



720 SW Washington St.
 Suite 500
 Portland, OR 97205
 503.243.3500
 dksassociates.com

DRAFT MEMORANDUM #4

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TO: Benton County TSP Project Management Team and Stakeholders

FROM: John Bosket, Ben Chaney and Dock Rosenthal | DKS Associates
 Stephanie Wright and Jamey Dempster | Nelson/Nygaard

SUBJECT: Benton County Transportation System Plan Update
 Task 2.2 Existing Transportation System Conditions and Deficiencies

The purpose of this memorandum is to describe the current transportation system within Benton County, Oregon. The focus of this review is on arterial and collector roadways under Benton County Jurisdiction (both inside and outside Urban Growth Boundaries) and ODOT highways (only outside Urban Growth Boundaries). The document structure follows the Table of Contents shown below:

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I. EXECUTIVE SUMMARY

The purpose of this memorandum is to describe the current transportation system within Benton County, Oregon. The focus of this review is on arterial and collector roadways under Benton County Jurisdiction (both inside and outside Urban Growth Boundaries) and ODOT highways (only outside Urban Growth Boundaries), as shown in Figure 1. Map figures included in this memorandum are also provided at additional zoom levels in the appendix. More detailed information regarding the municipalities in Benton County can be found in those city’s own Transportation System plans.

Benton County Facts

Population: 92,287 (2017)

Land area: 676 square miles

County seat: Corvallis

Incorporated cities: Adair Village, Albany (north), Corvallis, Monroe, Philomath

Census-designated places: Alpine, Alsea, Bellfountain, Blodgett, Kings Valley, Summit

County maintained roadway miles: Over 275 paved and 170 gravel centerline miles.

I.I Safety

The safety of Benton County roadways was evaluated by reviewing crash data and identifying patterns of motor vehicle, pedestrian, and bicyclist crashes.

ODOT’s crash data from 2011 to 2015 (the most recent five years of available data) for all roadways in Benton County showed a total of 4,315 crashes (an average of 863 crashes a year). Over that period, 2013 had the fewest crashes at 811, while 2015 had the most crashes at 959. Crashes that occurred outside of the dates above are still significant but are not included in standard crash analysis research.

Although more crashes occur within the urban areas of the county, the rural crashes tend to have more severe outcomes. As the injury severity of crashes increases, a higher portion of them were in rural areas. Over 80% of the fatal crashes between 2011 and 2015 occurred outside Urban Growth Boundaries (UGBs).

Over 50% of crashes in rural areas are roadway departure crashes, highlighting the importance of the roadside conditions, signing, and striping in rural roadway safety. Inside UGBs, most crashes occur at intersections and skew toward lower severities.

The following six intersections have high rates of crashes:

- OR 99W & NW Lewisburg Ave./NE Granger Ave.
- US 20 & NE Granger Ave.
- SW Country Club Dr. & SW 53rd St.
- NW Springhill Dr. & NW Independence Highway
- SW Airport Ave. & Bellfountain Rd.
- NW Quarry Rd. & NE South Nebergall Lp./NW Springhill Dr.

The top ten County jurisdiction roads where the most crashes occur account for over 45% of all County jurisdiction crashes.

- Springhill Dr.
- NE Granger Ave.

- 53rd St.
- NW North Albany Rd.
- NW Independence Highway
- Bellfountain Rd.
- NW Gibson Hill Rd.
- Alpine Rd.
- SW West Hills Rd.

Figure 1: Plan Area

I.II Motor Vehicle System Operations

The efficiency of the motor vehicle system was analyzed at 48 intersections throughout Benton County. Of these, four intersections on the state system did not meet Oregon Highway Plan mobility targets established as the maximum amount of congestion desired. They are:

- OR 99W & Lewisburg Ave./Granger Ave.
- US 20 & Scenic Dr.
- US 20 & Independence Highway
- US 20 & Granger Ave.

The unsignalized intersections of Scenic Dr., Independence Hwy., and Granger Ave. fail mobility standards due to difficult lefts onto US 20 due to high highway volumes. All intersections under Benton County jurisdiction operate with low amounts of congestion.

I.III Active Transportation

Within the rural areas of Benton County, facilities for people walking and bicycling are generally roadway shoulders or off-highway shared-use paths. The adequacy of shoulders for multimodal use was evaluated using a minimum target of 4 feet of paved shoulder and an additional recommended target based on the *ODOT Bicycle and Pedestrian Design Guide*.

County jurisdiction roadway shoulders overall generally do not meet the minimum target for a paved width of at least 4 feet, although roads serving more densely populated areas performed better. About 29 shoulder miles (12% of system) are paved to a width of at least 4 feet. About 18.5 shoulder miles (eight% of system) meet the higher recommendations based on functional classification and average daily traffic volumes.

ODOT jurisdiction roadway shoulders overall generally meet the minimum target for a paved width of at least 4 feet, although roads serving more rural areas performed worse. About 140 shoulder miles (58% of system) are paved to a width of at least 4 feet. About 57 shoulder miles (24% of system) meet the higher recommendations based on functional classification and average daily traffic volumes.

The urban bicycle and pedestrian systems were evaluated in Adair Village and Monroe using Level of Traffic Stress (LTS) methodology. Overall most of the facilities (especially local roads) in these urban areas are sidewalks or shared streets where there is not a specific space dedicated to bicycling. Level of Traffic Stress ranks segments and intersections from 1 (low stress) to 4 (high stress) based on design and traffic considerations. Intersection performance is generally good with most at a low LTS level, while segment performance is generally bad with many at a high LTS level. Creating a connected and low stress local network is an important step in enabling local opportunities for people to walk and bicycle.

I.IV Public Transportation

Numerous public transportation services are available in Benton County. This memo focuses upon analyzing services outside Corvallis that serve the rural county population. The Benton County Rural and Special Transportation Program provides both fixed route and demand response (“Dial-A-Bus”) public transportation services throughout the county and to regional destinations such as Newport.

Fixed route public transportation services in Benton County include the intercity routes 99 Express (average 419 passengers per month), Coast to Valley Express (average 312 passengers per month), Corvallis to Albany Connection (average 124 passengers per month), Philomath Connection (average 2,000 passengers per month), Corvallis-Amtrak Connector (pilot program launched in 2017), and the Corvallis Transit System (CTS) network in Corvallis. Regional and inter-regional operators connect with Benton County routes in Albany. A variety of long-haul public and private transportation options serve Benton County, as do taxi, ride hailing services, and specialty shuttle service for OSU and airports.

Demand response public transportation services in Benton County include the Benton County Rural and Special Transportation program, or Dial-A-Bus, providing an average of 2,180 rides per month, and the Corvallis and Philomath ADA paratransit services.

Coast to Valley Express ridership has increased during the past five years, as has ADA paratransit in Corvallis and Philomath. The Benton County Dial-A-Bus service has seen decreasing ridership in the past five years. The Benton County 99 Express service ridership declined after fiscal year 2015-2016, but has generally held steady in the recent past.

The decrease in Benton County Dial-A-Bus ridership is similar to public transportation ridership decreases across the state, which is generally understood to be in part related to gas prices and economic growth. The decline may also reflect Benton County's additional service on the 99 Express, which provides a resource for riders who may have formerly used the demand response services.

II. INVENTORY

This section describes the context for the Benton County TSP update and provides an inventory of the various elements of the transportation network. The existing conditions analysis section evaluates the performance of the transportation network against established targets.

II.I Lands and Population

For most trips on the transportation network, travel is a means to an end and not a goal in itself. Understanding the geography, land use, and demographics of the county sets the stage for understanding the existing transportation conditions.

Comprehensive Plan

The comprehensive plan designations guide the form that development will take throughout the county. This in turn impacts where, how, why, and when people will choose to travel. In Oregon, an integrated approach to land use and transportation planning ensures that the transportation network can adequately serve the desired land uses.

The *Benton County Comprehensive Plan (Adopted 2007)*¹ implements land use designations and zoning for the county, deferring to local city comprehensive plans for incorporated areas. The comprehensive plan designations specify a general use for the land, while the zoning implements more specific designations, densities, and requirements. The County's comprehensive plan designations are shown on Figure 2.

¹ For a summary of this document, see Technical Memorandum #2: Plan Assessment, Goals, and Objectives.

Figure 2: Land Use Designations

Natural Resources and Environmental Barriers

Benton County includes forests, croplands, wetlands, river valleys, and a wide array of historic and cultural resources. These are valuable assets to the county, and care needs to be taken to preserve these resources and properly account for environmental barriers when developing transportation network projects.

Oregon's Statewide Planning Goal 5² establishes a planning process to inventory and protect resources, and is reflected in the *Benton County Comprehensive Plan*. Although not included in this memo, a GIS inventory of the following resources has been collected for use later in the Benton County TSP update process to identify possible conflicts between recommended transportation projects and important resources:

- Riparian Corridors
- Wetlands
- Wildlife Habitat
- Federal Wild and Scenic Rivers
- Oregon Scenic Waterways
- Groundwater Resources
- Oregon Recreational Trails
- Natural Areas
- Wilderness Areas
- Mineral and Aggregate Resources
- Energy Sources
- Historic Resources
- Open Space
- Scenic Views and Sites

Population and Growth Patterns

Benton County is home to over 92,000 residents, with around 57,000 in the City of Corvallis. Benton County has seen 18% growth in population since the year 2000.³ This growth trend is expected to continue, with a forecast of over 110,000 residents by 2040. Figure 3 and Table 1 show the historical and future population growth in Benton County. Since 1990, the population growth has been in the urbanized areas, with Corvallis seeing the highest total population increases. This trend of urban growth is expected to continue in future years. As the number of people living, working, and visiting all areas of Benton County continues to grow, a safe and efficient transportation system will be increasingly important.

² "Explanation of Goal 5", Oregon Department of Land Conservation and Development.
<http://www.oregon.gov/LCD/pages/goal5explan.aspx>

³ Population estimate of 92,287 for July 1, 2017 by the Portland State University Population Research Center. The American Community Survey 2015 5-year estimate (2011-2015) is 86,495.

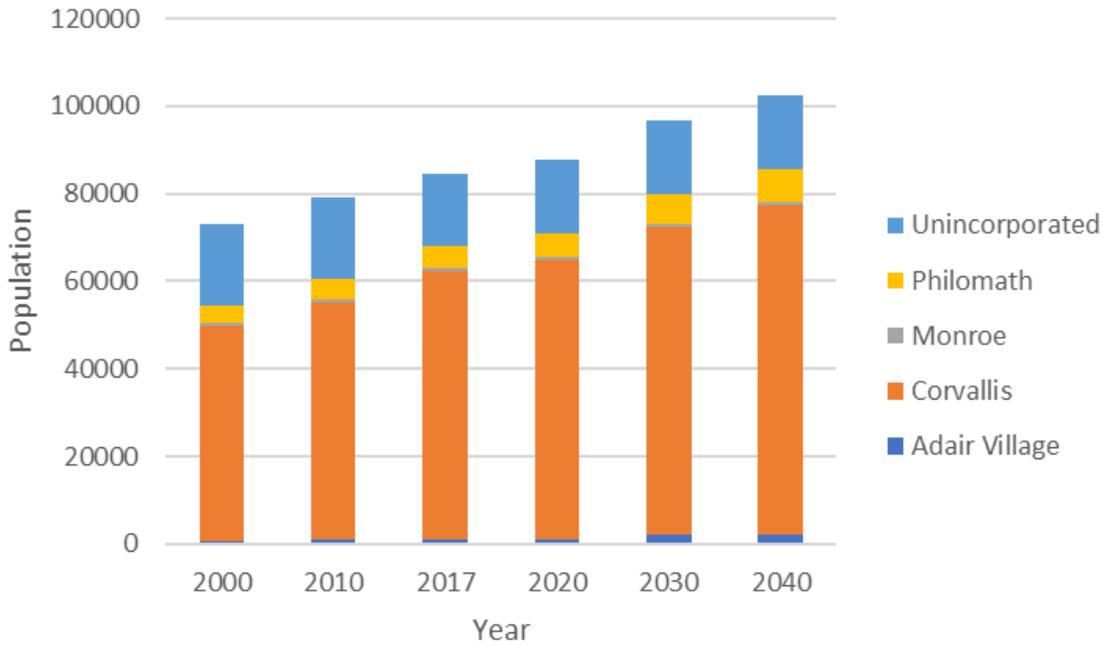


Figure 3: Benton County Population Growth History and Forecast

Table 1: Benton County Population Growth History and Forecast

Year	2000	2010	2017	2020	2030	2040
Benton County Total	78,153	85,579	92,287	95,818	106,498	113,169
Adair Village	536	840	928	1,127	1,934	2,075
Albany (Benton)	5,104	6,463	7,586	8,088	9,615	10,850
Corvallis	49,322	54,462	61,449	63,857	70,572	75,227
Monroe	607	617	637	643	660	675
Philomath	3,838	4,584	5,169	5,388	6,848	7,493
Unincorporated	18,746	18,613	16,517	16,715	16,868	16,849

* Data from PSU Population Research Center. 2000-2010 Census Counts (incorporated areas) and population forecasts (Urban Growth Boundaries)

The Environmental Protection Agency (EPA) recommends a set of demographic indicators that assist in identifying vulnerable communities.⁴ Demographically, Benton County largely resembles a typical Oregon county. Compared to Oregon, Benton County has a lower than average minority population, higher than average low-income population, and lower than average population with less than a high school education. Table 2 below summarizes some of these indicators compared to Oregon and the United States overall; the complete reports are included in the appendix.

Table 2: Environmental Justice Demographic Indicators

Indicator	Benton County	Oregon	United States
Minority Population	18%	23%	38%
Low Income Population	39%	36%	34%
Linguistically Isolated Population	3%	3%	5%
Population with Less Than High School Education	5%	10%	13%
Population Under 5 years of age	4%	6%	6%
Population Over 64 years of age	14%	15%	14%

II.II Major Trip Generators

One important early step in planning for an effective transportation system is gaining an understanding of the key destinations that people currently travel to throughout the county. These destination points are referred to as trip generators. Benton County is home to Oregon State University (OSU), a major location for national research in forestry, agriculture, engineering, and the sciences. OSU anchors an extensive economic network of agriculture, lumber, and wood product manufacturing companies throughout Benton County. Recreational and cultural destinations are also a popular draw for visitors to Benton County.

Employment

Benton County is the location of over 31,000 jobs, mostly concentrated in Corvallis, Philomath, and North Albany.⁵ Lower density clusters of employment are scattered throughout the county, including Adair Village, Asea, and Monroe. Employment locations of people who both live and work in Benton County are not concentrated in downtown Corvallis, with similar levels of employment density throughout outer Corvallis, Philomath, and North Albany. The most common cities for Benton County residents to commute to are

⁴ Environmental Justice data from EJSCREEN (Version 2017), based on 2015-2011 5-Year ACS estimates, accessed October 2017 from ejscreen.epa.gov

⁵ Employment data source US Census Bureau, via. OnTheMap application and LEHD Origin-Destination Employment Statistics, 2015 data release.

Corvallis (41%), Albany (11%), Salem (5%), and Eugene (4%). The most common cities for Benton County workers to commute from are Corvallis (34%), Albany (13%), Philomath (4%), and Lebanon (2%). Worker flow is generally balanced between those who commute in, commute out, and stay in Benton County, as shown in Table 3.

Table 3: Benton County Commute Pattern

	Employed People (2015)
Live and Work in Benton County	16,952
Live in Benton County, Work Elsewhere	15,823
Work in Benton County, Live Elsewhere	14,101

Additional insight into Benton County travel patterns are revealed by looking at how residents travel to work, including the mode of transportation, total travel duration, and departure time.⁶ Benton County residents make a significantly higher share of commutes through walking and bicycling, and have shorter travel durations, when compared to other Oregon residents. This is despite most residents having two or more vehicles available, and may be due to centrally located and easily accessible major destinations and compact land use planning. The most common time for workers to depart for work is between 7:00 am and 7:59 am, though a sizeable number of people also commute during non-traditional times of the day. Table 4 summarizes Benton County's commute mode share statistics, while additional employment information and maps are available in the appendix.

Table 4: Benton County Commute Mode Share

Mode of Transportation to Work	Benton County	Oregon
Drove alone	65.4%	71.4%
Carpooled	8.4%	10.4%
Public transportation (excluding taxicab)	2.1%	4.4%
Walked	7.1%	4.0%
Bicycle	8.4%	2.4%
Taxicab, motorcycle, or other means	0.9%	1.1%
Worked at home	7.6%	6.3%

⁶ American Community Survey 2015 5-year estimate (2011-2015)

Trip Generators

Benton County is home to numerous destinations that attract residents and tourists alike. Aside from residential and employment nodes, the most common categories of trip generators in the county include.

- Parks and Open Space, such as county or city parks, rivers, forests and wildlife refuges.
- Civic and Cultural locations, such as schools (Oregon State University), libraries, hospitals, churches, covered bridges, and museums.
- Retail and Shopping locations, such as shopping centers, restaurants, and grocery stores.

Figure 4 shows the density of trip generators throughout Benton County. Depending on the type of location, these trip generators exhibit different patterns in multimodal traffic generation throughout the day and over the course of the year. The seasons, weather, school schedules, and special events all impact the transportation system. For the Benton County TSP update analysis, traffic data was collected during a time when both school traffic would be present and weather conditions would encourage a wide range of activities.

Figure 4: Trip Generators

II.III Road System

The roadway network within Benton County is the main means of access and mobility for most people and goods in the county. This system is primarily used by automobiles but is necessary for freight, transit, bicycle, and pedestrian users as well. This section reviews the key ways the road system is categorized, through jurisdiction, functional classifications, and special route designations. The section also provides a summary of critical physical elements of the road system: the pavement, bridges, and culverts.

Roadway Jurisdiction

Within Benton County there are several different agencies responsible for roads. These agencies include the Oregon Department of Transportation, Benton County, incorporated cities, the U.S. Forest Service, and the U.S. Bureau of Land Management. Each jurisdiction sets its own standards and maintenance policies associated with its transportation facilities. The TSP update focuses on roads under the jurisdiction of Benton County and the Oregon Department of Transportation at a functional classification level of Collector and higher. Local roads are typically not studied in area plans due to the low traffic volumes. Roads under other jurisdictions are addressed in other local or federal transportation planning documents.

Functional Classification

Functional classification provides an organizational mechanism for developing roadway design standards, establishing traffic speeds, controlling access, designing intersections, and allocating monies for maintenance and improvements. Higher classification roadways typically focus on mobility (high speeds and less access), while lower classification roadways focus on providing access (lower speeds and more access).

Figure 5 shows the County functional classifications of all County roads. The County functional classifications, Oregon Highway Plan (OHP) classifications and Federal functional classifications are discussed below in more detail. ODOT's functional classification is the Federal Functional Classification system, which provides a uniform terminology used at the federal level.

Figure 5: Functional Classification

Benton County Functional Classifications

Benton County's functional classification system categorizes all public roadways to provide for a context-sensitive network that balances local access and regional connectivity, while recognizing the unique needs of timber and agricultural areas. Higher classified roadways prioritize safe and efficient through movement, while lower classified roads are designed to provide access to the adjacent land uses. The 2001 Benton County TSP defines the following functional classification system:

- **Principal Arterials** connect communities, provide through movement, and are primarily state highways. Access is limited and controlled, and parking is generally prohibited.
- **Minor Arterials** connect areas of principal traffic generation to principal arterials, provide through movement, and distribute traffic to collector and local roadways. Access and parking are controlled.
- **Major Collectors** carry local traffic between neighborhoods, or between neighborhoods and arterials, and provide access to minor collectors and community services. Access and parking are controlled.
- **Minor Collectors** serve internal traffic within areas having a single land use pattern, and serve minor traffic generators such as schools or neighborhood shopping or community centers. They should not form a continuous network in urban areas. Access and parking are allowed.
- **Resource Collectors** connect timber and agricultural areas with the arterial system. Their design standards take the characteristics of resource-oriented traffic into account.
- **Local Roads** provide on-street parking and direct access to abutting property. Their design discourages through traffic. Dead-end street lengths are minimized.

Additionally, Benton County has a designated over width vehicle route connecting OR 99W with OR 34 along Greenberry Rd. and Decker Rd. The appendix includes a table listing the functional classification of all County roads.

OHP Classifications

The 1999 Oregon Highway Plan (OHP)⁷ describes four primary categories for highway classification. These categories describe the level of importance of the system but are not functional class levels.

Interstate Highways (National Highway System, NHS) provide connections to major cities, regions of the state, and other states. A secondary function in urban areas is to provide connections for regional trips within the metropolitan area. The Interstate Highways are major freight routes and their objective is to provide mobility. The management objective is to provide for safe and efficient high-speed continuous-flow operation in urban and rural areas.

There are no Interstate Highways in Benton County, although Pacific Highway (I-5) is located nearby in Linn County.

Statewide Highways (National Highway System, NHS) typically provide inter-urban and inter-regional mobility and provide connections to larger urban areas, ports, and major recreation areas that are not directly served by

⁷ Oregon Highway Plan Action 1A.1 defines the use of these categories, while Appendix D: Highway Classification by Mile point defines the routes.

Interstate Highways. A secondary function is to provide connections for intra-urban and intra- regional trips. The management objective is to provide safe and efficient, high-speed, continuous-flow operation. In constrained and urban areas, interruptions to flow should be minimal.

Corvallis-Newport Highway (US 20/OR 34) is classified as a Statewide Highway in Benton County.

Regional Highways typically provide connections and links to regional centers, Statewide or Interstate Highways or economic or activity centers of regional significance. The management objective is to provide safe and efficient, high-speed, continuous-flow operation in rural areas and moderate to high-speed operations in urban and urbanizing areas. A secondary function is to serve land uses near these highways.

Albany-Corvallis Highway (US 20) and Pacific Highway West (OR 99W) are classified as a Regional Highways in Benton County.

District Highways are facilities of countywide significance and function largely as county and city arterials or collectors. They provide connections and links between small urbanized areas, rural centers and urban hubs, and serve local access and traffic. The management objective is to provide for safe and efficient, moderate to high-speed continuous-flow operation in rural areas reflecting the surrounding environment and moderate to low-speed operation in urban and urbanizing areas for traffic flow and for pedestrian and bicycle movements.

Alsea Highway (OR 34), Eddyville-Blodgett Highway (OR 180), Kings Valley Highway (OR 223), Territorial Highway (OR 200), Alsea-Deadwood Highway (OR 501), and Corvallis-Lebanon Highway (OR 34) are classified as District Highways in Benton County.

Additional designations made by ODOT can be used to reflect key characteristics of roadway corridors, and may impact the ODOT design standards, mobility standards, or access management standards of the roadway segment.⁸ Designations found in Benton County are described below.

Expressways are a subset of the OHP classifications that indicate a focus on providing high-speed, high-volume travel between major cities, ports, and recreation areas with limited interruptions.

Corvallis-Newport Highway (US 20/OR 34) is an expressway from SW Scott St. (MP 54.07) to the Linn County Line (MP 56.14).

Freight Routes are designated under the Oregon Freight Plan based on the volume of freight carried and the connectivity provided to significant freight-related areas of Oregon.

In Benton County Corvallis-Newport Highway (US 20/OR 34), Pacific Highway West (OR 99W), and Corvallis-Lebanon Highway (OR 34) are Freight Routes (see Figure 6).

⁸ The Oregon Transportation Commission approves these designations. Although all ODOT highways have a classification, only some receive additional designations.

Figure 6: Freight and OD Routes

Reduction Review Routes (RRR) are ODOT facilities that require additional review during planning, project development, development review, and maintenance to examine reductions in freight-related carrying capacity. Procedures for RRR review are established in ORS 366.215.

In Benton County, all Statewide Highways and Regional Highways are RRRs, as is Corvallis-Lebanon Highway (OR 34).

Special Transportation Areas (STAs) designate locations within UGBs where the need for local and multimodal access may outweigh that of highway mobility. STAs are intended to help facilitate compact development along community main streets.

In Benton County, portions of OR 99W, OR 34, and US 20 are STAs through downtown Corvallis. Within Monroe, Pacific Highway West (OR 99W) is an STA from Kelly St. (MP 100.9) to just north of Orchard St. (MP 101.08).

Seismic Lifeline Routes are roadways and bridges that play a critical role in emergency response and evacuation in the event of a seismic event.

In Benton County Corvallis-Newport Highway (US 20/OR 34) and Pacific Highway West (OR 99W) are Seismic Lifeline Routes.

Safety Corridors are segments of state or local highways with a high frequency of severe traffic crashes, where local jurisdictions and law enforcement have created a plan for focused efforts to improve safety. Safety Corridors can be decommissioned when safety improvement has been achieved.

There are no active Safety Corridors in Benton County, although Corvallis-Lebanon Highway (OR 34) between Corvallis and I-5 was one between 1993 and 2014.

Oregon Scenic Byways are a set of designations (All American Roads, National Scenic Byways, Oregon State Scenic Byways, and Oregon Tour Routes) that are informational, directing tourists and recreationalists to roadways that are scenic, historically significant, or offer recreation opportunities. Although not an OHP designation, Oregon Scenic Bikeways is a similar program operated by Oregon State Parks.

Alesea Highway (OR 34) between Philomath and Waldport is currently under consideration for a Scenic Byway designation.

ODOT & FHWA Functional Classifications

The Federal Highway Administration has established a set of uniform functional classifications that facilitate national-level planning efforts.⁹ These designations are important because they are used for federal funding eligibility. Set by ODOT and reported to the FHWA, these may differ from OHP classifications or local jurisdiction functional classifications. There are seven federal classifications, each of which may be recognized in both urban and rural forms:

⁹ USDOT FHWA *Highway Functional Classification Concepts, Criteria, and Procedures (2013 Edition)*.
https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/index.cfm

- Principal Arterial - Interstate
- Principal Arterial - Other Freeways and Expressways
- Principal Arterial - Other Principal Arterials
- Minor Arterial
- Major Collector
- Minor Collector
- Local

In Benton County, all ODOT highways have a federal functional classification of Minor Collector or higher, making them eligible for federal funding. There is some mismatch between the County's classification and federal classification, with most County jurisdiction roads federally classified as Major or Minor Collectors. Most of the County's Resource Collectors, and some Minor Collectors, are federally classified as Local or unclassified. This mismatch may impact the availability of federal funding for these roads. Future revisions of county functional classification should consider adopting ODOT/FHWA functional classifications.

Emergency Lifeline Routes

Oregon Highway Plan (OHP) Goal 1, Policy 1E designates routes for emergency response in the event of an earthquake. The 2014 ODOT Seismic Plus Report has since established an updated Seismic Lifeline system for a statewide investment and response program. These routes are categorized by the following priorities:

- **Tier 1 Lifeline Routes** are considered essential for emergency response within the first 72 hours after an incident and include I-5 in adjacent Linn County.
- **Tier 2 Lifeline Routes** are considered desirable for emergency response within the first 72 hours after an incidence and include OR 99W in Benton County.
- **Tier 3 Lifeline Routes** are routes that serve relatively few people but are still important because they are the only access and include US 20 in Benton County.

The Seismic Plus Program proposed a four-phase investment program to upgrade bridges and other critical vulnerabilities on the lifeline system. Benton County is included in Phase 3 (OR 99W) and Phase 4 (US 20)

Benton County has also established emergency lifeline routes, which prioritize local response efforts. Priority Lifelines routes and County Lifeline routes in Benton County are shown in Figure 7.

Figure 7: Emergency Lifeline Routes

Pavement Type and Condition

Pavement conditions in Benton County as of 2016 are summarized in Figure 8. The Pavement Condition Index (PCI) is a numerical rating system for evaluating and recording the condition of road segments. The PCI is determined by performing a systematic survey of sections of each road segment. The survey evaluates the type, extent, and severity of different forms of pavement distress as a composite index.

The PCI provides a record of the current condition of the road system. By using it as a component of an ongoing pavement management system, and performing the survey on a regular schedule, the PCI helps to indicate the performance of pavement surfaces and their deterioration over time. This information helps to inform pavement management decisions.

The PCI provides a rating structure from zero to 100. On this scale, zero is the worst condition, and 100 is the best. Breakpoints are established within that range to indicate the relative condition of the road segment. The PCI data available depends on jurisdiction. ODOT publishes their pavement condition data without PCI numbers, reduced to four categories: very good, good, fair, and poor. Benton County's data includes both PCI and condition categories, where the categories generally map to PCI as follows:

- Very Good 71 to 100
- Good 51 to 71
- Poor 0 to 50

An alternative scale could provide more detailed information about pavement condition for example:

- Very good 95 to 100
- Good 75 to 95
- Fair 50 to 75
- Poor 25 to 50
- Very Poor 0 to 25

This could be implemented for future inventories.

Figure 8: Pavement Type and Condition

Bridges and Culverts

Existing bridge conditions and needs were analyzed based on data obtained from ODOT's Technical Services Branch, Bridge Section. The database contains information on all non-federal bridges in the state, with data from inspections informed by the National Bridge Inventory (NBI) requirements. Information includes general condition summaries, sufficiency ratings, structural conditions, and height and load restrictions for both ODOT and county bridges. The ODOT data was supplemented with information from Benton County Public Works regarding bridges built to current seismic design standards.

This data is current as of 2016 and generally an accurate reflection of conditions on the ground, except for timber bridge load ratings.¹⁰ The rot and cracking that occurs on timber bridges has potentially reduced the load carrying capacity of some bridges and the typical load rating schedule may not be adequate to capture this impact. ODOT has a plan to update these load ratings soon. For many timber bridges, upcoming weight restrictions are expected.

The NBI rating system that serves as a base for the evaluation criteria results in a numeric value describing the sufficiency of a bridge to remain in service. A score of 100% would represent an entirely sufficient bridge, while a score 0% would indicate a completely deficient bridge. "Structurally deficient" classification does not mean a bridge is unsafe, but it is a reminder that the bridge may need further analysis that may result in load posting, maintenance, rehabilitation, replacement or closure. A structurally deficient bridge usually needs maintenance and repair and eventual rehabilitation or replacement to address deficiencies.

The Federal Highway Administration (FHWA) uses this index in evaluating the nation's bridges for funding distribution and eligibility.¹¹ Those bridges with a sufficiency rating of 80 or less are eligible for rehabilitation. Bridges with a rating of 50 or less are eligible for replacement. Bridges lose their eligibility status for a period of 10 years after a Federal Highway Bridge Program project is completed.

A "functionally obsolete" bridge is one that was built to standards that do not meet the minimum design clearance requirements for a new bridge. These bridges do not necessarily have structural deficiencies, and they are not inherently unsafe. Functionally obsolete bridges include those that have sub-standard geometric features such as narrow lanes, narrow shoulders, poor approach alignment or inadequate vertical under clearance. Any bridge classified as structurally deficient is excluded from the functionally obsolete category.

Seismic vulnerability of bridges is a concern across Oregon. Until recently, Oregon was considered to be a region with low seismic activity, however recent analysis indicates that a "Cascadia Subduction Zone earthquake (CSZE) with a magnitude of 8.0 or greater will hit Oregon; the question is when, not if."¹² Generally speaking, most bridges in Oregon were built before modern seismic design specifications were implemented in 1990. ODOT has identified vulnerable and potentially vulnerable bridges statewide based on modeling analysis, and Benton County has identified County jurisdiction bridges that may be vulnerable based on design standards at the date of construction. There are 211 total bridges that ODOT has assessed as seismically

¹⁰ Conversation with Benton County Public Works.

¹¹ "Additional Guidance on 23 CFR 650 D", USDOT Federal Highway Administration.
<https://www.fhwa.dot.gov/bridge/0650dsup.cfm>

¹² ODOT 2016 Bridge Condition Report and Tunnel Data, originally from ODOT's 2014 Seismic Plus Report.

vulnerable or potentially vulnerable in Benton County. There are 85 County jurisdiction bridges that do not meet seismic design standards.

Benton County’s priorities for maintenance and upgrades for their bridges focus on freight connectivity, with a goal of having no weight restrictions for bridges along freight routes.

Figure 9 shows the locations of all bridges located on Collector or higher roadways, highlighting Functionally Obsolete and Weight Restricted bridges, as well as all culverts in poor or worse condition.

Table 5 shows the number of bridges that have been positively evaluated to be structurally deficient, functionally obsolete, weight restricted, and potentially or definitely seismically vulnerable. In contrast to the map that only shows bridges along roads classified as collector or greater, this table shows the results for all bridges owned by the County or ODOT.

Table 5: Bridges in Benton County by NBI Status, Owner, and Evaluation

	County Jurisdiction	ODOT Jurisdiction
Total Bridges	103	81
Structurally Deficient	9	0
Functionally Obsolete	12	14
Weight Restricted	8	2
Seismically Vulnerable or Potentially Vulnerable	85	36

Figure 9: Bridges and Culverts

Pedestrian and Bicycle Facilities

Planning for pedestrians not only helps to provide a complete, multi-modal transportation system, it supports healthy lifestyles and ensures that the young, the elderly, and those not able to drive have access to goods, services, employment, and education. Pedestrian access is critical to transit, recreation, and day-to-day necessities. Cities typically have the most pedestrian activity, however outside of the city limits it is still important that collector and arterial roadways provide ample space for pedestrian travel to separate those walking from motor vehicles along these higher volume and speed facilities. This section discusses the existing environment and active transportation facilities. Sections II.II to II.VI provide analysis of those conditions.

The following section describes common active transportation facilities and/or treatments.

Sidewalks are located along roadways, and are often separated from the roadway with a curb and/or planting strip. They typically have a hard, smooth surface, such as concrete. Standard minimum sidewalk widths in most communities range from 5 to 6 feet.

Shared-use paths serve a variety of non-motorized travelers, including people walking, biking, running, and using mobility devices. Shared-use paths are typically paved (asphalt or concrete), but may also consist of an unpaved smooth surface as long as it meets Americans with Disabilities Act (ADA) standards. Shared-use paths are usually wider (e.g., 8-14 feet) than average sidewalks (e.g., 5-6 feet).

Roadway shoulders serve as pedestrian routes in many rural Oregon communities and in older urban areas where sidewalk infill has not yet occurred. On roadways with low traffic volumes (i.e., less than 3,000 vehicles per day), shoulders may be adequate for pedestrian travel; however, they must be wide enough for safe passage (minimum of 4 feet) and may not always be in suitable condition for passage by people with disabilities. The ODOT Bicycle & Pedestrian Design Guide recommends increasing the shoulder width to 6 or 8 feet as average daily traffic increases. In urban areas, the goal should be to ultimately replace all roadway shoulders with sidewalks.

Enhanced Roadway Crossings provide safer and more comfortable places for pedestrians to cross higher-volume and higher-speed roadways. Without such crossings, major roadways can create a barrier effect for pedestrians, discouraging people from walking when making short trips. Enhanced crossings include many types of treatments, such as curb extensions, flashing yellow beacons, and traffic signals, but generally require more than just a marked crosswalk to be effective.

Shared streets include streets on which bicyclists and motorists share the same travel lane. The most suitable streets for shared bicycle use are those with lower speeds (25 mph or less) and low traffic volumes (3,000 vehicles or fewer per day). Common practice is to sign a route with standard Manual on Uniform Traffic Control Devices (MUTCD) green bicycle route signs with directional arrows and/or pavement markings.

Bike lanes are portions of the roadway designated specifically for bicycle travel using striped lanes and pavement stencils. Typical minimum widths for bike lanes in most communities range from 5 to 6 feet. A bicycle lane may be as narrow as four feet, but only in very constrained situations. Bike lanes are most appropriate on arterials and collectors, where high traffic volumes and speeds warrant greater separation of the travel modes.

Shoulder bikeways are paved roadways that have striped shoulders wide enough for bicycle travel, but do not use signing or pavement markings to designate the shoulder specifically for bicycles. ODOT recommends a six-foot paved shoulder to adequately provide for bicyclists, and a four-foot minimum width in constrained areas. Roadways with shoulders less than four feet wide are considered shared streets. Some shoulder bikeways use warning signs to alert motorists to expect bicycle travel along the roadway.

Bicycle parking facilities are a fundamental component of a bicycle network. Lack of safe and secure facilities for either short-term or long-term parking can be an obstacle to promoting bicycle riding.

In Benton County, the majority of bicycle and pedestrian facilities are paved shoulders or separated multi-use paths. Figure 10 graphically shows the existing shoulder conditions for arterial and collector roadways under County and State jurisdiction. Figure 11 highlights areas of roadway where dedicated multimodal facilities are not available.

County roads generally provide adequate connections for the intraurban areas of the county based on recommendations from the ODOT's Level of Traffic Stress methodology (described in section II.IV), however there are major connectivity gaps both on and off the State Highway system. These gaps result in difficult interurban trips. Furthermore, the rural communities of Kings Valley, Summit, Alsea, Bellfountain, and Alpine, and Monroe are all isolated from the larger county multimodal network. Other major gaps include:

- Bellfountain Rd., which provides a major off-highway connection through the south portion of the county.
- Llewellyn Rd., Decker Rd., and Greenberry Rd., which provide east-west connections in the south portion of the county.
- OR 34 between Philomath and Alsea, which provides access to multiple forest areas.
- US 20 between Corvallis and Albany (North Albany), this corridor is identified as a high priority connection between the two major urban centers in the region. US 20 does not meet recommended minimum shoulder width thru most of the corridor and alternative off-highway routes traverse terrain with difficult grades.

These gaps in the shoulder bikeway network result in few origin and destination pairs currently accessible. The impact on bicycle connectivity may be somewhat reduced due to several roads without shoulders but low vehicle volumes. In good conditions, a rural road with low vehicle volumes and low speed can be a pleasant place to ride and may be preferred over a high volume, high speed facility with a bike lane. However, the comfort of non-motorized road users varies widely with age and experience. Without dedicated space multimodal users are vulnerable to high-speed vehicles, especially in difficult terrain, in poor weather, or low visibility conditions and for some potential users this creates a permanent barrier. Upgrading shoulders to the bicycle and pedestrian recommended width should always be considered in rural areas.

Monroe

The following bicycle and pedestrian infrastructure is available in the City of Monroe.

Sidewalks: Continuous sidewalk exists on Territorial Rd. and Pacific Highway (OR 99W), which are both state highways. Intermittent sidewalks are provided on sections of Commercial St., 6th St., 7th St., and 8th St., closer to Pacific Highway. There are no sidewalks outside of these areas.

Shared-use paths: A 542-foot long shared-use path at Residential Heights Park.

Roadway shoulders: Pedestrians must use road shoulders along OR 99W north of Fir St. These shoulders do not meet requirements for pedestrian facilities. North of Oak St. there are no parallel local streets to provide alternative routes. Pedestrian facility improvements are recommended along this segment from Fir St. to the city limits.

Enhanced Roadway Crossings: An enhanced crossing with a refuge island and flashing beacons exists along OR 99W between the Monroe Library and the northern end of Monroe High School campus. Another refuge island for pedestrians exists near Depot St. and the southern end of the high school campus. The intersection of OR 99W and Commercial St. provides curb extensions for improved pedestrian crossings.

Bike Parking: Bicycling can be challenge enough without having to deal with parking. Covered racks protect bicycles from the summer sun and, in the other three seasons, rain, and reduce the obstacles to choosing to bike as a travel mode. There is a bike rack at City Hall (3 bikes), bike rack at Legion Hall (5 bikes), and bike rack at the Library (10 bikes)

Figure 10: Bicycle and Pedestrian Facilities

Figure 11: Bicycle and Pedestrian Gaps

Adair Village

In Adair Village, the following bike and pedestrian infrastructure is available.

- **Sidewalks:** In Adair Village, neighborhood roads have generally continuous sidewalk throughout the city. Roughly half of the neighborhood roads have continuous sidewalks on both sides, while the other half have an existing sidewalk along one side of the road only. Arnold Ave. has continuous sidewalk along the southern side from 2nd Street to Adair County Park and provides access to most destinations in the city.
- **Shared-use paths:** A shared-use path through a neighborhood park connects Laurel Dr. with Columbia Ave. An additional narrow path connects Azalea Dr. with Adair County Park just outside the city limits, where a paved loop path provides access in the park.
- **Roadway shoulders:** Pedestrians utilize roadway shoulder on a few different blocks in Adair Village where sidewalks are absent. The streets include William R Carr Ave, Vandenberg Ave, and a few minor streets.
- **Enhanced Roadway Crossings:** Adair Village does not currently have any enhanced roadway crossings. Vandenberg Ave., crossing OR 99W to access the OSU Research Forest trailhead, is an opportunity for an enhanced roadway crossing that would serve Adair Village.

Although they do not include dedicated facilities, two very low volume roadways are commonly used as informal shared-use paths to connect with destinations just outside the city. Purple Vetch Ln, located on Oregon Department of Fish and Wildlife property, provides access to a fishing pond and natural areas south of Vandenberg Ave. ODOT's Adair Frontage Rd. is used to access the EE Wilson Game Management Area north of the city limits. Within the Game Management Area, a network of paved and gravel roads, from the land's previous US Government use, provides multimodal access to the area.

There is no data on bicycle parking for Adair Village.

II.IV Public Transportation Inventory

Public transit use and operation impact many aspects of Benton County. Public transit use reduces emissions and vehicle miles traveled making it a more environmentally friendly choice. It provides a travel option for vulnerable people in the community such as the elderly and disabled. Finally, transit allows people to live and work without the requirement of car ownership, this is particularly important in and around Corvallis due to the high proportion of students from Oregon State University.

Numerous public transportation services are available in Benton County. The following sections describe the transit services operating in the County's five incorporated communities and unincorporated areas, and the transit demand based on socio-demographic information. The transit services are generally discussed as either fixed route or demand response services. These types are defined below for clarity.

- **Fixed route** operates along a set path, follows a published schedule, and serves specific stops. A variation on this service type includes deviated fixed routes, or flex-routes, which may deviate off-route to pick up passengers who schedule a pick-up in advance.
- **Demand response** services offer curb-to-curb pick-ups in defined service areas through advance reservation. The ride may be shared when possible. This category includes paratransit service provided under the Americans with Disabilities Act (ADA). ADA Paratransit is required to operate where and when local fixed-route services operate.

The largest public transportation provider in Benton County in terms of ridership and resources is the Corvallis Transit System (CTS), which includes urban area fixed routes and ADA paratransit. CTS' service area is limited to the City of Corvallis, and the service is managed by the City. CTS is undergoing a Transportation System Plan and Transit Development Plan in 2017; therefore, this memo focuses upon analyzing services outside Corvallis that serve the rural county population.

The Benton County Rural and Special Transportation Program provides both fixed route and demand response public transportation services throughout the county and to regional destinations such as Newport. Benton County connects to Amtrak at the Albany Train Station. Greyhound connections to the larger region are provided in downtown Corvallis. Figure 12 summarizes public transportation providers by community. Note that the community of North Albany is part of Benton County, but is also part of the Albany Area MPO. North Albany residents are therefore eligible for Benton County services but are also within the Albany Transit System service area.

Table 6: Benton County Area Public Transportation Services Available by Community

Location	Fixed Route	Demand Response
Adair Village	<ul style="list-style-type: none"> ● Benton County 99 Express 	<ul style="list-style-type: none"> ● Benton County Dial-A-Bus
North Albany (Benton County)	<ul style="list-style-type: none"> ● Corvallis to Albany Connection ● Albany Transit System 	<ul style="list-style-type: none"> ● Albany Transit System Call-A-Ride ● Benton County Dial-A-Bus
Albany (Linn County)	<ul style="list-style-type: none"> ● Albany Transit System ● Corvallis to Albany Connection ● Coast to Valley Express ● Linn-Benton Loop ● Linn Shuttle ● Bolt Bus / Greyhound ● Cascades POINT ● Amtrak Cascades ● Corvallis-Amtrak Connector 	<ul style="list-style-type: none"> ● Albany Transit System Call-A-Ride
Corvallis	<ul style="list-style-type: none"> ● Corvallis Transit System ● Benton County 99 Express ● Corvallis to Albany Connection ● Coast to Valley Express ● Linn-Benton Loop ● Corvallis-Amtrak Connector ● Greyhound 	<ul style="list-style-type: none"> ● Corvallis Transit System ADA Paratransit ● Benton County Dial-A-Bus
Monroe	(NA)	<ul style="list-style-type: none"> ● Benton County Dial-A-Bus
Philomath	<ul style="list-style-type: none"> ● Coast to Valley Express ● Philomath Connection 	<ul style="list-style-type: none"> ● Philomath ADA Paratransit ● Benton County Dial-A-Bus
Unincorporated Areas	<ul style="list-style-type: none"> ● Benton County 99 Express (along OR 99W) 	<ul style="list-style-type: none"> ● Benton County Dial-A-Bus

Public transportation management and service delivery varies by service provider. Benton County contracts with third-party providers for management, operations, and maintenance. Management is provided through an intergovernmental agreement with the City of Corvallis, which provides staff to oversee the services through their public works department. Operations and maintenance of Dial-A-Bus, 99 Express, Corvallis to Amtrak Connector, Corvallis to Albany Connection, and Benton County’s share of the Coast to Valley Express is contracted to Dial-A-Bus of Benton County, a local non-profit that employs all drivers and maintenance personnel.

The City of Corvallis and City of Philomath ADA paratransit services are provided through an intergovernmental agreement with Benton County, which operates service through its contract with Dial-A-Bus. CTS services and the Philomath Connection are operated and maintained through a third-party contract with a

private for-profit transportation vendor. Fixed route services are managed by City of Corvallis employees in the Public Works Department. Call-A-Ride service in North Albany is directly operated and managed by the City of Albany.

Benton County Fixed Routes

Fixed route public transportation services in Benton County include the intercity routes 99 Express, Coast to Valley Express, Corvallis to Albany Connection, Philomath Connection, Corvallis-Amtrak Connector, and the CTS network in Corvallis. Regional and inter-regional operators connect with Benton County routes in Albany.

Figure 12 displays the fixed route services in the county and inter-regional services Benton County residents can connect to at the Albany Train Station. Table 7 summarizes these routes' operating characteristics.

Figure 12: Benton County Fixed Route Transit Services

Table 7: Benton County Area Fixed Route and Regional Transportation Summary

Route Name	Days Operating	Service Span	Frequency	Connections	One Way Fares
99 Express	Monday – Friday	7:08 a.m. – 5:56 pm	4 round trips per day	Corvallis Transit	\$0.75
Coast to Valley Express	Sunday – Saturday	6:20 a.m. – 7:30 p.m.	8 one-way trips per day	Lincoln County Transportation Service District, Corvallis Transit Service, Albany Transit Service, Amtrak, Bolt Bus	\$10 General; \$7 seniors 60+ and youth 12 and under; bulk ticket booklets discounted \$2
Corvallis-Amtrak Connector	Thursday – Monday	5:10 a.m. – 8:35 p.m.	5 round trips per day	Amtrak, Corvallis Transit, Albany Transit, Bolt Bus, Cascades POINT	\$5.00; bulk ticket booklets provide a discount up to \$2
Corvallis to Albany Connection	Monday, Wednesday, and Friday	7:30 a.m. – 6:00 p.m.	5 round trips per day	Albany Transit, Corvallis Transit, Amtrak, Bolt Bus	\$4.00
Philomath Connection	Monday – Friday	6:15 a.m. – 7:13 p.m.	7 round trips per day	Corvallis Transit	\$0.75
Corvallis Transit System	Monday – Saturday	6:15 a.m. – 8:45 p.m. Monday – Friday; 7:15 a.m. – 7:30 p.m. Saturday; OSU in session: 8:45 p.m. – 2:45 a.m. Thursday - Saturday	30 minute frequency on some routes; others 1 hour frequency. Some routes 4-8 trips per day; some p.m. peak only.	Albany Amtrak station via Linn-Benton Loop, Philomath Connection, Beaver Bus, 99 Express, Coast to Valley Express, Benton County Dial-a-Bus, Greyhound	Fareless
Linn-Benton Loop	Monday - Saturday	6:25 a.m. – 7:00 p.m. Monday – Friday; 8:00 a.m. – 6:00 p.m. Saturday	14 trips per day	Linn Shuttle, Coast to Valley Express, Amtrak, Bolt Bus, Greyhound, Albany Transit, Corvallis Transit System	\$1.50 General; seniors / youth / disabled \$0.75

Route Name	Days Operating	Service Span	Frequency	Connections	One Way Fares
Albany Transit System	Monday - Friday	6:30 a.m. – 7:00 p.m.	1 hour	Amtrak, Bolt Bus, Linn Shuttle, Greyhound, Corvallis-Amtrak Connector, Coast to Valley Express, Linn-Benton Loop	\$1.00 Adults; \$0.50 seniors, youth, or disabled
Linn Shuttle	Monday - Friday	6:10 a.m. – 7:30 p.m.	7 trips per day + 2 express	Amtrak, Bolt Bus, Linn Shuttle, Greyhound, Corvallis-Amtrak Connector, Coast to Valley Express, Linn-Benton Loop	\$1 General

Inter-Regional Services

Amtrak Cascades and Coast Starlight	Sunday – Saturday	6:11 a.m. – 7:40 p.m.	Four northbound and southbound trips per day	Albany Station: Connections to local transit service at most stations	Trips to Eugene from \$15, trips to Portland from \$21
Bolt Bus	Sunday – Saturday	10:45 a.m. – 7:00 p.m.	Four northbound and southbound trips per day	Albany Station: Connections to local transit systems throughout Oregon and Washington I-5 corridor	As low as \$1; Generally \$7-\$8 to Portland or Eugene
Cascades POINT	Sunday – Saturday	6:20 a.m. – 11:59 p.m.	Six northbound and southbound trips per day	Albany Station: Connections to local transit at most stops, and to statewide POINT network	Trips to Eugene from \$15, trips to Portland from \$21
Greyhound	Monday, Wednesday, and Friday	NA	3-4 northbound trips per day; 2-3 southbound	Corvallis Station: Connections throughout North America	Trips to Portland from \$16; Trips to Eugene from \$15

Sources: Provider websites and Benton County Coordinated Plan

The following section includes descriptions of each provider described above, plus information about private transportation services operating taxis and airport shuttles.

[Benton County 99 Express](#)

Benton County partners with CTS to provide the 99 Express service along OR 99W between Adair Village and Corvallis. Major destinations on the route in Corvallis include Good Samaritan Hospital, Linn-Benton Community College, and the Downtown Transit Center. In the six miles of rural highway between the two

communities, passengers can flag down the bus in areas where it is safe to pull over. Route deviations can be scheduled with 24-hour advance notice. Base fares are \$0.75, and connections in Corvallis are free due to CTS' fareless system. All vehicles have wheelchair lifts and two wheelchair securement locations, and most have bike racks. Funding sources for 99 Express include federal and state grants, and local funding. Ridership in fiscal year (FY) 2016-2017 averaged 419 riders per month.

Coast to Valley Express

Benton and Lincoln Counties co-operate the Coast to Valley Express on US 20, which connects Albany, Corvallis, Philomath, Eddyville, Toledo and Newport. The two agencies each provide two round trips per day. The service connects passengers to medical facilities, job training, shopping, recreation, and educational institutions. It is marketed in part to tourism markets. The Coast to Valley Express has a dedicated fleet with wheelchair lifts, two wheelchair securement spaces, and capacity for two bicycles. The service is funded by federal and state grants, and local sources. In fiscal year 2016-2017, ridership averaged 312 passengers per month.

Corvallis-Amtrak Connector

The Corvallis-Amtrak Connector is a one-year pilot program operated through a partnership with Benton County, the Oregon Department of Transportation (ODOT), and Amtrak. Launched in August 2017, it connects Corvallis to the Albany Amtrak station with five daily round-trips. Trips are timed to correspond with Amtrak train departures and arrivals. Vehicles are lift-equipped, contain internal luggage racks, and have capacity for two bicycles.

Corvallis to Albany Connection

Benton County provides the Corvallis to Albany Connection service on Monday, Wednesday, and Friday. The route is a hybrid fixed route and demand response service. Riders reserve pick-up and drop-off locations in Corvallis and Albany the day before in a specified service window. The Corvallis to Albany Connection is wheelchair-accessible and limited to residents with disabilities or those age 60 and over who register with the service. It operates using two buses with 12 seats and two wheelchair securement spaces. The cost of the service is split between federal and state grants, and local funding. Ridership averaged 124 riders per month in fiscal year 2016-2017.

Philomath Connection

CTS operates the Philomath Connection, providing weekday transit service between Corvallis and Philomath with stops at the Corvallis Downtown Transit Center, Oregon State University, Philomath City Library, and Philomath High School. All vehicles are "kneeling" buses, ADA accessible, and equipped with ramps and rack capacity for two bicycles. Funding for the Philomath Connection comes from federal funds and the Philomath City General Fund. The route provided about 2,000 rides per month in fiscal year 2014-2015.

Corvallis Transit System

The City of Corvallis operates CTS, a fareless fixed-route service throughout the city that is funded through federal grants, Oregon State University (OSU) contributions in lieu of fares, and a local tax called the Transportation Operation Fee. In addition to its core fixed routes with headways of 30 minutes to one hour, CTS operates a variety of routes including weekday commuter routes, special event shuttles serving festivals and OSU football games, and a seasonal holiday shopper express route sponsored by participating merchants.

CTS also operates Night Owl service until 2:45 a.m. Thursday, Friday, and Saturday while OSU classes are in session.

CTS routes are operated as a “pulse” system from the Downtown Transit Center. Passengers can transfer from CTS routes to the 99 Express, Linn-Benton Loop, Philomath Connection, and Coast to Valley Express. All vehicles are ADA accessible “kneeling” buses with ramps and rack capacity for two bicycles. Buses are equipped with Vehicle Information Systems that enable automated passenger counts and real-time bus tracking. Ridership reached about 1.2 million in fiscal year 2014-2015, or approximately 100,000 rides per month.

Linn-Benton Loop

The City of Albany operates the inter-city service called the Linn-Benton Loop, which connects Corvallis and Albany and major destinations such as Linn-Benton Community College, Oregon State University, and Hewlett-Packard. The Loop coordinates services with Benton County Dial-A-Bus, Corvallis Transit, and Linn County public transportation programs. The service is fareless for people with identification cards from Linn-Benton Community College (LBCC), OSU, Samaritan Health Services, and Hewlett-Packard. The Loop runs in a clockwise direction in the morning, and operates counterclockwise in the afternoon. All trips serve Corvallis and LBCC, but the routing and destinations served vary by the time of day. Morning and afternoon peak times are supplemented with direct non-stop service between Corvallis Downtown Transit Center and LBCC, and mid-day service, while mid-day service operates only between LBCC and OSU. Saturday service runs only in the counterclockwise direction, and does not serve Hewlett-Packard or OSU.

Loop vehicles are equipped with wheelchair lifts, on-board wheelchair securement spaces, and bicycle racks. The service is funded through federal and state funds, local governments, Linn-Benton Community College, and Oregon State University. Ridership varies by time of year due to student schedules; the Loop provided over 120,000 rides in fiscal year 2014-2015.

Albany Transit System

Albany Transit System provides both fixed-route and curb-to-curb ADA paratransit and demand-response services throughout the city of Albany, in Linn County. A part of Albany’s incorporated area, North Albany, is located across the Willamette River in Benton County. Only one fixed route serves this portion of Benton County, offering roughly hourly service from 6:30 a.m. to 6:20 p.m.

Linn Shuttle

Operated by the Sweet Home Senior Center, the Linn Shuttle provides transportation services between Lebanon, Sweet Home, and Albany. The Shuttle operates seven round trips per day, starting in Sweet Home to Lebanon to Albany then back to Lebanon, and Sweet Home. Three morning and three afternoon LBCC Express trips are made from Lebanon to Albany, ending in Sweet Home. The Linn Shuttle operates Monday through Friday, 6:10 a.m. to 7:30 p.m. Service is offered free for staff and students of LBCC; all other one-way fares are \$1 with multi-ride tickets that offer a ten-ride punch card costing \$10. In Albany, transfers are available to Corvallis through Linn-Benton Loop.

Inter-Regional Public Transportation Connections

A variety of long-haul public and private transportation options serve Benton County.

Bolt Bus

Bolt Bus provides long-distance service along the I-5 corridor in Oregon and Washington, connecting passengers at the Albany Amtrak Station with Eugene, Portland, and Seattle. Bolt Bus does not directly serve destinations in Benton County, though some Benton County area transit services can connect passengers traveling from locations in Benton County with the Albany Amtrak Station where Bolt Bus stops. There are four trips per day both northbound and southbound. All vehicles are wheelchair-accessible and provide wireless internet and a restroom.

Cascades POINT

ODOT provides intercity busses on I-5 called the Cascades POINT bus service. Six trips per day both northbound and southbound serve Albany Station, with seven stops between downtown Portland and the University of Oregon in Eugene. Buses are wheelchair accessible, have storage capacity, restrooms, wireless internet, and power outlets. Ticketing is managed through Amtrak.

Amtrak

Amtrak trains provide service to Albany via the Coast Starlight and Amtrak Cascades routes. The Coast Starlight connect passengers at the Albany Station with destinations all along the West Coast from Seattle to Los Angeles. The Amtrak Cascades runs are owned and funded by ODOT in partnership with Washington State DOT. It operates between Vancouver, BC and Eugene. The Amtrak Cascades line is operated by Amtrak. Four daily northbound and southbound trips serve the Albany Station.

Greyhound Bus Lines

Greyhound long-distance buses serve Corvallis via a depot near the Downtown Transit Center. Three trips per day depart north to Salem, Portland, and into Washington, and south through Eugene, Grants Pass, and Medford. Connections are possible to locations across North America.

Northwest Oregon Transit Alliance

Benton County Rural and Special Transportation collaborates with four other northwest Oregon transit providers to form a transit partnership called the Northwest Oregon Transit Alliance. The Alliance coordinates schedules and fares to provide rider convenience and accessibility, and has branded the coordinated services the Northwest Connector. The goal is to promote and provide reliable transit service between the Willamette Valley and the northern Oregon coast. Other partners working with the Alliance include ODOT, Amtrak, Yamhill County Transit, Tri-Met, Salem-Keizer Transit, the Siletz Tribe, and the Confederated Tribes of Grand Ronde. This cooperation allows riders to use a single weekend or weekly pass across the participating transit providers. Cooperating agencies coordinate service schedules to facilitate transfers and make travel between providers simpler. The development of the Alliance system has been supported by federal and state grants.

In Benton County, the 99 Express and Coast to Valley Express routes participate in the Northwest Connector network. The Connector shares the Corvallis Downtown Transit Center with Corvallis Transit System. Opportunities are being explored to bring Linn County transit networks into the Connector system, including the Linn-Benton Loop, Albany Transit, and the Linn Shuttle.

Shuttles Serving Benton County

OSU Shuttle (Beaver Bus)

Oregon State University operates a free campus shuttle that connects outer campus parking areas to central campus locations. Known as Beaver Bus, the service includes four vehicles on three routes operating 33 weeks per year, and one bus serving one route the remaining 19 weeks. Frequencies are between 5 and 14 minutes, and buses are equipped to provide live location information so that passengers can track shuttle arrivals. Buses operate between 7:00 a.m. and 7:00 p.m., and are free to ride. OSU owns the vehicles, but they are stored and maintained at the Corvallis Transit System depot. Beaver Bus is funded by OSU Transportation Services. Beaver Bus ridership in 2014-2015 was about 153,000 from October to June, or about 19,000 rides per month.

Airport shuttles

A number of shuttles connect residents in Benton County with regional airports.

- Hut Airport Shuttle provides service to Portland International Airport from Albany, Corvallis, Eugene, OSU, Salem, and Woodburn. Hut serves two pickup locations in Corvallis – one on the OSU campus in front of the Native American Longhouse, and another at the Hilton Garden Inn. There are eleven trips per day between 2:00 a.m. and 10:00 p.m., and travel time from Corvallis to Portland airport is two and a half hours. One-way fares are \$49 for adults and \$45 for students and older adults.
- City 2 City Shuttle serves Portland International Airport from stops in Albany, Eugene, and Salem. One-way fares to Portland airport are \$48 for adults and \$44 for seniors and students. There are five trips per day between 5:55 a.m. and 6:55 p.m., departing from the Holiday Inn Express.
- OmniShuttle provides round trip service to OSU from Eugene airport as demand dictates; there is no regularly scheduled service. Prices from Corvallis are \$71 for the first passenger and \$5 for each additional rider.

Taxis and Ride hailing

Several taxi services operate throughout Benton County, including Auto Taxi, Beaver Cab, The Hub Cab, Roadrunner Taxi, and Corvallis Pedicab. In addition to these taxi services, ride hailing services Uber and Lyft both operate in Benton County.

Demand Response Service

Demand response public transportation services in Benton County include the Benton County Rural and Special Transportation program, or Dial-A-Bus, and the Corvallis and Philomath ADA paratransit services. These are described in detail below.

Benton County Rural and Special Transportation

The Benton County Rural and Special Transportation Program provides countywide transportation services for older adults, persons with disabilities, people with low income, and rural residents. The service is called “Dial-A-Bus” after the company that operates the service. It is primarily funded through agreements with ODOT for state and federal funds. Benton County’s public transportation budget was approximately \$1.4 million in 2016.

Persons 60 years of age or older and persons of any age with a documented disability qualify for Benton County's transportation service. The service offers wheelchair-accessible vehicles with at least one wheelchair securement space. Passengers must request wheelchair accommodations when scheduling a trip. Passengers enrolled in CTS ADA paratransit program automatically qualify for the County's program.

Dial-A-Bus is available seven days a week, from 8 a.m. to 7 p.m. on weekdays, 8:30 a.m. to 6 p.m. on Saturdays, and 8:30 a.m. to 2:30 p.m. on Sundays. Customers must schedule at least one day in advance Monday through Friday between 8 a.m. and 5:30 p.m. Fares are based on zones and one-way trips range from \$2.50 to \$5.25. Zone 1 includes Corvallis city limits. Zone 2 includes the area surrounding Corvallis, including Lewisburg, Philomath, and Kiger Island Road. Zone 3 includes Adair Village, North Albany, and Wren, and Zone 4 includes outlying Benton County areas, including Alsea, Bellfountain, Blodgett, Kings Valley, Monroe, and Summit (Figure 13).

Benton County's Program oversight is provided by the nine-member Special Transportation Advisory Committee (STAC). The STAC members are appointed by the Board of County Commissioners, with required positions specified in ODOT's Special Transportation Fund rules. City of Corvallis staff provide dedicated program administration through an intergovernmental agreement with Benton County. The third-party contract to operate the service to Dial-A-Bus was worth \$466,000 in fiscal year 2016.

Ridership in fiscal year 2013-2014 was 25,833 trips, with a monthly average of 2,153 trips. In fiscal year 2014-2015, the total number of trips increased to 26,167. Approximately 91% of trips are typically provided during the day, with the remaining 9% during evening or weekend hours.

Figure 13: Benton County Dial-A-Bus Service Zones

Corvallis and Philomath ADA Paratransit

The Corvallis and Philomath ADA paratransit services provide curb-to-curb transportation for people not able to independently use the fixed route public transportation system due to a disability. The service is available within ¼ miles of the Corvallis and Philomath routes, and provides wheelchair-accessible vehicles with at least one wheelchair securement space. ADA paratransit is available during the same service span as the CTS and Philomath fixed-routes.

Customers determine their eligibility for the paratransit service through an application and review process with the City. Each case is reviewed for applicability under ADA regulations, which includes both permanent and temporary disabilities. Ridership on the Corvallis ADA paratransit in fiscal year 2013-2014 was 6,506 trips and 7,870 annual trips in fiscal year 2014-2015.

The Corvallis ADA service is fareless if the trip begins and ends within ¼ mile of a CTS route, and begins and ends during the CTS service span hours. The Philomath ADA paratransit one-way fare is \$1.50. Reservations for both service areas must be made between one and seven business days before the requested ride. Reservation call center hours are 8 a.m. to 5:30 p.m., Monday through Friday.

CTS contracts with Dial-A-Bus to provide the ADA paratransit service in coordination with countywide Benton County Rural and Special Transportation services. The contract cost about \$63,600 in fiscal year 2014-2015. Funds applied to this service include FTA Section 5310 and Oregon Special Transportation Fund.

Table 8 summarizes demand response service available in Benton County, including the days operating, the service span, and a one-way fare.

Table 8: Benton County Demand Response Service Summary

Service Name	Days Operating	Service Span	One-way Fare
Benton County Dial-A-Bus Origin-to-destination wheelchair accessible transportation throughout Benton County for older adults and persons with disabilities.	Monday – Friday Saturday Sunday	8 a.m. – 7 p.m. 8:30 a.m. – 6:00 p.m. 8:30 a.m. – 2:30 p.m.	\$2.50 to \$5.25 (zone based)
Corvallis ADA Paratransit Door-to-door wheelchair accessible transportation within Corvallis city limits for persons that qualify for ADA paratransit service.	Monday – Friday Saturday Thursday–Saturday (Night Owl)	6:15 a.m. – 9:25 p.m. 7:15 a.m. – 8:15 p.m. 8:45 p.m. – 2:45 a.m.	Fareless
Philomath ADA Paratransit Door-to-door wheelchair accessible transportation within Philomath city limits for eligible riders.	Monday – Friday Saturday	6:15 a.m. – 7:12 p.m. No service	\$1.50

Source: Benton County Coordinated Plan

Vehicle Inventory

Benton County STF Demand Response, 99 Express, Coast to Valley Express, and CTS ADA Paratransit Service share the vehicle fleet detailed in Table 9. There are 27 vehicles, including 13 buses, 5 vans, 8 cars, and 1 minivan. Most of the vehicles are rated in good or better condition. Vehicles in poor condition are prioritized for replacement based on the next funding cycle for vehicles. Vehicles and drivers are not assigned to specific fixed routes or demand response services, and receive assignments based on availability.

Table 9: Benton County Vehicle Fleet Inventory

Year	Make	Model	Style	Passenger Capacity†	Wheelchair Lift	Mileage	Condition
2014	Ford	El Dorado	Aero Elite	24+2	Yes	72,541	Good
2012	Ford	El Dorado	Aero Elite	26+2	Yes	170,838	Poor
2008	Ford	El Dorado	Aerotech	12+2	Yes	165,144	Good
2016	Ford	E-450	LF Transp.	12 + 2	Yes	7,848	Excellent
2015	Ford	Taurus	SEL AWD	4	No	8,027	New
2015	Ford	Taurus	SEL AWD	4	No	5,077	New
2014	Dodge	El Dorado	Amerivan	4+1	Yes	55,739	Good
2014	Dodge	El Dorado	Amerivan	4+1	Yes	49,857	Good
2014	Subaru	Outback	Wagon	4	No	32,169	New
2013	Ford	Seamax	Sedan	4	No	59,430	Good
2012	Ford	Champion	Challenger	12+2	Yes	62,459	Good
2012	Ford	Fusion	Sedan	4	No	70,309	Good
2011	Dodge	El Dorado	Amerivan	4+1	Yes	117,000	Good
2011	Dodge	El Dorado	Amerivan	4+1	Yes	102,863	Good
2011	Dodge	El Dorado	Amerivan	4+1	Yes	109,665	Good
2011	Ford	Fusion	Sedan	4	No	95,655	Good
2011	Ford	Fusion	Sedan	4	No	83,226	Good
2006	Ford	El Dorado	Aerotech	12+2	Yes	195,451	Poor
2006	Dodge	Caravan	Mini-van	4	No	150,395	Fair
2004	Chevrolet	Champion	Bus	24+2	Yes	201,370	Poor
2004	Ford	El Dorado	Aerotech	12+2	Yes	151,913	Good
2004	Ford	El Dorado	Aerotech	12+2	Yes	146,242	Good
2003	Ford	El Dorado	Aerotech	12+2	Yes	143,737	Good
1998	Nissan	Maxima	Sedan	4	No	150,395	Fair
2010	Ford	El Dorado	Aerotech	12+2	Yes	124,494	Good
2009	Chevrolet	El Dorado	Aero Elite	20+2	Yes	86,632	Good
2006	Ford	El Dorado	Aerotech	12+2	Yes	116,051	Good

† Passenger capacity includes the number of seats and wheelchair stations. Source: Benton County Rural & Special Transportation

Public Transit Demand

This section summarizes public transportation markets as indicated by trends in overall population and demographic groups with higher likelihood to use public transportation, employment, development densities, and regional travel demand by all modes. The demographic groups likely to use public transportation include older adults, people with low incomes, and people with disabilities. The analysis includes details for local communities where available, including the City of Albany which – though only partly located in Benton County – is an important travel market for public transportation services.

Development density is a key indicator in assessing public transportation demand. It is an especially important guide to planning fixed routes, as transit access and effectiveness are best where people have shared travel needs. Benton County has some input to development patterns through land use regulations and development review processes. The County can provide input to local jurisdictions land use regulations, but its own jurisdiction is limited to County land.

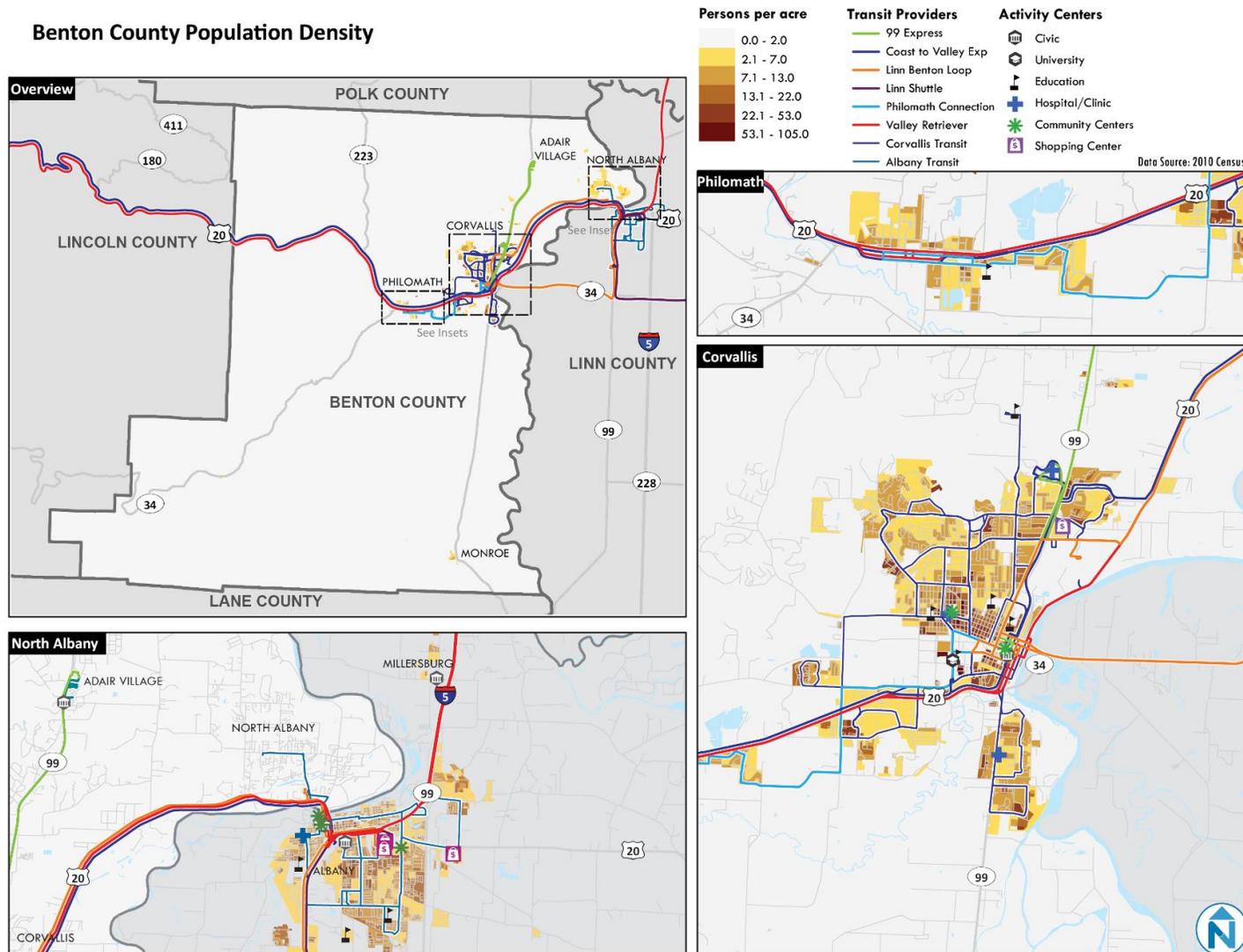
Public transportation demand also depends on how accessible and effective the routes are at getting people where they want to go. That transit level of service was described in the transit inventory and existing conditions, including when buses are available (service span), how often buses stop at destinations (frequency).

Population

As noted above, Benton County's growth is expected to increase from over 92,000 residents today to over 110,000 people in the year 2040. Four-fifths of the Benton County population lives in incorporated jurisdictions. Population by community suggests that Albany, Corvallis, and Philomath will continue to demand much of the region's public transportation demand, with the highest growth in Albany.

Population concentrations can be efficiently served by public transportation services. The challenge in Benton County's area is the relatively long distances between communities, and the resources needed to support public transportation trips between and around them. Figure 14 illustrates the year 2010 population density of the County. The map shows the highest population densities in Corvallis and Albany. Generally, Benton County has some areas of moderately high population density, most of which have access to at least minimal public transportation level-of service.

Figure 14: Benton County Population Density



Source: U.S. Census Bureau 2010 Census

Older Adults

Older adults are typically defined as 65 years and older for the purposes of assessing public transportation markets. Older adults typically use public transportation more frequently than the general population. Reasons may include declining ability or willingness to drive themselves, or a fixed income limiting the ability to support vehicle purchase and operating costs. The Benton County 2012 Community Health Assessment found that of adults over 65 years of age in Benton County,

- 33.7% had a disability,
- 29.9% lived alone,
- 4.5% lived below poverty level, and
- 2.5% resided in Nursing Homes.

Table 10 shows that the number of adults aged 65 and older increased across the County and in Albany from 2000 to 2015. The growth rate generally kept pace with overall population growth rate in the largest communities, with no change in the share of older adults in Corvallis and Albany. The share of older adults in unincorporated areas increased by 3 percentage points to 14% between 2000 and 2015, and in Philomath the share increased by 6 percentage points to 13%.

Table 10: Benton County Population 65 years and older, 2000-2015

Location	Year			Percent Change		
	2000	2010	2015	2000	2010	2015
Albany	5,200	6,589	7,003	13%	13%	14%
Adair Village	17	30	48	3%	3%	6%
Corvallis	4,970	5,721	6,089	11%	10%	11%
Monroe	51	81	105	8%	8%	16%
Philomath	264	430	610	7%	7%	13%
Unincorporated	2,724	4,018	5,027	11%	10%	14%
Benton County	8,026	10,280	11,879	3%	3%	6%

Source: U.S. Census 2000 and 2010, American Community Survey 5-year estimate 2015

Low Income Persons

Low income people are more likely to use public transportation, as they are more likely to have limited access to personal cars and funds to support ongoing vehicle operating costs (e.g. fuel, maintenance). “Low-income” is defined here as a household income below 150% of the U.S. Census Bureau’s poverty level. Approximately 30% of County residents were identified as low income in 2013.

Table 11 summarizes community population, the number of people earning less than 150% of the poverty rate, and the share of population that is low income. The figure also shows the percent change in both total and low-income populations. Overall 31% of Benton County’s population was considered low income in 2015, an increase of over 50% from the year 2000. The City of Corvallis had the highest share of low income residents in both 2000 and 2015 at 30% and 37% respectively, and increased 42% in that period. The cities of Adair Village and Monroe had the highest percent change in poverty from 2000 to 2013.

Table 11: Distribution of Low-Income Benton County Residents, Population with Incomes less than 150% Poverty Level

Location	2000			2015			% Change	
	Population	Low income	% Total	Population	Low income	% Total	Population	Low income
Albany	40,282	8,288	21%	50,871	15,602	31%	26%	88%
Adair Village	547	87	16%	828	184	22%	51%	111%
Corvallis	44,424	13,197	30%	50,141	18,757	37%	13%	42%
Monroe	628	134	21%	677	252	37%	8%	88%
Philomath	4,021	919	23%	4,572	1,200	26%	14%	31%
Benton County	73,237	16,831	23%	81,513	25,343	31%	11%	51%

Source: US Census 2000 and American Community Survey 2015 5-year estimates

Persons with Disabilities

People with disabilities are more likely to use public transportation due to limited physical and cognitive abilities related to personal vehicle use. Benton County's demand response public transportation services are particularly designed to support people with disabilities, offering scheduled door-to-door transportation service, travel training, and fares affordable for people with limited, fixed incomes.

There are several sources that have estimated the number of Benton County residents with physical and cognitive disabilities.

- The Good Samaritan Regional Medical Center's "2016 Community Health Needs Assessment" estimated that about 10% of people in Benton County reported having a disability between 2011 and 2013. Disability was defined as a person's risk of limited participation due to a functional limitation or impairment, encompassing different conditions. The most commonly reported disability in Benton County was cognitive difficulty, with ambulatory difficulty ranking the highest for people aged 65 and older. The prevalence of disability increases with age, from 1.4% of people under 5 years of age, up to 7.6% for 18 to 64 years of age, and 31.6% of those 65 and over.¹³
- The Oregon Office on Disability and Health's "2013 Annual Report on the Health of Oregonians with Disabilities" estimated that 22% of Benton County residents have some form of disability.
- The US Census Bureau's 2000 Census estimated 6,500 people with disabilities, or 9% of the County population.
- The Oregon Behavioral Risk Factors Surveillance System in 2013 estimated that 23% of Benton County residents "reported being limited in any activities because of physical, mental, or emotional problems".

Irrespective of the data source, the number of persons with disabilities in Benton County is greater than both statewide and national averages. Health, social service, and transportation professionals in Benton County have reported that population of persons with disabilities increased between 2000 and 2015, and will continue to increase at rates following the County's older adult population.

Primary services for persons with disabilities in Benton County include the Benton County STF Demand Response Service and the Corvallis Transit System ADA Paratransit Service. Benton County STF Demand Response Service is not an-ADA service but only seniors (persons 60 years of age or older) and persons of any age with a documented disability are eligible to use this service. Passengers enrolled in the Corvallis Transit System (CTS) ADA paratransit program are automatically qualified for the County's program, but the reverse is not true (i.e. enrollment in the Benton County STF service does not automatically enroll the passenger in the CTS ADA service).

Employment

Job locations are important to public transportation demand, as people are likely to use public transportation for commuting as long as the service is within safe walking distance to their work, provides reliable on-time service, and has a travel time comparable to personal vehicle travel. Public transportation is an especially critical link to employment for the demographic groups described above (older adults, low income persons, and

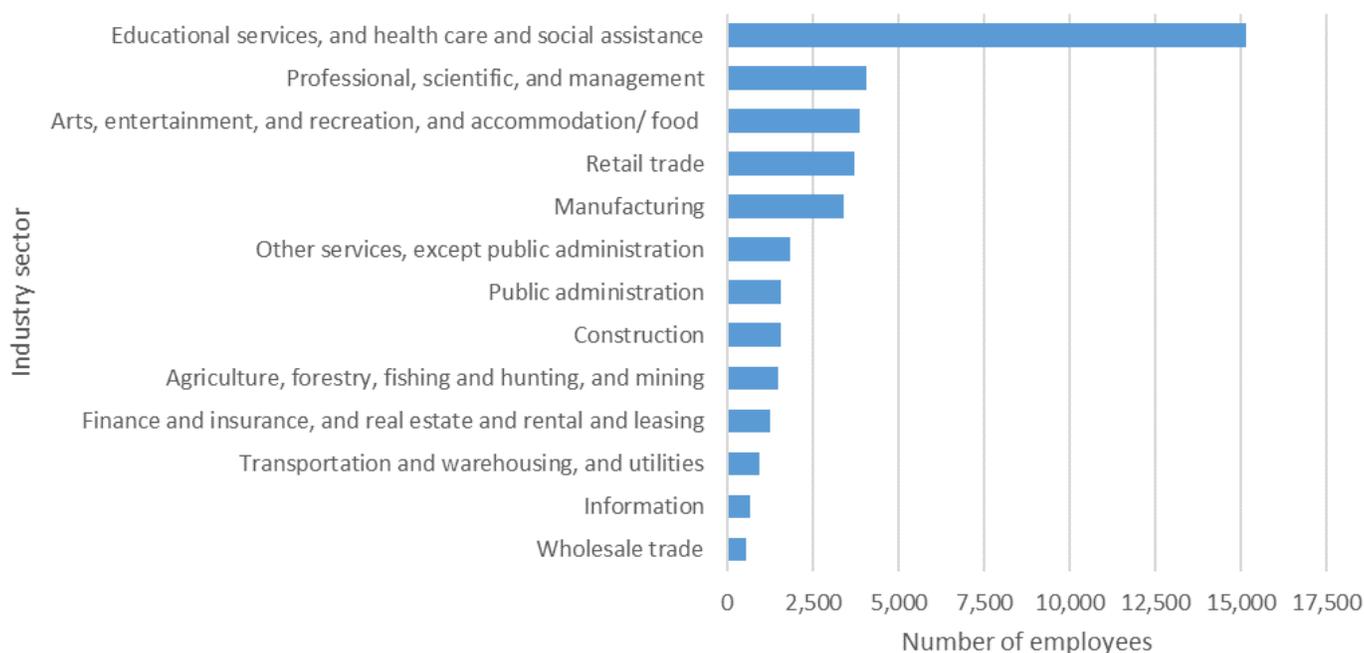
¹³ The statistics include non-institutionalized civilians ages 5 to 64.

people with disabilities) that may have limited access to other ways to get to work. For service planning, transportation providers can offer the most effective and efficient public transportation where employment densities are highest.

Benton County’s total civilian employment was 39,915 in 2015.¹⁴ Employment densities in the County, and the three largest cities, Corvallis, Albany and Philomath have most high-density employment areas somewhat near to minimal access to local and regional fixed route transit (i.e. 1-2 round trips daily).

Figure 15 summarizes County employment by industry sector. Benton County’s five largest employment sectors are education and health services; professional and scientific services; arts, entertainment, accommodation and food service; retail trade; and manufacturing. The largest employers are Oregon State University, Good Samaritan Regional Medical Center, Hewlett Packard, Corvallis Clinic, CH2MHill, and local and regional governments and school districts. OSU is by far the largest employer, employing more than 8,000 people.¹⁵

Figure 15: Benton County Employment by Sector



Source: American Community Survey 2011-2015 5-Year Estimates

Regional transportation demand

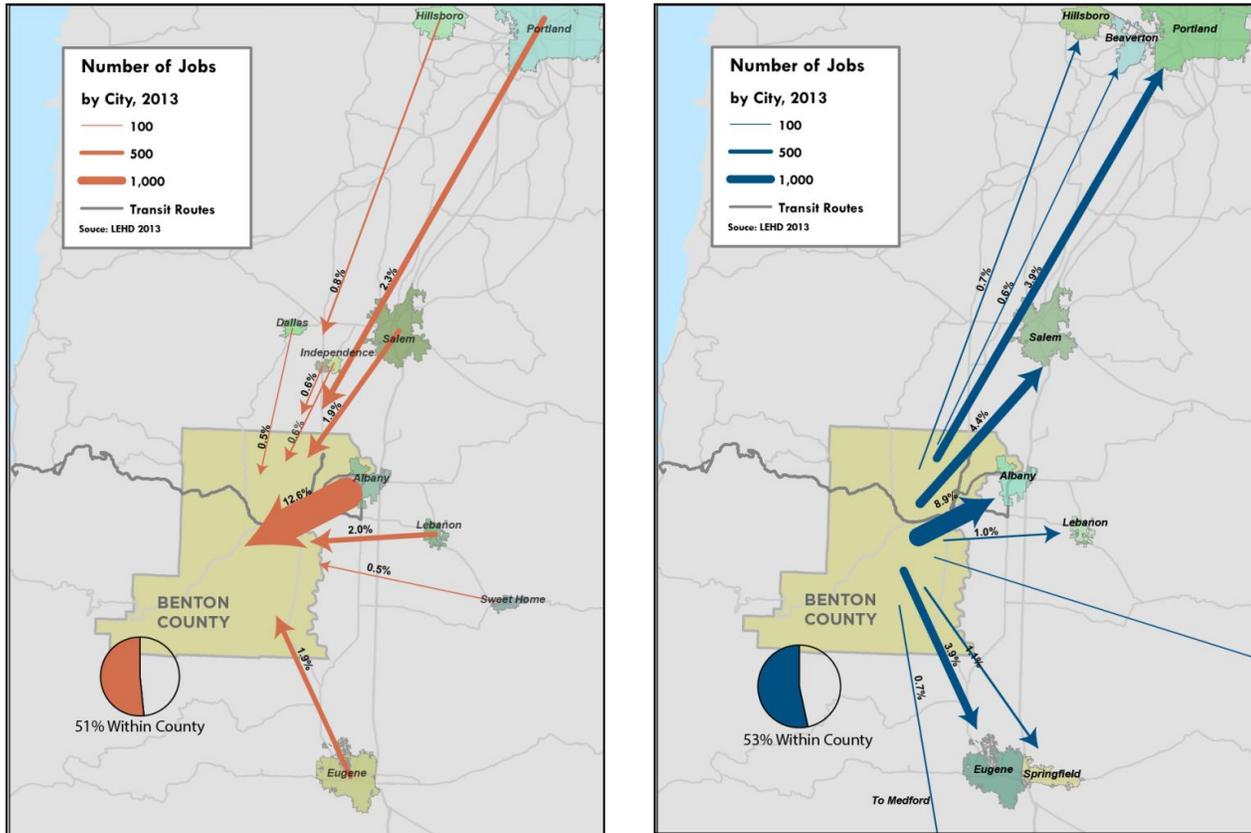
Nearly half of all people employed in Benton County travel from outside the County to access work, as seen in Figure 16. Albany has the largest number of employees residing outside the County, followed by Portland and

¹⁴ American Community Survey 2011-2015 5-Year Estimates

¹⁵ Oregon Employment Department Labor Trends, November 2015.

Eugene. In 2010, 15,284 people (45% of the total workforce) travelled into Benton County for employment and 15,616 people (45%) worked outside the County. Figure 16 illustrates the transportation flows of people leaving Benton County for employment. Albany is the primary employment location outside of the County, followed by Salem, Eugene, and Portland.

Figure 16 Employment Flow into Benton County



Source: Benton County Human Services Public Transportation Coordinated Plan

II.V Railroad System

The active railroad system in Benton County is used entirely for freight movement, which provides important interrelated capacity to the roadway freight system. At-grade railroad crossings, where the roadway system meets the railroad system, can be important safety and connectivity focus areas. Benton County also contains rail tracks that have been abandoned or removed by their owners, which could be an opportunity for developing active transportation paths as other jurisdictions have done successfully with “Rails-to-trails” programs.

There are currently no intermodal transfer facilities in Benton County, which connect the rail network to the roadway network for freight use.¹⁶ The nearest passenger service is provided by an Amtrak station in Albany.

Figure 17 shows the locations of the current railroads in Benton County. There are three rail operators active in Benton County:

- Portland & Western Railroad (PNWR) has 89 crossings with 6 trains per day between Corvallis and Toledo and 8 trains per day between Corvallis and Albany. Primary commodities include timber, agriculture, fuel, food products and bulk scrap metal.
- Albany & Eastern Railroad (AERC), operating on about nine miles of Bailey branch line track owned by Venell Farms Railroad (VFRC), has four public crossings and three private crossings with activity of about two trains per week. The commodity transported is agriculture.
- Benton County railbanked part of the Bailey branch line, formerly owned by Union Pacific, with an eye towards increasing future transportation options as acquiring right-of-way is a tedious and expensive endeavor.

Commodities transported by rail include:

- | | |
|-------------------------|----------------------|
| ● Aggregates | ● Consumer goods |
| ● Chemicals | ● Fertilizers |
| ● Concrete | ● Forest products |
| ● Grain | ● Petroleum Products |
| ● Non-metallic minerals | ● Steel |

At-grade railroad crossings must be signed, and may have active warnings (lights, sounds, etc.) or gates to prevent vehicles from crossing while in active use by a train. Of the active rail lines in Benton County, six paved and public crossings on County jurisdiction roadways do not have active warnings or lights. The most active of these crossings, at Elliott Circle near OR 99W, sees approximately 2 crossings daily. The above grade crossing over 53rd Avenue, north of US 20 in Corvallis is of concern due to the substandard high limit it places on vehicles crossing underneath.

¹⁶ As of October 2017, per the USDOT Bureau of Transportation Statistics’ National Transportation Atlas Database

Figure 17: Railroad, Air, Water, and Pipeline Networks

II.VI Air, Water, and Pipeline Networks

The transportation network in Benton County extends beyond just the ground transportation system of roadways and railroads. The air, water, and pipeline networks provide additional access for people, goods, and services throughout the county, and are shown earlier on Figure 17.

Airports

Corvallis Municipal Airport (FAA LID: CVO) is the only public-use air facility in Benton County. The airport is located south of Corvallis near the intersection of OR 99W and SW Airport Ave. The Corvallis Municipal Airport Master Plan was completed in 2013 to “provide guidance for future development and provide updated justification for project for which the airport may receive funding participation through federal and state airport improvement programs.”¹⁷ The Airport Master Plan reports that there are two functional asphalt runways: a 5,900-foot by 150-foot primary facility and a 3,534-foot by 75-foot facility for small aircraft. The airport does not currently provide any public commercial service.

Due to the proximity of airports in adjacent Linn and Lane County, they are also discussed in this section. The Albany Municipal Airport (FAA LID: S12) and the Lebanon State Airport (FAA LID: S30) are the only two publicly owned and operated airports in Linn County. The Albany municipal airport is a general aviation airport located 3.5 miles east of North Albany. Opening in 1920, it is the oldest known operating airfield in Oregon. There are 62 scheduled aircraft operations per day on average.¹⁸ The Lebanon State Airport is 17.5 miles east of the City of Corvallis. There are 27 scheduled aircraft operations per day on average.¹⁹ Eugene Municipal Airport (FAA LID: EUG) is about 11 miles south of Benton County. There are 22 scheduled aircraft operations per day on average.²⁰

Portland International Airport (FAA LID: PDX) is the nearest international airport, located approximately 80 miles north of Benton County. PDX is the largest airport in Oregon, and provides commercial, cargo, and military air service. There are 260 scheduled aircraft operations per day on average.²¹

¹⁷ Corvallis Municipal Airport Master Plan, Coffman Associates, 2013

¹⁸ http://www.dhonline.com/articles/2009/03/04/news/people/5peo01_flight.txt

¹⁹ <http://www.airnav.com/airport/S30>

²⁰ Value is US scheduled passenger flights. USDOT Bureau of Transportation Statistics. *Eugene Airport, OR (EUG)*.

²¹ Value is US scheduled passenger flights. USDOT Bureau of Transportation Statistics. *Portland International, OR (PDX)*.

Water & Pipelines

The water and pipeline system has not changed substantially since the previous TSP in 2001. The following section is taken from that plan.²²

Water

Although the Willamette River is considered a navigable waterway and maintained by the Army Corps of Engineers, no regular commercial use now exists or is anticipated, and this portion of the river is used primarily for recreation. Bridge crossings of the river located in Corvallis and Albany are stationary and limit the height and width of river vessels.

Pipeline

No significant through-transmission pipelines exist in Benton County, though there are transmission lines for electricity and telephone service. Water pipelines convey water from the City of Corvallis' watershed on Mary's Peak into the City's water system. No long-distance oil or gas pipelines are located within the County. There are no known capacity constraints for any pipeline or transmission line service.

²² Benton County 2001 TSP, <https://www.co.benton.or.us/publicworks/page/transportation-system-plan>

III. EXISTING CONDITIONS EVALUATION

This section describes how the transportation system in Benton County is currently performing. This evaluation is an important step towards identifying areas in need of improvement and helps set a baseline for comparison against future conditions.

III.I Safety

Safety is one of the most important considerations when assessing transportation system performance. The safety of Benton County roadways was evaluated by reviewing crash data and identifying patterns of motor vehicle, pedestrian, and bicyclist crashes.

Study intersection evaluation and network screening techniques help to identify locations with potential safety problems. High crash rates, fatal or severe injuries, and crashes involving pedestrians and bicyclists are all indicators of potential safety concerns. Analysis of the crash data can identify patterns in the crashes and suggest possible countermeasures and safety improvements.

ODOT provides uniform and verified motor vehicle crash data through the Crash Analysis and Reporting Unit. This includes crashes with pedestrians and bicyclists, but only if a motor vehicle was involved. Crash reports are the responsibility of individual drivers, and are only required in the event of death, bodily injury, or damage exceeding \$2,500. As such, low-severity crashes are generally underreported.

General Crash Trends

ODOT's crash data from 2011 to 2015 (the most recent five years of available data) for all roadways in Benton County showed a total of 4,315 crashes (an average of 863 crashes a year). ODOT's data contains all reported crashes on all roads, state, county and city over the time span. Over that period, 2013 had the fewest crashes at 811, while 2015 had the most crashes at 959. The five-year trend, separated by location inside or outside of UGBs, along with crash severity is shown in Figure 18.

Crashes are typically reported according to severity on the following scale:

- Fatal – a crash resulting in a fatality
- Injury A – a crash resulting in a serious or debilitating injury
- Injury B – a crash resulting in a visible injury
- Injury C – a crash resulting in minor injury
- PDO – Property damage only

While 92% of the crashes involved property damage only (no injuries) or minor injuries, there were 27 fatal crashes and 81 serious injury crashes. Of these 27 fatal crashes, four involved pedestrians. The other fatal crashes were mostly fixed-object (12), head-on (nine), rear-end (one) or turning (one) crashes.

Although more crashes occur within the urban areas of the county, the rural crashes tend to have more severe outcomes. Figure 19 shows that as the injury severity of crashes increases, a higher portion of them were in rural areas. Over 80% of the fatal crashes between 2011 and 2015 occurred outside UGBs.

Figure 20 shows the geographic location of high-severity, bicycle, and pedestrian crashes occurring on study roadways, along with the results of additional crash analysis discussed later in this section.

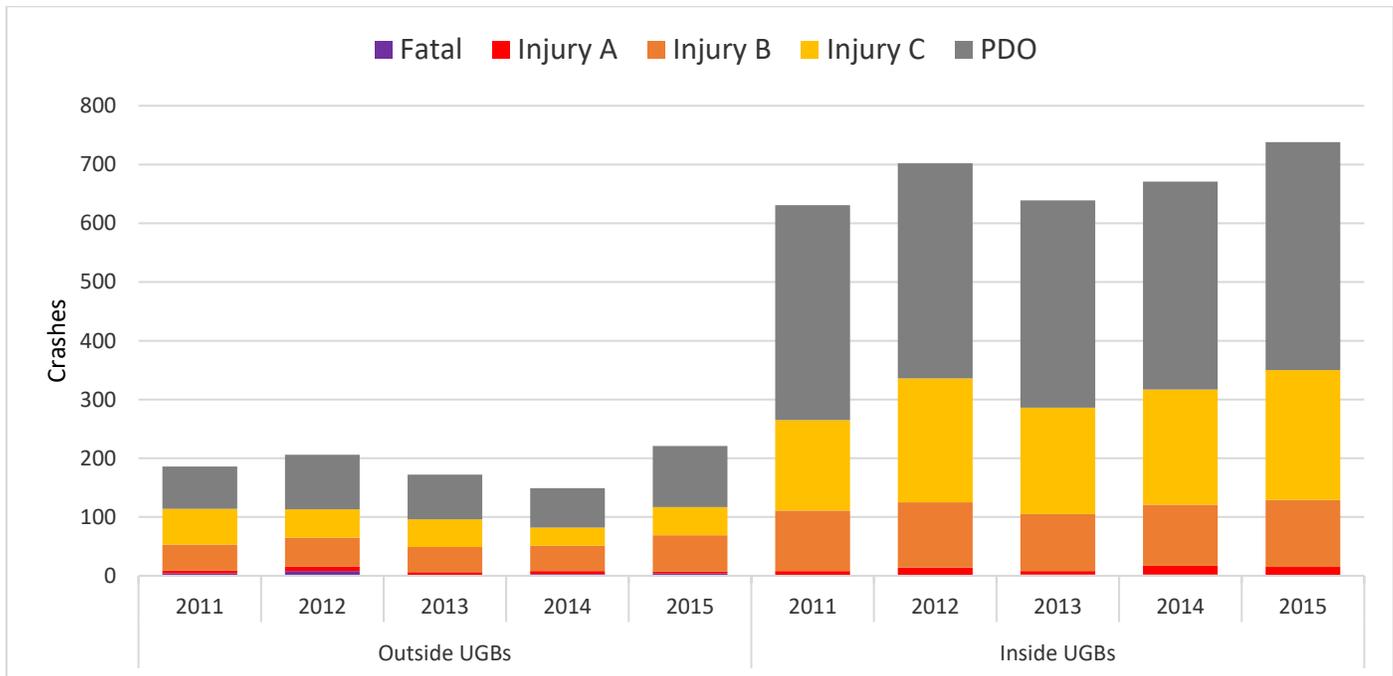


Figure 18: Benton County Crash History

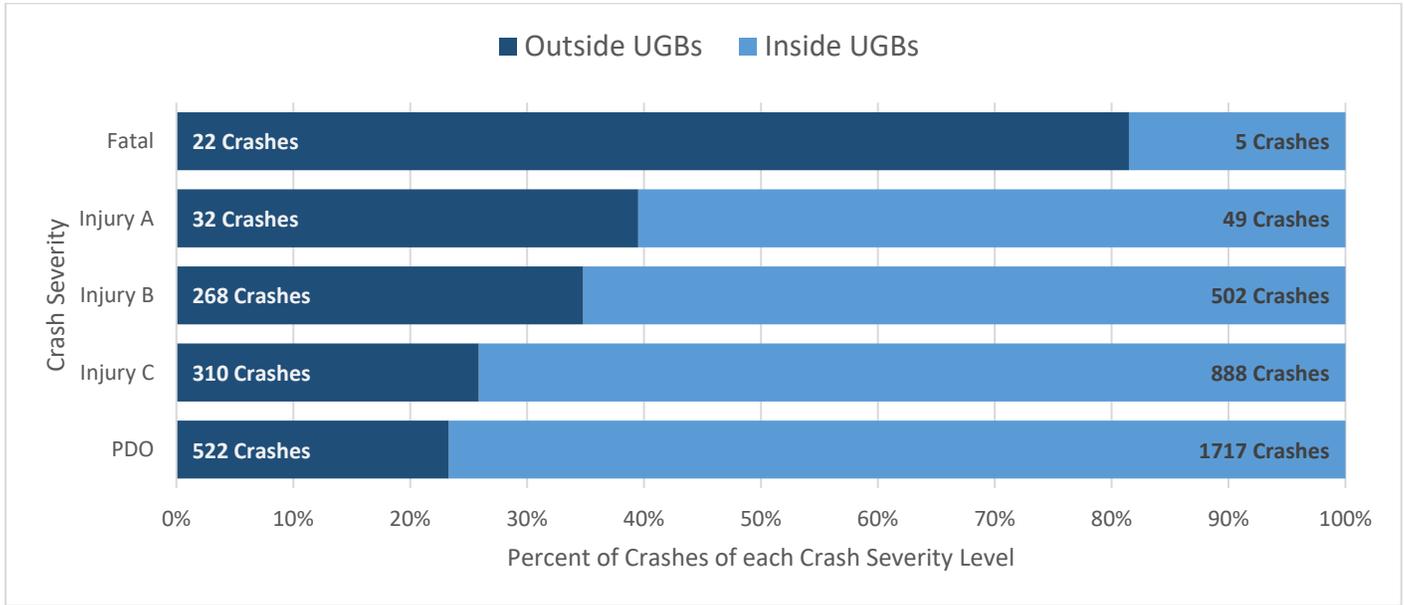


Figure 19: Severity of Crashes in Benton County

Figure 20: Crash Summary for Study Roads (2011-2015)

Informed by the Oregon Transportation Safety Action Plan,²³ five focus areas were identified as of potential interest: roadway departures, speed involved, distracted driving, alcohol, drugs, and school zones. These focus areas are common in statewide crash data, and are summarized for Benton County in Table 12.

Roadway departures or speed are involved in many the crashes in Benton County, and these are even more prominent outside of UGBs. Over 50% of crashes outside the UGB are roadway departure crashes, highlighting the importance of the roadside conditions, signing, and striping in rural roadway safety. Distraction and alcohol each account for less than 8% of crashes, however it is generally acknowledged that distracted driving is not well accounted for in the crash reports. ODOT and local jurisdictions are making efforts to better record distraction as a contributing circumstance, which is part of why there has been over a three-fold increase in distracted driving crashes recorded between 2011 (32 crashes) and 2015 (103 crashes).

Table 12: Crash Special Circumstances

	Benton County		Outside UGBs		Inside UGBs	
	Crashes	Percent	Crashes	Percent	Crashes	Percent
Roadway Departure	942	22%	585	51%	357	11%
Speed Involved	625	14%	360	31%	265	8%
Distracted Driving	308	7%	91	8%	217	7%
Alcohol	176	4%	71	6%	105	3%
Drugs	34	1%	16	1%	18	1%
School Zone	5	0%	0	0%	5	0%

Note: "Speed Involved" includes both speeding above the posted limit and too fast for conditions. "Distracted Driving" is categorized as inattentive in ODOT crash data, and does not specifically indicate distraction from electronic devices. Individual crashes may involve multiple circumstances listed here, therefore totals are not exclusive and percentages do not add to 100.

The roadway characteristics of crash locations influence the outcome of the crash, and help to guide the implementation of countermeasures to reduce crashes. Tables 13 and 14 below summarize generally where crashes occur in rural and urban contexts. Outside UGBs, most crashes happen away from intersections at segments that are straight or on a curve, and skew toward higher crash severities. Inside UGBs, most crashes occur at intersections and skew toward lower severities.

²³ Oregon Transportation Safety Action Plan 2016

Table 13: Crash Roadway Characteristics Outside UGBs

Roadway Characteristic	Crash Severity					Total
	Fatal	Injury A	Injury B	Injury C	PDO	
Segment - All Other	5	14	112	143	257	531
Segment - Curve	10	10	84	63	126	293
Intersection	2	4	55	92	111	264
Segment - Steep Grade	5	4	14	6	15	44
Segment - Bridge	-	-	3	6	13	22
Total	22	32	268	310	522	1154

Table 14: Crash Roadway Characteristics Inside UGBs

Roadway Characteristic	Crash Severity					Total
	Fatal	Injury A	Injury B	Injury C	PDO	
Intersection	2	26	313	508	888	1,737
Segment - All Other	3	20	159	350	771	1,303
Segment - Curve	-	2	22	18	40	82
Segment - Bridge	-	1	4	9	8	22
Segment - Steep Grade	-	-	4	3	10	17
Total	5	49	502	888	1,717	3,161

As a final means to understand the profile of crashes occurring in Benton County, Tables 15 and 16 cross-tabulate the most common causes and movement types for outside and inside UGBs. This asks the question “what happened and why did it occur?” It is important to note that for any given crash there are many contributing factors, these tables present the primary contributing factor as noted in the crash report. Each table is sorted by crash frequency for both causes and types, and displays the percentage of all crashes that falls into the given cause and type pairing in text and cell coloring.

Outside of UGBs the most common cause-type pair is a fixed object crash caused by speed, at 21% of crashes outside UGBs. Improper driving also contributes highly to fixed object crashes (12%). Other notable frequent pairs are rear-ends caused by following too close (13%) and turn movement crashes caused by failure to yield or inattention (10%). These crash pairs are characteristic of rural roads, where there are few users of the roadway at any given time. In these situations, crashes are often the cause of drivers incorrectly assessing the roadway environment.

Inside UGBs the most common cause pair is a rear end crash caused by following too close, at 21% of crashes inside UGBs. Failure to yield also contributes highly to rear end crashes (7%). The other prominent pairs are turn movement (19%) and angle crashes (18%) caused by failure to yield or inattention. These crash pairs are characteristic of intersections in urban areas, where there are many users of the roadway interacting frequently.

Table 15: Crash Causes and Types - Outside UGBs

Cause \ Type	Fixed Object	Rear-End	Other Movements	Turn Movement	Angle	Pedestrian	Total
Speed	21%	1%	3%	0%	0%	0%	25%
Improper Driving (Other)	12%	1%	6%	2%	0%	0%	22%
Failure to Yield or Inattention	4%	5%	1%	10%	2%	0%	21%
Other Causes	11%	0%	8%	0%	0%	0%	19%
Following Too Close	0%	13%	0%	0%	0%	0%	13%
Total	48%	20%	18%	12%	2%	0%	

Table 16: Crash Causes and Types - Inside UGBs

Cause \ Type	Rear-End	Turn Movement	Angle	Other Movements	Fixed Object	Pedestrian	Total
Failure to Yield or Inattention	7%	19%	18%	3%	1%	2%	50%
Following Too Close	21%	0%	0%	0%	0%	0%	21%
Improper Driving (Other)	2%	5%	1%	7%	4%	0%	18%
Speed	1%	0%	0%	1%	3%	0%	6%
Other Causes	0%	0%	0%	2%	2%	0%	5%
Total	32%	25%	19%	13%	9%	2%	

Pedestrian Safety

There were 78 pedestrian crashes in the study period, 73 of which occurred inside a UGB. Within the UGBs, most of the pedestrian crashes (47) occurred at intersections due to a failure to yield. Most (57) occurred during the day or in a lit environment.

Of the five pedestrian collisions that occurred outside UGBs, all were away from intersections and resulted in injury or death. They were evenly split between daytime and darkness.

Four of the crashes involving a pedestrian resulted in a fatality:

- Two occurred along OR 99W at the Circle Blvd., a signalized intersection in Corvallis. Both occurred in dark and wet conditions, with the report stating that the person walking was in the roadway and not visible.
- Two occurred on Fern Road. One happened during the dark in dry conditions, when the driver lost control of their vehicle. The other happened during the day in wet conditions, with the report stating that the person walking was in the roadway and not visible.

Bicycle Safety

There were 202 crashes during the study period that involved a person riding a bicycle, 194 of which occurred inside a UGB. Within the UGBs, most bicycle crashes (171) occurred at intersections due to a failure to yield, often while the motor vehicle was turning. Most bicycle crashes (177) occurred during the day or in a lit environment. There were no bicyclist deaths within UGBs, but nearly every crash resulted in injury.

Of the eight bicycle collisions that occurred outside UGBs, seven resulted in injury and one resulted in death. All but one occurred on road segments away from intersections. All but one occurred during the day, one occurred at dusk.

The bicyclist fatality occurred in 2012 on Sulfur Springs Rd. east of Lewisburg. It occurred when a driver, going too fast for conditions, drove left of the centerline and collided head-on with the bicyclist. It was daytime and raining.

Intersection Safety

When evaluating the crash history at specific locations across the transportation network, it is valuable to consider both the frequency and rate of crashes. The frequency is the number of crashes over the study period, and reflects to total societal burden of the crashes. The rate of crashes, in comparison, evaluates crash risk as a function of traffic volumes. For intersections, crash rate is measured in units of “crashes per million entering vehicles (MEV).”

Intersection crash frequency, by injury severity and by crash type, for each of the 48 study intersections in Benton County are provided in the appendix. The five most frequent crash types at intersections were rear-end, turning, fixed-object, sideswipe, and angle crashes.

High crash rate locations were identified following guidance in the ODOT Analysis Procedures Manual Version 2 Chapter 4, using the critical crash rate network screening method from the Highway Safety Manual to compare to similar intersections in the county and for comparison to ODOT’s published intersection 90th percentile crash rates. Excess Proportion (EP) analysis was used to identify statistically significant unusual crash type patterns. Crash rates at the following six study intersections were identified as high:

- **#5: OR 99W/NW Lewisburg Ave./NE Granger Ave.** is a four-legged signalized intersection in the rural area. The crashes at this intersection were primarily rear-end crashes (63%) where the driver was following too closely or turning type crashes (21%). The severity of the crashes was low, with all crashes involving property damage only (no injuries) or minor injuries. EP identified turning and rear-end crashes crash types as prominent.
- **#18: US 20/NE Granger Ave.** is a three-legged intersection with stop control on NE Granger Ave. in the rural area. Most of the crashes (92%) were turning crashes, with the majority caused by drivers failing to yield. The severity of the crashes was generally low, with most (36 of 37) resulting in property damage only (no injuries) or minor injuries. Although there were no fatalities at this intersection, there was one major injury. EP identified turning crash types as prominent.

- **#30: SW Country Club Drive/SW 53rd St.** is a four-legged two-way stop control intersection in the urban area. The severity was generally low, with no fatalities or serious injuries resulting from these crashes. EP identified fixed-object crash types as prominent.
- **#35: NW Springhill Drive/NW Independence Highway** is a three-legged intersection with stop control onto NW Springhill Drive in the rural area. There were six crashes involving fixed-object crashes. Most of crashes were caused by drivers going too fast or driver inattentiveness. The severity of the crashes was low, with all involving property damage only (no injuries) or minor injuries. EP identified fixed-object crash types as prominent.
- **#39: SW Airport Ave./Bellfountain Rd.** is a four-legged two-way stop control intersection in the rural area. There were five crashes involving angle and rear end crashes. Two crashes were caused by drivers going too fast or following too close, while three were caused by drivers failing to yield. The severity of the crashes was low, with all involving property damage only (no injuries) or minor injuries. EP identified angle crash types as prominent.
- **#48: NW Quarry Rd./NE South Nebergall Loop/NW Springhill Dr.** is a four-legged, two-way stop control intersection in the urban area. The crashes were primarily rear end crashes. Four of five crashes at this intersection were caused by drivers going too fast or following too close, while one was caused by a driver failing to yield. The severity of the crashes was low, with no fatalities or serious injuries. EP identified rear-end crash types as prominent.

Roadway Segment Safety

Roadway segment crash rates were reviewed to help identify places outside of the study intersections where crashes are occurring at a higher than expected rate. For segments, crash rates are given in units of “crashes per million vehicle miles traveled (MVMT).” State facilities were evaluated by comparing ODOT Crash Rate Book values for each highway to the statewide average for similar facilities.²⁴

State highway segments that exceeded the comparison average crash rate are shown in Figure 20, and listed in full in the appendix. Large portions of US 20, OR 34, and OR 180 all have high crash rates.

County facilities were also evaluated.²⁵ Due to vehicle volume information being limited in some locations,²⁶ County facilities are reported here using total crash frequency and crash frequency per centerline mile of roadway rather than comparison to statewide crash rates.

County segment results are presented in Table 17, which presents the top County study roads by five-year total crash frequency. These nine roads are the location of over 45% of all crashes on County study roads.

²⁴ ODOT 2015 Crash Rate Book. Segments compared using 5-year crash rate averages by land use type and functional classification.

²⁵ This analysis includes all crashes occurring at intersections, related to intersections, and on non-intersection roadway segments. Crashes occurring at nodes between segments were partially attributed between each connected segment. For example, a crash occurring at the intersection of four road segments would be analyzed as 0.25 crashes for each of the four segments. Because of this, totals in this analysis may not exactly match those produced through other methods.

²⁶ Traffic counts were used where available on segment or reasonably applicable. Volumes based on functional classification averages were used where traffic counts were unavailable.

Table 17 also includes crash frequency per centerline mile. Figure 20 highlights roadway segments where the crash rate exceeds the statewide average crash rates for similar facilities.

Table 17: High Crash County Roadways

County Road Number and Name	Crashes on Segment	Total Centerline Miles	Average Annual Crashes per Centerline Mile
13470 - Springhill Dr	63	7.63	1.65
14360 - NE Granger Ave	54	2.37	4.53
25270A - 53rd St	44	1.40	6.25
14430 - NW Independence Hwy	43	5.89	1.45
25100 - Bellfountain Rd	33	16.54	0.39
04910 - Gibson Hill Rd NW	26	1.26	4.09
45120 - Alpine Rd	21	7.97	0.53
25320 - SW West Hills Rd	20	2.24	1.81

Safety Priority Index System (SPIS) Segments

The Safety Priority Index System (SPIS) is a multi-factor ranking system developed by ODOT to identify potential safety problems on state highways. The 2015 data (from 2012-2014) is used for this analysis. SPIS scores are developed based upon crash frequency, severity, and rate using a sliding-window approach with overlapping 0.10 mile segments along the state highway over a rolling three-year window (i.e., every year it is updated with the most recent three years). Several groups of segments in Benton County rank in the top 10% of SPIS segments. The identified locations are listed below and included in the map in Figure 20.

- US 20/OR 34 at 53rd St. (MP 2.62)
- US 20 near Conifer Blvd. (MP 2.88 to 2.96)
- US 20 north of Granger Ave. (MP 4.83 to 4.86)
- US 20 east of Granger Ave. (MP 5.50 to 5.59)
- US 20 near Independence Highway (MP 6.34 to 6.38)
- OR 34 north of Hayden Rd. (MP 37.94 to 37.95)
- OR 34 north of Gray Creek Ln. (MP 53.83 to 53.85)

III.II Motor Vehicle System

The level of congestion experienced on many roadways in Benton County varies based on the time of year, but is typically greater in the summer months. In urban areas where more commuting traffic is present, the variation in traffic volumes between a busy summer weekday and an average weekday may be about 10%. However, on recreational routes in rural areas traffic volumes can be 20 to 25% greater in the summer.

Traffic volumes during the weekday peak hour from these busier summer months are commonly used for design purposes. ODOT uses this time period, referred to as the 30th highest annual hour of traffic (30HV), as the basis of its adopted mobility targets. ODOT’s mobility targets are documented in the 1999 Oregon Highway

Plan (OHP)²⁷ and set thresholds for the maximum amount of congestion desired. In contrast, Benton County does not have adopted mobility targets, so no formal expectation for the efficiency of travel on County roads exists.

ODOT’s mobility targets use volume-to-capacity (v/c) ratios to measure congestion levels. A v/c ratio is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation). It is determined by dividing the peak hour traffic volume by the hourly capacity of a given facility. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. At 1.00, capacity has been reached and the facility is oversaturated, resulting in long delays.

The summer weekday p.m. peak hour (30HV) traffic volumes were used to analyze the level of congestion at study intersections in Benton County because of their common use for design and to facilitate comparison against ODOT’s mobility targets. The analysis was completed using Synchro, a software that assists with the calculation of the Highway Capacity Manual (HCM) procedures. The evaluation utilized 2000 Highway Capacity Manual methodology²⁸ for signalized intersections and 2010 Highway Capacity Manual methodology²⁹ for unsignalized intersections. The results of this analysis are shown in Table 18 and illustrated in Figure 21. The 2017 30HV traffic volumes for each study intersection, as well as the detailed analysis output worksheets, are provided in the appendix.

Table 18: 2017 30th Highest Annual Hour Intersection Operations

Int. ID	Intersection Name	Mobility Target (v/c)	Intersection Performance ³⁰			
			Delay (sec)	LOS	v/c	Worst Movement
1	OR 99W & Coffin Butte Rd/Camp Adair Rd	0.70 [0.75]	1.1 [18.8]	A [C]	0.05	Westbound Left/Thru
2	OR 99W & Arnold Ave	0.70 [0.75]	0.8 [31]	A [D]	0.42	Westbound Left/Thru
3	OR 99W & FR 540/Vandenberg Ave	0.70 [0.75]	0.1 [31.9]	A [D]	0.19	Westbound Left/Thru
4	OR 99W & Ryals Ave	0.70 [0.75]	0.1 [38.3]	A [E]	0.31	Westbound Left/Thru
5	OR 99W & Lewisburg Ave/Granger Ave	0.90	34.4	C	0.91	-

²⁷ 1999 Oregon Highway Plan (as amended May 2015), Goal 1, Policy 1F, Table 6.

²⁸ *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000.

²⁹ *2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.

³⁰ BOLD text indicates mobility target is not met

Mobility Targets pertain to the intersection for signalized control and to Major [Minor] street approaches for TWSC

Delay is shown in seconds at an intersection level for signalized control and as Major [Minor] for TWSC

LOS is shown at the intersection level for signalized control and as Major [Minor] for TWSC

V/C is shown at the intersection level for signalized control and the worst movement for TWSC

Int. ID	Intersection Name	Mobility Target (v/c)	Intersection Performance ³⁰			
			Delay (sec)	LOS	v/c	Worst Movement
6	OR 99W & Llewellyn Rd	0.70 [0.75]	0.5 [11.9]	A [B]	0.08	Eastbound Left/Right
7	OR 99W & Greenberry Rd	0.70 [0.75]	1.5 [10.9]	A [B]	0.10	Eastbound Left/Right
8	OR 99W & Old River Rd	0.70 [0.75]	0.3 [10.7]	A [B]	0.03	Westbound Left/Right
9	OR 99W & Dawson Rd/Hubbard Rd	0.70 [0.75]	0.4 [11.6]	A [B]	0.02	Eastbound Left/Thru
10	OR 99W & Alpine Rd	0.70 [0.75]	0.2 [11.4]	A [B]	0.02	Eastbound Left/Right
11	OR 99W & Orchard St	0.90 [0.95]	1.1 [11.6]	A [B]	0.08	Eastbound Left/Right
12	OR 99W & Territorial HWY	0.90 [0.95]	0.3 [14.4]	A [B]	0.19	Eastbound Left
13	OR 99W & Ingram Island Rd	0.70 [0.75]	0.3 [10.7]	A [B]	0.02	Westbound Left/Right
14	US 20 & Springhill Dr	0.95	26.9	C	0.83	-
15	Takena Landing Park Rd/North Albany Rd & US 20	0.95	20.6	C	0.67	-
16	US 20 & Scenic Dr	0.95 [0.95]	1.5 [129.9]	A [F]	0.99	Southbound Left
17	US 20 & Independence HWY	0.70 [0.75]	0.6 [188.7]	A [F]	0.93	Southbound Left
18	US 20 & Granger Ave/Autumn Seed Drwy	0.70 [0.75]	0.1 [>300]	D [F]	1.94	Eastbound Left/Thru
19	US 20 & Merloy Ave	0.70 [0.75]	0.1 [34.5]	A [D]	0.12	Eastbound Left/Right
20	US 20-OR 34 & 53rd St	0.85	47.3	D	0.81	-
21	Alesa HWY & Decker Rd	0.75 [0.75]	1 [9.4]	A [A]	0.02	Westbound Left/Right
22	Alesa-Deadwood HWY/N 1st St & Alesa HWY OR34	0.80 [0.80]	2.6 [10.4]	A [B]	0.07	Northbound Left/Thru/Right
23	Alesa-Deadwood HWY & S Fork Rd	0.75 [0.75]	2.1 [8.6]	A [A]	0.02	Westbound Left/Right

Int. ID	Intersection Name	Mobility Target (v/c)	Intersection Performance ³⁰			
			Delay (sec)	LOS	v/c	Worst Movement
24	William R Carr Ave & Arnold Ave	NA	2.9 [9.9]	A [A]	0.07	Southbound Left/Thru/Right
25	Ryals Ave & Arnold Ave	NA	1.2 [11.1]	A [B]	0.13	Northbound Left/Right
26	Arnold Ave & Laurel Dr	NA	0.3 [10.3]	A [B]	0.02	Southbound Left/Right
27	Bellfountain Rd & Chapel Dr	NA	1.7 [10]	A [B]	0.11	Eastbound Left/Right
28	Bellfountain Rd & Southwood Dr/Plymouth Dr	NA	8.8	A	0.32	-
29	53rd St & Reservoir Ave	NA	20.8	C	0.78	-
30	53rd St & Country Club Dr	NA	1 [15.5]	A [C]	0.28	Eastbound Left/Thru/Right
31	53rd St/Walnut Blvd. & Oak Creek Dr/Harrison Blvd.	NA	20.1	C	0.71	-
32	Highland Dr & Lester Ave	NA	0.5 [24.8]	A [C]	0.23	Eastbound Left/Right
33	Highland Dr/Highland Pl & Lewisburg Ave	NA	5.1 [16.5]	A [C]	0.39	Northbound Left/Thru/Right
34	West Hills Rd & Reservoir Ave	NA	0.1 [17.2]	A [C]	0.31	Northbound Left/Thru
35	Independence HWY & Springhill Dr	NA	5.3 [9.2]	A [A]	0.09	Westbound Right
36	Independence HWY & Camp Adair Rd	NA	3 [9.1]	A [A]	0.05	Eastbound Right
37	Independence HWY & Ryals Ave	NA	4.3 [10.8]	A [B]	0.20	Eastbound Right
38	Independence HWY & Metge Ave	NA	4.4 [11.6]	A [B]	0.11	Westbound Left/Right
39	Bellfountain Rd & Airport Ave	NA	1 [10.8]	A [B]	0.06	Eastbound Left/Thru
40	Bellfountain Rd & Dawson Rd	NA	3.3 [10.3]	A [B]	0.05	Northbound Left/Thru/Right

Int. ID	Intersection Name	Mobility Target (v/c)	Intersection Performance ³⁰			
			Delay (sec)	LOS	v/c	Worst Movement
41	Bellfountain Rd & Alpine Rd	NA	1.8 [9.5]	A [A]	0.06	Southbound Left/Thru/Right
42	Fern Rd & Grange Hall Rd	NA	1.3 [9.8]	A [A]	0.07	Eastbound Left/Thru/Right
43	Alpine Rd & Alpine Cutoff Rd	NA	1.2 [9.1]	A [A]	0.08	Westbound Left/Right
44	S 6th St & Orchard St	NA	0.7 [9]	A [A]	0.01	Northbound Left/Thru/Right
45	Scenic Dr & Springhill Dr	NA	0.9 [11.2]	A [B]	0.09	Northbound Left/Right
46	Scenic Dr & Oak Grove Dr/Oak Grove Way	NA	3.4 [16]	A [C]	0.48	Eastbound Left/Thru
47	Scenic Dr & Gibson Hill Rd	NA	6.7 [10.8]	A [B]	0.21	Westbound Right
48	Springhill Dr & Quarry Rd/South Nebergall Loop	NA	1.8 [17]	A [C]	0.13	Eastbound Left/Thru/Right

As shown above, most study intersections on state highways are operating within mobility targets. However, four intersections are experiencing a significant amount of congestion and are not meeting mobility targets. Those include:

- Pacific Hwy & Lewisburg/Granger Ave (signalized)
- US 20 & Scenic Dr (unsignalized)
- US 20 & Independence Hwy (unsignalized)
- US 20 & Granger Ave (unsignalized)

In addition, the signalized intersection on US 20-OR 34 & 53rd St is congested and is approaching the mobility target.

Figure 21: Average Daily Traffic

As mentioned previously, Benton County does not have adopted mobility targets to use for determining whether facilities have sufficient capacity to serve travel demand. However, according to the results above, County facilities are not experiencing a significant amount of congestion under existing conditions.

The in-progress Philomath TSP update included analysis at several intersections on Benton County roadways not included in Table 18. It was found that all intersections operate adequately without significant congestion under existing conditions, as well as under conditions through the year 2040.

III.III Rural Pedestrian and Bicycle System Evaluation

Within the rural areas of Benton County, facilities for people walking and bicycling are generally roadway shoulders or off-highway shared-use paths. The adequacy of shoulders for multimodal use was evaluated using a minimum target of 4 feet of paved shoulder and an additional recommended target based on the *ODOT Bicycle and Pedestrian Design Guide*.

The bicycle system provides a non-motorized travel option for trips that are longer than a comfortable walking distance. A well-developed bicycle system promotes a healthy and active lifestyle for residents and visitors. Benton County's bicycling network consists of bike lanes, shared use paths, roadway shoulders, and shared roadways. Major designated routes should optimally provide wayfinding signage for bicyclists.

Rural areas typically have few dedicated multimodal facilities. Viability of the walking and bicycling network in these areas is largely evaluated based on shoulder presence, type and width.

The adequacy of shoulders for multimodal use was evaluated using a minimum target of 4 feet to a minimum width of 8 feet based on the average daily traffic (from the *ODOT Bicycle and Pedestrian Design Guide*). Recommended shoulder widths are based on functional classification and traffic volume, as shown in Table 19. Where volume information was not available, ADT was assumed to be less than 400 vehicles per day. Table 20 summarizes the results of the shoulder evaluation, which are shown in Figure 22. Overall, a limited amount of the County system meets minimum or recommended shoulder targets. Although much of the core ODOT system meets minimum targets, with high vehicle volumes and speeds the minimum is not enough for a well-connected network.

Table 19: Recommended Rural Road Shoulder Widths

Average Daily Traffic (ADT)	<400	400-1500	1500-2000	>2000
Rural Arterials	4'	6'	6'	8'
Rural Collectors	4'	5'	6'	8'
Rural Local Roads	4'	5'	6'	8'

Table 20: Roadway Shoulder System Statistics

Shoulder	County		ODOT	
	Miles	Percent	Miles	Percent
Meets Minimum Shoulder Targets	29.3	12%	140.1	58%
Meets Recommended Shoulder Targets	18.5	8%	57.0	24%

The above table shows total shoulder miles, evaluating either side of the road separately

Paved roads with substandard shoulder width can be problematic for pedestrians and bicyclists. High speed vehicles and limited buffer space result in uncomfortable and potentially fatal pedestrian conditions when conflicts occur. Any improvements on these facilities should aim to provide the recommended target width, with consideration of larger shoulders where there are physical barriers, high multimodal activity, or freight use.

As discussed earlier in the inventory section, many of the County roadways that do not meet minimum shoulder targets currently have low vehicle volumes.

Table 21 discusses major rural intersections for unincorporated communities in Benton County and their pedestrian and bicycle facility status. All the five unincorporated communities have deficient shoulders. The roads tabulated below should be considered for shoulder improvement based on their importance to the local community.

Figure 22: Roadway Shoulder System Evaluation

Table 21: Unincorporated Community Roadway Shoulder Discussion

	Road by primary direction	
	N/S	E/W
Alpine	Bellfountain Rd has 3' gravel shoulders on either side and does not meet pedestrian or cyclist minimums.	Alpine Rd has 2' gravel shoulders to the west of Bellfountain Rd and 4' gravel shoulders to the east, it does not meet pedestrian or cyclist minimums.
Alsea	Alsea-Deadwood Hwy has less than 4' shoulders on the right and 8' shoulders on the left. The standard is 6'.	Main St has 8' shoulders on either side to the east and west of Alsea-Deadwood Hwy. The standard is 6.'
Bellfountain	Bellfountain Rd has 3' gravel shoulders on either side and does not meet pedestrian or cyclist minimums.	Dawson Rd has no inventory information available, but shoulders appear to be 1-2' gravel on average, which does not meet pedestrian or cyclist minimums.
Greenberry	Pacific Hwy (OR 99W) has 4' shoulders on either side. The standard is 8'.	Greenberry Rd has no inventory information available, but there appears to be little to no shoulders.
Wren	Kings Valley Hwy has less than 4' shoulders on either side. The standard is 6'.	Wren Rd has no shoulder inventory information available.

III.IV Urban Pedestrian System Performance

Pedestrian facilities in urban areas have higher demand than their rural counterparts and are evaluated differently. Continuous sidewalk connections along major activity corridors and arterial or collector roadways is important to promote walking access to urban destinations.

The performance of urban area pedestrian systems was evaluated using the pedestrian Level of Traffic Stress (LTS) methodology.³¹ The result of this analysis is a number describing the LTS a pedestrian can expect to experience while using that facility. These numbers range from 1 to 4, with a 1 indicating low traffic stress and a 4 indicating high traffic stress. Analysis of urban area pedestrian systems for this TSP update was limited to the cities of Monroe and Adair Village. Pedestrian LTS was recently evaluated for the cities of Corvallis, Philomath, and north Albany as part of their TSP updates.

³¹ Multimodal Analysis section (Chapter 14) of ODOT's Analysis Procedures Manual.

Adair Village

Approximately 1.2% of commuters in Adair Village walk to work, with another 0.9% utilizing public transportation to get to work, which generally includes walking at the beginning or end of the trip. The pedestrian LTS results for Adair Village are shown in Figure 24.

Table 22 shows a summary of LTS conditions on Adair Village roadway segments and intersections. The average pedestrian LTS on roadway segments in Adair Village is 3.3, indicating a moderate to high exposure to traffic stress. This average is sensitive to long roads with poor pedestrian facilities such as William R Carr Ave with seven segments at LTS 4. Given the circuitous layout of residential streets in Adair Village, shared used path connections between loops to nearby destinations are an option to decrease pedestrian LTS.

Less than 25% of segments evaluated for Adair Village provide an LTS of 2 or less, indicating a deficit of adequate pedestrian facilities overall. On certain roads without an expectation of pedestrian access, a high LTS may be acceptable. On other key roads, pedestrian facility improvements will increase the attractiveness of walking and could lead to an increase in pedestrian trips. Roads that have a pedestrian LTS at or above 3 include William R Carr Ave., Laurel Ave., Arnold Ave., and Vandenburg Ave.

At an intersection level, the average pedestrian LTS is 1.2, indicating a low level of exposure. Therefore, the primary need for pedestrian improvements in Adair Village is the provision of improved segment connections.

Table 22: Adair Village Pedestrian LTS Summary

	Block Faces		Intersection Approaches	
	Count	Percent	Count	Percent
LTS 4 (High Stress)	63	63.2%	0%	0%
LTS 3 (Moderate Stress)	12	12.2%	0%	0%
LTS 2 (Mild Stress)	24	24.4%	17%	19.1%
LTS 1 (Low Stress)	0	0%	77%	86.5%

Figure 23: Adair Village Pedestrian Level of Traffic Stress (LTS)

Monroe

Table 23 and Figure 24 show pedestrian LTS for roadway segments and intersections in Monroe. Almost 85% of analyzed roadway segments have an LTS of 4, indicating a high level of pedestrian exposure. Sidewalk improvements should be targeted along key corridors that serve as important pedestrian facilities. The following streets are identified as in need of improvement and will enhance the pedestrian experience in Monroe:

- Pacific Hwy W (OR 99W)
- Commercial St
- Orchard St

All intersections in Monroe operate at a LTS of 2 or lower, indicating a moderate to low level of pedestrian stress. These results indicate that improvements are best targeted at the segment level, such as providing sidewalk infill along key corridors.

Table 23: Monroe Pedestrian LTS Summary

	Block Faces		Intersection Approaches	
	Count	Percent	Count	Percent
LTS 4 (High Stress)	130	100%	120	100%
LTS 3 (Moderate Stress)	110	84.6%	0	0%
LTS 2 (Mild Stress)	1	<1%	0	0%
LTS 1 (Low Stress)	19	14.6%	101	84.2%

Figure 24: Monroe Pedestrian Level of Traffic Stress (LTS)

III.V Urban Bicycle System Performance

The bicycle system provides a non-motorized travel option for trips that are longer than a comfortable walking distance. A well-developed bicycle system promotes a healthy and active lifestyle for residents and visitors. Benton County’s bicycling network consists of bike lanes, shared use paths, roadway shoulders, and shared roadways. Major designated routes should optimally provide wayfinding signage for bicyclists.

Urban bicycle facilities typically include bike lanes, paved shoulders, shared use paths and/or shared streets. Similar to the urban pedestrian system, the urban bicycle system was evaluated using the bicycle Level of Traffic Street (LTS) methodology, resulting in ratings from 1 to 4, with 1 representing low stress and 4 representing high stress. However, bicycle LTS does not evaluate intersection approaches. The following sections discuss the LTS for bicyclists in the cities of Adair Village and Monroe. Bicycle LTS was recently evaluated for the cities of Corvallis, Philomath, and north Albany as part of their TSP updates.

Adair Village

Adair Village’s size makes it very bicycle-friendly. It is less than 1 mile long (from north to south) and approximately 0.25 miles wide. Most of the roads do not have a separate bike lane or accessible shoulder but traffic speeds are low. Currently, only about 0.6% of Adair Village commuters travel by bicycle.

Table 24 summarizes the roadway segment results from the bicycle LTS analysis for Adair Village. The average LTS for the system is 1.3, indicating low exposure to traffic stress. Almost 93% of studied roadway segments provide an LTS of 2 or lower. The LTS analysis reveals no major deficiencies for bicycle facilities. This suggests that there is an opportunity to provide new additional connections to nearby destinations. The results of the bicycle LTS analysis are illustrated in Figure 25.

Table 24: Adair Village Bicycle LTS Summary

	Block Faces	
	Count	Percent
LTS 4	0	0%
LTS 3	7	7.1%
LTS 2	23	23.4%
LTS 1	68	69.3%

Figure 25: Adair Village Bicycle Level of Traffic Stress (LTS)

Monroe

The compact size and gridded street network of Monroe make it easily navigable by bicycle. Most streets are shared streets with no exclusive right of way for bicycles. These streets typically have a low speed limit resulting in lower stress interactions between bicycles and vehicles. Currently, there are no commuters who travel by bicycle.

Table 25 shows the bicycle LTS performance for the city of Monroe. The average LTS is 1.4 and over 87% of roadway segments are LTS 2 or lower indicating low stress throughout the network. Of the eight segments at LTS 4, six are from OR 99W north of Fir St and two are along Territorial Rd. The existing adjacent parcels for both segments are unlikely to generate significant bicycle demand. If future development occurs along northern OR 99W and Territorial Rd, improving the bike facilities could be tied into other system improvements. The results of the bicycle LTS analysis are illustrated in Figure 26.

Table 25: Monroe Bicycle LTS Summary

	Segments	
	Count	Percent
at LTS 4	8	6.2%
at LTS 3	8	6.2%
at LTS 2	18	13.8%
at LTS 1	96	73.8%

Figure 26: Monroe Bicycle Level of Traffic Stress (LTS)

III.VI Rural Safe Routes to Schools

This section considers conditions related to Safe Routes to School for all Benton County schools outside of Urban Growth Boundaries. The analysis is based on the availability of adequate bicycle or pedestrian facilities in a 2-mile radius around the school of interest. While some students will not live within 2 miles, this is the range where most active transportation trips are expected. The shoulder standards for this analysis are identical to those used in evaluation of countywide road shoulders in the section above. See appendix for figures depicting existing facilities.

Alsea Elementary School and Alsea High School

The major intersection near this campus is Alsea Highway (Main St.) and Alsea-Deadwood Highway (S First St.). Within a 0.5 mile radius, the segment of Alsea Highway from west of N First St./S First St. to E Alder St. mostly meets shoulder standards with widths from 6-8 feet. This section provides access to local streets that connect with the Alsea Elementary/High School campus. The rest of the pedestrian/bicycle network within 2 miles does not meet shoulder standards resulting in higher exposure to traffic for students making that connection.

Blodgett Elementary School

This school is off US 20 at the intersection of Blodgett Rd. and Tum Tum Rd. Shoulder standards are not met along either road. The segment of US 20 between 1-2 miles east of Blodgett Elementary School meets shoulder standards but does not connect with any local roads that provide access to the school. Students walking or biking to this school do not have an adequate route available to them.

Kings Valley Charter School

Kings Valley Charter School is located off Kings Valley Highway (OR 223) near the intersection of Maxfield Creek Rd. Only the segment of Kings Valley Highway surrounding the bridge over the Luckiamute River provides adequate shoulders. All other segments do not provide adequate bicycle and pedestrian shoulder widths.

Muddy Creek Charter School

Located off Bellfountain Rd., there are no segments within 2 miles that provide a safe route. Llewellyn Rd., Decker Rd., Greenberry Rd. and Starr Creek Rd. all intersect with Bellfountain Rd. within this area and fail to meet adequate shoulder standards.

III.VII Public Transportation Operations

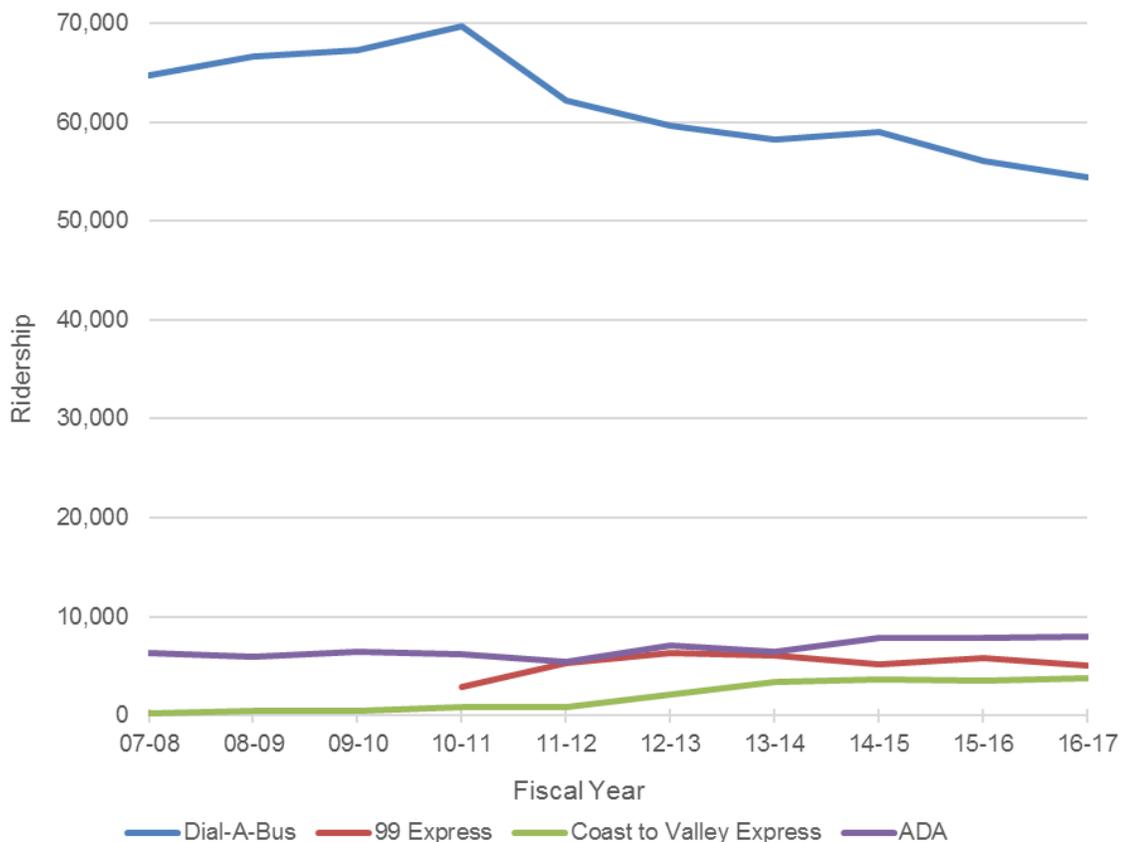
The following provides an overview of service statistics for public transportation services operated or delivered by Benton County (Dial-A-Bus, 99 Express, Coast to Valley Express). The section includes statistics reflecting use trends in ridership, revenue miles, and revenue hours; productivity (rides per hour); and efficiency (cost per mile, hour and ride). Ridership statistics for the Corvallis and Philomath ADA paratransit service is provided for context, though more detailed service statistics were not available.

Ridership

Figure 27 illustrates public transportation ridership statistics during the past 10 fiscal years, and Table 26 shows the same data in table format. Coast to Valley Express ridership has increased during the past five years, as has ADA paratransit in Corvallis and Philomath. The Benton County Dial-A-Bus service has seen decreasing ridership in the past five years. The Benton County 99 Express service ridership declined after fiscal year 2015-2016, but has generally held steady in the recent past.

The decrease in Benton County Dial-A-Bus ridership is similar to public transportation ridership decreases across the state, which is generally understood to be in part related to gas prices and economic growth. The decline may also reflect Benton County's additional service on the 99 Express, which provides a resource for riders who may have formerly used the demand response services.

Figure 27: Benton County Ridership, FY 07-08 to FY 16-17



Source: Benton County. Note: Dial-A-Bus includes weekday, evening, and weekend ridership.

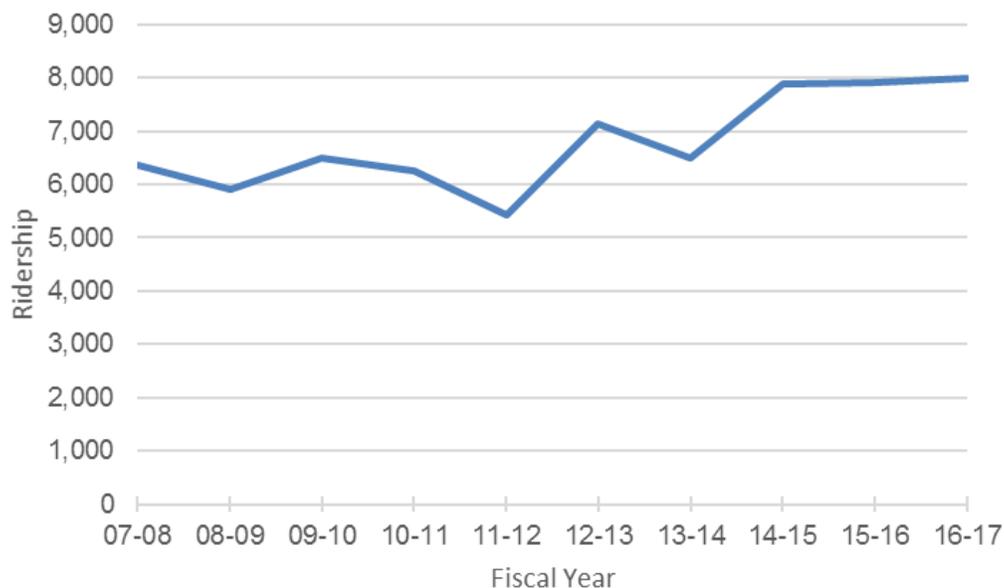
Table 26: Benton County Transit Ridership, FY 2007-2008 to 2016-2017

Fiscal Year	Dial-A-Bus	99 Express	Coast to Valley Express	ADA	Total
2007-2008	64,749	NA	289	6,364	71,402
2008-2009	66,575	NA	485	5,904	72,964
2009-2010	67,261	NA	485	6,489	74,235
2010-2011	69,669	2,937	834	6,243	79,683
2011-2012	62,217	5,263	898	5,424	73,802
2012-2013	59,647	6,341	2,188	7,143	75,319
2013-2014	58,212	6,047	3,374	6,506	74,139
2014-2015	58,983	5,192	3,639	7,870	75,684
2015-2016	56,108	5,825	3,565	7,904	73,402
2016-2017	54,350	5,032	3,748	7,986	71,116

Source: Benton County

Benton County delivers CTS' ADA paratransit services. Figure 28 charts the ADA paratransit ridership from Fiscal years 2007 to 2017. Ridership on paratransit has increased from the most recent low in 2011, and has remained relatively steady over the past three years. Rising demand on ADA paratransit can affect total funding, as the customized rides are costlier to deliver than fixed route services.

Figure 28: CTS ADA Ridership, FY 2007-2008 to FY 2016-2017



Source: Benton County

Revenue Miles and Revenue Hours

Benton County service delivery statistics include revenue miles and revenue hours, reflecting the amount of time vehicles are in service and ready to provide rides. The data is available from fiscal year ending 2013 to 2016. In that period, Benton County increased service by about 1.4% more revenue miles, and 6.4% more revenue hours. As shown above, ridership decreased by about 2.5% over the same period. Table 27 summarizes the statistics for each Benton County-managed service type (Dial-A-Bus, 99 Express, Coast to Valley Express) and the County total. As shown in ridership statistics, the County demand response service provides most of service miles and hours; in fiscal year 2015-2016 Dial-A-Bus accounted for 80% of revenue miles, 87% revenue hours, and 76% total County ridership.

Table 27: Benton County DAB and Fixed Route Summary, Fiscal Year 2012-2013 to 2015-2016

Fiscal Year	Dial-A-Bus		99 Express		Coast to Valley Express		Total Benton County	
	Revenue Miles	Revenue Hours	Revenue Miles	Revenue Hours	Revenue Miles	Revenue Hours	Revenue Miles	Revenue Hours
2012-2013	401,647	29,569	19,152	1,587	78,438	3,023	499,237	34,179
2013-2014	373,500	29,055	20,286	1,804	80,957	3,277	474,743	34,136
2014-2015	395,279	30,438	17,743	1,479	81,788	3,351	494,810	35,268
2015-2016	406,337	31,644	16,979	1,393	82,861	3,337	506,177	36,373

Source: Benton County

Productivity

Riders per revenue hour is a common public transportation measure that shows how productive a public transportation system is. Table 28 shows ridership productivity. The higher the number of riders per hour, the more efficient a system is, by capturing a greater share of potential transit user markets. For rural demand response and fixed route systems, it's not uncommon for the riders per revenue hour to be low relative to more highly developed areas. This is because the vehicles must travel a long distance, on average, to provide the transportation connections people need. Higher density population areas are much more efficient to serve than lower density population areas. Additionally, larger populations allow for more frequent service, which encourages additional people to use public transit as opposed to driving. Benton County served about two people per revenue hour, on average, between 2012 and 2016. The 99 Express was the highest performing route, with up to 4.2 people per revenue hour; this route operates in a relatively high-density corridor compared to the rest of the County service area. With 1 person per revenue hour, on average, the Coast to Valley Express values reflect the long travel time required connecting people between Albany and Newport (60 miles, or about two hours).

Table 28: Ridership per revenue hour, fiscal years 2012-2013 to 2015-2016

Fiscal Year	Dial-A-Bus	99 Express	Coast to Valley	Total
2012-2013	2.02	4.00	0.72	2.20
2013-2014	2.00	3.35	1.03	2.17
2014-2015	1.94	3.51	1.09	2.15
2015-2016	1.77	4.18	1.07	2.02

Source: Benton County

Efficiency

Cost per revenue mile, revenue hour, and ride are performance measures providing a snapshot of how efficient a public transportation system or route is operating. Benton County's total funding by fiscal year provides the basis for assessing the total cost per unit of service provided (see Technical Memorandum 3 for more information on Benton County funding). Benton County's funding needs have increased every year since 2012, reflecting capital and operating cost expenditures. The cost per unit of service provided has likewise increased. The cost per revenue hour has increased 27% to about \$38 between 2012 and 2016. The cost per rider increased 39% in the same period, as expenditures continued to rise while ridership declined slightly (see Table 26). Table 29 summarizes Benton County's public transportation funding, and the cost per unit of service provided.

Table 29: Benton County Total Cost per Service Unit

Fiscal Year	Total Funding	Cost per:		
		Revenue Mile	Revenue Hour	Ride
2012-2013	\$1,024,000	\$2.05	\$29.96	\$13.60
2013-2014	\$1,154,000	\$2.43	\$33.81	\$15.57
2014-2015	\$1,310,000	\$2.65	\$37.14	\$17.31

2015-2016	\$1,384,000	\$2.73	\$38.05	\$18.86
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Source: Benton County; Total budget reflects the "Total Funding" row from Technical Memorandum 3, Table 1.

III.VIII Corridor Health Assessment

The U.S. Department of Transportation recommends the use of multiple criteria to analyze needs and prioritize transportation projects and investments in rural areas. Following this guidance, a corridor health assessment was applied for all state highways and county roads within the county with a functional classification of collector or higher. The corridor health concept is based on the idea of measuring the “health” of a corridor for several different categories of performance, and then combining the measurements to provide a picture of overall corridor health.

Development of Factors, Weights, and Formulas

The corridor health tool uses a set of evaluation categories with formulas and weights that are used to calculate a composite health score for each road segment. The four evaluation categories reflect much of the analysis presented earlier in this memo and includes mobility, safety, active transportation, and resilience. Each category is evaluated through one or more elements that correspond to available data. The category scores may be weighted to reflect the priorities expressed in the project goals. Presently, the categories are weighted evenly. Categories, elements, and weights are shown in Table 30.

Table 30: Corridor Health Assessment Category Weighting

Category	Weight	Elements
Mobility	25	Motor Vehicle Delay
Safety	25	Crash Rate (all crashes)
		Severe Crash Frequency
		SPIS History
Active Transportation	25	Pedestrian LTS Results (urban areas)
		Bicycle LTS Results (urban areas)
		Multimodal Shoulders (rural areas)
		Availability of Separate Parallel Facility (rural areas)
Resilience	25	Bridge Weight Restrictions
		Bridge Seismic Vulnerability

Study roads were divided into evaluation segments based on those established for the segment safety analysis. Every segment is given a score of Good (1 point), Fair (0.5 point), or Poor (0 points) for each of the four categories based on evaluation of the elements. Where evaluation data varies over a segment, the lowest score is used. The category scores are multiplied by the category weight and summed together for an overall segment health score between 0 and 100.

Scoring was adjusted to provide roughly equal distribution of centerline miles between Good, Fair, and Poor labels. A score above 70 is Good, a score of above 60 is Fair, and a score of 60 or lower is Poor. Additional details about the scoring and evaluation criteria, as well as the full results listing, is available in the appendix.

Corridor Health Results

Most of the roads in Benton County received a good or fair corridor health score overall. A “good” score indicates generally high performance on all evaluation categories. A “fair” score indicates medium performance on all evaluation categories, or a mix of high and low performance. A “poor” score generally indicates low performance in more than one evaluation category, and should be considered as a location for further study in the future.

Altogether, over 460 miles of roadway were assessed with the corridor health tool, 326 miles of County Roadway and 136 miles of ODOT Highway.

Of the County Roadways, approximately 199 miles (61%) received a “good” rating, 192 miles (28%) received a “fair” rating, and 36 miles (11%) received a “poor” rating. Of the ODOT Highways, approximately 37 miles (28%) received a “good” rating, 29 miles (22%) received a “fair” rating, and 66 miles (50%) received a “poor” rating. A map of the overall corridor health scores is shown in Figure 29. The following sections briefly discuss each category result.

Figure 29: Corridor Health Assessment Summary Map

Mobility Category Details

To learn how traffic flows on state highways within Benton County, motor vehicle speeds were analyzed via HERE, which is a database of sampled travel times along predefined roadway segments using vehicle GPS data. HERE data was available in 69 segments that allowed comparison of speed and congestion issue in five-minute increments. Data was collected on typical weekdays (Tuesday through Thursday) between May 23th and June 8th of 2017.

In the mobility analysis, congestion was defined as the average speed of a segment at or below 66.7% of its average free flow speed. The data over the three-week period was aggregated to report the % of time the road segment is congested.

As shown in Figure 30, the roads that were congested for more than 30 minutes per day are located along US 20, OR 34, and OR 99W in and between the urban areas of Corvallis, Philomath, and North Albany. Most of the roads outside of the two urban areas were not congested or congested for less than 30 minutes a day.

Safety Category Details

The safety category incorporates earlier analysis of crash rates with the SPIS history and an overlay of high severity crashes (those that resulted in a death or serious injury). As shown in Figure 31, the result highlights US 20 between North Albany and Corvallis as a safety hot-spot, and flags portions of 99W and OR 34. Generally, the County roadways score well here, since they do not see a high frequency of crashes compared to State highways due to lower volumes.

Active Transportation Category Details

As was concluded in the earlier section on walking and bicycling facilities, there is significant room to improve the County's multimodal network. Figure 32 highlights the fact that this is especially true further away from the Corvallis-Albany core area.

Resilience Category Details

Figure 33 summarizes the resilience category, which is based on bridge vulnerability to seismic events and the weight limitations, which can be an impediment to emergency response and recovery. Generally, the pattern shows that the eastern portion of the county has more roadway segments impacted by vulnerable or limited bridges, but also has better route redundancy (i.e., connectivity).

Figure 30: Corridor Health Assessment Mobility Category

Figure 31: Corridor Health Assessment Safety Category

Figure 32: Corridor Health Assessment Active Transportation Category

Figure 33: Corridor Health Assessment Resilience Category

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