longer Spans of Service

The increase in service proposed in this Plan would obviously trigger a need for more fixed-route and Dial-a-Ride bus drivers. This relates to the increase in the amount of fixed route and Dial-a-Ride service offered on all days, but it also specifically relates to early morning and later evening service:

- While the first and last fixed route bus in service would not be earlier or later than today, there would be many more buses on the road earlier.
- The Dial-a-Ride service day would be longer by 2 hours in the morning and 3 hours in the evening on weekdays (and one hour in the morning and one in the evening on Saturdays). This would be required because the fixed route service provided at that times would be “local” rather than “express” and would therefore require paratransit.
- The early morning and later evening service increases would trigger a need for additional supervisor hours at those times, on weekdays as well as Saturdays.
- A Dial-a-Ride dispatcher would be required for 4 additional hours of the day on weekdays, 13 additional hours on Saturdays.
- At least one supervisor and one dispatcher would be required on Sundays as well.

With the increases in span of service, the increases in quantity of service (and therefore drivers and vehicles on the road), and the additional of Sundays, the recommended 2028 service would trigger the need for:

- As many as 123 new supervisor hours per week.

- As many as 44 new Dial-a-Ride dispatcher hours per week.
- A full-time (40 hours per week) customer service staff person.
- A full-time (40 hour per week) maintenance staff person. (In fact, any increase in service at all, let alone an increase to the level of the 2028 recommendation, will trigger the need for an additional maintenance staff person.)

Operations Personnel

Adding more fixed route and Dial-a-Ride service on weekdays would not only require more drivers, it would increase the daytime work load for operations staff such as supervisors and dispatchers.

It would also lengthen the operating work day, adding hours to shifts in the mornings and evenings, as the fixed route and Dial-a-Ride spans of service would get longer.

A major increase in staffing would be required on weekends, when both fixed route and Dial-a-Ride increases would trigger additional weekend shifts for staff and a larger team of staff in total.

In addition, the work of administering, managing and communicating about SMART service will increase as the size and usefulness of the system increases.

Administrative Personnel & Facility

With a nearly two-fold increase in fixed route service (as shown in the table on page 44), and with further increases in DAR service, SMART will need to grow its administrative team.

Administrative personnel support passengers, service and operations by providing planning, marketing, financial management, staff management, procurement, and more.

With growth of the administrative team, more space will be needed for their work, both office spaces and flexible space such as training rooms. The SMART administrative facility is currently at capacity so an expansion would be needed in order to provide space for this growth.

Maintenance Personnel

The planned increase in service hours, service miles and peak vehicles will require additional maintenance staff and supporting equipment, supplies and infrastructure.

The staff who maintain SMART vehicles work on all City of Wilsonville vehicles. There are four mechanics who work Monday through Friday in five 8-hour shifts.

These maintenance staff are at capacity today. Hiring and retaining mechanics has been a challenge, similar to the nationwide and local challenge of hiring and retaining transit operators. SMART currently has an

open position listed for a maintenance service worker. If filled, that will help provide currently-needed maintenance capacity.

The service increases described in this Plan would modestly increase the size of the fleet, which on its own would trigger a need for more maintenance staff, and may also trigger increases in required equipment, storage space, supplies and other infrastructure that supports maintenance. However, the service increases described in this Plan would greatly increase mileage and hours per vehicle, which would trigger more frequent preventative and reactionary maintenance per vehicle and would also increase needed maintenance capacity.

Additional maintenance staff would be needed to support the larger fleet and the greater wear-and-tear on the fleet. Those positions would be:

- Maintenance Hostler
- Equipment Mechanic
- Shop Foreperson

These positions cannot be added smoothly, one hour at a time, as service increases are implemented. The need for an additional full- or part-time position may be triggered by a small increase in service.

Regional Customer Service Center

SMART is currently in the planning stages of developing a regional customer service center that will handle customer service requests across multiple south metro transit providers. When the regional customer service center opens at the earliest in 2025, SMART will need to add more staff to operate the customer service center. The service increases recommended for 2028 would also trigger a need for additional customer service staff. The addition will relieve SMART's current dispatchers to focus solely on dial-a-ride scheduling and not general customer service as well.

An associated project, a trip planning tool at rideclackamas.org, will be connected to the regional customer service center and maintained by the same agency partners. It will provide one-stop-shop for information about service, fares, rules and trip planning for all of the small Clackamas County transit providers.

Maintenance Yard

SMART’s fleet and administrative facility was built in 2012 to match the funding available at the time. It is near the Wilsonville Transit Center.

Planning is underway to improve the circulation for fueling, vehicle storage, and system growth in general. There is enough land to expand bus storage by about 40%, which is sufficient to accommodate the service increases and fixed-route peak fleet increase proposed by this Plan.

In the yard, there are currently three chargers for the electric buses. A fourth charger will be installed in FY 2023.

In addition, the administrative building will need to be evaluated for space and potential expansion as personnel and service expands.

Preliminary design and cost estimates for the maintenance yard expansion are currently in development and expected to be complete in 2023.

Technology and Public Information

SMART staff are satisfied with most of the software used on-board transit vehicles, as well as software for operations and planning. SMART uses the vendor GMV for automatic vehicle locators (AVL), automatic

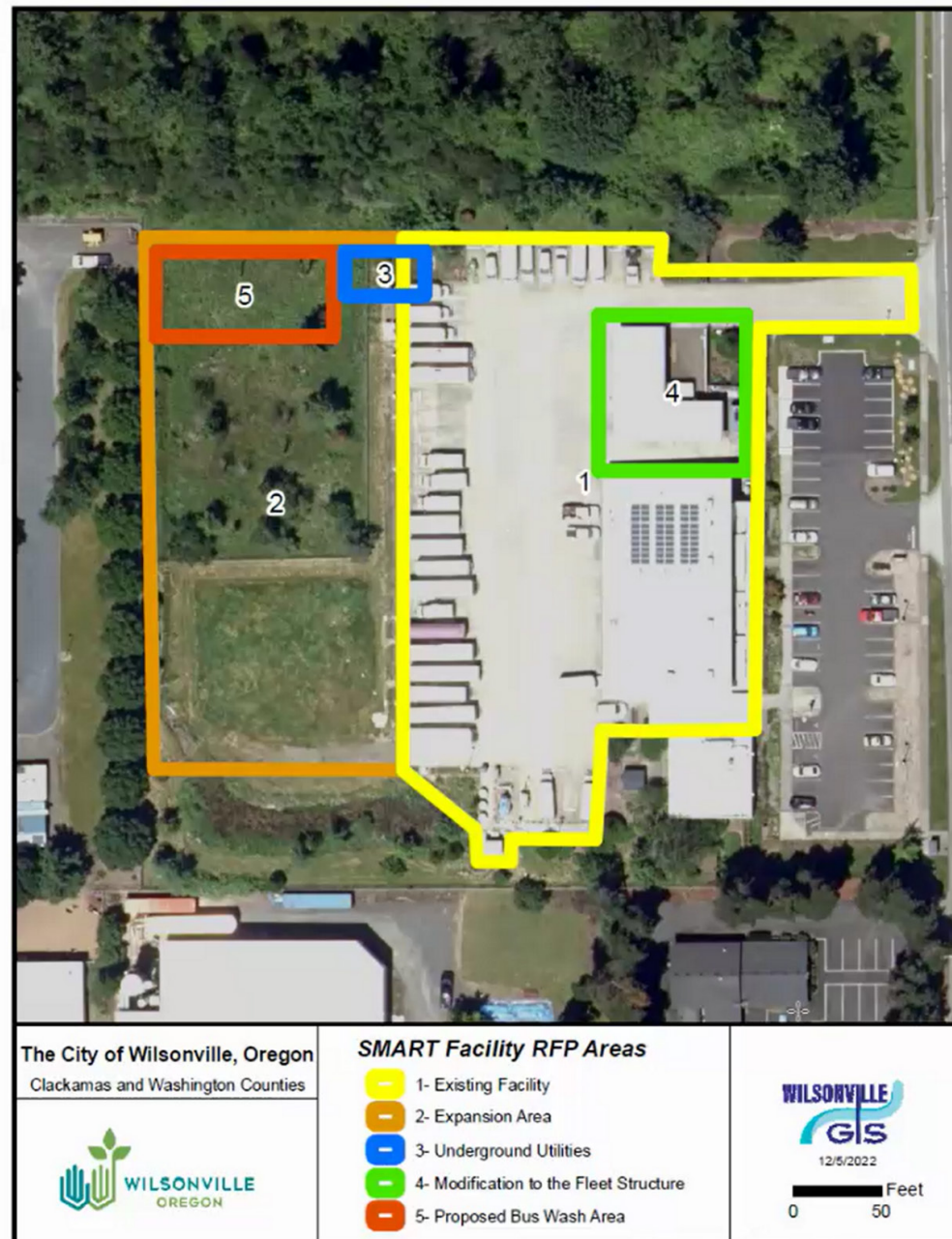


Figure 52: SMART Maintenance Yard Future Site Plan

passenger counters (APC) and mobile data terminals (MDT) on buses. GMV also provides real-time bus arrival information and can be used for booking subscription riders, paratransit dispatching, and driver logs. Staff use Optibus for fixed-route scheduling and mapping.

SMART is ordering digital displays to provide next bus information at the busiest bus stops. SMART also plans to replace its on-board surveillance system.

Real Time Bus Tracking

SMART currently has a bus tracking app, mySMARTbus, which is available to download for free from the Apple Store or Google Play. Real time bus information is also accessible on the [mySMARTbus](#) website.

Most smartphone users rely on navigation apps to provide them with information when they travel or move to a new city, such as Google Maps, Apple Maps, Transit App or Moovit. In the future, we recommend that SMART focus on providing reliable open data on its services via GTFS and GTFS-realtime feeds, so that people do not need to discover and download an additional app to find transit information.

Small Terminal Facility in Town Center

The 2028 network in this Plan includes two routes (E and G) that would have one terminus in the Town Center east of I-5 (Route E's other end would be in Keizer, and Route G's other end would be in Villebois). Routes A, B, D and F would pass through the Town Center. This area is shown in the excerpted map of the 2028 network in **Figure 53**.

The area marked on the map in **Figure 53** with a "T", representing the place where Routes E and G would end and other routes would pass through, is approximately at the intersection of Park Place and Courtside Drive. It is a 1.5 mile walk from the existing Transit Center / WES station on the west side of I-5.

Plans for a pedestrian and bicycle bridge over I-5 would shorten the walk from the Town Center to the west side Transit Center to a little less than one mile. SMART also plans to offer a small autonomous shuttle vehicle over the pedestrian bridge to help those who have difficulty walking connect between the Town Center and the west side transit center. However, engineering and construction of the pedestrian bridge are unfunded and it may not be built for years to come.

Normally a transit agency would not want two transit centers so close to one another.

However, the severely divided nature of Wilsonville – with I-5 acting as a barrier between the two sides of the city – makes it an unusual case in which transit centers that allow routes to terminate, and passengers to transfer, on either side of the barrier could make the transit network simpler and more reliable.

The purpose of this small east side facility would be to:

- Eliminate the obligatory passage of all buses under I-5 on Wilsonville Road, regardless of whether that movement is useful to passengers, simply because they need to reach the Wilsonville Transit Center. Wilsonville Road at I-5 is extremely congested and causes delay.
- Make the Wilsonville Road route (currently called Route 4, or proposed

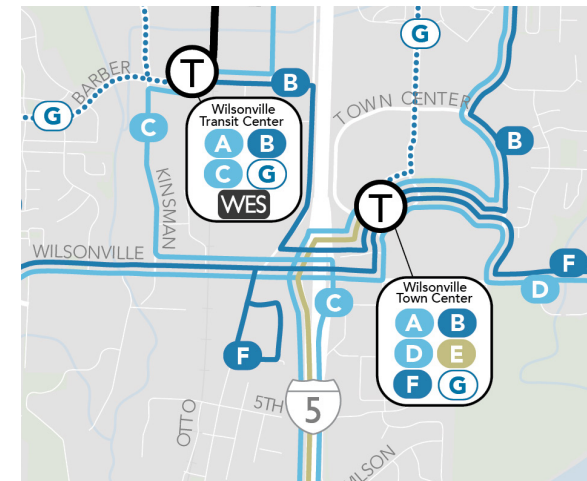


Figure 53: Central Wilsonville excerpt of the 2028 Network Map

Routes D and F in this Plan) more direct by replacing the time-consuming deviation to the west side Transit Center with a smaller deviation onto Park Place. Wilsonville Road travelers bound for places in north Wilsonville, Tualatin or Tigard could transfer to Routes G or B at the Town Center.

- Provide shelters and seating where passengers can transfer from a local bus trip to a regional bus trip.
- Create a terminus for certain routes where bus drivers could take breaks, and passengers could make transfers.

Site Guidelines

While the precise site can be determined in a later process, the appropriate site should be:

- On or very close to Wilsonville Road, to minimize out-of-direction travel for passengers using the Wilsonville Road bus route.
 - The ideal, unconstrained location would in fact be on Wilsonville Road itself, between Memorial Drive and Town Center Loop W. This would allow all bus routes to be as linear as possible while still connecting. However, it seems unlikely that the City of Wilsonville would be able to dedicate the necessary amount of road width to laying-over buses, sidewalk

width for passenger shelters, and adjacent land for the operator facility. The second-best location, in terms of route directness, is along Park Place or Courtside Drive, where more land is currently used as surface parking and where curb lines are planned to change anyway.

- In the middle of the Town Center, to minimize walking distances to people and destinations in every direction.
- Not directly adjacent to I-5 (such as on Town Center Loop W), for two reasons:
 - To maximize the number of destinations within walking distance (the freeway acting as both a barrier

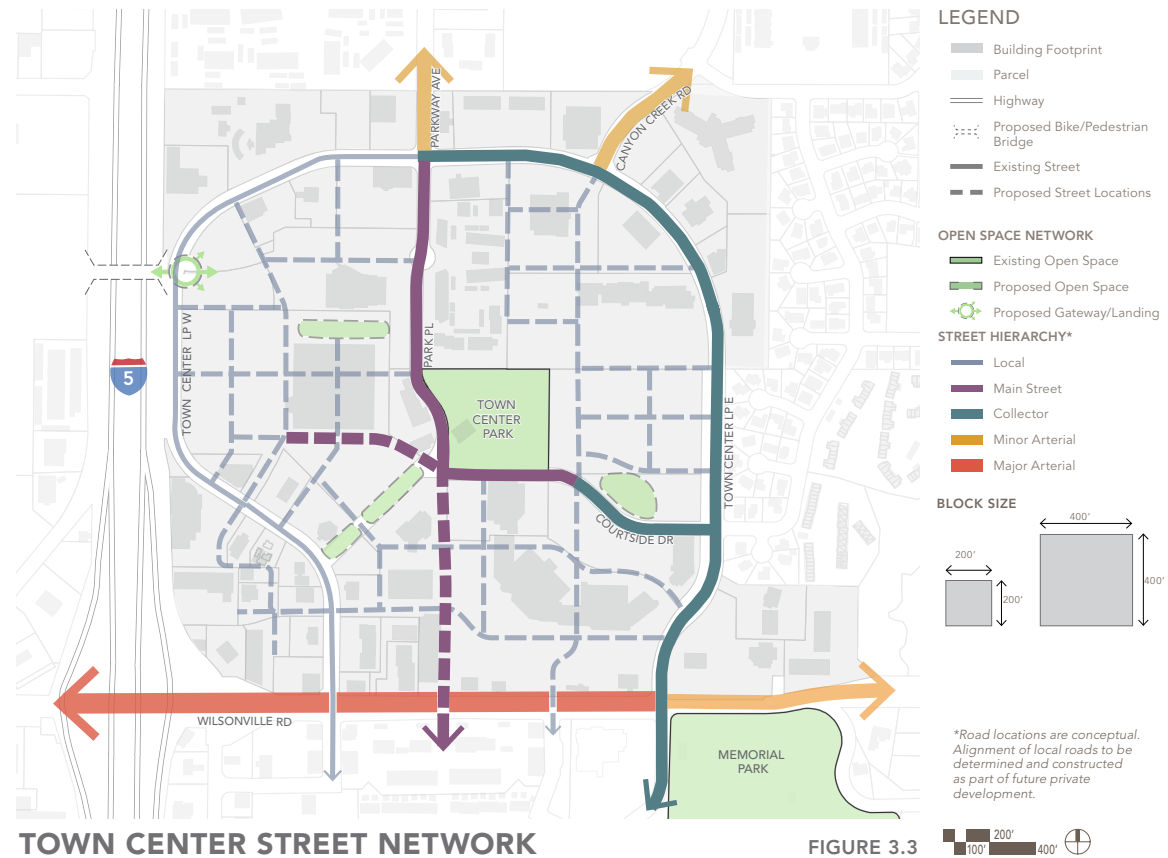


Figure 54: Planned Street Network from the City of Wilsonville’s Town Center Plan 2021

and an empty area in a bus stop's walkshed) and

- o To avoid duplicating service provided to the west side of I-5. (Once a pedestrian bridge is added over the freeway, the west side of the Town Center will be walking distance from SW Boones Ferry Road).

Many changes to the Town Center are contemplated by the City's Town Center Plan, last updated in 2021 (the planned street network is shown in **Figure 54**). The implementation of that plan should take into account the need for a small bus route terminus in the Center, and the guidelines given above for choosing its precise location.

Two Centers

The names of the existing (west side) and new (east side) transit centers should be carefully considered.

- "Wilsonville Transit Center" and "Wilsonville Town Center" are easy to misread at a glance, and have the same abbreviation.
- "SMART Central Station," is the old name for what is now called the Transit Center, but it is not very "Central."
- The "Station" refers to WES, but the future of WES is uncertain, so a long-lasting name should not depend on it.

- If there are two places in a city that an ordinary person would describe as "transit centers" then neither should be given the name "Wilsonville Transit Center" as it fails to differentiate them.

For now, in planning work, we suggest distinguishing the two facilities by referring to their respective locations, on the west and east sides of the city.

Where in the Town Center?

The best location for this site would be either on Wilsonville Road, just south of the Town Center, or along the street currently known as Park Place. (The hypothetical site has been marked along Park Place on maps of the 2028 network.) The site would be small, just large enough for a few routes to terminate and for a modular break room.

If the site is off-street, the needed infrastructure and bus movements could be accommodated in a site as small as 10'x32'. If the site is on-street, then linear space in the right-of-way would be used to lay-over (park) buses, while a smaller space outside of the right-of-way would be needed for the modular break room only.

Consideration for how operators would access the locked facility, and whether and how any operator reliefs (with one operator replacing another on the same route/vehicle) would happen there, should also be a part of the planning and costing process.

Off-Street Facility Near Park Place & Courtside Drive

If the site is off street, along Park Place or Courtside Drive (shown on the next page in **Figure 55**) then the bus stops on those two streets could mostly remain in place.

The off-street site would need to be configured so that two buses could occupy it at the same time, and pass one another if necessary. The layover spaces for the two buses would be close to the operator break room. The buses would need to be able to turn around on the site, and exit in either direction (since Route G

heads north, and Route E heads south). A drawing of an example bus turn-around and layover area is shown in **Figure 56**, drawn for a site that is approximately 350 feet long (including the driveway at the top of the drawing) by 140 feet wide.

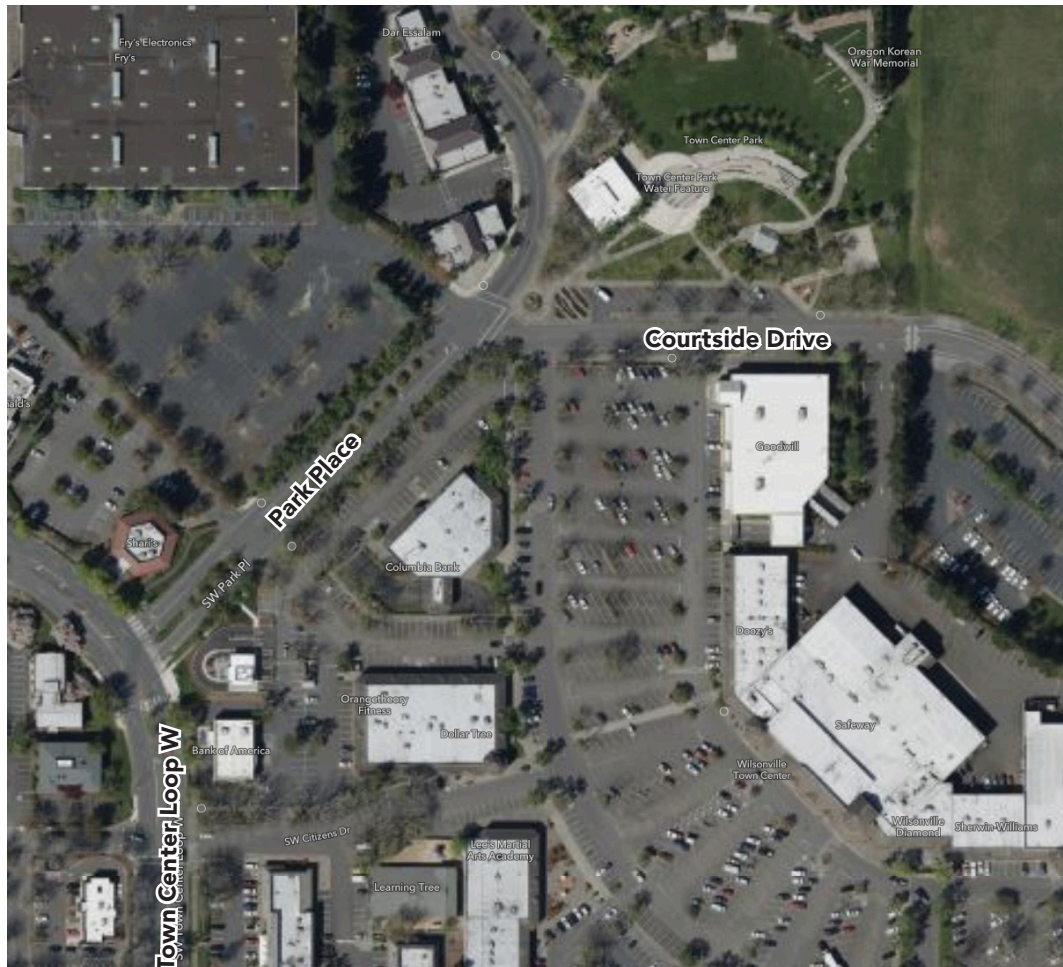


Figure 55: Potential Area for an East Side Terminal Facility in the Town Center

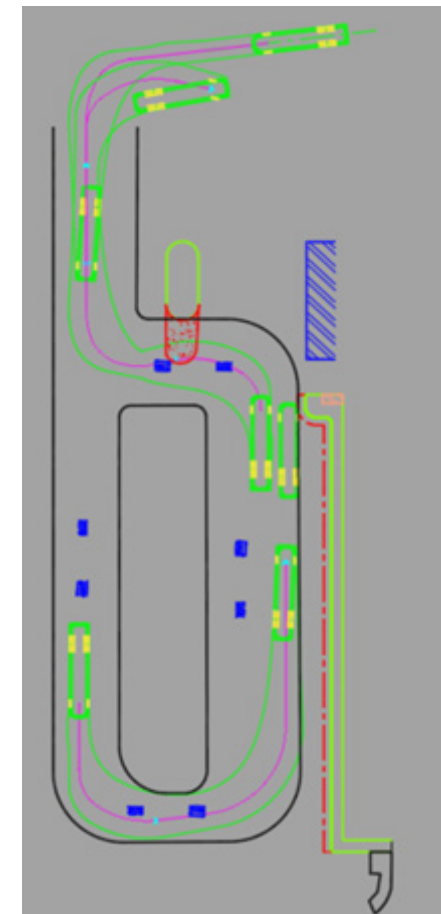


Figure 56: Bus circulation allowing for turn-around and layover in an example off-street terminal site.

For an off-street site in this area, the existing on-street bus stops could be maintained as the places where passengers would board and alight from buses, rather than in the terminal facility itself.

- Route A, B, D and F buses would run through and make stops on Park Place/Courtside Drive, and would not enter the facility at all.
- Route E buses would make stops on Park Place before turning into the facility to terminate and turn around.
- Route G buses could serve new stops on Park Place, close to the intersection with Courtside Drive, before pulling into the facility to terminate and turn around.

While the existing stop locations could be retained, the stops would need be improved based on SMART's usual standards for providing amenities at bus stops. We expect that shelters, benches and trash cans would be justified by ridership within a few years of introducing the 2028 network routes.

Ideally, the bus stops on these streets would also be closer to one another, to facilitate easy transfers. However, the current configuration of the area makes this difficult to change:

- The current design of the Park Place/Courtside Drive intersection seems to preclude placing bus stops close to the intersection on Courtside Drive, for

both directions.

- The wide driveway at that same intersection, into the Goodwill parking lot, eliminates a possible location for an eastbound stop.
- The angled parking at Town Center Park eliminates the possibility of stops on Courtside Drive that are closer to Park Place.

In consultation with City planners, SMART should evaluate the best potential sites for this terminal facility, and how bus stops served by buses in both directions (whether on Courtside Drive and Park Place, or other streets) could be moved close together to facilitate easy and intuitive transfers by passengers.

On-Street Facility on Wilsonville Road

If the goal is to make transit as useful as possible to the maximum number of people, then the ideal location for this terminal facility is not off of Park Place or Courtside Drive, but rather on Wilsonville Road itself (shown below in **Figure 57**) between Town Center Loop W and Memorial Drive.

This would make it possible for bus routes to be more linear and faster, especially routes that would *not* terminate in the Town Center.

Routes could stay on Wilsonville Road, rather than deviating to the north to serve Courtside Drive and Park Place. This would save passengers time, and also make the routes more efficient to operate for



Figure 57: Potential Area for an East Side Terminal Facility in the Town Center

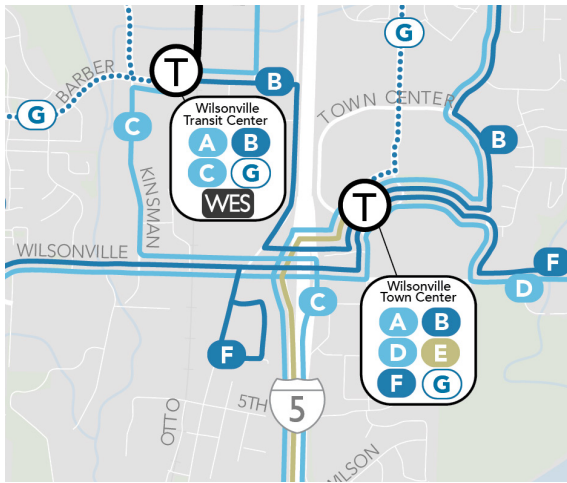


Figure 58: Central Wilsonville Excerpt of the 2028 Network Map

SMART, which in the long run supports higher frequencies.

Buses would still use the local streets of the town center in order to turn around, but the bus stops for terminating routes would be on Wilsonville Road.

In this case, spaces on both sides of Wilsonville Road would be needed for buses to layover (park) while drivers took a break. Improved bus stops for passengers would be needed on the sidewalks near these layover spaces. And, crucially, a nearby break room would be needed for bus operators so that they would have a short walk to and from their break. The break room may need to be on private property, or on City property, but regardless it would not fit in the right-of-way of Wilsonville Road itself.



Figure 59: Example of a Modular Break Room, 10' x 36'

Modular Building

Most of the costs of a terminal facility are likely to arise from changes to the streetscape or traffic controls, rather than from the facility itself. SMART will need to work with City planners and engineers to identify and evaluate possible locations, and estimate costs for both the terminus infrastructure and any needed street or engineering changes.

The facility would not necessarily require substantial construction and could be physically small, but it should be built with basic comforts that allow SMART to use it

for driver meal breaks rather than returning to the Wilsonville Transit Center break room. To that end, it should include:

- A restroom. If vehicles are scheduled with overlapping layover at the Town Center, then two small restrooms may be important for operator comfort and health.
- A small break space, with seating, a table, and access to potable water, electricity and a way to warm food.
- Electricity for air conditioning and heating and plumbing for the

bathroom and potable water for drinking would be needed.

- Wifi connectivity.
- Cleaning, first aid, and bathroom supplies.

Recognizing that the utility hookups have a one-time cost, the building itself could be a modular one to minimize construction costs. An example of the type of modular building that could be used as an operator break site is shown in **Figure 59**.

Modular buildings come in many configurations that can be plumbed with septic underneath. Electricity will require a tie in, and the best precise location for the facility may be influenced by where on the property is the closest junction, pedestal, or transformer box. Inside the modular building, a pre-fab wall for a separate quiet area or field supervisor office could be included.

Approximate costs for this facility would be \$124,000. This includes the modular building, minor sidewalk improvements, moving and reinstallation of bus stops, a new bus shelter, minor asphalt striping, and other miscellaneous labors. This would include electrical and water hook-up but not sewer hook up. Additional costs would occur for operation and maintenance of the building.

The actual cost to create this facility will obviously vary greatly depending on where exactly the facility is located, whether

there are property leasing or acquisition costs, how suitable the streetscape is for bus stops and passenger transfers, and whether any traffic engineering changes are needed to allow for new bus movements at intersections.

Using a lower-cost modular building for this facility, rather than building a permanent structure, would be especially prudent if the best terminal site that can be developed by 2028 is not the same as the best site in the long-term Town Center Plan. Rather than wait to offer the service improvements described in this Plan until the Town Center Plan is built out, which could take decades, SMART could move forward with an interim, lower-cost but still comfortable facility.

Future Town Center Redevelopment

Much larger changes to this site example will need to be discussed once the Town Center Plan is implemented at the very least because “Park Place” will become a directly north-south street (shown in dashed purple on the map at right, which is repeated from an earlier page for easy reference).

The example location we have identified on the current, diagonal “Park Place” is planned to become a parkway for walking and cycling only (shown in green on this map).

Many European cities have incorporated

buses into such car-free parkways. The possibility of continuing to run bus service on the diagonal, old “Park Place” should not be dismissed out of hand.

However, the north-south “Park Place” would also be a suitable alignment for the proposed 2028 bus routes, especially if priority is given to buses turning on and off of Wilsonville Road. The new north-south “Park Place” would also be an appropriate site for passenger transfers and the terminal facility.

Finally, as mentioned above, if all of these improvements (layover spaces for buses, shelters and benches for passengers, and an operator break room) could be placed on Wilsonville Road and adjacent property, between Memorial Drive and Town Center Loop W, that would be ideal to support the 2028 Network and maximize potential ridership and access to transit. That idea may be worth considering in the context of the Town Center Plan as well, depending on the scale of change City staff expect will result from this Plan.

The recommendation for a small Town Center terminal facility, and more generally for improved transit service to and through the Town Center, is supportive of the Town Center Plan overall. The two Plans will need to be further harmonized and implemented together.

Transportation Options, Marketing & Information

SMART does more than just operate fixed-route and demand-response transit services. This section describes some of the other programs SMART administers that would continue through the period of this Plan.

SMART supports the statewide “Get There Challenge,” which incentivizes non-single-occupancy-vehicle use. People who use other modes, such as vanpooling, carpooling, cycling or transit, can qualify for rewards, during two weeks in October.

Vanpool

Vanpool options are available to commuters who begin or end their trips in Wilsonville.

SMART offers up to a \$500 per van/per month subsidy to help start more vanpools coming into and out of Wilsonville. Vanpools with at least five passengers in the group can lease a vehicle from Commute with Enterprise, with no long term commitment required.

Safe Routes to School (SRTS)

SMART delivers SRTS programming. SRTS is a nation-wide program that encourages and educates children and parents on the

benefits and safety knowledge of walking and rolling (skateboard, bike, scooter, carpool, and school or SMART bus) to and from school. SMART hosts Walk+Roll to School Day events and challenges to promote active transportation.

The SRTS program improves transportation for students, parents, and staff and also reduces the number of driving trips to and from schools to improve air quality and congestion. SMART is working to ensure safe, healthy, and equitable outcomes for all participants including historically marginalized group

Travel Training

SMART has partnered with Ride Connection’s RideWise Travel Training Program to provide information and training to support independent public transit use at no cost. The program is aimed at training older adults and people with disabilities to inform them about their transit options, and help participants feel comfortable with using SMART.

The RideWise Program offers personal, one-on-one travel training and group transit trips to help participants learn about fares, trip planning, accessibility, and how to use trip planning apps.

RideConnection also provides specialized shuttle services. One such shuttle serving Clackamas County near West Linn could connect with the proposed Route D at one of multiple places along the route, for

example Legacy Meridian Medical Center or downtown West Linn.

Transit Service Marketing

Marketing and public information are key elements in maintaining and increasing ridership. SMART can provide service that effectively meets passengers’ needs, but if people don’t know it’s there, they won’t use it. As Wilsonville continues to grow, there are also many new residents and employees who may not have previously heard about SMART. There is great opportunity to leverage outreach efforts through coordination with other providers and existing resources. The actions that need to be taken in order to get the information to the intended audience are often very inexpensive and represent a good value in terms of increased ridership.

SMART services are marketed through various efforts, including through printed informational materials, social media, attending community events, and providing information on the SMART website.

Safety and Enforcement

While SMART’s services and facilities are generally safe and without patterns of concerning incidents or behaviors, SMART should continue to pursue trainings, best practices, policies and procedures to maintain a high level of safety on buses, around

bus stops and at SMART facilities.

Special attention should be paid to providing a safe environment for women and young people. A [study](#) completed in 2019 for Metro, in Los Angeles, made the case that “women tend to bear outsized burdens and risks in the course of their daily travel. Being cognizant of how women travel can help ensure SMART provides a welcoming environment at all hours of operation. For example, women tend to take more trips than men, which means there is a greater chance of exposure to travel incidents. They are also more likely to be traveling with children. Service design that helps minimize time, cost, and physical burdens of travel will improve the travel experience for all, not just women and children.

Signage at major transit stops should instruct people in how to make transfers to other transit vehicles or how to walk to major destinations. Such signage reduces the vulnerability of occasional or first-time travelers, and improves their comfort and confidence in their trip. The real-time arrival boards that SMART is planning to install at major bus stops can also help with this.

Additional signage at major transit facilities should instruct people how to call for help, and should be visible, current, and translated into Spanish, at a minimum.

The routes proposed in the 2028 Network extend far into other agencies’ service

areas, and far beyond the immediate reach of Wilsonville Police and other City staff who could help respond to emergencies or provide aid to passengers and operators. SMART, TriMet, Canby Area Transit, Woodburn Transit and Cherriots should have recent agreements in place at shared stop locations indicating the protocol for a safety incident or threat.

SMART has been fortunate not to have experienced an increase in challenging interactions since the pandemic, as have many other urban transit agencies. The 2028 Network is expected to be more useful to a greater number of people, and would naturally therefore bring SMART staff in contact with safety and social challenges that have been uncommon on more specialized, lower-ridership routes in the past. Additional training and support for SMART staff would be appropriate as part of implementing the 2028 Network.

We recommend that SMART review studies published by the Federal Transit Administration and other transit agencies to continue staying informed on current safety strategies. SMART and TriMet staff should routinely discuss and collaborate on safety approaches, especially in the “border” areas where the two agencies’ routes overlap and where they share facilities.

Additional resources for SMART staff are the [Transit Cooperative Research Program Synthesis 121: Transit Agency Practices in Interacting with People Who Are](#)

[Homeless](#), and ongoing training and discussions organizing by the American Public Transit Association (APTA) and Oregon Transit Association.

Human trafficking is a crime in which someone is coerced or forced to work, and this criminal activity is known to be concentrated along the I-5 corridor in Oregon, Washington and California.

SMART signed onto the USDOT’s Initiative against Human Trafficking in 2021 and conducted all-staff training in 2022. Ongoing training and awareness campaigns should be supported. SMART could develop materials for riders on how to identify and report potential risks, and promote an awareness campaign during National Human Trafficking Prevention Month in January.

Other Oregon transit agencies also located along I-5 (such as TriMet, Cherriots, Lane Transit District and Rogue Valley Transit District) may have information to share as well.

6. Financial Context and Project Costs

There are a number of funding sources available for the various types of improvements recommended in this plan. Since many people throughout Oregon enjoy the amenities of the greater Wilsonville region, the City has taken a financial approach that spreads the costs of public transit among property owners, businesses, overnight and day visitors, transportation systems users, and local, state, and federal governments.

The five major available funding categories are federal funding (formula and discretionary grant programs), state funding, regional/local funding, and private funding sources/partnerships. The most relevant and promising sources to fund improvements proposed in this Plan Update for 2023-2028 are described below.

Capital rolling stock, such as vehicles and equipment replacement, can be purchased with a match of up to 85% of the cost by Federal and state sources.

Federal, State, Private/Partnership and Local sources of transit funding are described in turn by the tables on the following pages.

Federal Funding (Discretionary Grant Programs)

The Infrastructure, Investment, and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), was signed in November of 2021 and is the current federal transportation funding bill. The law replaced Fixing America's Surface Transportation Act (FAST) and will add an additional \$550 billion to transportation, broadband, and utility investments across the United States. This funding will be distributed from FY 2022 through FY 2026 via a competitive grant application process. Several of the most relevant funding sources are described in the following sections.

Funding Source	Amount	Match Required	Eligible Projects	Notes
5339(b) Federal Transit Administration Discretionary Buses and Bus Facilities Infrastructure Investment Program	Varies based on year. No current update for 2023.	15% for vehicles; 10% for bus-related equipment and facilities.	<ul style="list-style-type: none"> Capital projects to replace, rehabilitate, purchase, or lease buses, vans, and related equipment. Capital projects to rehabilitate, purchase, construct, or lease bus-related facilities. 	Recipients of 5307 funding may apply directly to the Federal Transit Administration.
5339(c) Federal Transit Administration Discretionary Low or No Emission Program	Varies based on year. No current update for 2023.	15% for vehicles; 10% for bus-related equipment and facilities.	<ul style="list-style-type: none"> Purchasing or leasing low- or no-emission buses. Acquiring low- or no-emission buses with a leased power source. Constructing or leasing facilities and related equipment (including intelligent technology and software) for low- or no-emission buses. Constructing new public transportation facilities to accommodate low- or no-emission buses. Rehabilitating or improving existing public transportation facilities to accommodate low- or no-emission buses. 	Recipients of 5307 funding may apply directly to the Federal Transit Administration.
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	Minimum award is \$5 million in urban areas. No more than \$345 million per state.	20% excluding local areas.	<ul style="list-style-type: none"> Highway, bridge, or other road projects eligible under title 23, United States Code. Public transportation projects eligible under chapter 53 of title 49, United States Code. Passenger and freight rail transportation projects. Planning, preparation, or design of eligible transportation capital projects. 	Funding is obtained via an application to USDOT.
Safe Streets and Roads for All (SS4A)	FY 2023 Notice of Funding Opportunity to open in spring 2023.	20%.	<ul style="list-style-type: none"> Creating action plan to prevent roadway fatalities and serious injuries. Funding and implementing specific projects previously identified in the action plan. 	Funding is obtained via an application to USDOT.

Figure 60: Federal Discretionary Grant Funding Programs

Funding Source	Amount	Match Required	Eligible Projects	Notes	
STBG Discretionary Bus Replacement Program	Funding varies based on solicitation year. No current update for 2025 – 2027 solicitation.	10.27% for STBG.	<ul style="list-style-type: none"> Vehicle replacements that were purchased through ODOT Public Transportation Division and have ODOT on the title as first security interest holder. 	ODOT receives funds from the FHWA's STBG program, then allocates those funds to agencies via a competitive application process. The funds are transferred into FTA Sections 5310, 5311, or 5307.	
Statewide Transportation Improvement Fund Discretionary	Varies based on Oregon payroll tax revenue. Revenues stream from 5% of Statewide Transportation Improvement Fund.	20% of project's total costs. Eligible for 10% match if project meets certain characteristics.	<ul style="list-style-type: none"> Vehicle purchase. Equipment purchase. Facility purchase. Signs/shelters purchase. Planning. 	<ul style="list-style-type: none"> Project administration. Operating. Preventive maintenance. Mobility management. 	Funding is obtained via an application to a Qualified Entity (TriMet), then to ODOT.
Statewide Transit Network Program	Varies based on Oregon payroll tax revenue. Revenues stream from 4% of Statewide Transportation Improvement Fund and FTA 5311(f).	20% of project's total costs. Eligible for 10% match if project meets certain characteristics. If receiving 5311(f) funds, must provide 50% match for operations projects and 20% match for capital projects and project administration.	<ul style="list-style-type: none"> Vehicle purchase. Equipment purchase. Facility purchase. Signs/shelters purchase. Planning. Project administration. Operating. Preventive maintenance. Mobility management. 		Funding is obtained via an application to ODOT.

Figure 61: State Discretionary Grant Funding Programs (continued on next page)

Funding Source	Amount	Match Required	Eligible Projects	Notes
Transportation and Growth Management (TGM) Program	Varies based on formula that considers number of cities and the population within a region. Common award amounts are \$100,000 to \$250,000.	12%.	<ul style="list-style-type: none"> Planning work leading to local policy decisions. Projects should result in the development of an adoption-ready plan or land use regulation or amendments to an existing plan or land use regulation. 	Funding is obtained via an application to ODOT / Oregon Department of Land Conservation and Development (DLCDC).

Partners	Eligible Projects	Notes
Developers / Transportation System Development Charges	<ul style="list-style-type: none"> Infrastructure within or related to new developments which improves transit usefulness and accessibility. 	<p>Opportunity to incorporate desired transit facilities into new developments to improve transit amenities on existing or planned routes.</p> <p>For example, sidewalks and bus pads on Stafford Road would allow SMART to place bus stops to serve residents of new Frog Pond developments.</p>
Local school district	<ul style="list-style-type: none"> Safe Routes to School (SRTS) plans. 	Opportunity to meld transit with SRTS planning and collaborate with the West Linn-Wilsonville school district to expand transit access to students, for example by deviating proposed Route D to serve a new district high school at times that suit the school schedule.

Figure 62: Potential Partnerships or Other Sources of Support

Local Wilsonville Funding

The City of Wilsonville funds transit service chiefly through a local payroll tax and self-employment tax, also called the “transit tax.” It is applied at a rate determined by the City Council and the rate has been set at 0.5% of wages.

The amount of money available is directly linked to the total wages earned each year. According to the Wilsonville 2022-23 Adopted Budget, the wage base growth has grown an average of 4.3% each year since FY 2008-09. The budget for future years has payroll tax receipts set to increase at 2%, a conservative assumption.

Transit Fund Forecast 2023-2028

The table on the following page summarizes the Wilsonville Transit Fund recent Actuals and Forecasts. It shows Revenues (“Resources”) and Requirements (“Expenditures” and “Transfers to other funds”) for the Transit Fund over the past three and coming five fiscal years, through FY 2026-27. This forecast was prepared in the first half of 2022 and is part of the adopted FY 2022-23 budget.

The Transit Fund in Wilsonville is made up of three main revenue sources: the local payroll tax, intergovernmental revenue (which includes grants from Federal and State sources described on previous pages), and charges for services. The local payroll tax and the intergovernmental revenue together represented 99% of the

Funding Source	Amount	Eligible Projects	Notes
Transit payroll and self-employment tax	\$0.005 rate on gross payroll earnings.	<ul style="list-style-type: none"> • Transit capital projects. • Transit operations. 	Funds are raised through payroll taxes paid by businesses in the City.

Figure 63: Wilsonville’s Local Payroll Tax

total funding, approximately 55%, and 44%, respectively.

Statewide Funding

Intergovernmental revenue includes state and federal grants and contracts, especially the Statewide Transportation Improvement Fund (STIF). Enacted by the State Legislature as HB2017 “Keep Oregon Moving,” STIF provides a dedicated source of funding to expand public transportation through a 0.1% statewide payroll tax on employees. The Oregon Department of Transportation disperses STIF funds through formula and competitive grants. Thanks to this funding source, the SMART Transit Fund is keeping up with expenditures and offers potential to expand service in coming years.

In FY 2022-23, SMART forecasted \$1,428,000 from formula funds and an award of \$300,000 in competitive STIF funds. SMART has forecasted \$300,000 annual revenue from competitive grants each year beginning in FY 2023-24, which is lower than actual competitive grant receipts from STIF from 2020-2022. Forecast grants from Federal and other

sources start at \$750,000 in 2022-2023 and grow gradually in future years, but are forecast to be considerably lower than actual received grant amounts in prior years.

TABLE 5 - Transit Fund Forecast

	Actual 2018-19	Actual 2019-20	Budget 2020-21	Proposed 2021-22	Forecast 2022-23	Forecast 2023-24	Forecast 2024-25	Forecast 2025-26	Forecast 2026-27
Beginning fund balance	3,592,929	4,595,626	5,084,730	7,505,702	\$ 7,536,271	\$ 7,263,781	\$ 6,973,383	\$ 6,707,951	\$ 6,422,500
RESOURCES									
Revenues:									
Transit tax	\$ 5,026,869	\$ 4,902,080	\$ 5,050,000	\$ 5,000,000	\$ 5,100,000	\$ 5,202,000	\$ 5,306,040	\$ 5,412,161	\$ 5,520,404
Intergovernmental:									
STIF Formula	-	-	1,800,000	1,400,000	1,428,000	1,456,560	1,485,690	1,515,400	1,545,710
STIF (competitive)	-	-	1,300,000	530,000	300,000	300,000	300,000	300,000	300,000
Grants (#5307, TDM, Ot)	3,381,180	3,463,450	2,196,588	2,034,104	750,000	757,500	765,075	772,726	780,453
Intergovernmental Total	3,381,180	3,463,450	5,296,588	3,964,104	2,478,000	2,514,060	2,550,765	2,588,126	2,626,163
Charges for services	206,399	140,935	170,000	-	-	-	-	-	-
Investment income	106,952	134,123	31,100	75,000	37,681	36,319	34,867	33,540	32,113
Miscellaneous	47,061	177,415	21,000	21,000	15,000	15,000	15,000	15,000	15,000
Revenue Total	\$ 8,768,461	\$ 8,818,003	\$ 10,568,688	\$ 9,060,104	\$ 7,630,681	\$ 7,767,379	\$ 7,906,672	\$ 8,048,826	\$ 8,193,680
REQUIREMENTS									
Expenditures:									
Personnel services	\$ 3,384,655	\$ 3,736,261	\$ 4,106,110	\$ 4,251,900	\$ 4,336,938	\$ 4,467,046	\$ 4,556,387	\$ 4,693,079	\$ 4,786,940
Materials & services	1,732,360	2,416,826	2,268,268	2,118,188	2,120,306	2,122,426	2,124,549	2,126,673	2,128,800
Capital outlay	2,071,020	69,667	2,629,941	1,990,000	787,500	793,125	798,806	804,544	810,340
Expenditures Subtotal	7,188,035	6,222,754	9,004,319	8,360,088	7,244,744	7,382,598	7,479,742	7,624,296	7,726,080
Transfers to other funds:									
General Fund	543,250	567,310	594,370	585,240	599,871	614,868	630,239	645,995	662,145
Building Capital Fund	34,479	58,608	214,493	84,207	58,556	60,312	62,122	63,985	64,625
Transfers Subtotal	577,729	625,918	808,863	669,447	658,427	675,180	692,361	709,980	726,770
Expenditures Total	\$ 7,765,764	\$ 6,848,672	\$ 9,813,182	\$ 9,029,535	\$ 7,903,171	\$ 8,057,777	\$ 8,172,104	\$ 8,334,277	\$ 8,452,850
<i>NET (Revenues less Expenditures)</i>	<i>1,002,697</i>	<i>1,969,331</i>	<i>755,506</i>	<i>30,569</i>	<i>(272,490)</i>	<i>(290,399)</i>	<i>(265,432)</i>	<i>(285,451)</i>	<i>(259,171)</i>
Ending fund balance	\$ 4,595,626	\$ 6,564,957	\$ 5,840,236	\$ 7,536,271	\$ 7,263,781	\$ 6,973,383	\$ 6,707,951	\$ 6,422,500	\$ 6,163,329
Financial Policy Minimum	1,023,403	1,230,617	1,274,876	1,274,100	1,291,500	1,317,900	1,336,200	1,364,000	1,383,200

Figure 64: City of Wilsonville Transit Fund Actuals and Forecasts, FY 2018-19 through FY 2026-27

Service and Capital Projects

This section provides cost estimates for investments that could be made towards implementation of the 2028 recommendation.

This cost estimates are approximate. Actual cost estimates will be developed at the time, based on resolved details related to scheduling of transit services, vehicles and staff, and then-current costs for labor, materials and/or construction.

“Table 1: Service Increases” on page 86 describes potential marginal increases to service frequency, span or capacity as SMART works to implement the full 2028 service vision. This table covers both fixed route (FR) improvements and Dial-a-Ride (Demand Response, DR) improvements. Some DR improvements would be required to complement fixed route improvements, per the American’s with Disabilities Act.

The costs in Table 1 are estimated based on the hours that buses and drivers would be in service, Revenue Hours (RH). Actual labor hours will be longer, and the number of full-time drivers hired to provide this service would not be so simple as the total RH divided by 40 hours per week. Operating costs are calculated based on estimated Revenue Hours of service and the average operating costs for 2022,

which differ for fixed route and demand response. Costs per RH will change over future years.

Table 1 indicates when one or more additional vehicles may be needed, and when overhead positions may need to be added due to a change or increase in service.

“Table 2: Assumed Costs per Service Revenue Hour” on page 88 shows the average costs per Revenue Hour of service which were used to estimate operating costs in Table 1.

“Table 3: Costs for New Overhead Personnel” on page 89 shows the fully-loaded annual 2023 salaries of full-time overhead personnel. These personnel cannot be added incrementally as service is increased incrementally. Service increases may trigger the need for one or more additional personnel, at part- or full-time.

“Table 4: Capital Projects and Investments” on page 90 provides rough estimated 2023 costs for the major capital projects recommended by this Plan.

Table 1: Service Increases	Estimated Change in Fixed Route Operating Costs					Likely Additions of Operations Personnel Hours?				
	2021 RH ¹	2028 RH	Approx. Increase in RH	Direct Operating Cost Estimate ²	Fully-Loaded Operating Cost Estimate	Additional vehicles likely required?	Maintenance? (H=Hostler, M=Mechanic, F=Foreman)	Supervisor?	Dispatcher?	Customer Service?
Additions to service frequencies (fixed route) or capacity (DAR) to 2028 recommended levels:										
Upgrade 1X to recommended A ³	8200	8800	600	\$64,000	\$111,000					
Upgrade 2X to recommended B	8600	19600	11000	\$1,175,000	\$2,030,000	X	H, M, F	X		X
Upgrade 3X to recommended C	3000	4400	1400	\$150,000	\$258,000		H			X
Upgrade 4 and M to recommended D	12500	25000	12500	\$1,335,000	\$2,306,000	X	H,M,F	X		X
Launch E ³		2500	2500	\$267,000	\$461,000	X	H			X
Upgrade V to recommended F	1800	9600	7800	\$833,000	\$1,439,000	X	H,M,F	X		X
Change 5, 6 & 7 to recommended G	5500	5100	-400	\$(43,000)	\$(74,000)					
Add DR capacity and span on weekdays			4320	\$542,000	\$1,056,000	X	H,M,F	X	X	X
Add DR capacity and span on Saturdays			3300	\$414,000	\$806,000	X	H,M,F	X	X	X

1 RH stands for Revenue Hour. One Revenue Hour represents one hour of a driver and vehicle on the road providing service (or, in the case of Dial-a-Ride, available to respond to requests for service).

2 For information about sources of operating cost estimates, see the table following.

3 For Routes A and E we assume that weekday service would be split equally between SMART and Cherriots (with RH divided equally), but that Saturday and Sunday service would be provided entirely by SMART.

Table 1: Service Increases		Estimated Change in Fixed Route Operating Costs				Likely Additions of Operations Personnel Hours?				
		2021 RH ¹	2028 RH	Approx. Increase in RH	Direct Operating Cost Estimate ²	Fully-Loaded Operating Cost Estimate	Additional vehicles likely required?	Maintenance? (H=Hostler, M=Mechanic, F=Foreman)	Supervisor?	Dispatcher?
Lengthening of spans to 2028 recommended levels:										
Weekdays										
Earlier morning spans by one hour, for FR and DR ⁴			1800	\$248,000	\$436,000		H	X	X	X
Earlier morning spans by two hours, for FR and DR			2800	\$417,000	\$734,000		H,M,F	X	X	X
Later evening spans by one hour, for FR and DR			1800	\$248,000	\$436,000		H	X	X	X
Later evening spans by two hours, for FR and DR			3800	\$525,000	\$921,000		H,M,F	X	X	X
Later evening spans by three hours, for FR and DR			4100	\$611,000	\$1,076,000		H,M,F	X	X	X
Saturdays										
Upgrade Saturday FR service level to recommended	2300	7600	5300	\$566,000	\$978,000		H,M,F	X		X
Upgrade Saturday DR service level to recommended			690	\$87,000	\$169,000		H,M,F	X	X	X

⁴ FR = Fixed Route. DR = Demand Response = SMART Dial-a-Ride

	Estimated Change in Fixed Route Operating Costs					Likely Additions of Operations Personnel Hours?				
	2021 RH ¹	2028 RH	Approx. Increase in RH	Direct Operating Cost Estimate ²	Fully-Loaded Operating Cost Estimate	Additional vehicles likely required?	Maintenance? (H=Hostler, M=Mechanic, F=Foreman)	Supervisor?	Dispatcher?	Customer Service?
Sundays										
Launch Sunday & Holiday FR service as recommended		3500	3500	\$374,000	\$646,000		H,M,F	X		
Launch Sunday & Holiday DR service as recommended			1100	\$138,000	\$269,000		H,M,F	X	X	
							The additions of operations personnel marked above, plus the additions of drivers, would trigger a need for administrative staff and administrative space.			

Table 2: Assumed Costs per Service Revenue Hour	Direct Operating Cost Per Vehicle Revenue Hour	Fully-Loaded Operating Cost Per Vehicle Revenue Hour
Fixed Route (FR)	\$106.81	\$184.51
Demand Response (DR, DAR)	\$125.51	\$244.32

Estimated operating costs in Table 1 are calculated based on the estimated number of Revenue Hours required to provide the service, and SMART’s estimated operating cost per Revenue Hour which is taken from SMART’s submission of 2022 service data to the National Transit Database. “Direct costs” are only those that relate to the driving and operation of vehicles. “Fully-loaded” costs include vehicle maintenance, facility maintenance and administration.

Table 3: Costs for New Overhead Personnel	Annual Fully-Loaded Salary for a Full-Time Position
Transit Supervisor	\$152,000
Transit Dispatcher	\$112,000
Transit Customer Service	\$95,000
Maintenance Worker/Hostler	\$84,000
Maintenance Equipment Mechanic	\$99,000
Maintenance Shop Foreperson	\$134,000

While the “fully loaded” operating costs in the previous two tables do include the per-hour average cost of supervision, dispatching, customer service and maintenance, those functions cannot in fact be added incrementally. The per-hour average cost of these overhead functions over a year of operations is not the same as the marginal cost of adding these functions each time an hour of service is added. Personnel costs are somewhat “lumpy” and a small increase in service can trigger the need for a new position. The 2023 annual, fully-loaded salaries for new full time positions that may be triggered by service increases as the 2028 network is implemented are therefore given in this table.

Table 4: Capital Projects and Investments	Approximate 2023 Capital Cost (if known)	Notes
Each additional BEB vehicle (40')	~\$879,000	A 40' heavy-duty Battery Electric Bus (BEB) would be appropriate for SMART's high-ridership routes and any routes that pass by a middle or high school and are subjected to crowding. The State of Oregon provided \$838,000 as an estimated cost for a 40' BEB vehicle in 2020. A more recent estimate is available from the State of Washington negotiated price agreement, which is the price given at left for a 40' BEB vehicle plus 10% for miscellaneous contract and delivery-related costs.
Each addition CNG vehicle (30' - 40')	\$467,000 – \$614,000	CNG vehicles would be appropriate for SMART's high-ridership, long distance routes, as well as for in-town routes, lower ridership routes and Dial-a-Ride. For Dial-a-Ride, CNG vehicles of 26' or less would be needed, but they are not available for reference as part of the Oregon or Washington State negotiated vehicle price agreements. Larger 30' and 40' CNG vehicles are covered by these price agreements. The range of average costs for CNG vehicles under the Washington State price agreement, as of March 2023, is given at left.
Each additional electrical charger	\$80,000	Additional chargers will be needed for each BEB vehicle added to the fleet to deliver the planned 2028 services, plus a spare charger.
Maintenance yard expansion	TBD	Preliminary design and a cost estimate for the yard expansion are underway.
Administrative building	TBD	Growth in service levels, span, and operations and maintenance staff would trigger a need for additional administrative staff. The current administrative facility would need to be expanded to add offices, training rooms, and other shared areas.
Town Center terminal facility (off-street)	\$124,000	The capital costs of starting service to a new Town Center facility would include the purchase price of the break room and rest room (a modular building), a bus shelter and bench, small sidewalk modifications, minor changes to street striping and signage, and electrical/water hook-up of the modular building.
Town Center bus stop improvements	\$120,000	Bus stop, amenity and sidewalk investments to improve bus stops around the new Town Center terminal facility, in particular to make transfers between routes there easier and more accessible.
Stafford Road sidewalks	TBD	Sidewalks will make it possible for SMART to install bus stops on Stafford Road adjacent to new Frog Pond developments. Sidewalks could be constructed by developers or funded for city construction through System Development Charges (SDCs).
Autonomous shuttle and pilot service	TBD	When the pedestrian bridge over I-5, foreseen as part of the Town Center Plan, is funded and constructed, SMART is interested in piloting a small autonomous shuttle over the bridge. This shuttle could be used to connect the existing west side Transit Center and the recommended east side facility, especially for those passengers who have difficulty walking.

Appendix

Resources for Vehicle and Fuel Comparison

[New York City Transit Hybrid and CNG Transit Buses: Interim Evaluation Results.](#) National Renewable Energy Laboratory (NREL) Technical Report, 2006.

[Comparison of Modern CNG, Diesel and Diesel Hybrid-Electric Transit Buses: Efficiency & Environmental Performance.](#) MJB & A. November, 2005.

[Electric vs. Diesel vs. Natural Gas: Which Bus is Best for the Climate?](#) Jimmy O'Dea. July 19, 2015.

[U.S. DOE. New York City Transit Diesel Hybrid-Electric Buses: Final Results.](#) DOE/NREL Transit Bus Evaluation Project. July 2002.

[EESI Hybrid Buses Costs and Benefits.](#) March 2007.

[The Transit Bus Niche Market for Alternative Fuels. Module 6: Overview of Biodiesel as a Transit Bus Fuel.](#) Clean Cities Coordinator Toolkit. December 2003.

[Proterra vendor infographics comparing CNG, Diesel, Hybrid, and Proterra mile per gallon and cost per mile.](#)

[Zero-Emission Bus Evaluation Results: King County Metro Battery Electric Buses.](#) FTA Report 0118, February 2018.

[Fuel savings of STM's hybrid buses less](#)

[than half what was promised, documents show.](#) Madger, J. Montreal Gazette, June 2019.

[Reduced Engine Idle Load \(REIL\) System for Conventional Propulsion Diesel & CNG Buses: Development, Validation & Market Study Program.](#) FTA Research.

[Washington State Transit Buses Contract,](#) Washington State Department of Enterprise Services. 2020-2023

[Oregon Transit Fleet Electrification Guide and Lifecycle Cost Analysis Tool,](#) Oregon Department of Transportation. 2020.

2022 Existing Conditions Report

Prior to the drafting of this Plan, an Existing Conditions Report documented the transit system and its performance as of 2022. It is available in the Documents area of the [project website](#).

Public Involvement Summary

Public input guided the major features of this Plan, as summarized above. In the Documents area of the [project website](#) a Public Engagement Summary Report describes public input received in greater detail.