# CHAPTER 4: TRANSPORTATION STANDARDS

Adair Village applies transportation standards and regulations to the construction of new transportation facilities and to the operation of all facilities to ensure the system functions as intended and investments are used efficiently. These standards enable consistent future actions that reflect the goals of the city for a safe and efficient transportation system.

## Street Functional Classification

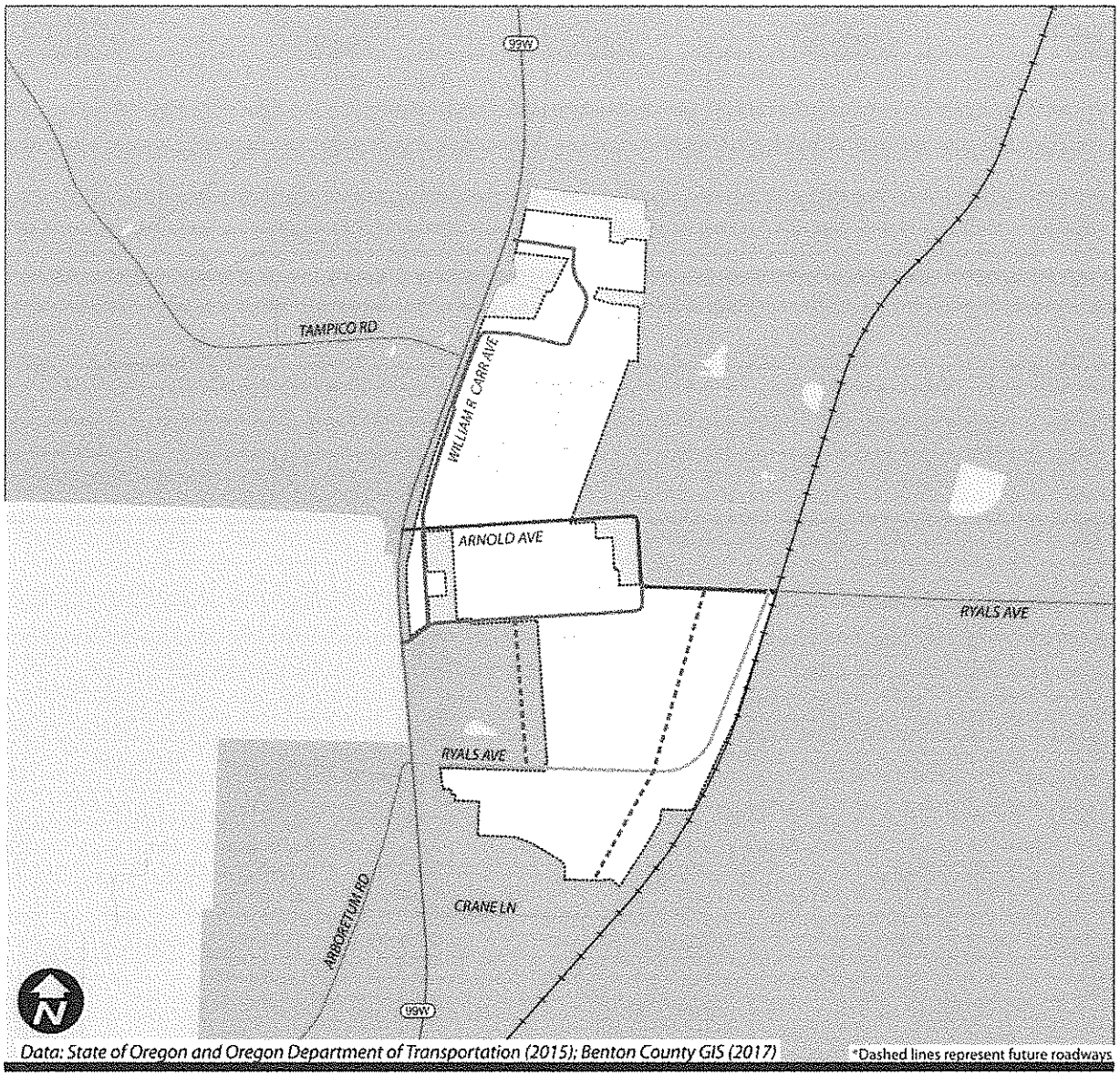
Traditionally, roadways are classified based on the type of vehicular travel they are intended to serve. In Adair Village, the functional classification system provides an organizational mechanism for developing street design standards, establishing appropriate traffic speeds, controlling access, designing intersections, and allocating funds for maintenance and improvements.

Adair Village's functional classification system categorizes all public roadways to provide for a context-sensitive network that balances local access and regional connectivity. Higher classified roadways prioritize safe and efficient through movement, while lower classified roads are designed to provide access to the adjacent land uses. The naming convention used in Adair Village's functional classification system has been amended as shown below to better align with the federal functional classification system. Being able to clearly align with the federal functional classification system is important for the city to qualify for federal funding that is reserved for arterial and collector street projects.

- **Principal Arterials (formerly Highways)** carry regional traffic with origins and destinations outside the area.
- **Minor Arterials (formerly Arterials)** carry major local traffic between communities or nearby areas, or between community districts.
- **Major Collectors and Minor Collectors (formerly Collectors)** carry major local traffic between communities or nearby areas, or between community districts. Major Collectors typically carry higher traffic volume than Minor Collectors.
- **Local Streets (formerly Local Service Streets)** carry primarily local traffic seeking access to adjacent property.

Figure 4 maps the streets in Adair Village and shows assigned functional classifications.

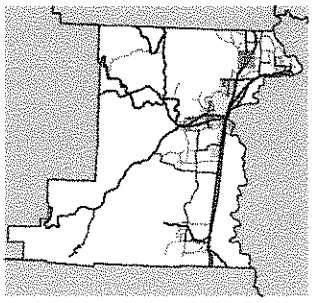
**Figure 4: Street Functional Classification**




Legend

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector
- Local
- Railroad
- River
- Park
- Urban Growth Boundary
- City Limits

**BENTON COUNTY**
*TRANSPORTATION SYSTEM PLAN*



## Typical Roadway Cross-Section Standards

Table 7 below presents the typical cross-section standards for city roadways within the UGB. Outside of the UGB, roads are subject to either the County or State design standards, as appropriate. These standards remain unchanged from the previous cross-section standards in the City of Adair Village Public Infrastructure Design Manual, with the following exceptions:

- Lane widths for Minor Arterials and Major Collectors have been reduced from 12 feet to 11 feet.
- Center turn lane widths have been reduced from 14 feet to 12 feet.
- A new Neighborhood Local Street with a 28-foot curb-to-curb width has been included for compliance with state requirements to establish standards for local streets and accessways that minimize pavement width and total right-of-way.
- The new functional classification system naming convention has been applied.

Within UGBs, Benton County applies city design standards to improvements on County roads. The TSP does not include a design type for OR 99W, the only Principal Arterial in the area. OR 99W is a state highway and subject to the design criteria in the State's Highway Design Manual.[8]

These typical roadway cross-section standards are illustrated in Figures 5 through 11. Figure 12 provides a typical cross-section standard for shared-use paths.

**Table 7: Typical Roadway Cross-section Standards**

| Functional Classification / Special Design | Alley (one-way) | Cul de Sac | Neighborhood Local | Local | Minor Collector | Major Collector | Minor Arterial (2-lane) | Minor Arterial (3-lane) |
|---|---|---|---|---|---|---|---|---|
| Previous Functional Classification | Local | Local | Local | Local | Collector | Collector | Arterial | Arterial |
| Projected ADT | - | 200 | - | 1200 | 7000 | 12000 | 32000 | 32000 |
| Min ROW (ft) | 20' | 47' | 47' | 47' | 66' | 80' | 46' | 86' |
| Surface Width | 12' | 20' | 36' | 36' | 47' | 61' | 33' | 61' |
| Lane Widths | 12' | 2@10' | 2@10' | 2@10' | 2@10' | 2@11' | 2@11' | 2@11' |
| Center Turn Lane | No | No | No | No | No | 12' | No | 12' |
| Parking | - | - | 2@8' | 2@8' | 2@8' | 2@8' | - | 2@8' |
| Surface Material | Asphalt | Asphalt | Asphalt | Asphalt | Asphalt | Asphalt | Asphalt | Asphalt |
| Example Structure | 2" AC over 2" Leveling over 8" Rock | 2" AC over 2" Leveling over 8" Rock | 2" AC over 2" Leveling over 8" Rock | 2" AC over 2" Leveling over 8" Rock | 2" AC over 2" Leveling over 8" Rock | 4" AC over 2" Leveling over 8" Rock | 4" AC over 2" Leveling over 8" Rock | 4" AC over 2" Leveling over 8" Rock |

[8] Highway Design Manual, ODOT, 2012. https://www.oregon.gov/ODOT/HWY/ENGSERVICES/Pages/hwy_manuals.aspx.

| Shoulder | 4' gravel | Curb & Gutter | Curb & Gutter | Curb & Gutter | Curb & Gutter | Curb & Gutter | Curb & Gutter | Curb & Gutter |
|---|---|---|---|---|---|---|---|---|
| Max Grade | 21% | - | 12% | 12% | 10% | 10% | 6% | 6% |
| Sidewalk & Curb | - | 5' 6" | 5' 6" | 5' 6" | 5' 6" | 5' 6" | 6' 6" | 6' 6" |
| Planter Strip | - | - | 4' | - | 4' Optional | 4' Optional | - | 6' Optional |
| Bike Lanes & Gutter | - | - | - | - | 5' 6" if required | 5' 6" if required | 5' 6" if required | 5' 6" if required |
| Min Curve Radius | 100' | 45' | 100' | 100' | 200' | 200' | 300' | 300' |
| Design Speed | - | - | 25 mph | 25 mph | 30 mph | 30 mph | 45 mph | 50 mph |

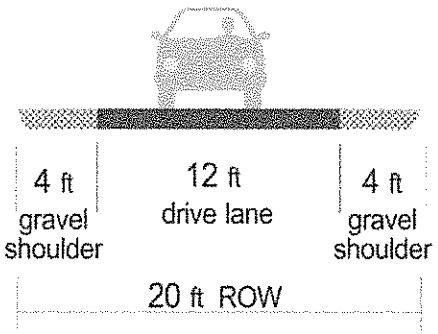



**Figure 5: Alley Standard Cross-Section**

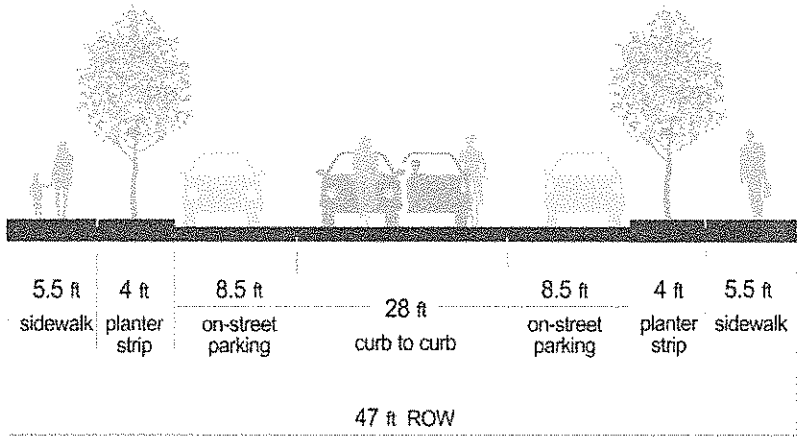



**Figure 6: Neighborhood Local Street Standard Cross-Section**

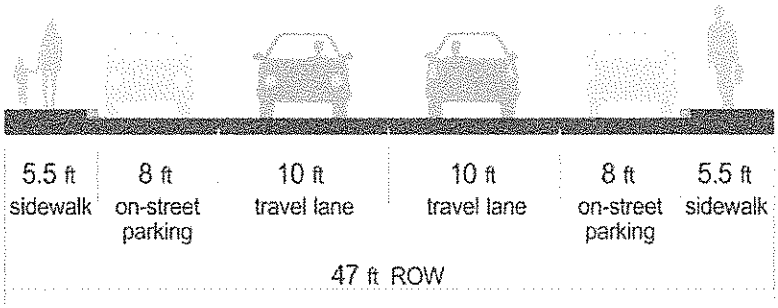



**Figure 7: Local Street Standard Cross-Section**

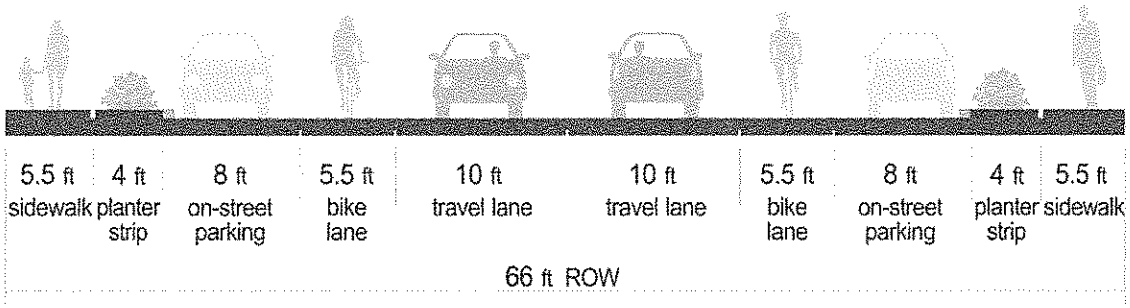



**Figure 8: Minor Collector Standard Cross-Section**

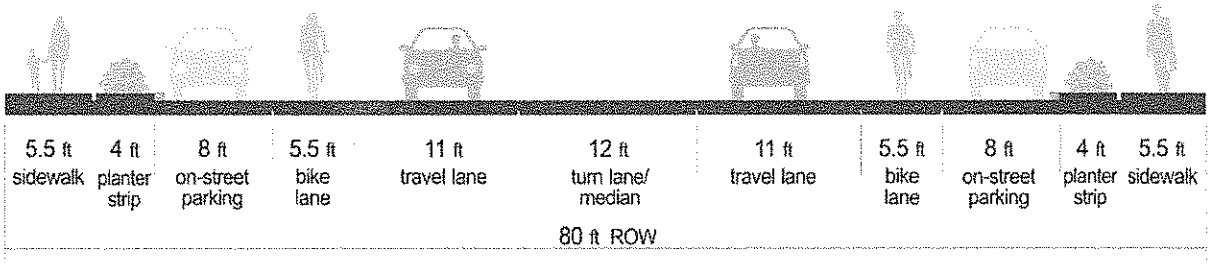



**Figure 9: Major Collector Standard Cross-Section**

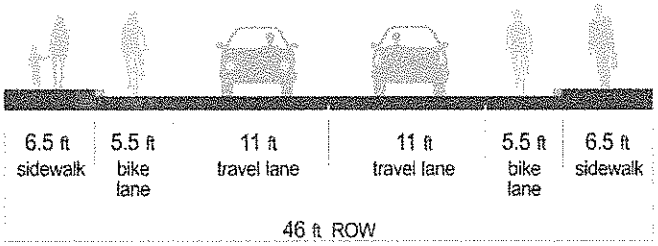



**Figure 10: 2-lane Minor Arterial Standard Cross-Section**

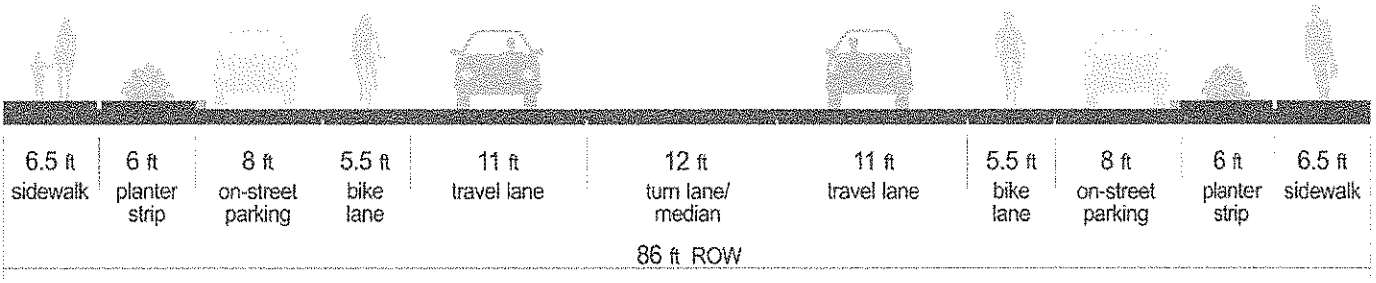



**Figure 11: 3-lane Minor Arterial Standard Cross-Section**

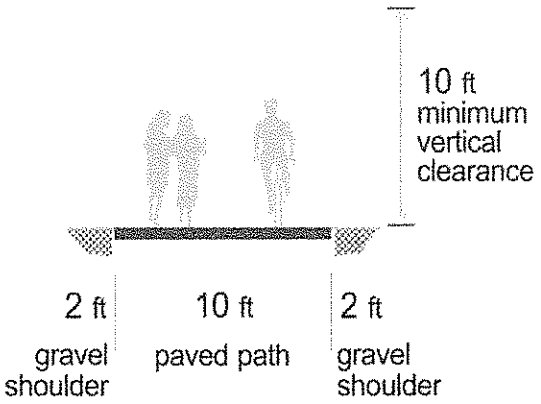



**Figure 12: Shared-use Path Standard Cross-Section**

## Street Connectivity

Local street connectivity is required by the state Transportation Planning Rule (OAR 660-012). Providing adequate connectivity can reduce the need for wider roads, traffic signals, and turn lanes. Increased connectivity can reduce overall vehicle-miles traveled (VMT), balance the traffic load on major facilities, encourage citizens to walk or bike, and reduce emergency vehicle response times. While improvement to local street connectivity is easier to implement in newly developed areas, retrofitting existing areas to provide greater connectivity should also be attempted.

The design and construction of connector roadways must evaluate whether neighborhood traffic management strategies are necessary to protect existing neighborhoods from potential traffic impacts caused by extending stub end streets. In addition, to establish appropriate expectations, the city will require the installation of signs indicating the potential for future connectivity when development constructs stub streets.

The Adair Village Land Use Development Code regulates proposed development to ensure good transportation system connectivity is provided.[9] Table 8 highlights key requirements and some proposed changes to consider.

**Table 8: Adair Village Proposed Changes to Connectivity Requirements**

| Existing Requirement | Proposed Change |
|---|---|
| A block shall have an average block size of approximately 400 feet. No block shall be more than 1,200 feet in length between street corner lines unless approved by the city. | *No change* |
| There are no block length or perimeter maximums placed on specific land use (i.e. residential, commercial, or industrial) zones. | *No change* |
| Cul-de-sac streets should have a maximum length of 500 feet but may be longer where unusual circumstances exist. A cul-de-sac shall terminate with a circular turn-around with a minimum right-of-way of 50 feet. | *Cul-de-sacs should be discouraged, however, when they are unavoidable they may not exceed 500 feet in length. The city may approve longer cul-de-sac lengths, not to exceed 900 feet, where site-specific conditions such as environmental or topographical constraints, existing roads, development patterns, or compliance with other city standards preclude street extension and through-circulation. A cul-de-sac shall terminate with a circular turn-around with a minimum right-of-way of 50 feet.* |
| Developments adjoining existing or proposed bikeways shall include provisions for connection and extension of such bikeways through dedication of easements or rights-of-way. The city may include bikeway improvements as conditions of approval for developments that will benefit from bikeways. Where possible, bikeways should be separated from other modes of travel, including pedestrian ways. Minimum width for bikeway shall be 5 feet per travel lane. | *No change* |

## Access Spacing Standards

Access management is a broad set of techniques that balance the need to provide for efficient, safe, and timely travel with the ability to allow access to individual destinations. Appropriate access management standards and techniques can reduce congestion, accident rates, and may lessen the need for construction of additional roadway capacity. The spacing of street and driveway (i.e., accesses) intersections on a roadway is a key element of access management.

Minimum public roadway intersection and private access spacing standards for city-owned roadways are identified in Table 9 below. New roadways or redeveloping properties must comply with these standards to the extent practical, as determined by city staff. As the opportunity arises through redevelopment, roadways not

[9] Adair Village Land Use Development Code Article 5, City of Adair Village, Amended March 2013.

complying with these standards could improve with strategies such as shared access points, access restrictions (median or channelization islands), or closure of unnecessary access points, as feasible.

**Table 9: Minimum Roadway and Access Spacing Standards**

| Minor Arterial | Major and Minor Collectors | Local |
|---|---|---|
| 150 feet | 125 feet | 10 feet |

Access spacing standards are for the minimum separation required between all access points (public or private) to a roadway, measured from center to center of adjacent access points on the same side of the roadway. Local street access spacing is measured from edge of driveway to edge of driveway.

Access spacing standards for OR 99W are determined by ODOT and are defined in the Oregon Highway Plan, OAR 734-051, and ODOT's Highway Design Manual.

## Mobility Standards

Prior to adopting this TSP, Adair Village had no mobility standards to provide a metric for assessing the impacts of new development on the existing transportation system and for identifying where capacity improvements may be needed. They are the basis for requiring improvements needed to sustain the transportation system as growth and development occur.

The new Adair Village mobility standards use volume-to-capacity (v/c) ratios to measure congestion, which is consistent with the methodologies used by Benton County and ODOT. A v/c ratio is a decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. The ratio is the peak hour traffic volume divided by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. A ratio approaching 1.00 indicates increased congestion and reduced performance.

The new Adair Village mobility standards are described below for each type of intersection control that may apply.

**Signalized, All-way Stop, or Roundabout Controlled Intersections:** The intersection must operate with a volume to capacity (v/c) ratio not higher than 0.85 during the highest one-hour period on an average weekday (typically, but not always the evening peak period between 4 p.m. and 6 p.m. during the spring or fall).

**Two-way Stop and Yield Controlled Intersections:** All intersection approaches serving more than 20 vehicles during the highest one-hour period on an average weekday (typically, but not always the evening peak period between 4 p.m. and 6 p.m. during the spring or fall) shall operate with a v/c ratio not higher than 0.90. Mobility targets do not apply to approaches at intersections serving 20 vehicles or fewer during the peak hour.

All roadways and intersections under the jurisdiction of ODOT must operate at the required mobility targets presented in the 1999 Oregon Highway Plan.[10] All roadways and intersections owned by Benton County must operate at the required mobility targets presented in the 2018 Benton County TSP. Adair Village may apply city mobility standards to County facilities within the UGB as long as they do not allow for a lesser degree of mobility.

[10] Oregon Highway Plan, ODOT, 1999, Last amended March 2018.

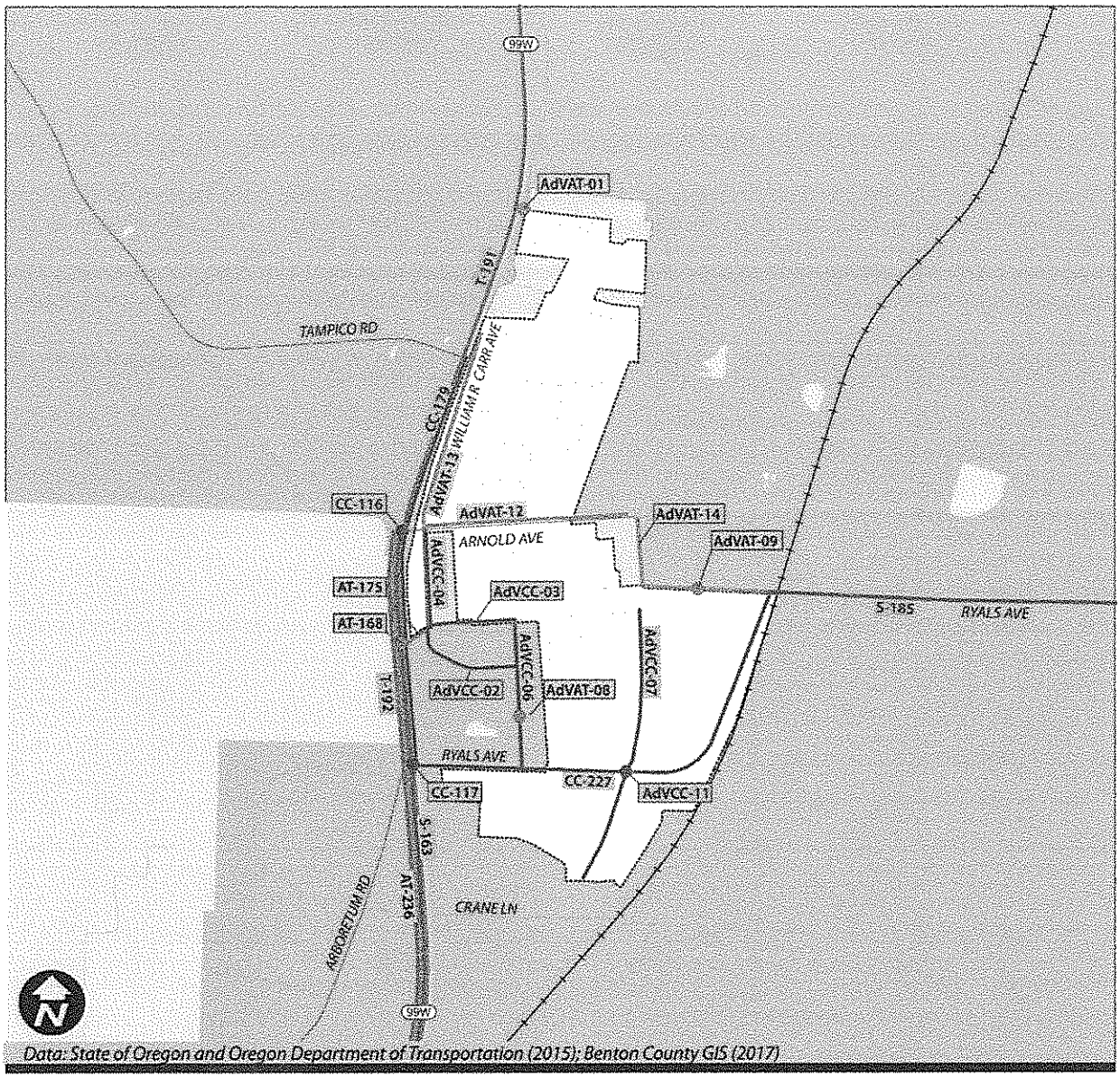
# CHAPTER 5: PROJECTS

This chapter presents the transportation plan solutions in tabular and map formats. Each project includes a description, the travel mode affected, the responsible lead agency, the likely funding source, and preliminary cost estimate. This is a master list of all projects regardless of cost, priority or the likelihood of being constructed within the planning horizon. Projects from the Benton County TSP (2018) along County or State facilities are also shown in the map and table below.

The project categories include the following types (order does not imply priority):

- **Connectivity and Congestion (CC)**
- **Safety (S)**
- **Active Transportation (AT)**
- **Transit (T)**

## Figure 13: City of Adair Village Projects




Legend

- S-00 - Safety Project
- AT-00 - Active Transportation Project
- CC-00 - Connectivity/Congestion Project
- T-00 - Transit Project
- - Principal Arterial
- - Collector
- - Local Roadway
- - Railroad
- - River
- - Park
- - Airport
- - Urban Growth Boundary
- - City Limits

BENTON COUNTY
TRANSPORTATION SYSTEM PLAN

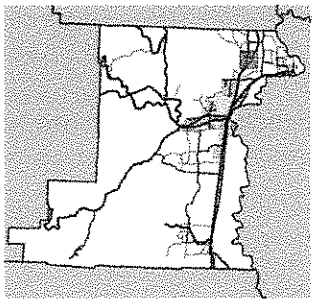


**Table 10: Adair Village Project List**

| Project ID | Project Name | Cost (2018 dollars) | From | To | Primary Funding Source |
|---|---|---|---|---|---|
| AdVAT-01 | Adair Frontage Road Active Transportation Corridor | $100,000 | - | - | Adair Village |
| **Description: Prohibit motor vehicle access along Adair Frontage Road north of the UGB to create an active transportation path. Requires coordination with ODOT.** | | | | | |
| AdVAT-12 | Arnold Avenue - Adair County Park Shared-use Path | $1,150,000 | OR 99W | Adair County Park | Adair Village |
| **Description: Construct shared-use path along the Arnold Avenue corridor from OR 99W to Adair County Park.** | | | | | |
| AdVAT-08 | Marcus Harris Extension Pedestrian Crossing | $45,000 | - | - | Adair Village |
| **Description: Provide an enhanced pedestrian connection across the Marcus Harris Extension (AdVCC-06).** | | | | | |
| AdVAT-09 | Arnold Avenue Pedestrian Crossing | $50,000 | - | - | Adair Village |
| **Description: Provide an enhanced pedestrian connection across Arnold Avenue between 5th Street and Ryals Avenue to connect future development to Brian Unwin Field and Adair County Park.** | | | | | |
| AT-168 | Vandenberg Avenue/OR 99W Enhanced Pedestrian Crossing | $250,000 | - | - | ODOT |
| **Description: Construct an enhanced pedestrian crossing on OR 99W at the Vandenberg Avenue intersection to improve access to Calloway Creek Trail. May be addressed as part of project CC-179. Project is subject to ODOT approval.** | | | | | |
| AdVAT-13 | William R Carr Avenue Modernization | $950,000 | Vandenberg Avenue | Barberry Drive | Adair Village |
| **Description: Upgrade to cross-section standards including sidewalk on east and west sides.** | | | | | |
| AT-175 | Vandenberg Avenue Modernization | $150,000 | OR 99W | Oregon Dept. of Fish and Wildlife west driveway | Adair Village |

| Project ID | Project Name | Cost (2018 dollars) | From | To | Primary Funding Source |
|---|---|---|---|---|---|
| **Description: Upgrade to cross-section standards including sidewalk on north and south sides.** | | | | | |
| AdVAT-14 | Arnold Avenue Modernization | $500,000 | Adair County Park | Ryals Avenue | Adair Village |
| **Description: Upgrade to cross-section standards including sidewalks and bike lanes where needed.** | | | | | |
| AT-236 | Lewisburg-Adair Village Shared-use Path | $3,450,000 | Lewisburg Road | Arnold Avenue | ODOT |
| **Description: Construct shared-use path within the OR 99W corridor (may use parallel facilities). Project should connect with Corvallis-Lewisburg shared-use path. Project is subject to ODOT approval.** | | | | | |
| AdVCC-02 | Purple Vetch Modernization | $400,000 | Vandenberg Avenue | Marcus Harris Extension | Adair Village/Oregon Department of Fish and Wildlife |
| **Description: Improve Purple Vetch to cross-section standards, this project may require State Planning Goal exception due to alignment outside of the Urban Growth Boundary.** | | | | | |
| AdVCC-03 | Vandenberg Ave Modernization | $700,000 | William R Carr Avenue | Marcus Harris Avenue | Adair Village |
| **Description: Improve Vandenberg to cross-section standards. This project may require State Planning Goal exception due to alignment outside of the Urban Growth Boundary.** | | | | | |
| AdVCC-04 | William R Carr "Main Street" Project | $400,000 | Vandenberg Avenue | Arnold Avenue | Adair Village |
| **Description: Streetscape improvements along William R Carr Avenue to create a Main Street.** | | | | | |
| AdVCC-06 | Marcus Harris Extension | $1,100,000 | Vandenberg Avenue | Ryals Avenue | Adair Village |
| **Description: Extend Marcus Harris from Vandenberg Avenue to Ryals Avenue. This project may require State Planning Goal exception due to alignment outside of the Urban Growth Boundary.** | | | | | |
| AdVCC-07 | 5th Street Extension | $2,050,000 | Vandenberg Avenue | Southern UGB | Adair Village |
| **Description: Extend 5th Street south as a Minor Collector from current terminus to southern UGB.** | | | | | |
| AdVCC-11 | 5th Street & Ryals Avenue Intersection Improvement | $500,000 | - | - | Adair Village |

| Project ID | Project Name | Cost (2018 dollars) | From | To | Primary Funding Source |
|---|---|---|---|---|---|
| **Description: Construct a roundabout or traffic signal, when warranted. Project may also include an enhanced pedestrian crossing.** | | | | | |
| **CC-116** | OR 99W/Arnold Avenue Intersection Improvement | $670,000 | - | - | ODOT |
| **Description: Project may install a traffic signal or roundabout, if feasible, when warranted. Project is subject to ODOT approval. May be addressed as part of project CC-179.** | | | | | |
| **CC-117** | OR 99W/Ryals Avenue Intersection Improvement | $670,000 | - | - | ODOT |
| **Description: Project may install a traffic signal or roundabout, if feasible, when warranted. Project is subject to ODOT approval. May be addressed as part of project CC-179.** | | | | | |
| **CC-179** | OR 99W Streetscape Study | $250,000 | Ryals Avenue | Tampico Road | ODOT |
| **Description: Streetscape Study to explore alternative highway designs and gateway treatments to slow traffic on OR 99W to enhance the safety and accessibility of Adair Village. May include intersection improvements and enhanced pedestrian crossings. Project is subject to ODOT approval.** | | | | | |
| **CC-227** | Ryals Avenue Modernization | $1,800,000 | OR 99W | Arnold Avenue | County |
| **Description: Improve Ryals Avenue to cross-section standards. Coordinate with planned development.** | | | | | |
| **S-163** | OR 99W Widening | $16,950,000 | Elks Drive (Corvallis) | Arnold Avenue | ODOT |
| **Description: Project may include widening shoulders to cross-section standard (8'). Project is subject to ODOT approval.** | | | | | |
| **S-185** | Ryals Avenue Widening | $2,700,000 | Arnold Avenue | Independence Highway | County |
| **Description: Widen to cross-section standard. This project provides east-west connectivity between Adair Village and North Albany and improves safety for drivers and active transportation users.** | | | | | |
| **T-191** | OR 99W North - Phase 1 | $100,000 | Corvallis | Monmouth | County |
| **Description: Based on results of the corridor evaluation and service development plan, implement regional public transit bus service on OR 99W between Corvallis and Monmouth. This may be a contracted service with regional transit providers or a private firm.** | | | | | |
| **T-192** | 99 Express Expansion | $85,000 | Corvallis | Adair Village | County |

| Project ID | Project Name | Cost (2018 dollars) | From | To | Primary Funding Source |
|---|---|---|---|---|---|
| **Description: Expanded evening and weekend 99 Express service to Adair Village to supplement service to a growing community.** | | | | | |
| T-193* | Demand Response Phase I | $130,000 | - | - | County |
| **Description: Expand demand response senior and disabled services to include additional AM, early evening, and expanded Sunday service, for a growing older adult population in the greater Corvallis area and to address current capacity needs.** | | | | | |

*This project does not have a defined extent and is not shown on the map

## Financially Constrained Projects

The Oregon Transportation Planning Rule (TPR) (OAR 660-012) requires that local agencies identify a Financially Constrained list of projects within their TSP document. Aside from complying with this regulation, this project list and expected funding value provides a basis of comparison for subsequent proposed amendments to the TSP. For example, if a major land use amendment is proposed that would significantly intensify travel activity beyond what is identified in the TSP, then Adair Village would need to demonstrate that the transportation system could still adequately serve the increased needs in the 2040 horizon year. In answering that question, the Financially Constrained system improvements would be assumed to be in place since it is reasonably likely, based on historical trends, that enough funding would be available to construct them.

As noted in Chapter 2, Adair Village is expected to have roughly $1.4 million available for transportation system improvements through the planning horizon. Most of that funding comes from federal and State discretionary programs.[11] The projections over the planning horizon of current funding levels compared to estimated expenditures indicates there will not be any available discretionary money to allocate to moving projects identified in the TSP forward. As a result, there are very few Adair Village-led solution projects on the Financially Constrained list, as shown in the table below.

**Table 11: Financially Constrained Project List**

| Project ID | Project Name | Cost |
|---|---|---|
| AT-168 | OR 99W & Vandenburg Avenue Enhanced Pedestrian Crossing | $250,000 |
| CC-116 | OR 99W & Ryals Avenue Intersection Improvement | $670,000 |
| AdVCC-04 | William R Carr "Main Street" | $400,000 |

[11] Funding does not include new revenues provided by House Bill 2017

# CHAPTER 6: STRATEGIES

Finding solutions to identified needs requires additional strategic approaches to supplement the investments in infrastructure. This chapter presents the strategies around safety education, travel demand management, and preparing for how innovations in technology will change transportation. Chapters 4 and 5 provide the transportation standards and list of projects that will be implemented along with the strategies and actions described in this section. This section includes a discussion of the need to continue partnering with ODOT so that an alternative mobility target can be implemented at select intersections along OR 99W, strategies to reduce the number of single occupancy vehicle trips by investing in active transportation and transit network improvements, and finally a discussion of the future of transportation and some of the innovative technologies that exist today.

## Alternate Mobility Targets

Even with the proposed intersection improvement project at Ryals Avenue and OR 99W the operations analysis indicates this intersection will still fail to meet mobility targets with increased vehicle volume in 2040. However, the vehicle volumes and volume to capacity ratio of this intersection do not exceed normal urban levels. The lower v/c mobility target (0.70) is applied because the Adair Village UGB does not extend to OR 99W and therefore is considered a rural intersection. The regulatory boundary of the UGB does not alter the need of Adair Village's residents to access important regional connections via the intersections at Arnold Avenue, Ryals Avenue and Vandenburg Avenue at OR 99W. As future development occurs, and the intersection traffic volumes approach the capacity during the peak hour, Adair Village will work with Benton County and ODOT to consider adopting an alternate mobility target at the intersection of OR 99W and the streets that access Adair Village.

## Transportation Demand Management

Transportation Demand Management (TDM) or "transportation options" are terms for strategies that support transportation system efficiency by encouraging a shift from drive-alone trips to other means of travel such as carpooling, transit, bicycling, walking, and ridesharing. Successful implementation of these strategies can result in reduction in vehicle miles traveled (VMT)

## Active Transportation

With the recommended active transportation improvement projects in place, the safety of walking and biking along major travel corridors in Adair Village will be significantly improved and walking and biking connections will be established between significant destinations. As a result, more inviting recreational opportunities will be provided, access to existing and future transit services will be enhanced, and non-motorized travel options for trips to work, schools, and daily activities will be better supported. Key connections include:

- Adair Village to Corvallis: Connection along OR 99W shared-use path (AT-236) and OR 99W shoulder widening (S-163).
- Adair Village to North Albany: Connection through Arnold Avenue Modernization (AdVAT-14) and Ryals Avenue widening (S-185).

## Public Transportation

Public Transportation in Adair Village will help create a safe, equitable, and efficient component of the transportation system that supports healthy lifestyles, environmental health, and economic development by connecting people with where they want to go. The public transportation recommendations address the needs for:

- **Improved on-demand transit:** Benton County's demand response transit system supports a wide range of travel needs for some of the city's most transportation-disadvantaged residents. The system is experiencing increased delays and trip denials at peak periods. The ADA-accessible vehicles are aging out and need replacement. The system will need continuous improvements and capacity expansion as the older adult population continues to grow and demand for transportation increases.
- **Enhanced Service on OR 99W:** The 99W North service is envisioned as a deviated fixed route bus offering four round trips daily between Corvallis and Monmouth, with a stop in Adair Village. This would provide connections to Oregon State University and Western Oregon University. This route would expand the 99 Express service between Corvallis and Adair Village, offering four round trips daily, Monday through Friday.

## Preparing for the Future and Smarter Mobility

Emerging transportation technologies will shape our roads, communities, and daily lives for generations. Vehicles are becoming more connected, automated, shared, and electric. This future is highly uncertain, but it may have significant impacts for how Adair Village plans, designs, builds, and uses the transportation system. Below are some important definitions that provide the basis for the impacts, policies and action items discussed in the following sections.

**Connected vehicles (CVs)** will enable communications between vehicles, infrastructure, and other road users, see Figure 14. This means that our vehicles will be able to assist human drivers and prevent crashes while making our system operate more smoothly.

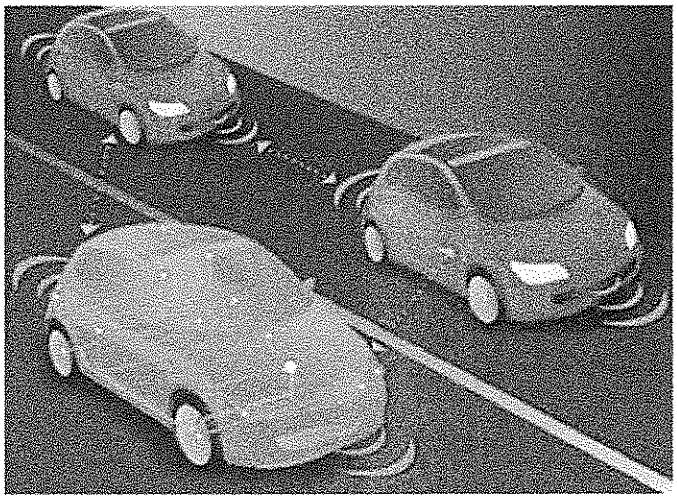


**Figure 14: Vehicle to Vehicle Communication**

**Automated vehicles (AVs)** will, to varying degrees, take over driving functions and allow travelers to focus their attention on other matters. Already today we have vehicles with combined automated functions like lane keeping and adaptive cruise control. However, these still require constant driver oversight. In the future, more sophisticated sensing and programming technology will allow vehicles to operate with little to no operator oversight.

**Shared vehicles (SVs)** that allow ride-hailing companies to offer customers access to vehicles through cell phone applications are already on the road today. Ride-hailing applications allow for on-demand transportation

with comparable convenience to car ownership without the hassle of maintenance and parking. Ride-hailing applications can enable customers to choose whether share a trip with another person along their route or travel alone.

**Electric Vehicles (EVs)** have been on the road for decades and are becoming more economically feasible as the production costs of batteries decline.

Many of these vehicles will not be exclusive of the others and it is important to think of the host of implications that arise from the combination of these technologies. When discussing these vehicles, they can be referred to as connected, automated, shared, and electric **(CASE) vehicles**.

## Impacts of Case Vehicles

### Congestion and Road Capacity

There are several competing forces that will unfold as connected, automated, and shared vehicles are deployed. It is difficult to predict how these vehicles will influence congestion and road capacity. The following factors will transform how people use roadways:

- AVs will provide a more relaxing or productive ride experience and people will have less resistance to longer commutes.
- Shared AVs will likely cost significantly less on a per mile basis which will increase demand for travel.
- CV technology will allow vehicles to operate safely with closer following distance, less unnecessary braking, and better coordinated traffic control. This will increase road capacity in the long run as CVs and AVs comprise increasing portions of the public and private fleet of vehicles.
- In the near term, as AVs still make up a fraction of the fleet of vehicles, road capacity could decrease as AVs will operate more slowly and cautiously than regular vehicles.
- A new class of traffic – zero-occupant vehicles – will increase traffic congestion.
- Roadways may need to be redesigned or better maintained to accommodate the needs of automated driving systems. For instance, stripping may need to be wider and more consistently maintained.

The following questions remain open and should be followed closely to understand the degree to which CASE vehicles will impact road capacity and congestion:

- How much will AVs cost for people to own them personally?
- How much will AVs cost if they are used as a shared fleet?
- How does cost and the improved ride experience of AVs influence travel behavior?
- How much more efficiently will AVs operate compared to regular human driven vehicles once they dominate the vehicle fleet?
- How will AVs impact road capacity in the near term as they are deployed in mixed traffic with human driven vehicles?

- What portion of traffic will be zero-occupant vehicles and what areas will likely generate the highest portion of zero-occupant vehicles looking for parking or waiting for their next passenger?

### Transit

Transit is expected to remain the most efficient way to move high volumes of people through constricted urban environments. AVs will not eliminate congestion and as discussed above, could exacerbate it – especially in the early phases of AV adoption. In addition, shared AVs may not serve all areas of a community and underserved communities still require access to transit to meet their daily needs.

### Parking

Because AVs will be able to park themselves, travelers will elect to get dropped off at their destination while their vehicle goes to find parking or their next passenger. Shared AVs will have an even greater impact on parking because parking next to your destination will no longer be a priority for the traveling public. This means that parking may be over-supplied in many areas and new opportunities to reconfigure land use will emerge. Outstanding questions related to parking that should be closely followed include:

- How does vehicle ownership impact parking behavior?
- What portion of the AV fleet will be shared?

### Package Delivery

AVs will also be used to deliver packages, food, and expand services. This may mean that delivery vehicles will need to be accommodated in new portions of the right of way. Package delivery by aerial drone could introduce new sets of challenges for Adair Village.

### Electric Vehicle Charging Stations

The proportion of electric vehicles represented in the overall vehicle fleet is expected to continue to increase in the future. Providing convenient electric vehicle charging locations helps support this trend and is consistent with the TSP goals related to Health, Environment, and Mobility and Circulation. There are currently no electric vehicle charging locations in Adair Village.

### Electric Scooters & Electric Bicycles

Fleets of dockless electric scooters have arrived in many cities across the nation. Electric bikes are also appearing as a subscription-based service like bike-sharing (in addition to privately owned electric bikes that have been around for several years). The scooters are activated with a smartphone app and have little to no parking restrictions at the destination of the trip. Their convenience and low cost (also true for e-bikes) make them an attractive option for many making shorter trips, potentially reducing the number of short trips made by motor vehicles. Innovative modes of transportation, like scooters, can change the transportation system in an instant and Adair Village will monitor new technologies so that the system can adapt to future travel options.

## Policies and Action Items

### Mobility Hubs

A mobility hub is a central location that serves as a multimodal connection point for transit, car share, bike share, and ride share stations, see Figure 15. This system can serve as a tool to encourage travelers to take seamless multimodal trips that are well timed and convenient. Mobility hubs can be integrated into transit

centers, park-and-ride lots and other areas needing or with access to multimodal supportive infrastructure (e.g., protected bike lanes) to maximize connectivity for first-and last-mile solutions.

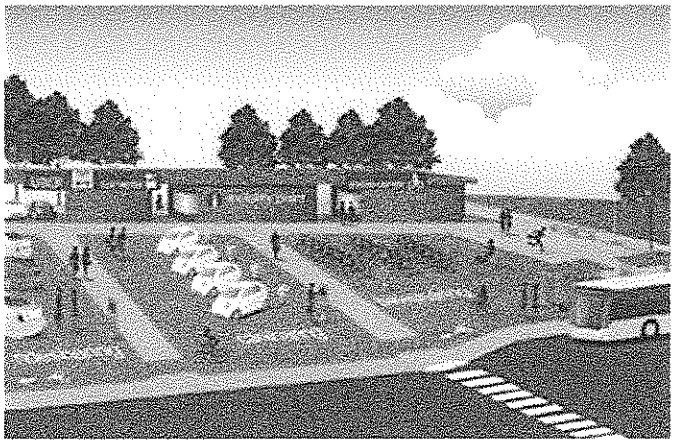


**Figure 15: Mobility Hub**

### Road Planning and Capacity

It is difficult to plan for the impacts of CASE vehicles on road capacity at this point in their development. Because there is a high potential that ultimately road capacity will increase after CASE vehicles are widely adopted along with a corresponding increase in traffic demand, we can expect that congestion will continue to persist.

However, CASE vehicles provide a much greater opportunity for effective transportation demand management solutions because the expected congestion can be used to encourage use of transit, shared vehicles, and bike share. These modes could all be encouraged through pricing mechanisms that are vastly less expensive to implement than building more road capacity. A variety of pricing mechanisms and alternatives to the State gasoline tax are enabled with CASE technology because these vehicles will be tracked geographically, and by time of day. With time/location data, transportation system operators will be able to develop pricing mechanisms that reduce congestion at a lower cost than other roadway improvements.1 As opportunities arise, Benton County will coordinate with partnering local and regional agencies to explore options for implementation of such region-wide travel demand management strategies.

### Transit

To avoid potential equity and congestion issues, transit agencies need to work together to integrate the use of automated vehicles and transit. Transit needs to adapt to new competition in the transportation marketplace as well as consider adopting CASE technologies to support transit operations, including mobility hubs.