Bend Metropolitan Planning Organization

PUBLIC TRANSIT PLAN AND TRANSIT CORRIDOR LAND USE ASSESSMENT

Public Transit Plan – Appendices

BMPO Bend Metropolitan Planning Organization

DKS Associates TRANSPORTATION SOLUTIONS

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NELSON NYGAARD

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Table of Contents

Table of Figures

APPENDIX A LAND USE AND TRANSIT DEMAND

Although there is no single answer to the question, "What is transit-supportive density?" as a general rule the minimum density to support high-performing local bus transit service is 5 to 7 households per acre and transit use increases most significantly when density increases from 6 to 12 households per acre. This appendix provides a more complete overview of the research linking land use/development factors to transit ridership.

For the purpose of comparison, the following conversions and assumptions are used:

- 1 dwelling unit/acre = 640 dwelling units/square mile
- 1 dwelling unit/acre = 2.5 persons/acre = 1,600 persons/square mile

Unless otherwise noted, density refers to gross density.

LITERATURE REVIEW

Several studies point to a strong connection between density and transit ridership. In *Transit Metropolis*, Robert Cervero states, "It is widely agreed that higher urban densities will do more than any single change to our cityscapes in attracting people to trains and buses."

A general conclusion, aggregating a number of density studies, is that every 10% increase in population and employment densities yields anywhere between a 5 and 8% increase in transit ridership, controlling for other factors (such as lower incomes, restricted parking, and better transit services generally associated with more compact settings). Other studies listed below refine this conclusion.

- A well-recognized analysis highlights the relationship between residential densities and different types of transit services these developments can support.[1] The authors conclude that at least 4 dwelling units per residential acre are required to support hourly local bus service. Densities

[1] Pushkarev, B. S. and J. M. Zupan. "Where Transit works: Urban Densities for Public Transportation." in *Urban Transportation: Perspectives and Prospects*, ed. by H. S. Levinson and R. A. Weant, Westport, CT, Eno Foundation (1982).

of 7 dwelling units per residential acre are needed for 30-minute service. These thresholds are also promoted by the Institute of Transportation Engineers (ITE) which recommends a series of minimum levels of service for transit corresponding to several levels of residential density and employment center size. [2] ITE defines the threshold for hourly service at 4 to 6 dwelling units per residential acre, or 5 to 8 million sq. ft. of active commercial/office space. This resource specifies the threshold for 30-minute service at 7 to 8 dwelling units per residential acre or 8 to 20 million sq. ft. of active commercial/office space.

Two studies cited a level of residential density at which point transit ridership per person or household levels out (at about 1.5 transit trips per household per day):

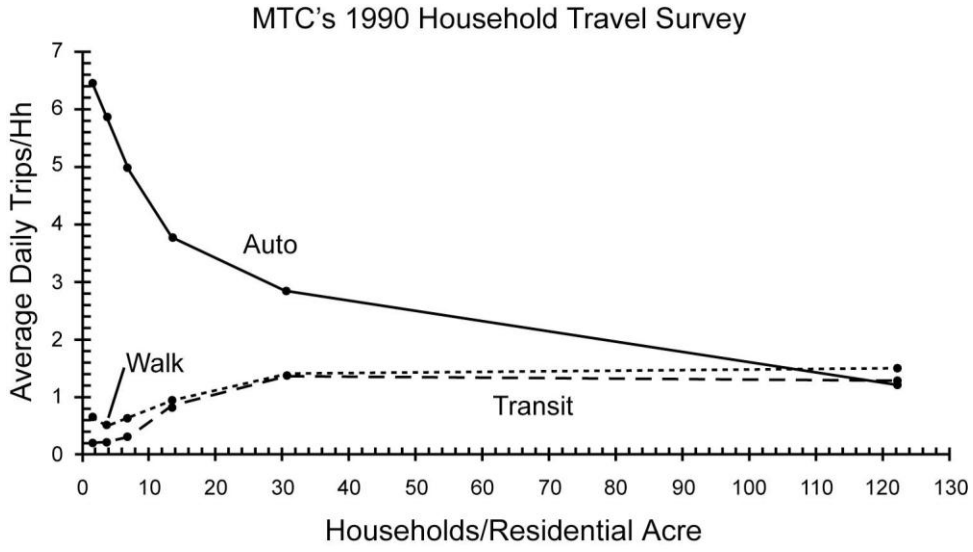
- A study by Spillar and Rutherford (1998) states, "Transit use per person grows with increasing density up to a ceiling at somewhere between 20 and 30 people per acre (about 19,000 people per square mile or 12 dwelling units/acre). In terms of income, in higher income neighborhoods (those with less than 18% low-income families) density has less of an effect on transit use than in low-income areas, but this could be due to the relatively small number of samples available."[3]
- Similarly, the San Francisco Bay Area region's Metropolitan Transportation Commission surveyed over 10,000 households throughout the metropolitan region in its 1990 Household Travel Survey, and showed that transit trip ridership per household flattens out at a density of about 30 households per acre, or roughly 48,000 people per square mile. (See Figure A-1 below). The study also shows that transit needs a base of at least 5 households per acre (8,000 people/square mile) before ridership will grow, increasing noticeably at about 10 households per acre (16,000 people per square mile) and up.

[2] ITE. *A Toolbox for Alleviating Traffic Congestion*. Washington, DC(1989).

[3] Spillar, Robert J., and G. Scott Rutherford. 1998. "The Effects of Population Density and Income on Per Capita Transit Ridership in Western American Cities." *Institute of Transportation Engineers' Compendium of Technical Papers*: 60th Annual Meeting. August 5-8, 1998. Pp. 327-331.

Figure A-1 shows that when neighborhoods are more compact, trip lengths are shorter. Many destinations are close at hand. As a result, auto trips fall sharply, while more trips are taken by walking and transit. A crucial point is that up to about 12 households/acre, the relationship between density and transit use is parabolic – transit ridership/household rises faster than density. Transit ridership/acre (the real determinant of the market for a given transit service) thus rises extremely steeply against density up to this threshold, then gradually falls back to a linear relationship in which every new increment in population (and hence density) added to a fixed area generates new ridership at the same rate.

Figure A-1 Average Daily Trips per Household vs. Density



Additional research findings include:

- Newman and Kenworthy (1989) found that that bus service becomes poor at densities below 12 persons per acre (7,500 persons per square mile). They therefore recommend densities above 5 to 6.5 dwelling units/ acre (7,500 to 10,000 persons per square mile) for public transit-oriented urban areas.[4]
- Levinson and Kumar (1994) conclude that relationships between density and mode choice"are found only in densities greater than 10,000 persons per square mile," (6 dwelling units/acre) using data from the 1990/91 Nationwide Personal Transportation Survey (NPTS). The lower limit of

[4] Newman, P. and J. Kenworthy. Cities and Automobile Dependence: An International Sourcebook. Aldershot, Avebury Technical (1989).

7,500 persons per square mile (4.5 dwelling units/acre) is also used in other sections of the paper.[5]

- For employment density, a study of travel behavior in the Seattle metropolitan area by Frank and Pivo (1994) concluded that a threshold exists at which transit work trips show a significant increase, of 50 to 75 employees per acre, and nine to 13 persons per gross acre (5500 to 8500 persons per square mile). They found that there are thresholds of 75 employees per acre and over 18 persons per gross acre (11,500 persons per square mile) for the same phenomenon to occur for shopping trips.[6]
- The 1996 Transit Cooperative Research Program (TCRP) paper, *Transit and Urban Form*, reviewed several studies that all point to a correlation between density and transit trip generation.[7]
- In an analysis of transit demand in Portland, Oregon, Nelson\Nygaard (1995) found that "of 40 land use and demographic variables studied, the most significant for determining transit demand are the overall housing density per acre and the overall employment density per acre. These two variables alone predict 93 percent of the variance in transit demand among different parts of the region."[8]
- An unpublished TCRP analysis of travel behavior in 11 metropolitan areas surveyed in the 1985 Housing Survey suggests that both land use mix and residential densities contribute to transit mode choice decisions. It determines that the probability of choosing transit is better explained by the overall levels of density rather than by measures of land use.[9]
- Research conducted to establish the Location Efficient Mortgage program shows an indirect correlation between density and transit ridership, by illustrating an inverse impact on vehicle trips and miles traveled. The research included every neighborhood in the Los Angeles, San Francisco and Chicago metropolitan areas, and controlled for other potential explanatory variables such as household income and household size. As shown in Figure A-2, in each of the three metropolitan areas, the compactness of the neighborhood was found to be the most important

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[5] Levinson, D. and A. Kumar. "The Rational Locator: Why Travel Times Have Remained Stable." *Journal of the American Planning Association*, 60, 3 (1994) pp. 319–332.

[6] Frank, L. D. and Gary Pivo. *Relationship Between Land Use And Travel Behavior in the Puget Sound Region*. Olympia, WA: Washington State Department of Transportation, WA-RD 351.1 (1994).

[7] Source: (http://transweb.sjsu.edu/publications/transitridership2/TransitRidership_7_16.pdf), The Mineta Transporta-tion Institute College of Business, 2002

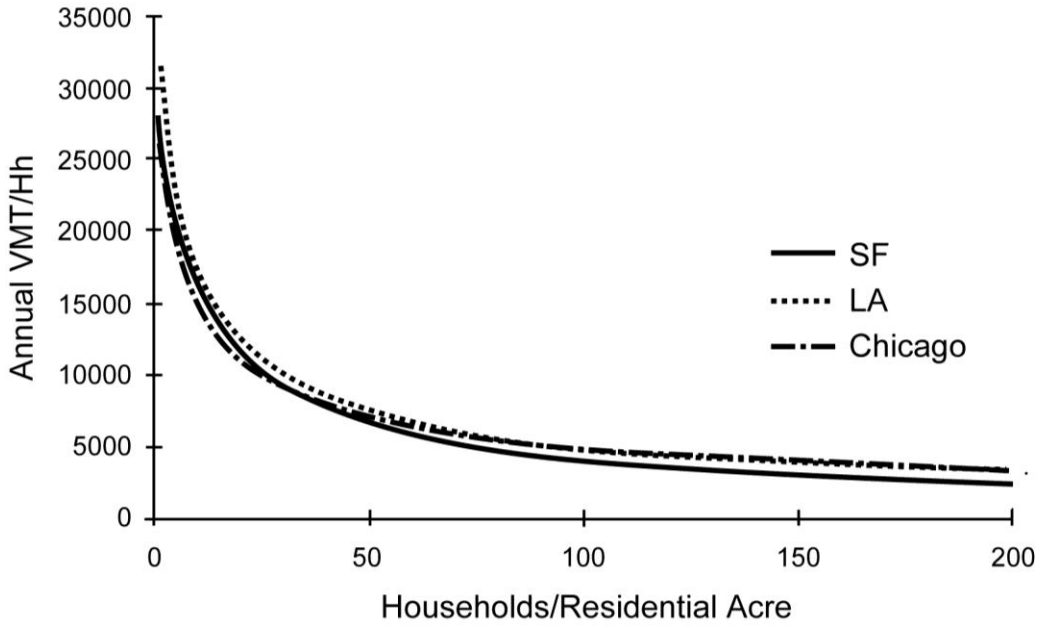
[8] Nelson/Nygaard Consulting Associates. "Land use and Transit Demand: The Transit Orientation Index," Chapter 3 of *Community Transit Network Study* (Draft). Portland, OR: Tri-Met (1995).

[9] Transit Cooperative Research Program. 1996. Transit and Urban Form. Washington, D.C.: National Academy Press. TCRP Report 16(1): 1-25. Unpublished paper entitled, *Influence of Land Use Mix and Neighborhood Design on Transit Demand.*

explanatory variable. As residential density in a neighborhood rises, the number of nearby destinations (such as shops, restaurants and other services) increases, and as a result, driving rapidly decreases.

Figure A-2 shows the reduction in vehicle miles traveled per household as residential density increases. In Los Angeles neighborhoods with a density of two households per acre, the average household drives nearly 25,000 miles per year. At 40 households per acre (the density of the Mission Meridian Station project), the average Los Angeles household drives approximately 8,000 miles per year. Note that the parabolic part of the transit ridership curve in Figure A-2 corresponds to the steepest part of the curve in this figure, beginning to flatten at about 12 du/acre.

Figure A-2 Driving vs. Residential Density



APPENDIX B FUTURE TRANSIT SERVICE CONCEPTS – SUPPORTING DETAIL

This appendix is based on the Future Service Concepts memo, which addresses how transit can serve the corridors identified in the transit corridor and land use analysis (Future Opportunities memo) and meet current and future transportation needs in Bend. This appendix includes only additional material from the memo that was not included in the PTP.

SERVICE QUALITY AND LAND USE

TriMet Service Standards

TriMet, the transit provider in the Portland area, has a number of criteria it uses to determine whether a corridor merits "Frequent Service," its designation for routes that operate 15 minutes or better all day, seven days per week. Two of the density criteria applied by TriMet in prioritizing Frequent Service corridors are shown in Figure B-1. There are fifteen discrete criteria, but the density criteria are among the most fundamental.

In addition, a companion minimum standard for productivity[10] is that *coverage-oriented* service should exceed 15 boardings per revenue hour for fixed routes.

Figure B-1 Tri-Met Frequent Transit Criteria

Criterion	Rating	Residents Per Acre	Dwelling Units Per Acre (@ 2.4 persons per unit) [1]
Number of Residents Per Acre within ¼ Mile of Frequent Service Corridor	10 (Highest)	15+	6+
	8	12-14	5.0 - 5.9
	6	9-11	3.8 - 4.6
	4	6-8	2.5 - 3.3
	2	3-5	1.3 - 2.1
	0 (Lowest)	<3	<1.3

Criterion	Rating	Employees Per Acre
Number of Employees Per Acre within ¼ Mile of Frequent Service Corridor	10 (Highest)	15+
	8	12-14
	6	9-11
	4	6-8
	2	3-5
	0 (Lowest)	<3

Notes: (1) Calculation of dwelling units per acre based on 2.39 persons per household for city of Bend from 2010 U.S. Census.

Source: TriMet Transit Investment Plan (TIP), 2012

[10] Number of boardings per hour of vehicle revenue service

Additional Service Design Criteria

In addition the designation of primary corridors and/or the establishment of new routes should consider:

- **Logical routing**. Service on a primary transit corridor must be part of a logical route that links logical destinations.
- **Strong anchors**. All routes should serve at least one anchor that is a major transit generator.
- **Line Spacing**. In general, parallel routes should be a minimum of a half-mile apart from one another, but exceptions should be made where barriers prevent a given line from serving a key area near it.
- **Barriers**. Bridges, steep slopes, water bodies, highways, railroads, and other barriers will strongly influence the shape of the transit network, forcing service in some corridors over others and overriding the standard of 1/2 mile line spacing.
- **Pedestrian accessibility**. Both along the corridor and on key intersecting streets, key factors of safe and convenient pedestrian access include: the presence of sidewalk facilities and curb ramps, the presence of safe pedestrian crossings at stops, the density of intersections, and/or the presence of pedestrian cut-throughs where access limitations exist.
- **High-Ridership Locations.** Places with high concentrations of students or transit-dependent residents may merit primary-level service even if they miss the appropriate density threshold.

Right-of-Way Management

Ensuring that transit can maintain a reliable schedule and relatively fast travel time is a key factor in service quality for the passenger, and is particularly important for attracting "choice" riders to the system. On-time performance is particularly important for a hub and spoke system where many passengers depend on timed connections between routes.

Traffic congestion is already a significant operational issue, particularly on Route 5 (serving St. Charles Medical Center) but also on routes serving 3rd Street. As Bend continues to grow and traffic congestion worsens, measures like those described in this section should be considered to protect transit from traffic delay. These types of features are typically employed with the Rapid Bus transit mode described above.

Avoiding Merging Delay from Stops

A transit vehicle that is required to pull out of a travel lane into a bus zone often loses significant time waiting for traffic to clear so that it can reenter the flow of traffic. Where there is on-street parking, bus bulbs that extend the sidewalk out to the travel lane allow buses to stop in the traffic lane and eliminate the need to merge back into traffic. Oregon state law requires traffic to yield to a bus exiting a bus zone. CET has already deployed flashing yield signs on the rear left of vehicles that drivers can use to alert drivers to this requirement.

Traffic Signal Timing, Stop Placement, and Transit Signal Priority (TSP)

Signals along major arterials that are not coordinated can cause significant delay to all vehicles including transit. Upgrading traffic signal systems and timing signals to prevent vehicles from making multiple stops, as is planned on 27th Street in Summer/Fall 2012, optimizes travel for all traffic utilizing the corridor.

Transit signal priority (TSP) is a mechanism for extending the green light at a traffic signal to prevent a bus from being delayed by a red light, if doing so does not disrupt the overall coordination of traffic signals. TSP utilizes a capability that is typically standard on new traffic signals to provide priority for emergency vehicles. In some cases TSP can be manually activated by a driver to alert the signal to the bus' presence or in more sophisticated systems the bus communicates to the traffic signal and requests an extended green signal if it is behind schedule.

Bus stop placement is also a factor in reducing transit delay. The preferred location for a stop at a signalized intersection is either before or after the intersection, known as a near-side or far-side stop. Stops that are located mid-block, as is the case on some parts of 3rd Street, may be warranted in some cases but can require the bus to stop once to pick up passengers and again at a traffic signal. Stops that are spaced too closely together can also impact transit operating speed.

Queue Jumps and Bus-Only Lanes (Rapid Bus Features)

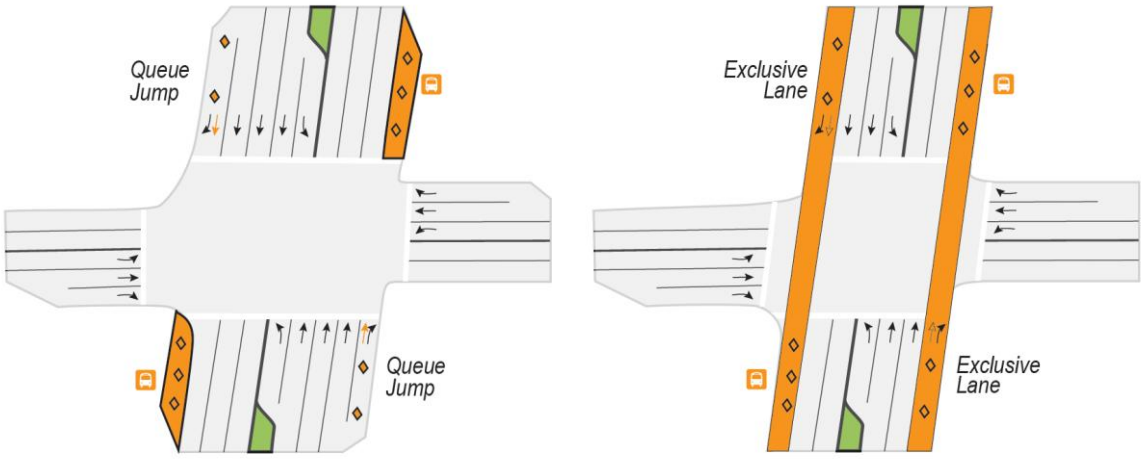
A queue jump or bypass is a mechanism that can be employed to allow a bus to bypass traffic at a congested intersection. As illustrated in Figure B-2, the right lane approaching the intersection is reserved for buses and right-turning traffic only. A special signal phase allows traffic in the right lane to clear out so that the bus can cross the intersection prior to the other lanes of queued traffic.

A bus-only (or high-occupancy vehicle) lane provides a high level of priority to transit in congested areas and can be appropriate in very high-frequency transit

corridors. Depending on the available right-of-way, such lanes can significantly impact the capacity of the street for traffic and parking, and typically require a well-established issue with transit operating speed.

Queue jumps and bus-only lanes could be considered in the future as part of implementation of a mode like Rapid Bus on a trunk corridor.[11]

Figure B-2 Queue Jumps and Bus-Only Lanes



Source: Nelson\Nygaard

CET Monthly Management Report Example

Figure B-3 provides a sample CET monthly management report, including both Bend and regional services.

[11] Although there are no industry-standard thresholds for considering queue jumps of bus-only lanes, intersection delay that significantly impacts transit operations could suggest that a queue jump be considered. Similarly, significant delay along a corridor segment could suggest that a bus-only lane be evaluated. Evaluation of the benefits of queue jumps of bus-only lanes could include estimating total person-delay with and without these features.

Figure B-3 Sample Monthly Management Report (October 2012)

Cascades East Transit Monthly Management Report

October 2012

Ridership

Demand Response	17,405
Fixed Route	39,749
Community Connector	7,937
Contracted Providers	7,316
Total Rides	72,407
% Change over last March	10.4%

Demand Resp.	Rides
Bend	5,875
Redmond	7,498
La Pine	1,096
Madras	1,212
Prineville	1,637
Sisters	87
Total Rides	17,405
% Change	3.2%
Oct '11	16,873

Fixed Route	Rides
Rt 1 South 3rd St	5,948
Rt 2 Brookswood	5,276
Rt 3 Newport	8,451
Rt 4 N. 3rd St	6,382
Rt 5 Wells Acres	7,911
Rt 6 Bear Creek	4,631
Rt 11 Galveston	1,150
Total Rides	39,749
% Change	12.3%
Oct '11	35,391

Comm. Conctr	Rides
Redmond/Bend	3,606
Prnvll/Redmond	1,645
La Pine/Bend	943
Madras/Redmond	973
Sisters/Redmond	259
Wrm Spgs/Madras	140
Clvr-Metlius/Madras	352
The Airporter	19
Total Rides	7,937
% Change	22.4%
CC Oct '11	6,484
Contr. Prov. Oct '11	6,843

Contracted Providers	Rides
Unspecified	34
Baker	192
Crook	569
Deschutes	4,202
Grant	105
Harney	225
Jefferson	469
Malheur	780
Out of Area	144
Union	461
Wallowa	135
Total Rides	7,316
% Change	6.9%

Elderly/Disabled Rides

Demand Response	11,928
Fixed Route	9,492
Community Connector	2,659
Contracted Providers	7,316
Total Rides	31,395

Service Delivery & Performance Data

	Bend DAR	Rural DAR	Fixed Route	Comm. Conctr		Total
Service Hours	1,445	1,897	1,814	1,049		6,205
Service Miles	16,799	28,069	24,239	31,660		100,767
Rides/Hour	4.07	6.08	21.91	7.57		10.49
Miles/Ride	2.86	2.43	0.61	3.99		1.55

Trip Purpose (Oct '10)

Work & Training	54.0%
Other	20.6%
Medical	8.9%
Shopping	6.3%
Recreation/Social	5.9%
Senior/Meal Center	4.4%
Total	100.0%

Service Days

Weekdays	23
Saturdays (Bend only)	4
Sundays (Bend DAR only)	4
Maj. Holidays w/Serv.	0
Maj. Holidays no Serv.	0

Safety & Security

Incidents	1	10/10-WC tipped while wheeling self in.
Prev. Accidents	2	10/14-mirror clipped by passing motorist.
Non-Prev Accdnts.	1	10/1-Backing - 10/25-Bus clipped mirror of another bus.
Injuries	0	

Customer Service

Total Calls Received	13,583
Ride Denials	54
FTA Denials	0
No Rides Found	48
No Shows	878
Late Cancellations	2,824

Monthly Operations Financial Data (October)

	Bend DAR	Rural DAR	Fixed Route	Comm. Conctr		Total
Fixed Contract Cost (hours)	$10,427	$0	$13,089	$0		$23,516
COIC Admin Cost (hours)	$3,323	$16,322	$4,172	$9,026		$32,843
Driver Cost (hours)	$41,844	$29,410	$52,526	$16,263		$140,045
Other Ops Wages & Benefits	$11,413	$38,061	$14,327	$21,047		$84,847
Fuel Cost (miles)	$33,601	$13,211	$48,482	$14,901		$110,194
Maint. Cost (miles)	$3,512	$15,260	$5,067	$17,212		$41,051
Other Cost (hours)	$4,306	$13,835	$5,406	$7,650		$31,198
Total Cost	$108,427	$126,099	$143,069	$86,099		$463,694
Farebox Revenue (month)	$5,361	$6,543	$15,782	$10,318		$38,004
Cost/Ride (Oct)	$18.46	$10.94	$3.60	$10.85		$7.12
% Farebox Recovery (Oct)	4.9%	5.2%	11.0%	12.0%		8.2%

Complaints & Compliments

CET Service	
Driver Complaints	13
Call Center/Dispatch Compl.	4
Program/General Compl.	25
Total Complaints	42
Compliments	1

Brokerage Service	
Contracted Provider Compl.	18
Call Center/Dispatch Compl.	6
Program/General Compl.	3
Total Complaints	27
Compliments	1

COMPARISON OF SERVICE ALTERNATIVES FOR ROUTE 5

As discussed in Chapters 5 and 7 of the PTP, the most significant operational issue for the Bend local fixed-route system is to resolve issues with on-time performance for Route 5 that were mitigated by pulling Route 5 off of a standard 40-minute pulse schedule. This section describes various solutions that were considered and how the project team arrived at the preferred solution included in the PTP to enable Route 5 to return to the coordinated schedule as soon as possible.

Two options were pursued but were not feasible for implementation in the short-term time frame:

- Provide an additional route (#7) on Greenwood Avenue to provide direct service between Hawthorne Station and the Forum Shopping Center and St. Charles Medical Center. This option is recommended for the mid-term but is not feasible in the short-term where no increase in operating costs is assumed.
- Extend Route 11 to serve Northwest Crossing and COCC, enabling a shortened Route 3 that runs in 30 minutes, and rely on a variety of improvements to reduce running time (including signal timing improvements on 27th Street and low-floor buses). This option depends on the new OSU facility planned for SW Colorado Avenue. Due to uncertain timing, these changes are assumed for the near mid-term time frame.

Option #1, illustrated in Figure B-3 below, was identified as a feasible alternative. It shortens Route 5, turning it around at St. Charles Medical Center, and extends Route 6 to serve a one-way loop on 27th (NB) – Neff (WB) – Purcell (SB) – Greenwood (EB). This option was presented for public feedback in an online survey and at public outreach events in early October 2012.

Subsequently, a variation on this alternative ("Option #2") was developed based on a suggestion from a driver. This alternative would interline Route 5/6, as illustrated in Figure 7-8 in the PTP (reproduced in Figure B-7 below). It works as follows:

- Outbound Route 5 turns into inbound Route 6 after serving St. Charles Medical Center and Purcell Boulevard.
- Outbound Route 6 turns into inbound Route 5 after serving Bear Creek Road and Greenwood Avenue.
- At Hawthorne Station, inbound Route 5 turns into outbound Route 6 and vice-versa.

Both Option #1 and Option #2 have advantages and disadvantages, and most importantly both options would allow Route 5 to return to the pulse schedule. However, based on consideration of the tradeoffs identified in Figure B-4, the project team selected Option #2 as the preferred option that is included in the PTP. In particular, Option #2 maintains a direct connection for Route 5 passengers to the Forum Shopping Center (disadvantage of Option #1) and only impacts passengers returning from St. Charles Medical Center or parts of Purcell Boulevard to destinations on Route 5. The addition of an outbound Route 6 stop at Purcell and Greenwood would help reduce the walking distance for these passengers; the Route 6 bus becomes the inbound Route 5 bus after this stop.

Option #2 is also consistent with a mid-term recommendation to interline Routes 5 and 6 (in conjunction with Route 7). In the mid-term time frame, introduction of Route 7 would address the disadvantages of Option #2.

Figure B-4 Comparison of Short-Term Options for Route 5

	Infrastructure Changes Required	Comparative Advantages/Disadvantages
Option #1 (shorten Rt 5, extend Rt 6)	▪ Signage changes on 27th and Purcell (Greenwood – Neff)	Advantages (a) Rt 5 could be interlined with Rt 3 to provide a one-seat ride to COCC (b) No impact on inbound or outbound Rt 5 riders between Hawthorne Station and Medical Center, and provides a faster trip. (c) Passengers from Purcell Blvd or 27th (between Neff and Greenwood) traveling inbound to Hawthorne Station or COCC are not impacted (can ride Rt 6) Disadvantages d) No direct inbound or outbound connection for Rt 5 passengers to/from Forum Shopping Center e) No direct connection for passengers along 27th (near Greenwood) to/from Rt 5 destinations, e.g. Mtn. View H.S. f) No direct connection for passengers along Purcell (between Neff and Greenwood) to inbound Rt 5 destinations, e.g. Mtn. View H.S. (without walking to St. Charles Medical Center stop).

	Infrastructure Changes Required	Comparative Advantages/Disadvantages
Option #2 (interline Rt 5 and Rt 6)	▪ Addition of a stop for outbound Route 6 at Purcell and Greenwood (could likely be used by Route 7 in the future)	Advantages a) Addresses issue #1(d) and #1(e) above b) Passengers from Purcell Blvd or 27th (between Neff and Greenwood) traveling to Hawthorne Station or COCC are not impacted (can ride Rt 6)[Same as #1(c)] c) Consistent with plan to interline 5 & 6 in the mid-term d) Provides connections from Rt 6 to St. Charles Medical Center Disadvantages e) Inbound trips from St. Charles Medical Center and the northern two stops on Purcell to destinations on Rt 5 would have to walk to 27th Future Considerations f) Based on current running time estimates, it would not be possible for inbound Rt 5 to deviate from 27th to serve St. Charles Medical Center; if this is possible in the future, it would help address #1(f)

Figure B-5 lists walking distances and times from affected stops at St. Charles Medical Center and along Purcell Boulevard to the existing stop at 27th and Neff and the proposed stop at Greenwood and Purcell.

Figure B-5 Walking Distances and Times from Existing Stops to Inbound Route 5 Stops for Option #2

To→ ↓ From Stop # and/or Location	Stop #518 NB 27th @ Neff	Proposed Stop EB Greenwood @ Purcell
St. Charles Medical Center (Front Entrance)	0.4 miles (7 min)	-
Stop #533, Purcell @ Lotus	0.7 miles (13 min)	0.8 miles (16 min)
Stop #534, Purcell @ Sam's Loop	0.9 miles (16 min)	0.6 miles (13 min)
Stop #535, 1025 Purcell	-	0.4 miles (9 min)
Stop #536, Purcell @ Paula	-	0.3 miles (6 min)
Stop #537, Purcell N. of Hwy 20	-	0.1 miles (3 min)

Note: Yellow shading identifies the new stop in closest proximity to stops that would no longer be served by inbound Route 5.

Figure B-6 Short-Term Service Improvements (Option 1)

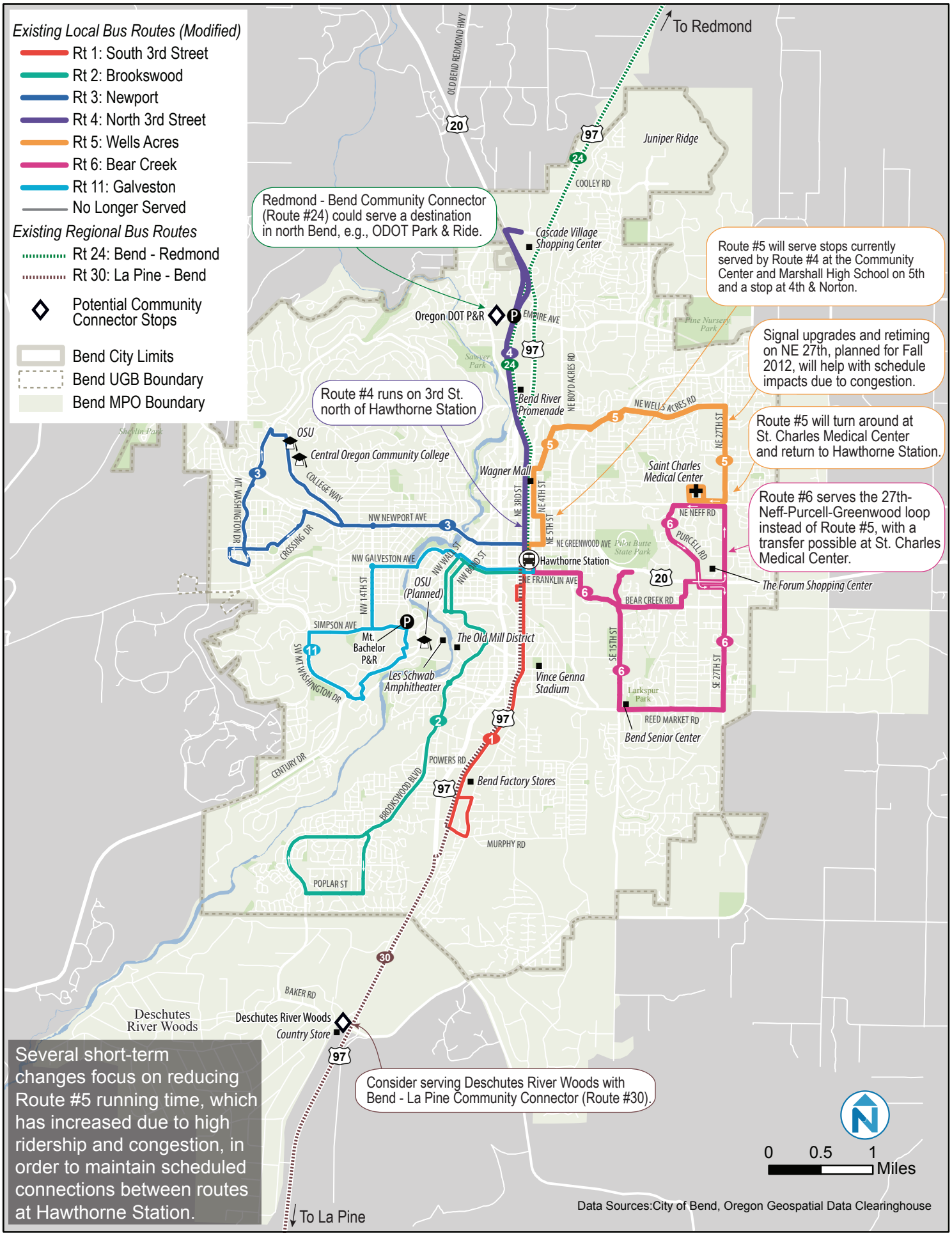
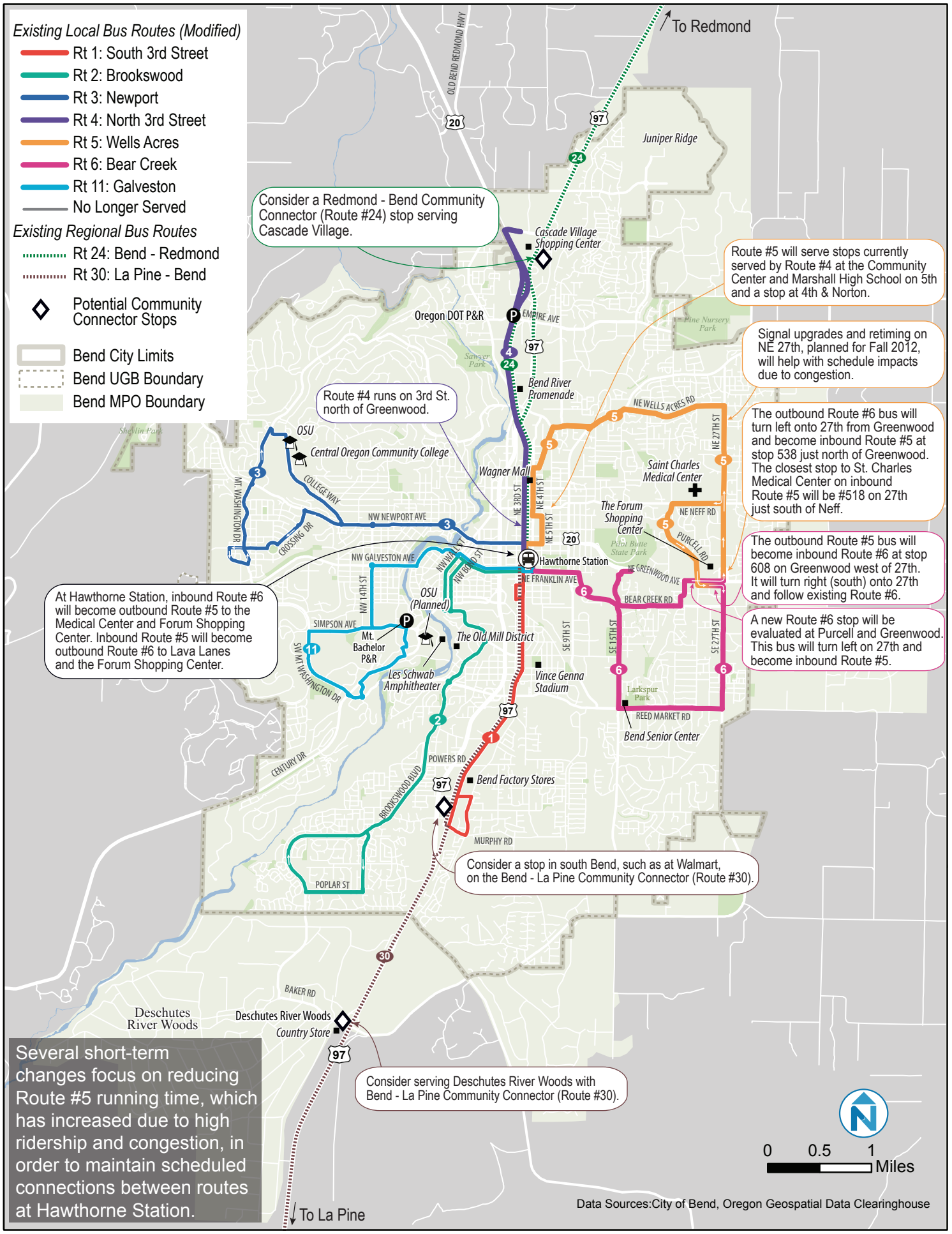


Figure B-7 Short-Term Service Improvements (Option 2) - Proposed in PTP



DETAILED RESTRUCTURED SERVICE CHARACTERISTICS AND COSTS

Figure B-8 Service Characteristics by Route: Initial Restructured Service Implementation

Route	Description	Key Changes		Headway						
			Cycle Time	Peak	Midday	Early Evening	Late Evening	Saturday*	Sunday	# Peak Buses
1	South 3rd St	No change	30	30	30	30	-	60	-	1.0
2	Brookswood	No change	60	60	60	60	-	60	-	1.0
3	Newport	MODIFIED to serve Newport and COCC only. Interlined with Route 7.	30	30	30	30	-	60	-	1.0
4	North 3rd St	No change	60	30	60	60	-	60	-	2.0
5	Wells Acres	Interlined with Route 6 to avoid duplication with	60	60	60	60	-	60	-	1.0
6	Bear Creek	Interlined with Route 5 to avoid duplication with	60	60	60	60	-	60	-	1
7	Greenwood (New)	NEW ROUTE - to St. Charles Medical Center	30	30	30	30	-	60	-	1
11	Galveston (to COCC)	MODIFIED to serve Summit HS, NW Crossing, and COCC	60	60	60	60	-	60	-	1.0
11	Galveston (Short to OSU/Cascades)	Short version of modified Route 11 that runs peak/midday and turns around in the vicinity of the new OSU facility	30				-	-	-	
OVERALL HEADWAY			**30-60**	**30-60**	**30-60**	**30-60**	**-**	**30-60**	**-**	**9.0**
# PEAK BUSES				**9.0**	**8.0**	**8.0**	**-**	**6.5**	**-**	

Figure B-9 Service Characteristics by Route: Long-Term Service Targets

Route	Description	Key Changes		Headway						
			Cycle Time	Peak	Midday	Early Morning / Evening*	Late Evening*	Saturday*	Sunday*	# Peak Buses
1	South 3rd St	No change	30	15	30	30	60	30	60	2.0
2	Brookswood (to Poplar/Brookswood)	No change	60	60	60	60	60	60	60	1.0
2	Brookswood (to Murphy/Brosterhous)	EXTENDED to Brosterhous/Murphy	60	60	60	60	60	60	60	1.0
2	Brookswood (Short to Reed Market)	Short version of Route 2 to provide increased service in downtown and Old Mill	30	30	-	-	-	-	-	1.0
3	Newport	MODIFIED to serve Newport and COCC only. Interlined with Route 7.	30	15	30	30	60	30	60	2.0
4	North 3rd St	EXTENDED to serve Juniper Ridge or NE Bend	60	15	30	30	60**	30	60	4.0
5	Wells Acres	Interlined with Route 6 to avoid duplication with	60	30	30	30	60	60	60	2.0
6	Bear Creek	Interlined with Route 5 to avoid duplication with	60	30	60	60	60	60	60	2.0
7	Greenwood (New)	NEW ROUTE - to St. Charles Medical Center	30	15	30	30	60	30	60	2.0
8	8th/Boyd Acres/18th (New)	NEW ROUTE - NE Bend and Juniper Ridge	60	60	60	60	60	60	60	1.0
11	Galveston (to COCC)	MODIFIED to serve Summit HS, NW Crossing, and COCC	60	30	60	60	60	60	60	2.0
11	Galveston (Short to OSU/Cascades)	Short version of modified Route 11 that runs peak/midday and turns around in the vicinity of the new OSU facility	30	30	60	60	60	60	-	1.0
OVERALL HEADWAY			**30-60**	**15-60**	**30-60**	**30-60**	**30-60**	**30-60**	**60**	**21.0**
# PEAK BUSES				**21.0**	**12.5**	**12.5**	**8.5**	**11.5**	**8.5**	

Figure B-10 Flexible Service Plan: Estimated Operating and Capital Cost Breakdowns

Enhancement	Annual Operating Cost [1]	One-Time Vehicle Costs	One-Time Non-Vehicle Capital Costs	Notes
Short-term				
Route 4, 5, 6 changes (permanent stop improvements)	$0	$0	$12,000	
Near Mid-term				
Restructured Route 3 and 11	$0	$0	$68,000	a
All-day and Saturday service on Route 11 (hourly)	$153,000	$0	$0	b
One additional run of early evening service on all routes, i.e., up to 7:00 pm (varies by route)	$92,000	$0	$0	
ADDITIONAL SHORT-TERM COSTS	**$245,000** [2]	**$0**	**$68,000**	
Mid-term: Initial Implementation of Restructured System				
Early evening service hours (6:00 – 8:00 PM) with 30 or 60 minute headways (same as weekday midday)	$259,000	$0	$0	c, d
New Route 7 via Greenwood to Forum Shopping Center/Medical Center (30 minute), interlined with Route 3 to COCC	$274,000	$540,000	$70,000	e
Bidirectional Routes 5 and 6	$0	$0	$46,000	f
30 minute peak headway on Route 4	$110,000	$0	$0	g
Hourly Saturday headway, including service on Route 11. Up to 30-minute wait for some transfers.	$202,000	$0	$0	h
ADDITIONAL MID-TERM COSTS	**$880,000** [2]	**$540,000**	**$116,000**	
Longer-term Flexible Service Options (General Priority Order / Based on Service Targets)				
Later evening service hours (8:00 – 10:00 PM) on all routes. Assume to operate similar to Saturday service, with up to 30-minute wait for some transfers	$259,000	$0	$0	c, h, i
Provide Sunday Service (Hourly, 8 AM – 5 PM)	$281,000	$0	$0	c, i
Upgrade Route 4 to all-day 30 minute headway	$165,000	$0	$0	j
Upgrade Route 2 to midday 30 minute headway on the core of the route with hourly service to existing Poplar/Brookswood loop and hourly service to Murphy/Brosterhous.	$310,000	$270,000	$47,000	k
Upgrade to 30 minute peak headway on Routes 5 and 6 and full route 11	$331,000	$578,000	$0	l
Upgrade to 30 minute midday/early evening headway on Routes 5 and 6	$331,000	$0	$0	

Enhancement	Annual Operating Cost [1]	One-Time Vehicle Costs	One-Time Non-Vehicle Capital Costs	Notes
Morning service hours (start at 5:00 AM)	$231,000	$0	$0	c, d, i, m
Upgrade Saturday headways to 30-minutes on primary routes: 1, 3, 4, 7, 11 (short route)	$160,000	$0	$0	i
Extend Saturday service to 7 am – 7 pm on all routes	$118,000	$0	$0	c, d, i, m
Service to Juniper Ridge via extended Route 4	See note	$0	$28,000	n
Service to Juniper Ridge and/or Cascade Village via new Route 8 (serving NE neighborhoods), with 60 minute headways	$389,000	$154,000	$110,000	o
15 Min peak weekday headway on primary corridors (1, 2 short, 3, 4, 7, 11 short)	$826,000	$1,542,000	$0	p
ADDITIONAL LONGER-TERM COSTS	**$3.3 M [2]**	**$2.5 M**	**$266,000**	
***TOTAL* COST WITH ALL IMPROVEMENTS (SHORT, MID, AND LONGER-TERM)**	**$5.7 M**	**$3.1 M**	**$460,000**	**q**

Notes:
(1) Operating cost based on 2012 fixed-route cost of cost of $72 per vehicle revenue hour.
(2) Operating cost breakdowns do not correspond exactly to total costs for each time frame, since costs of a particular option depend on phasing of other improvements and there is some overlap in costs between packages.
(a) Assumes 16 basic and 6 major directional stops.
(b) Priority funding item if additional operating resources are available in this time frame. Assumes existing span of service.
(c) Requires expansion of ADA Paratransit service (see Figure B-11).
(d) Does not include morning and/or evening service on Route 7, included with Route 7 cost
(e) Includes early evening service from 6 am – 8 pm. Assumes 4 basic and 10 major directional stops. Includes a new low-floor vehicle for Route 7 and a low-floor replacement vehicle for Route 3. For cost purposes, it is assumed the old Route 3 bus could provide peak service for Route 4.
(f) Assumes 11 basic and 4 major stops.
(g) 30-minute service on Route 1, 3, 7, and on 11 (short to OSU) is included in the base cost of the initial restructuring. Vehicle cost for peak Route 4 service is included with Route 7 (see note "e").
(h) It is assumed that routes which cycle in 30-minutes will run hourly but will be interlined to reduce the total number of buses in operation and therefore costs. This is similar to the current practice for scheduling existing Saturday service, but could result in an up to 30-minute transfer time. Interlining/scheduling should be employed strategically to best serve travel patterns. Route 7 cost is included with that line item.
(i) Does not include new Route 8.
(j) "All-day" does not include later evening service. It is assumed that the Route 4 peak-hour vehicle would provide this service.
(k) Assumes 18 basic and 2 major directional stops. Does not include Saturday service to Murphy/Brosterhous (included with expansion of Saturday headways)
(l) A mix of low-floor (1) and standard vehicles (2) is assumed.
(m) Operates similar to weekday midday and early evening service
(n) Operating cost included in base cost. The restructured Route 4 is assumed to have adequate time to serve Juniper Ridge or NE neighborhoods within an hour cycle time without additional operating resources or vehicles.

Service to Juniper Ridge or NE Bend may not be warranted at the same level as the core route to Cascade Village. Capital cost assumes 8 basic and 2 major directional stops.

(o) Includes costs of morning, early/later evening, expanded Saturday hours, and Sunday service. Assumes 32 basic and 8 major directional stops. Assumes a standard vehicle.

(p) Requires 7 additional peak vehicles (mix of low-floor and standard vehicles is assumed). Expansion may not be warranted on all routes; expansion should be based on based on service design guidelines and prioritized on primary transit corridors, i.e., 1, 2 (short route at least to Old Mill District), 3, 4, 7, and 11 (short route at least to OSU)

(q) Total non-vehicle costs include improvements such as secondary and primary transit hub enhancements.

Figure B-11 Estimated Incremental ADA Paratransit Operating Costs

Service Concept	Proposed Time Frame	# Annual Service Hours	Estimated Number of Vehicles	Estimated Annual Incremental Cost
Early Evening Service (6:00 – 8:00 pm)	Mid-Term	510	3	$110,000
Later Evening Service (8:00 – 10:00 pm)	Long-Term	510	2	$73,000
Early Morning Service (5:00 – 6:00 am)	Long-Term	255	2	$37,000
Increased Saturday Hours (7:00 – 7:45 am, 5:00 pm – 7:00 pm)	Long-Term	156	3	$34,000
Sunday Service (8:00 – 8:45 am, 3:15 pm – 5:00 pm)	Long-Term	174	2	$25,000
Mid-Term Costs				$110,000
Long-Term Costs				$169,000
TOTAL				$279,000

Notes: Based on 2012 Dial-A-Ride cost of $72 per vehicle revenue hour

Figure B-12 Capital Improvement Unit Costs

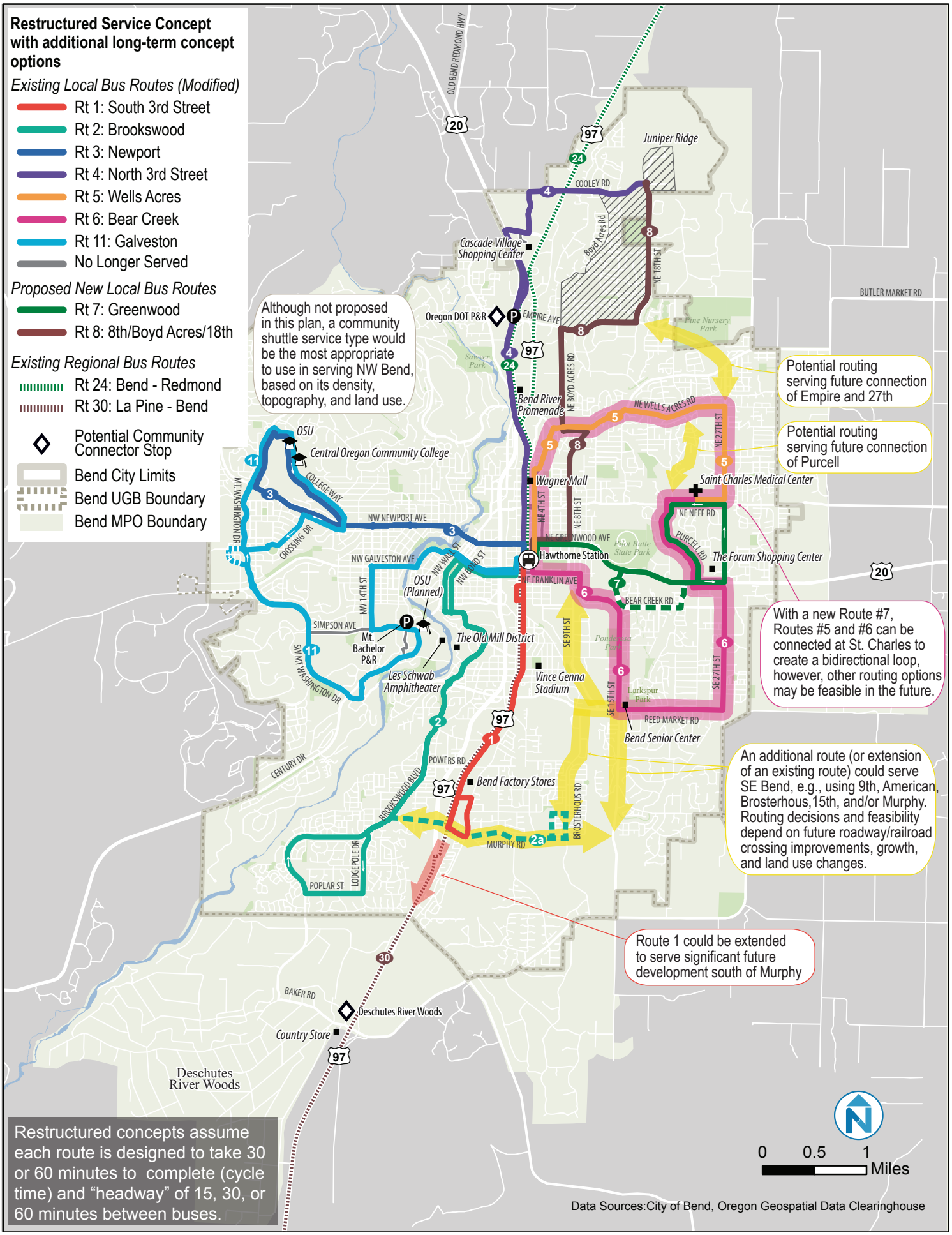
Item	Unit Cost	Source
High-Floor, Medium-Duty Bus	$154,000	CET Price Quote
Low-Floor Bus	$270,000	CET 5-Year Budget
Dial-A-Ride Bus (Cutaway)	$45,000	ODOT
Basic Stop	$1,900	CET
Major Stop	$6,200	CET
Enhanced Stop (Low)	$10,200	CET
Enhanced Stop (High)	$30,000	High-level estimate

ADDITIONAL LONG-TERM SERVICE CONCEPTS

Figure B-13 illustrates several additional long-term concepts, particularly in NE and SE Bend, that could be enabled by planned/future roadway connections and/or projects to address significant connectivity issues. It is difficult to anticipate how land use and transit demand will respond to these improvements, therefore the map identifies potential connections and where applicable, suggests how they may be served. These options should be revisited in the future.

- **NE Empire Ave and 27th Connection**. The planned, future connection of Empire Ave and 27th Street will provide a more direct connection from north Bend to the Medical Center district. Any service planned to this connection would require a strong northern anchor, such as Cascade Village or Juniper Ridge.
- **NE Purcell Blvd**. A future connection on Purcell Blvd between Wells Acres Road and Neff Road may be useful in providing service to the Medical Center district.
- **Additional Corridors in SE**. The future connection of Murphy Road to 15th Street and future land use development in SE Bend may justify a route serving some combination of: 9th and 15th Streets north of Reed Market; American Lane/Brosterhous Road, 15th Street, and Murphy Road south of Reed Market. A critical fix to enable any such service is realignment of the American Lane connection to Reed Market and addressing delay at the railroad crossing of Reed Market just west of 9th Street. Residential and/or mixed-use development along SE 15th south of Murphy Road that is realized at transit-supportive densities would also be an essential component of any such route. Additional service in SE Bend could serve a south transit hub that facilitates connections with Route 1 and/or 2.
- **NW Bend.** The relatively low density and hilly topography of NW Bend (north of Route 3 along Newport Avenue) makes it challenging to serve with traditional fixed-route transit. The service guidelines provided in the PTP (see Figure 7-5) identify service types appropriate for serving lower-density areas, such as a community shuttle or deviated fixed-route. Public input received as part of this planning process has not (to date) identified a stated need for service in this area. Any future assessment of such a service should include analysis of potential demand/ridership, likely productivity, and focused public input.

Figure B-13 Additional Conceptual Options



TRANSIT CENTER LOCATION CONSIDERATIONS

Hawthorne Station has advantages and disadvantages compared to other potential transit center locations in downtown or between 3rd Street and the Bend Parkway. This plan recommends retaining the existing transit center location, but provides a summary of its advantages and disadvantages in Figure B-14, to aid consideration of any future opportunities to relocate the transit center, such as in conjunction with a Hawthorne Avenue undercrossing of the Bend Parkway, as proposed in the Central Area Plan and Transportation Systems Plan (TSP).

Figure B-14 Advantages and Disadvantages of Current Transit Center Location

Advantages	Disadvantages
▪ Provides central location for routes serving east Bend, which are already tight on schedule. ▪ Limited access across the Bend Parkway could impose additional delay on east-serving routes given a downtown transit center location. ▪ Relatively new, comfortable facility with restrooms and indoor passenger waiting area. ▪ Location has adequate on- and-off street capacity for local, Community Connector, and longer-distance intercity services, as well as moderate expansion of the number of Bend local routes. Potential for redevelopment/increased density exists in vicinity of current location (or other eastside locations west of 3rd Street). ▪ Current site is owned by COIC.	▪ Current location is beyond comfortable walking distance to downtown destinations (0.75 miles or more). A downtown transit center site would provide better downtown access. A location west of 3rd Street would also provide improved access, especially if a potential Hawthorne Avenue undercrossing is constructed in the future. ▪ Current location lacks significant transit demand generators and the adjacent street environment along 3rd Street is not particularly pedestrian-friendly or conducive to walking, although both of these conditions have and are likely to continue to improve. ▪ Traffic volumes on 3rd Street can delay transit vehicles attempting to reach the transit center from the north or south. ▪ Bus circulation is not optimal on 4th, which is narrow and has a residential character. Modification of on-street parking on 4th north of Hawthorne should be considered to improve transit operations. ▪ Increased service frequency/hours would increase impact of buses on the neighborhood.

DOWNTOWN CIRCULATOR CONSIDERATIONS

Downtown circulators are a specialized type of bus route typically serving visitors, tourists, and/or downtown workers/residents. Circulators may use a historical vehicle or a standard, but distinctively branded, bus. Developing such a circulator in Bend, building upon the successful Ride the River service, was suggested in public input received as part of this plan. Figure B-15 summarizes potential strengths and weaknesses of this type of service in Bend—conceived as a seasonal circulator between downtown Bend and the Old Mill District.

Figure B-15 Strengths and Weaknesses of a Potential Bend Downtown Circulator

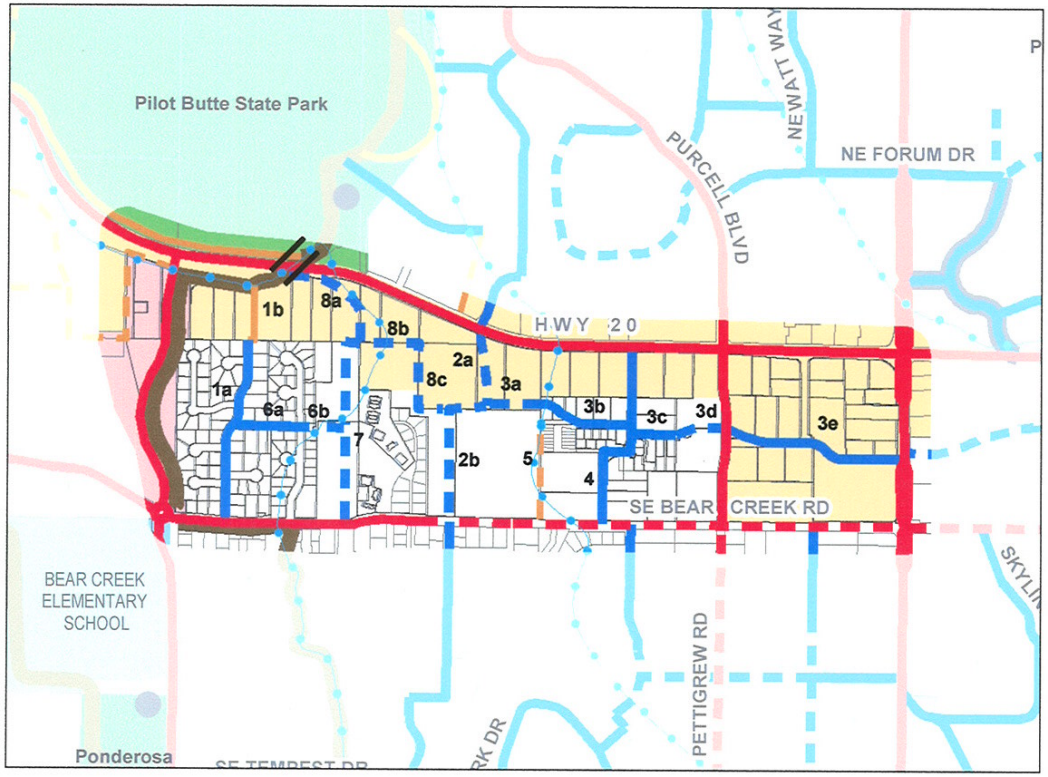
Potential Strengths	Potential Weaknesses
▪ Downtown Bend and the Old Mill District are highly walkable, attractive destinations and a distinctively branded, visually attractive circulator could complement walking trips. ▪ Bend has a strong and established business association that could be an effective sponsor for the service.	▪ A circulator would have to be very frequent to compete with walking within each district, which would incur a high cost. ▪ Current parking supply may not be sufficiently constrained to make a circulator attractive. ▪ The current transit system does not run frequently enough or during later evening hours to enable convenient transit connections with a frequent downtown circulator. ▪ Population and employment density is likely not currently sufficient to make a circulator feasible without high utilization by visitors. ▪ Bend may lack the density of major tourist destinations to create sufficient demand for a circulator service. ▪ A circulator will need to appeal to the recreation-oriented visitor/tourist market in Bend, e.g., as evidenced by bicycles available for guest use at many hotels.

A dedicated funding source or benefactor would have to be identified to support the service financially, however the critical issue for a circulator is likely that downtown parking is not currently supply and/or cost-constrained. When/if parking constraints develop, they may provide the momentum for a circulator. A circulator concept could also be incorporated with the Central Area Plan, a pedestrian-oriented potential Hawthorne Avenue undercrossing, and/or future relocation of the transit center. In the interim, designating the key east-west and north-south corridors serving downtown and the Old Mill District as primary transit corridors, as recommended in this plan, identifies more frequent and later service as a priority. The impact of these improvements on transit ridership could demonstrate future demand for a more specialized circulator service in the future.

GREENWOOD PEDESTRIAN ACCESSWAYS MAP

The map on the following page (Figure B-16) from the Bend TSP illustrates existing or planned pedestrian connections between Bear Creek Road and Greenwood Avenue. These accessways would support pedestrian access to the recommended routing of Route 7 along Greenwood Avenue instead of Bear Creek Road.

Figure B-16 TSP Accessways Map N-21 (for Greenwood Route)



Urban Area Reserve
City Boundary
River
Canals
Schools
Commercial / Industrial Zoning
Public Ownership
Golf course

Developed Parks
Undeveloped Parks
Potential / Future Parks
Existing trailhead
Proposed trailhead
Railroad
Proposed Rails with Trails
Existing Bridge / Grade Separation
Proposed Bridge / Grade Separation

Existing bicycle lane
Future bicycle lane
Existing shared roadway
Future shared roadway
Existing multi-use path, Primary
Future multi-use path, Primary
Existing multi-use path, Connector
Future multi-use path, Connector
Forest Service Trails
Private Road

N
W E
S

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Miles

D. Quinlan / neigh_21.mxd

DESCHUTES GEOgraphics

J.T. ATKINS COMPANY PC

Bend Urban Area Bicycle and Pedestrian System Plan

Neighborhood 21

October 20, 2006

PUBLIC INPUT ON SERVICE CONCEPTS

An online survey was developed to solicit input on the proposed service concepts. The link was posted on the transit plan (Bend MPO) and CET websites and listed on a flyer distributed on buses and at other locations in Bend. Input on the service concepts and other elements of the PTP was solicited at a public open house on October 3, 2012 and at a mobile outreach event at Hawthorne Station on October 4, 2012. Meeting attendees were able to complete full or abbreviated paper versions of the surveys. This section summarizes feedback received through the meetings and the online survey. While relatively few responses were received, the results indicate general support for the proposed concepts.

Short-Term Improvements

- All respondents (n=16) support proposed Option #1 that brings Route 5 back onto the pulse schedule; Option #2 was developed after the public outreach events, however based on the above analysis it is assumed that it will serve riders as well as or better than Option #1.
  - *"I think these changes, though they will affect some riders, will make it far more convenient for those who have to transfer at Hawthorne station."*
- Most riders support interlining Route 5 or 6 with Route 3 to provide a one-seat ride to COCC, however in Option #2 Routes 5 and 6 are interlined. In the mid-term time frame, Route 3 to COCC would be interlined with new Route 7.
- Most riders support the proposed routing changes to Routes 4 and 5 north of Hawthorne Station (Route 4 serves 3rd Street while Route 5 serves Marshall High School and the Community Center). The following comment is not related to the proposed changes, but provides a suggestion that can be considered operationally by CET related to Route 4.
  - *"I feel that the #4 bus should pick up passengers at Cascade Village on its last run of the day. As it is now, it leaves Cascade Village with no passengers. I work until 6 PM on Thursday and Friday. I have no way to get home on these days with no bus. The bus leaves Cascade Village at 6:20 PM, empty, which to me is a waste of money when there are people who would take the bus to Hawthorne Station. Since Hawthorne Station is on the way to the bus terminal, it would not be a waste of money doing this. Since the Bus Barn is so close to Hawthorne station, I don't think any route should have a final return empty of passengers."*
- All respondents (n=14) support using the Bend-La Pine Community Connector to provide service to Deschutes River Woods. Comments included the potential for a

park and ride lot and noted that it could be valuable for school children since it is beyond the school bus system. Two of the five comments suggested providing service to Sun River (which will be considered as part of the Regional Transit Master Plan):

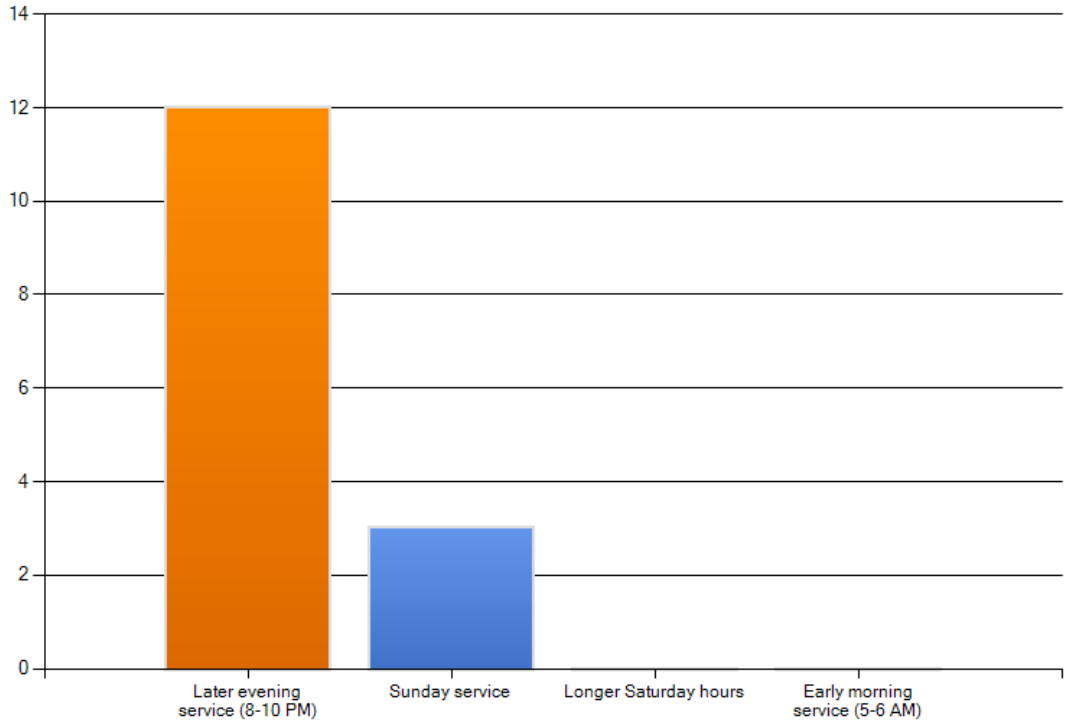
- *"YES! DRW really needs service, even if it's just one stop it would be such a help for the people who live there. Have you considered using the same bus to make a stop in Sun River? I know I would use it regularly and so would quite a few of my friends. It's really tough to be driving 40 miles every day especially with gas being so expensive and biking takes a decent chunk of time out of the day."*
- *"Sounds like a good idea to me, and even as a La Pine rider, it wouldn't be that big of a delay added to the route."*

Near Mid-Term (Year 4), Mid-Term (Years 5-9), and Long-Term (up to 20 Years) Improvements

- Over 80% of respondents (n=16) support the proposed changes to Routes 3 and 11, while 20% of respondents supported them with reservations ("I do not like the changes, but I could live with them"). Two comments favored implementing these changes sooner.
  - Several members of the MPO Citizen's Advisory Committee raised the potential to connect a new OSU facility to COCC via 14th Street. This option could be evaluated further closer to the time of implementation. Initial evaluation is that while 14th Street could be a potential route for a direct shuttle connection, it is unlikely to be suitable to be served by Route 11. Strengths of the proposed routing are that Mt. Washington provides a fast connection, serves NW Crossing, and provides a Summit High School-COCC connection. However, if Route 11 were to use 14th/Newport, inbound Route 11 passengers would need to travel to downtown and Hawthorne Station via COCC. Likewise, trips from COCC to the new OSU facility would need to go to Hawthorne Station and then to OSU. In addition, the proposed route 11 would serve Northwest Crossing and allow Route 3 to be restructured with a 30-minute running time. This would enable a direct, interlined Route 3 – Route 7 connection in the future.
- Over 90% of respondents (n=12) support restructuring the system around routes that run every 30 or 60 minutes, while about 10% support the change with reservations.
  - *"I think it would be great as long as it also means more area is being covered at the same time."*

- All respondents (n=13) support the proposed Route 7 serving Greenwood Avenue.
  - *"I think this would be great especially if 5 and 6 are combining into one big route."*
- Related to Route 7, most respondents (n=13) either prefer running the bus on Greenwood Avenue instead of Bear Creek Road, or were fine with either option (combined over 90%). The question noted that there would be accessible pedestrian connections from Bear Creek Road to stops on Greenwood Avenue.
- Over 90% of respondents (n=13) support running Routes 5 and 6 in a bidirectional loop after Route 7 is in place.
- If one additional improvement could be included in the mid-term time frame, 80% of respondents (n=15) favored providing later evening service (8-10 PM). Twenty percent (20%) of respondents favored providing Sunday service. Two respondents commented that they would also include early morning service.

Figure B-17 Service Concepts Survey: Preferences for Additional Mid-Term Improvements

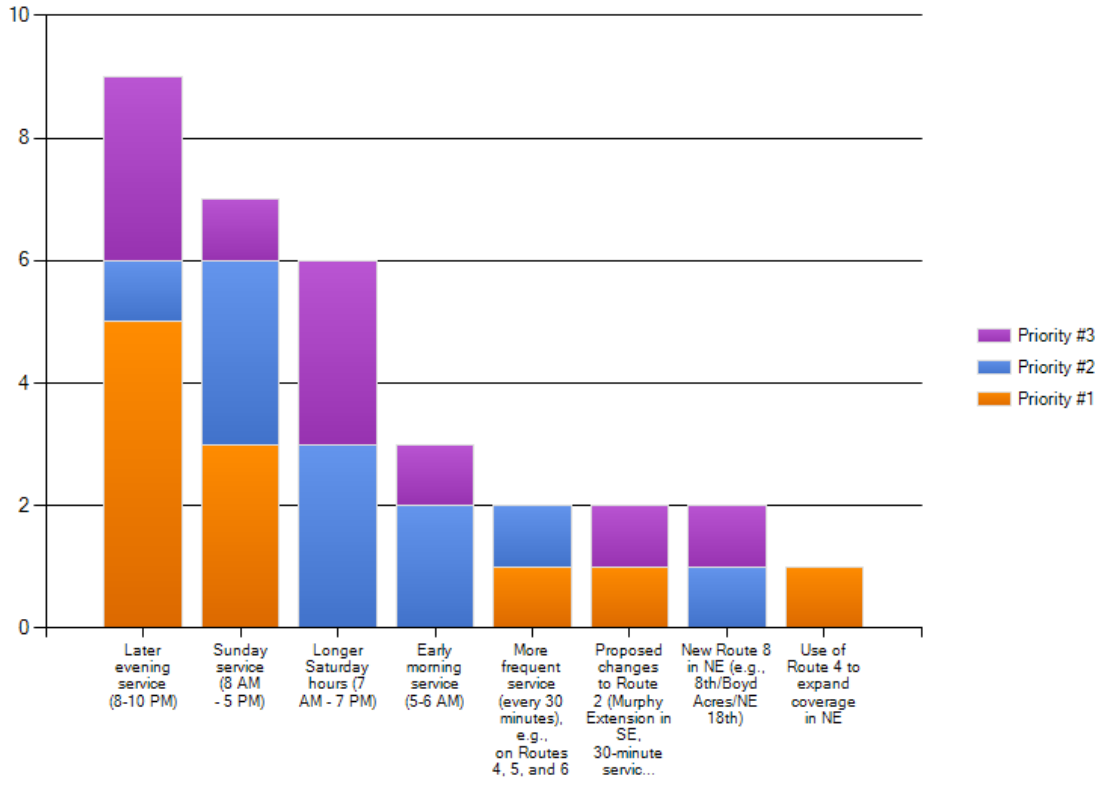


- All respondents (n=15) support the mid-term concepts, of which one respondent supported them with reservations. One comment asked about

service to the Murphy/Brosterhous area (proposed as a long-term improvement).

- About 85% of respondents (n=13) support extending Route 2 to the Murphy/Brosterhous area (hourly) on alternating trips with service on the existing Poplar Street loop; the overlapping portion of the route would have service every 30 minutes. One respondent supports this concept with reservations while another respondent does not support the concept.
- All respondents (n=13) support proposed improvements in NE Bend (Route 4 extension or new Route 8).
- Among the long-term improvements, later evening and Sunday service are among the top three priorities for the largest share of respondents (n=11) as shown in Figure B-18. This is consistent with public input earlier in the project.
- Nearly 88% of respondents support the long-term concept overall. The remaining respondents support it with reservations ("I do not like all of the changes, but I could live with the overall concept").

Figure B-18 Top Three Priorities among Long-Term Improvements



Additional Input

Additional input or comments received include:

- Shelters should be protected from wind and rain, and have space for wheelchairs.
- Open Hawthorne Station on Saturdays, especially in winter.
- More free days, like on Commute Options Day.
- Early morning transit on icy mornings helps with safety.

APPENDIX C FUNDING OPTIONS

This appendix provides additional details about existing and potential funding sources for transit (discussed in Chapter 9). It includes information on federal, state, and local sources as well as public-private partnerships, including whether they are based on a funding formula (e.g., population) or discretionary (grant), restrictions on use (operating and/or capital), the required local match, and an assessment of their potential applicability for Bend.

Summary of Existing and Potential Funding Sources

Figure C-1 Potential Funding Sources and Applicability to Bend

Program Name	Description	Applicability/Assessment/Comments
Federal Grants		
FTA 5307 (MAP-21)[12]	The MAP-21Urbanized Area Formula Program (Section 5307) can be used for operating or capital purposes. It now also includes formula-based section 5340 (Growing States/High Density) and Job Access and Reverse Commute (JARC) funding. ▪ 5307 funds may be used for : Capital, Planning, and JARC projects (provide transportation to jobs and employment opportunities for welfare recipients and low-income workers). About 3% of total funds are designated for JARC, but there are no restrictions or requirements related to use of funds for JARC purposes. ▪ For areas of 50,000 to 199,999 in population, the formula is based on population and population density, and number of low-income individuals ▪ Eligible for operating costs in areas with fewer than 200,000 in population ▪ 20% local match for capital assistance ▪ 50% local match for operating assistance ▪ 20% local match for ADA paratransit service (up to 10% of a recipient's apportionment)	**APPLICABLE – INCREASED POTENTIAL** – Current funding for federal FY 2012 is $707,376. Federal FY 2013 funding under MAP-21 is about $1.1 million, of which half is currently allocated ($580,034). However, a local match is required to leverage additional federal money.
FTA 5310 (MAP-21)[13]	The MAP-21 Enhanced Mobility for Seniors and Individuals with Disabilities Program (section 5310) is used to provide mobility for seniors and persons with disabilities, beyond traditional public transportation services and ADA paratransit. ▪ Consolidates former 5310 and New Freedom programs ▪ 55% of funds must be used on capital projects to meet the special needs of seniors and individuals with disabilities when public transportation is insufficient, inappropriate, or unavailable. ▪ 45% may be used for public transportation projects that – Exceed the requirements of the ADA. – Improve access to fixed-route service and decrease reliance by individuals with disabilities on complementary paratransit. – Alternatives to public transportation that assist seniors and individuals with disabilities. ▪ 20% local match for capital assistance; 50% local match for operating assistance ▪ Projects selected must be included in a locally developed, coordinated public transit-human services transportation plan. ▪ Acquisition of public transportation services can be treated as a capital expense. ▪ Local share may be derived from other federal (non-DOT) transportation sources	**APPLICABLE – UNKNOWN POTENTIAL –** Existing 5310 funds budgeted for FY 2013 were received through ODOT and are used for vehicle maintenance ($66,890) and purchased transportation ($20,241). Under MAP-21, 5310 funds may also be used for operations. Although details of the revised program or specific funding levels for small urban areas are not yet available (ODOT is currently developing guidance as of 8/2012), ODOT may apportion 5310 funds to small urban areas based on the percentage of total population (50%), older adults (25%), and persons with disabilities (25%), or could distribute the funds through a competitive statewide process.

[12] FTA, MAP-21 5307/5340 Fact Sheet, http://www.fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Urbanized_Area_Formula_Grants.pdf

[13] FTA, MAP-21 5310 Fact Sheet, http://fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Enhanced_Mobility_of_Seniors_and_Individuals_with_Disabilities.pdf

Program Name	Description	Applicability/Assessment/Comments
FTA 5339 (MAP-21)[14]	The MAP-21 Bus and Bus Facilities Formula Grants Program (section 5339) provides capital funding to replace, rehabilitate, and purchase buses and related equipment, and to construct bus-related facilities. ▪ Replaces the Section 5309 Bus and Bus Facilities Program ▪ Funds are available for three years after the fiscal year in which the amount is apportioned. ▪ 20% local match	**APPLICABLE – INCREASED POTENTIAL –** Under MAP-21 this program is formula-based, whereas previously CET needed to submit a competitive grant application. A preliminary estimate for the federal FY 2013 allocation for the Bend Urbanized Area is $170,000. However, funding for urban areas of 50,000 – 199,999 persons is apportioned to the state for allocation.
FTA Small Transit-Intensive Cities MAP-21)	The Small Transit-Intensive Cities formula program provides an additional funding increment per each of six criteria met ($218,747, based on illustrative MAP-21 funding).	**NOT CURRENTLY APPLICABLE – FUTURE POTENTIAL –** Bend currently does not meet any of the criteria [15], but may be able to do so in the future based on increased provision and utilization of transit service. The criteria which Bend is most likely to be able to meet in the future include: Vehicle Revenue Miles per Capita, Vehicle Revenue Hours per Capita, and Passenger Trips per Capita
FTA 5316	Job Access and Reverse Commute (JARC). This program has been folded into the 5307 program and Bend's allocation includes formula-based JARC funds.	**NO LONGER APPLICABLE**– Bend currently is receiving funds from a two-year JARC grant ($183,871). Future funds will be formula-based and distributed under the 5307 program.
State[16]		
Oregon State Grant: Special Transportation Fund[17]	The State's Special Transportation Fund (STF) Program provides financial support to designated counties, transit districts and Indian tribal governments for special transportation services benefiting seniors and people with disabilities. The majority of the STF money (75%) is allocated on a population-based formula. The remaining funds are distributed by the Public Transportation Discretionary Grant Program. STF funds can be used for transit operations, administration, and capital expenses. ▪ Must be used for programs that benefit seniors and people with disabilities. Could be used for capital and operating. ▪ The STF Discretionary Grant funds are distributed through a competitive grant program	**APPLICABLE – SIMILAR TO EXISTING POTENTIAL–** CET is expecting to receive $122,687 in funds from the STF Program in FY 2013 for Bend operations, via Deschutes County which is allocated these funds based on a formula. Deschutes County will continue to distribute future funds to Bend by based on a local public involvement process. Funds can be used for replacement or expansion vehicles, vehicle preventative maintenance, equipment, and facilities. Deschutes County received $1,053,446 from a total available of $26,572,000 in the last biennium.
Mass Transit Vehicle Replacement Program	This funding program for transit vehicle replacement uses a competitive grant process to allocate $4 million available each biennium to MPOs that are direct recipients of FTA 5307 Program funds, as is the case in Bend. Vehicles are prioritized based on mileage and age within each vehicle category[18] (e.g., medium-size, heavy-duty transit bus). Regional equity is also considered in grant awards. The program funds about 6-14 vehicles per biennium.[19] Replacements must be similar in category and type, however a slight capacity increase or replacing a high-floor vehicle with a low-floor one is permissible.	**APPLICABLE – LIMITED FUTURE POTENTIAL –** This program can help CET replace buses in the Bend fleet, although its impact will be limited due to limited funds available for each grant cycle. It is recommended that vehicles serving routes with high levels of wheelchair boardings be replaced with low-floor vehicles, which is permissible under this grant program.

[14] FTA, MAP-21 5339 Fact Sheet, http://www.fta.dot.gov/documents/MAP-21_Fact_Sheet_-_Bus_and_Bus_Facilities.pdf

[15] FTA, MAP-21 Illustrative Apportionments, Small Transit Intensive Cities Formula, http://fta.dot.gov/documents/STIC_tables_Final.pdf

[16] ODOT, Grant Programs Presentation, http://cms.oregon.gov/ODOT/PT/docs/2011-13_discgranttrng_fullpresentation.pdf

[17] ODOT, Discretionary Grants, http://cms.oregon.gov/odot/pt/pages/programs/disc_grant_program.aspx

[18] ODOT, 2011 Oregon Vehicle Useful Life, http://cms.oregon.gov/ODOT/PT/docs/5310-capital/2011-vehicle-useful-life-orpin-crosswalk.pdf

Program Name	Description	Applicability/Assessment/Comments
Flexible Funds Program[20]	The Flexible Funds Program funded Bicycle, Pedestrian, Transit and Transportation Demand Management (TDM) projects, plans, programs and services through a competitive process. Flex funds were used to fund a number of the existing stop improvements.	**NO LONGER APPLICABLE –** As of September 2012, this program is now included in the STIP Enhance program (see below).
Enhance and Fix-It Program[21]	Starting in Summer 2012, the State Transportation Improvement Program (STIP) has two categories, Fix-It (76% of funds) and Enhance (24%). A new selection process is being used for funding in the 2016-2018 STIP.	**APPLICABLE – FUTURE POTENTIAL –** Relevant projects for funding under the "enhance" category include projects previously eligible for flexible funds (see above) and public transportation capital projects.
Oregon Transportation Infrastructure Bank (OTIB)[22]	The Oregon Transportation Infrastructure Bank (OTIB) is a statewide revolving loan fund "designed to promote innovative financing solutions for transportation needs." Cities as well as transit districts are eligible to borrow from the bank. Projects generally must be eligible for funding under Title 23 or Title 49 of the Code of Federal Regulations (CFR) and include transit capital projects and pedestrian/bike access projects on highway rights-of-way (e.g., Hwy 20 or 97).	**APPLICABLE – FUTURE POTENTIAL –** May be applicable in securing funding for capital improvements, such buses or bike/ped improvements along state highways in Bend (e.g., Greenwood Avenue) but would require a reliable local funding stream against which to borrow. The cost of using this funding source would need to be compared to the cost of issuing and repaying bonds.
BETC	The Business Energy Tax Credit Program (BETC) provided financial incentives to businesses, non-profits, and government agencies for reducing energy use. Under the program, "pass-through" partners could offset the cost of energy-saving programs such as transit operations in exchange for a tax break.	**NO LONGER APPLICABLE –** BETC was discontinued the Legislature, with a sunset date of July 1, 2014.
ConnectOregon	ConnectOregon is a program that uses lottery-backed bonds to support multimodal transportation other than highway. The Legislature authorized $100 million statewide for each of the first three rounds of the program (2005-07, 2007-09, and 2009-2011 bienna). About 8% of the funding for ConnectOregon III (2009-2011) was allocated to transit projects. ConnectOregon IV (2011-13 biennium) had only $40 million allocated. The City of Bend and COIC have received funding for operations and maintenance bases and intermodal facilities (Hawthorne Station).	**UNKNOWN:** As of 2013, the Oregon Legislature is considering a ConnectOregon V program. Bend/CET may be eligible if the Legislature authorizes funding for ConnectOregon V program, depending on the eligibility requirements.

[19] ODOT Public Transit Division, Joni Bramlett, Personal Communication, 8/20/2012

[20] State of Oregon, Flexible Funds Program, http://cms.oregon.gov/ODOT/TD/TP/pages/flexfunds.aspx

[21] State of Oregon, http://cms.oregon.gov/ODOT/TD/TP/pages/stip_guide.aspx

[22] State of Oregon, http://cms.oregon.gov/odot/cs/fs/Pages/otib.aspx

Program Name	Description	Applicability/Assessment/Comments
Local Taxes and Fees		
Transit Access (Utility) Fee	A transit access (utility) fee is paid by households and businesses and is designed to support the transit agency over time. A transit access fee could be assessed for all households within the transit district. Transit access fees are typically a monthly charge of between $1 to $ 5 per household. These revenues can be used for operations, administration, and capital expenses. Corvallis generated $850,000 in the first year of a transit utility fee in 2011. The fee, charged on water bills, cost $3.73 per month per single-family dwelling or $2.58 per housing unit per month for multi-family residential customers, and varying amounts for commercial and industrial customers, based on typical transportation demand generated. The fee replaced $400,000 in property tax revenue and bus fares were eliminated. It comprises over a quarter of system revenues.[23]	**POTENTIALLY APPLICABLE.** A transit access (utility) fee provides long-term stable opportunities for funding operations, administration, and capital expenses. A transit access fee could generate over $400,000 in revenue annually for every $1 of monthly fee on residential units, not including any revenues from employers.[24]
Payroll Tax	A payroll tax is a progressive tax imposed directly on the employer, with workers with higher earnings paying more. The tax is based on payroll for services performed within a transit district, including traveling sales representatives and employees working from home. This tax applies to covered employees and self-employed workers. Advantages include flexibility of revenues—it could be used for capital and operating purposes, administrative ease, and equity. Examples of the use of payroll tax to fund transit in Oregon include: ▪ TriMet:0.68% ▪ Wilsonville's SMART: 0.5% ▪ Canby Area Transit and Sandy Transit: 0.6%	**POTENTIALLY APPLICABLE.** A payroll tax could result in about $1.2 million in revenue per 0.1% tax within Bend city limits. [25] Such a funding mechanism would likely need to be implemented as part of a broader regional initiative.
Gasoline Tax	Gas taxes are an attractive funding mechanism because motorists already pay federal, state, and local taxes on motor fuel so the levy would not impose a new type of tax. Using a gas tax to fund transit has merit because gas taxes reduce the externalities associated with automobile travel (e.g., congestion, pollution) and induce drivers to use vehicles that are more fuel-efficient. Advantages include flexibility of revenues—it could be used for capital and operating purposes, administrative ease, and equity. An analysis of options for generating $1 million in local transit funding in Portland found that a gas tax had the least distorting economic effects.[26] However, gas tax revenues are declining due to increasing vehicle fuel efficiency and adoption of alternative vehicle fuel sources, a long-term trend that is expected to continue. Various cities in Oregon have local gas taxes, ranging from $0.01 to $0.05 per gallon,[27]	**LIMITED APPLICABILITY – DECLINING FUTURE POTENTIAL.** Use of a local gas tax to fund transit is not typical in the U.S., although a gas tax could expect to generate over $310,000 annually per penny of gasoline tax.[28] In addition there is currently a moratorium on new local gas taxes in Oregon. Finally, due to increasing fuel efficiency and use of alternative fuel sources, gas tax revenues have been declining.

[23] City of Corvallis, Transit Operations Fee FAQ, http://www.ci.corvallis.or.us/downloads/pw/FAQsontransitfee.pdf

[24] This estimate is based on the 36,110 housing units in Bend based on the 2010 U.S. Census.

[25] According to the Oregon Employment Department, payroll for covered employment (33,625 employees) located in Bend was about $1.2 billion in 2010.

[26] James G. Strathman and Kenneth J. Dueker, Regional Economic Impacts of Local Transit Financing Alternatives,Transportation Research Record No. 1116, 1987

[27] State of Oregon, Fuels Tax Group, http://cms.oregon.gov/ODOT/CS/FTG/pages/current_ft_rates.aspx#bm3

Program Name	Description	Applicability/Assessment/Comments
Property Tax	Property taxes that contribute to the City of Bend general fund are the primary existing source for Bend local transit funding. The City has committed to maintaining its approximately $1 million contribution to transit operations in Bend (fixed-route and Dial-A-Ride) through 9/1/2015. There are several examples of dedicated property taxes for transit in Oregon. Tillamook County has a tax of $0.20 per $1,000 in property value to fund operation of its transit system. Basin Transit (Klamath Falls) has a levy of $0.38 per $1,000 in property value. A 2001 report identified seven districts in Oregon that used property taxes to fund transit, with average annual per-capita revenues of $14.10.[29]	**POTENTIALLY APPLICABLE.** Dedicating property taxes to transit in the long-term could generate about $800,000 for transit from a $0.1 tax per $1,000 property value in the city of Bend.[30] Property taxes are subject to compression due to statewide property tax limitations, reducing the revenue potential. Compression has a greater impact on local option taxes than other taxes levied by various municipal districts.
Local Option Sales Tax	Although Oregon does not have a sales tax, sales taxes are widely used to fund transit in other states. A specific local option sales tax can apply to tourism, collecting revenue from outside visitors. For example, Ashland collects a 9% transient occupancy tax (hotel/motel). There is an existing state lodging and hotel tax of 1%, providing an existing collection mechanism.	**POTENTIALLY APPLICABLE**
System Development Charges	Systems Development Charges (SDCs) are fees paid by land developers intended to reflect the increased capital costs incurred by a municipality or utility as a result of a development. Development charges are calculated to include the costs of impacts on adjacent areas or services, such as increased school enrollment, parks and recreation use, or transit use. The basic principle for setting a transportation SDC is to charge each new development its proportional share of the cost of providing transit to the new development and to accommodate increased demand for transit. One limitation of a transit SDC is that SDCs can only be used for capital improvements (ORS 223.297). The SDC could be applied to residential, commercial, or industrial development. Charging SDCs for transit projects is not common but is legally permitted.	**LIMITED APPLICABILITY –** Even if Bend were to approve a transit SDC, there is currently a broader set of SDC-eligible projects than available SDC funding. A transit SDC would also be limited to capital improvements.
Property Access Fee, Land Value Capture, or Benefit Assessment Districts	Property access fee, land value capture, and benefit assessment districts are approaches to sharing transit costs with owners of property located near a transit resource (e.g., a transit station) who benefit directly from the proximity to the transit resource. They provides a way to use public taxing authority to help finance transit through taxes on nearby private development, where the property value increased as a result of transit investments. These revenues can be used for operations, administration, and capital expenses.	**LIMITED APPLICABILITY –** Such a funding mechanism may have future potential in conjunction with a specific development proposal.

[28] Based on Oregon average of 7.8 weekly gallons of gasoline consumed per capita and 2010 City of Bend population of 76,639. (Per capita gas consumption from Sightline Institute, http://sightline.wpengine.netdna-cdn.com/wp-content/uploads/downloads/2012/02/Braking-news-report-sightline.pdf, based on 2006 FHWA and U.S. Census data).

[29] Goldman, Corbett, and Wachs. Local Option Transportation Taxes in the United States, Research Report UCB-ITS-RR-2001-3, March 2001. http://www.its.berkeley.edu/publications/UCB/2001/RR/UCB-ITS-RR-2001-3.pdf

[30] Based on nearly 8.2 billion in assessed property value in 2011-2012 (Deschutes County Assessor's Office).

Program Name	Description	Applicability/Assessment/Comments
Tax Increment Financing	Tax increment financing (TIF) is the primary finance tool used within urban renewal areas. TIF is generated when an urban renewal area (URA) is designated and the assessed value of all property in the area is 'frozen.' Over time, the total assessed value in the area increases above the 'frozen base' from appreciation and new development. The value in the area greater than the frozen base is called the incremental assessed value, and taxes generated on the incremental assessed value are received by the URA, rather than other taxing districts. TIF could only be used on capital transit projects that directly benefit the URA. Projects that benefit the broader area can only receive TIF funding proportional to the benefits the URA receives. TIF funds could provide a substantial source of revenue to fund capital projects within the URA. The revenues generated by the program would increase over time as property values increase, and new development occurs in the Area. To receive TIF funding, all projects must be approved in the Urban Renewal Plan, and the total project costs cannot exceed the Maximum Indebtedness listed in the Plan and limited by State statute.	**LIMITED APPLICABILITY –** Such a funding mechanism may have future potential in conjunction with a specific development proposal. Existing Urban Renewal Zones in Bend include Murphy Crossing and Juniper Ridge.
Public and Private Partnership Funding Programs		
Advertising	Transit systems can raise revenues by selling advertising to businesses and non-profit organizations. Opportunities for advertising on buses include: (1) ads inside the bus, (2) ads on the outside of buses and (3) ads in stations or at stops. Revenue from advertising is generally relatively small, generally accounting for less than 3% of revenues for small transit districts. Advertising revenues can be used for operations, administration, and capital expenses. Some potential issues with advertising include: (1) controlling the content of the advertising can be difficult and (2) some districts prefer to have a specific look to the outside of their bus, without advertisement.	**MODERATE APPLICABILITY –** Despite some potential current restrictions, advertising is expected to yield about $23,333 in 2013 and may provide a small, but increased source of revenue for transit in Bend.
Employer Transit Pass Program	Employer transit pass programs are partnerships between a transit agency and private employers, and offer employers the opportunity to purchase a transit pass for all employees, often at discounted rates. The pass benefits the employees by allowing them to use the transit system free of charge. The company may be able to take a tax deduction on the cost of the transit pass. The benefit to the transit agency is an increase in ridership and in revenues from the purchase of the pass. Typically yield between 1-3% of total revenues.	**MODERATE APPLICABILITY –** Increasing adoption of COIC's existing pass programs might be a relatively easy way to raise a limited amount of revenue, while benefiting employers and employees. As Bend service hours and frequency increase, interest may increase among employers whose workers can access the Bend and/or regional systems.
School Transit Pass Program	Schools and transit agencies sometimes partner to provide students with a transit pass, as a way for students to get to school. Typically public school districts purchase transit passes for students in middle and/or high school. The school district or university agrees to pay the transit district a fixed amount each year. School transit passes are transit-neutral in some communities, with the cost of providing the transit service funded by the State or another source but providing no additional revenue to the transit district.	**UNKNOWN.** The current fiscal conditions at many school districts may make establishing a school transit pass program difficult in the next several years, unless the transit pass is funded through a grant. Legislative changes may be needed to provide school districts with a financial incentive to partner with transit agencies for student transportation.
Naming Rights / Sponsorships	Historically, the selling of naming rights to people or organizations that make a donation for a capital improvement was most common for large organizations, such as universities or hospitals. Selling naming rights has become more common among smaller organizations and some transit agencies sell naming rights to vehicles, stations, or transit corridors.	**APPLICABLE.** Selling naming rights may provide a small amount of revenue for transit.

Program Name	Description	Applicability/Assessment/Comments
Public-Private Partnerships and Joint Development	A public-private partnership is a mutually beneficial agreement between both entities that seeks to increase revenues or improve the value of an asset. Public-private partnerships include: private entities that rent space for concessions, shared right-of-way with organizations such as a utility, shared fueling facilities for alternative fuel vehicles, and other opportunities. Transit funding from public-private partnerships are most likely to be for capital projects such as a mixed use development that combined a transit station or center.	**APPLICABLE.** Public-private partnerships and joint development efforts may present opportunities for revenue generation or saving on the costs of some types of development. CET currently exchanges off-hours use of its Bend maintenance facility by a private fleet maintenance provider for discounted maintenance rates on its bus fleet.

Notes: Estimates of local funding options are order-of-magnitude figures. Table focuses on programs most relevant to Bend, e.g.,.the Federal State of Good Repair Program (section 5337) is limited to fixed guideway investments (or "high-intensity" buses that share HOV lanes with other vehicles) and is not relevant for Bend at this time.

APPENDIX D UPDATED BEND URBANIZED AREA MAP

Figure D-1 provides a map of the Bend Urbanized Area boundary, showing the revised boundary based on the 2010 U.S. Census and the older boundary based on the 2000 Census, in relation to the existing MPO boundary and Urban Growth Boundary (UGB).

Figure D-1 Bend Urbanized Area Revised 2010 Census Boundary