INTELLIGENT TRANSPORTATION SYSTEM PLAN UPDATE

WASHINGTON COUNTY

DECEMBER 2020

ACKNOWLEDGMENTS

WASHINGTON COUNTY

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CONTENTS

FIGURES & TABLES

FIGURES

TABLES

EXECUTIVE SUMMARY

INTRODUCTION

Washington County's Intelligent Transportation System (ITS) Program leverages technology and support systems to help achieve a safer and more effective, equitable, and multimodal transportation system for the mobility of people, goods, and services. The ITS program has a decade-long tradition of cutting-edge innovation through treatments such as high-speed fiber optic communication (benefitting transportation, schools, public utilities, etc.), smart traffic signal sensors for pedestrians and bikes, adaptive traffic signals, and truck and transit priority systems.

This plan outlines the ITS program's next generation of planned technology treatments to build upon this successful tradition of excellence in providing value to Washington County's roadway users.

Washington County's first ITS Plan was developed in 2005 and updated in 2014. The 2020 ITS Plan updates the Executive Summary and Chapters 1, 2, and 5 of the 2014 ITS Plan:

- Chapter 1 – Introduction
- Chapter 2 – Current Conditions
- Chapter 5 – Deployment Plan

Chapter 2 includes a summary of systems, technologies, and Intelligent Transportation System (ITS) practices already in place, and Chapter 5 includes the proposed projects along with high-level cost estimates, descriptions, and maps. The following chapters from the 2014 ITS Plan remain relevant for the purposes of this 2020 update:

- Chapter 3 – User Needs Assessment
- Chapter 4 – Regional ITS Architecture

This effort is consistent with plans put together in other regions statewide that ensure that the ITS strategies used are integrated, complimentary, and conform with National ITS Architecture and applicable standards.[1] This plan will be used by agencies and partners for local and regional planning, project funding, and implementation.

ITS IN WASHINGTON COUNTY

ITS applications leverage technology and support systems to improve the safety and mobility of the transportation system in Washington County at a lower impact and cost than adding more lanes. ITS employs technology, processes, and systems to achieve these goals. Washington County and its partner agencies have successfully employed ITS for many years, regionally collaborating on effective management of the transportation system.

The 2020 ITS Plan was developed with the participation and input from the City of Hillsboro, City of Beaverton, City of Tigard, City of Tualatin, City of Sherwood, Portland Bureau of Transportation, Oregon Department of Transportation, and TriMet.

WASHINGTON COUNTY'S ITS PROGRAM SEEKS TO ACHIEVE THESE OUTCOMES:

- **ENHANCED SAFETY FOR ALL TRAVEL MODES**
- **EFFECTIVE MOBILITY FOR PEOPLE, GOODS, AND SERVICES**
- **EQUITABLE ACCESS TO THE WASHINGTON COUNTY TRANSPORTATION SYSTEM**
- **REDUCTION IN VEHICLE EMISSIONS, CONGESTION, AND USER FRUSTRATION**
- **ENHANCED TRAVELER INFORMATION**

[1] https://ops.fhwa.dot.gov/publications/regitsarchguide/index.htm

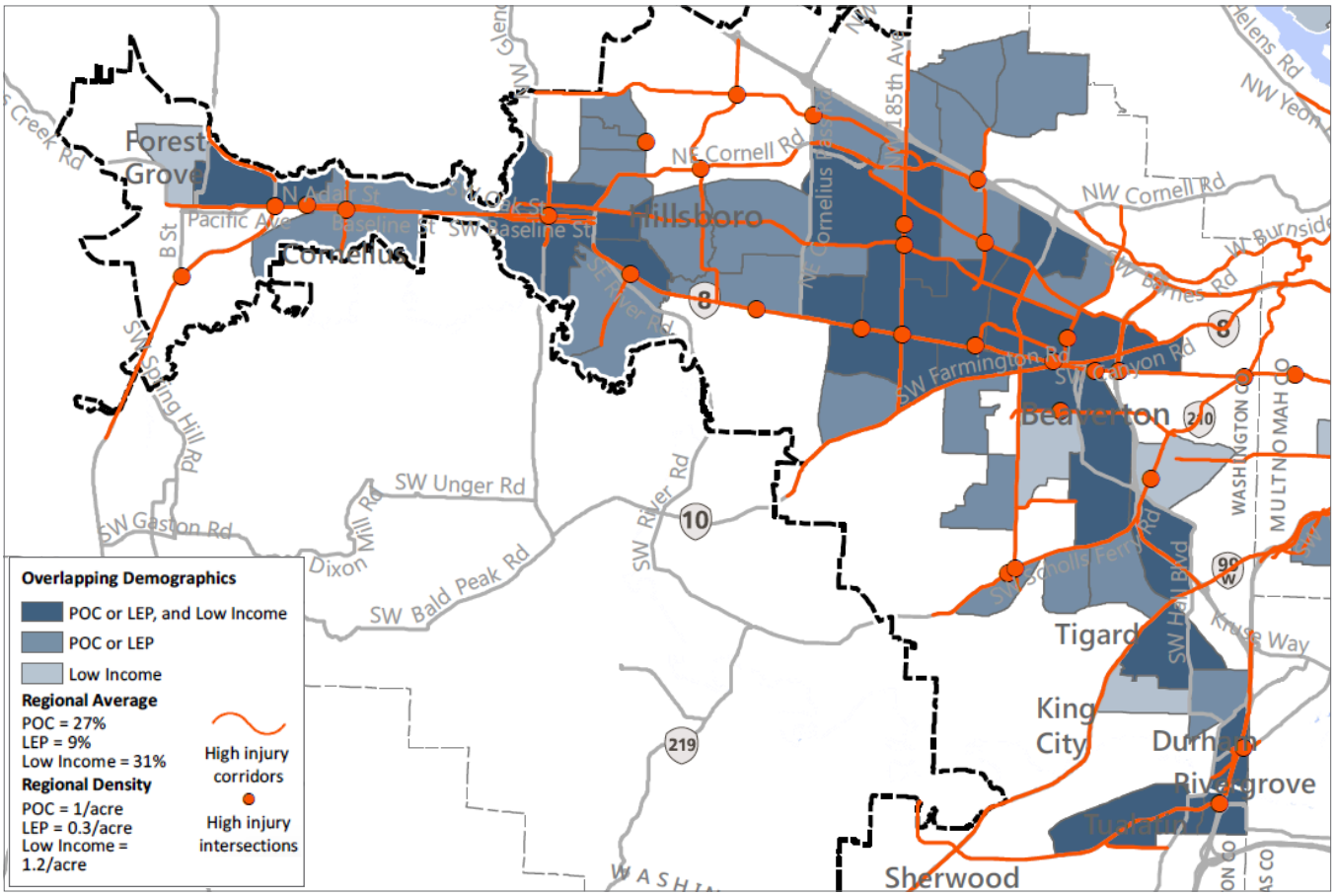
STUDY AREA

The ITS plan covers all county roads in Washington County, including rural and urban corridors (see Figure 3). Additionally, the plan includes signals that are owned by the cities and maintained by the county. Roadways and signals operated by cities are not included in this plan.

ADDRESSING DIVERSITY, EQUITY, AND INCLUSION IN THE ITS PLAN

Washington County's Diversity, Equity and Inclusion (DEI) initiative, adopted February 2020, is designed to guide equitable outcomes in county programs, budgets, decision-making, and service delivery. The 2020 ITS Plan Update advances the county's DEI initiative by recommending projects that improve transportation mobility and safety in corridors that Metro identifies as serving a high percentage of people of color and low English proficiency. An excerpt of Metro's map is shown in Figure 1 below.

FIGURE 1. HIGH INJURY CORRIDORS OVERLAPPING COMMUNITIES OF COLOR, ENGLISH LANGUAGE LEARNERS, AND LOWER-INCOME COMMUNITIES



Source: https://www.oregonmetro.gov/sites/default/files/2020/07/29/Adopted-2018-RTP-all-chapters.pdf, page 94.

WHAT ITS STRATEGIES ARE INCLUDED IN THIS PLAN?

This plan identifies projects and practices that build on well-established partnerships, and encourages expansion to new opportunities, ensuring that the Washington County transportation system is prepared for increased traffic and meeting customer expectations of safety, mobility, mode choice, equity, and information. The ITS projects and practices fall under the four categories described here.

1. **Traffic Operations & Management**
   a. Install high-capacity fiber optic communications to all ITS assets. Fiber is the foundation of the ITS program. Central management of ITS assets allows for better resource allocation and information sharing among the county, public partners, and private partners, and saves time, improves effectiveness, and reduces costs.
   b. Enhance agency ability to manage key corridors by employing "Safe & Smart Corridors" tools and technology on key routes and locations.
   c. Address isolated locations where ITS can improve safety and mobility.
   d. Actively manage traffic operations using high-capacity fiber communication networks, traffic management cameras, networked ITS weather, mobility, and safety sensors and components, and upgraded traffic signal hardware and software systems.
   e. Improve freight, transit, bicycle and pedestrian safety and mobility using connected vehicle technology, detection, special signal timing, and active signage.

WASHINGTON COUNTY ITS MISSION STATEMENT

WASHINGTON COUNTY SEEKS TO IMPROVE THE SAFETY, SECURITY, AND MOVEMENT OF GOODS, PEOPLE, AND SERVICES FOR ALL MODES OF THE TRANSPORTATION NETWORK BY USING ADVANCED TECHNOLOGIES, COORDINATED MANAGEMENT TECHNIQUES, AND BY PROVIDING REAL-TIME TRAVELER INFORMATION.

GOALS:

1. IMPROVE THE SAFETY AND SECURITY OF OUR TRANSPORTATION SYSTEM.
2. IMPROVE THE EFFICIENCY OF THE TRANSPORTATION SYSTEM.
3. PROVIDE IMPROVED TRAVELER INFORMATION.
4. DEPLOY FUNCTIONAL AND COST EFFICIENT ITS INFRASTRUCTURE.
5. INTEGRATE REGIONAL ITS PROJECTS WITH LOCAL AND REGIONAL PARTNERS.

2. **Traveler Information**
    a. Increase the type and reliability of information available to travelers using a variety of media and the integration of emerging technologies.
    b. Provide location-specific communications such as weather alerts, reduced speeds, detours, roadway conditions, and construction with Variable Message Signs (VMS) or Connected Vehicle, Internet of Things Systems for direct-to-vehicle dashboard or user smart device messaging (i.e., pedestrian push buttons with Bluetooth connectivity to a smart device app to aid the visually impaired in crossing at traffic signals).
3. **Incident & Emergency Management**
    a. Prepare in advance by scenario planning and route identification for emergency response
    b. Increase system security and resiliency by preparing a power interruption strategy
    c. Increase incident situational awareness capabilities using emerging technologies, cameras, and improved communications
4. **Data Management & Performance Measurement**
    a. Collect, analyze, and distribute data on traffic operations, safety, emergency response, and construction, both locally and in a multiagency, regional data warehouse.
    b. Increase the efficiency, economy, and effectiveness of traffic management and emergency response by improving data sharing practices with partners and third-party providers.
    c. Improve the accuracy, reliability, and timeliness of data collection and performance reporting by automating these activities with technology.
    d. Collaborate with state, university, and local partners to develop a shared resource(s) for expediting the verification, validation, and documentation of new technology and systems via an independent assessment.

WORKFORCE DEVELOPMENT TO DELIVER AND MAINTAIN ITS

Transportation systems are rapidly evolving due to advances in technology. Washington County must hire, train, and retain specialized staff to deliver and maintain ITS investments.

PROJECT RECOMMENDATIONS

A total of fifty-two ITS projects were identified by the stakeholders to improve safety and traffic operations in Washington County. Detailed project descriptions, locations, and costs are summarized in the 2020 ITS Plan.

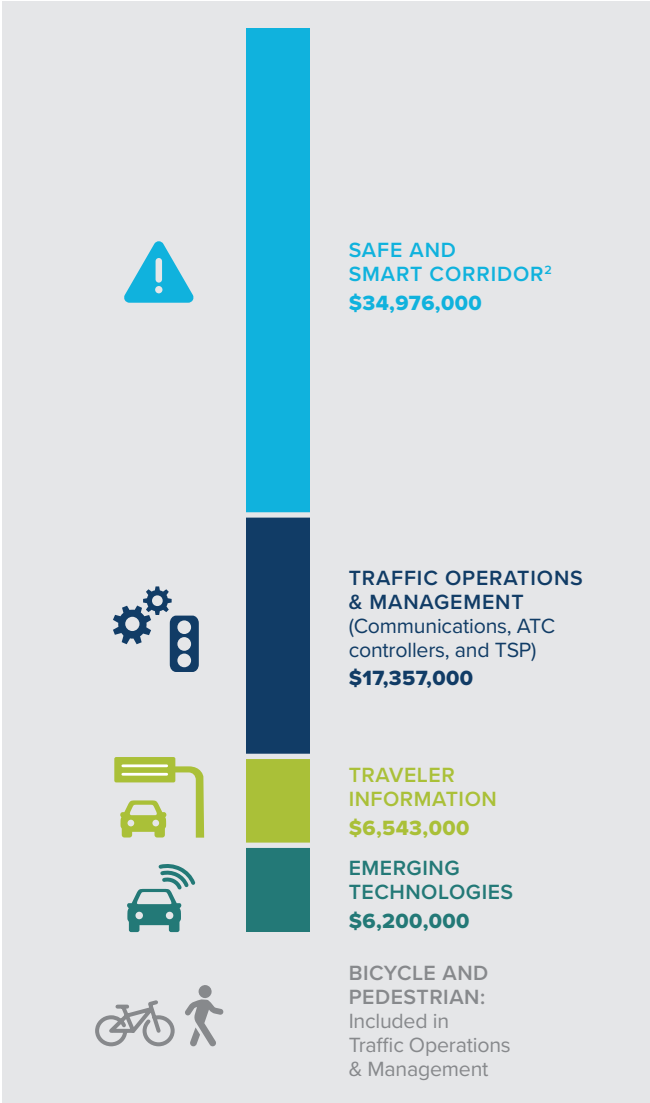
PROPOSED PROJECTS

Projects are distributed across Washington County based on need and application. Responsibility for project funding is assigned to the lead agency; however, a variety of funding tools and partnerships are likely to create the resources to implement these projects. The cost estimates of the projects by each ITS category and region are given in Table 1 and Figure 2. Project descriptions are provided in the Deployment Plan, and maps showing project locations are provided as Figures 3, 3A, 3B, 3C, 3D, 3E, and 3F.

TABLE 1. ITS COST ESTIMATES BY REGION

COST BY REGION	CAPITAL COST	ANNUAL OPERATIONS AND MAINTENANCE COSTS
Hillsboro Area	$17,435,000	$523,050
Beaverton Area	$24,799,000	$743,970
Tigard/Tualatin/ Sherwood Area	$5,995,000	$164,820
Countywide/ Rural ITS	$14,742,000	$594,540
Local Agency[1]	$2,193,000	$65,790

FIGURE 2. ITS COST ESTIMATES BY CATEGORY



[1] Local Agency Projects refer to projects that will be the responsibility of the local agency to implement.

[2] Costs in Safe and Smart Corridors are not double-counted under Traffic Operations and Management.

FIGURE 3. ITS DEPLOYMENT PLAN INSET MAPS AND DETAIL INDEX

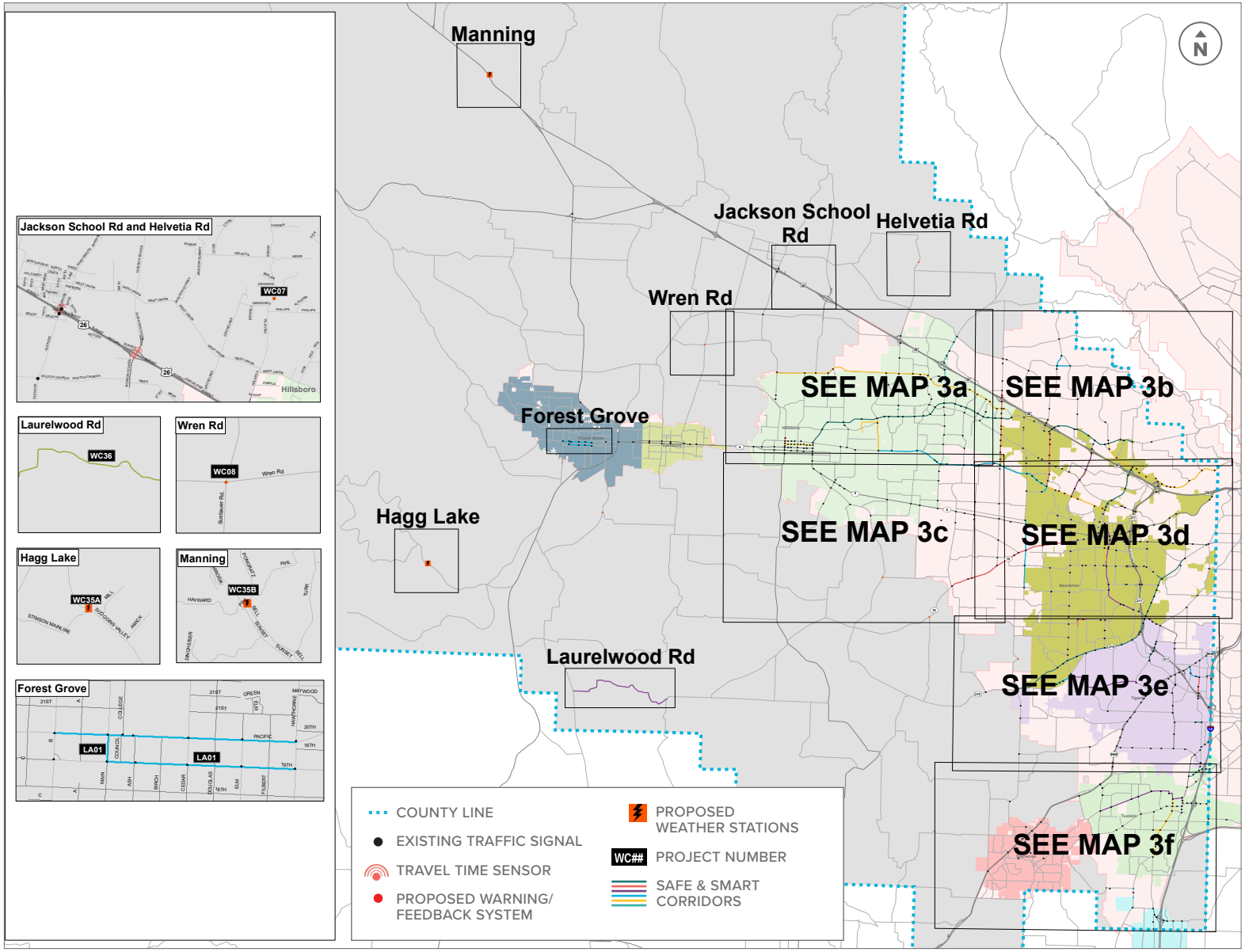


FIGURE 3A. ITS DEPLOYMENT PLAN PROJECTS – DETAIL

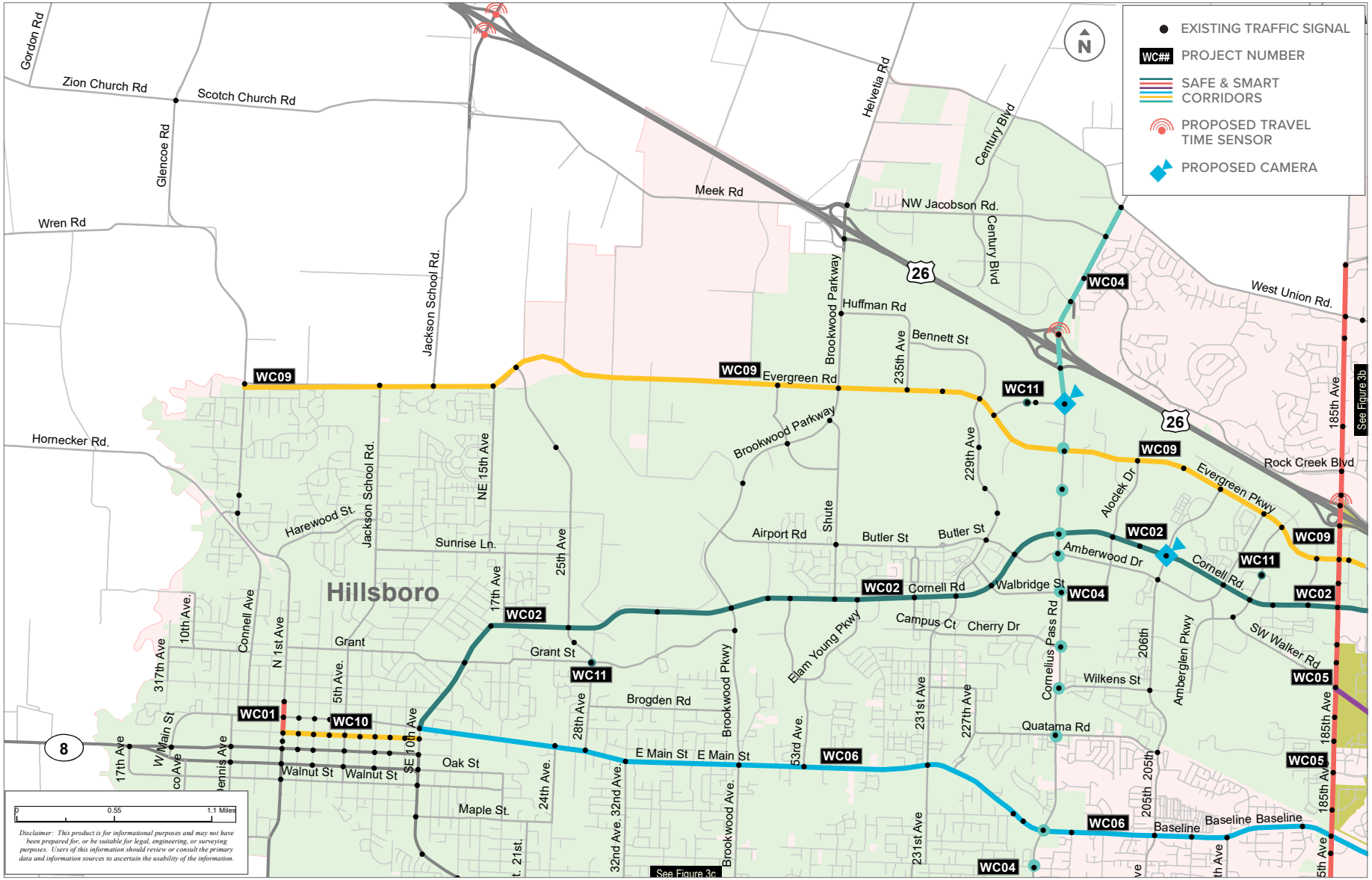


FIGURE 3B. ITS DEPLOYMENT PLAN PROJECTS – DETAIL

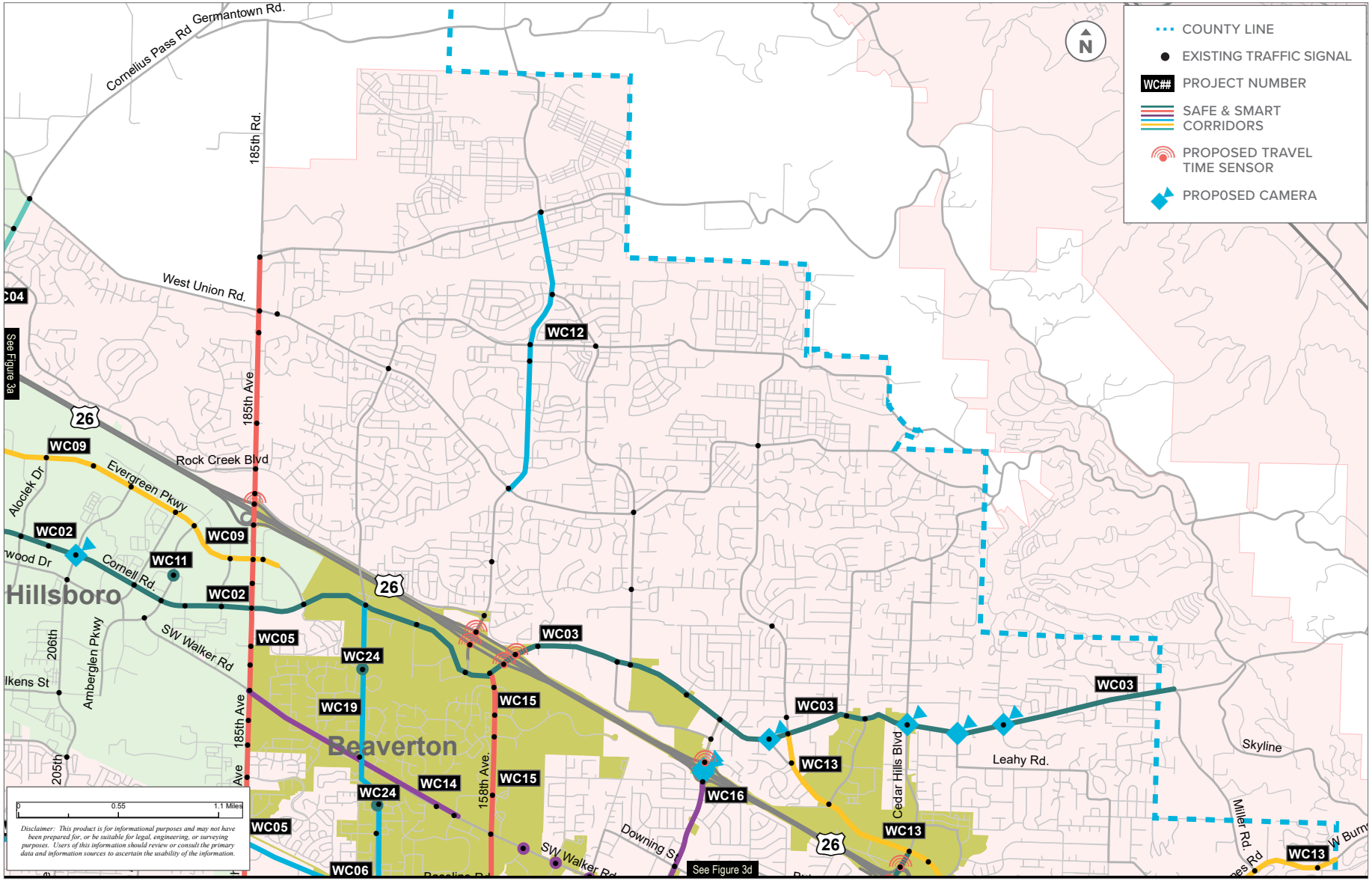


FIGURE 3C. ITS DEPLOYMENT PLAN PROJECTS – DETAIL

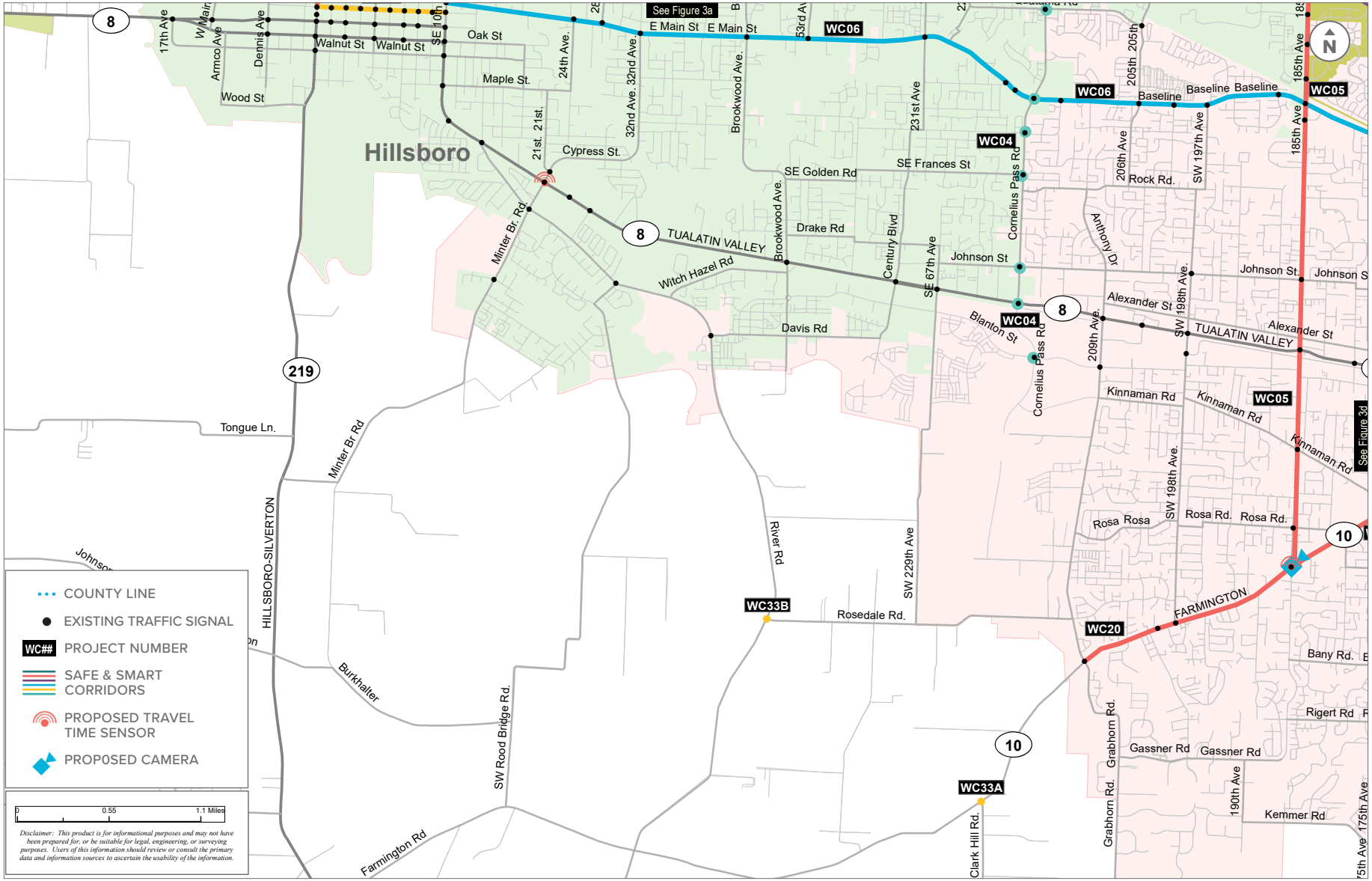


FIGURE 3D. ITS DEPLOYMENT PLAN PROJECTS – DETAIL

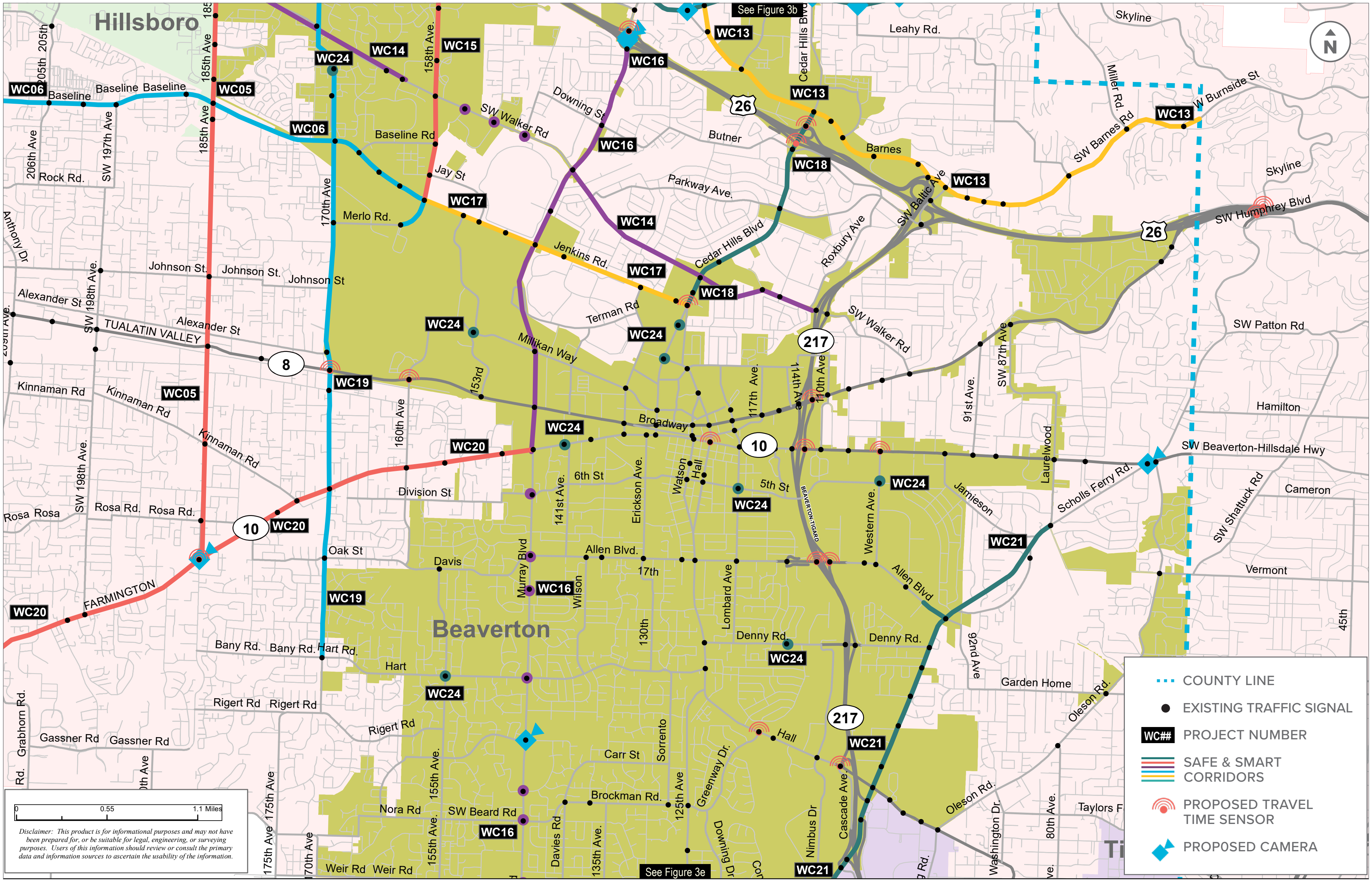


FIGURE 3E. ITS DEPLOYMENT PLAN PROJECTS – DETAIL

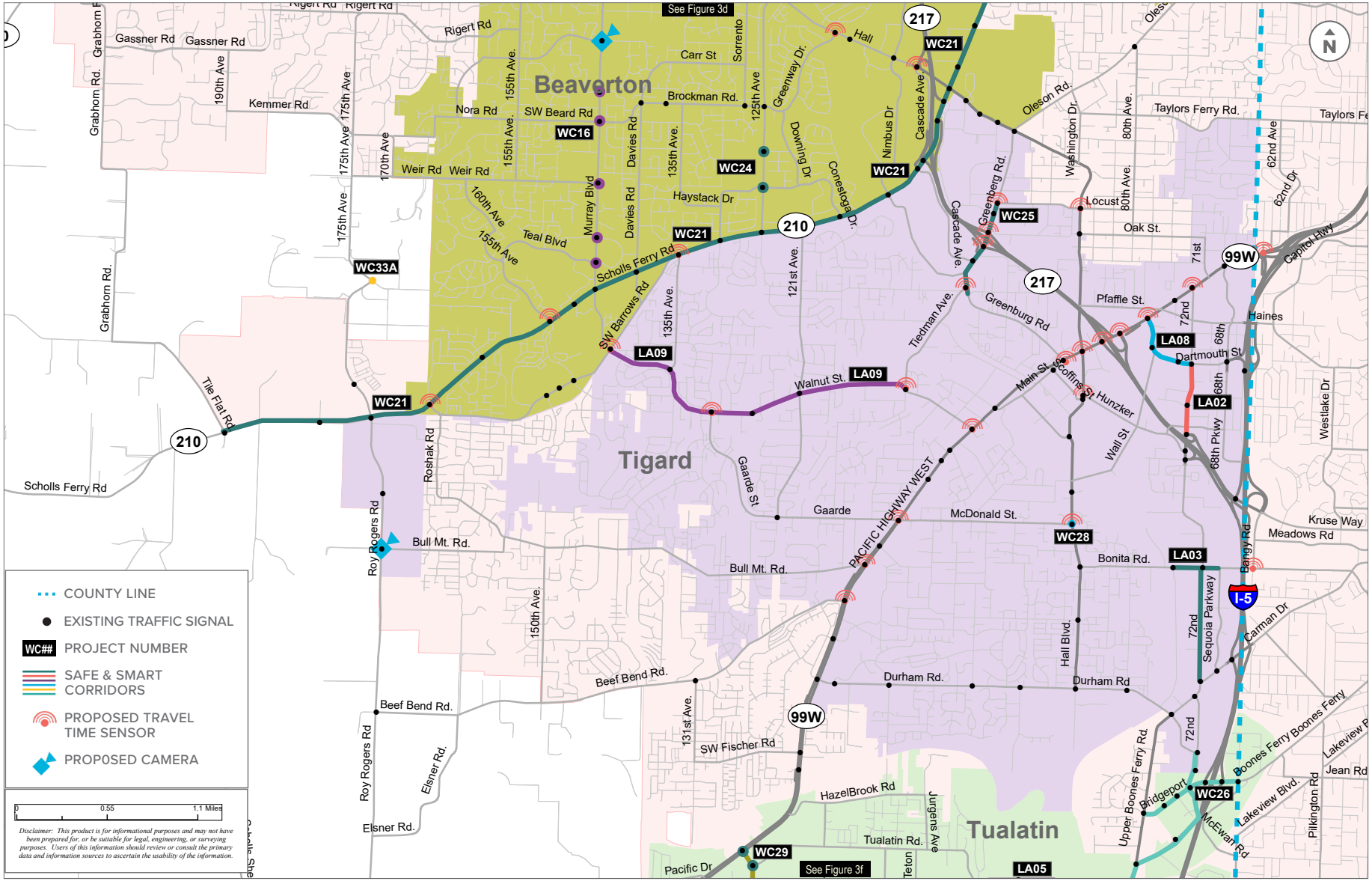
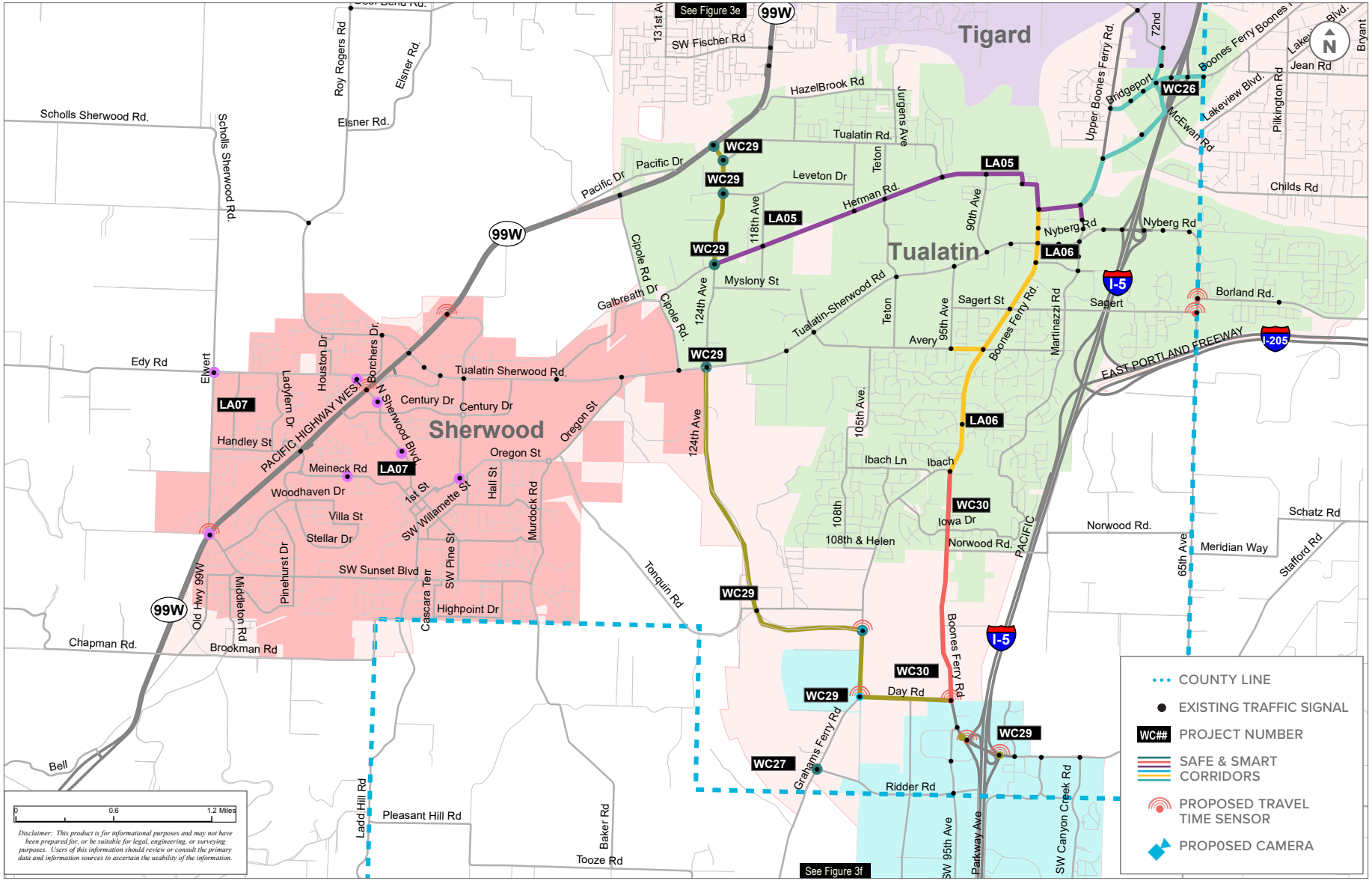


FIGURE 3F. ITS DEPLOYMENT PLAN PROJECTS – DETAIL



INTRODUCTION

Washington County has made significant progress implementing projects that were identified in the 2014 Intelligent Transportation System (ITS) Plan Update. More than half of the planned projects have been implemented in the past five years, in large part, due to partnerships with other public agencies and grants.

This Plan updates the Current Conditions and Deployment Plan Chapters from the 2014 ITS Plan, Chapters 2 and 5, respectively. The following chapters from the 2014 ITS Plan were not updated and should be referenced separately: Chapter 1, Introduction; Chapter 3, User Needs Assessment; and, Chapter 4, Regional ITS Architecture.

The *Current Conditions* chapter documents the existing and funded ITS infrastructure in Washington County through the end of 2019. The Current Conditions chapter highlights the County's accomplishments with implementing the 2014 ITS Plan, over the past five years, including funded ITS projects and current ITS systems related to traffic control and operations, traveler information, and bicycle and pedestrian infrastructure improvements. The Current Conditions chapter established baseline ITS conditions as of 2019, which was used to develop the projects list in the ITS Deployment Plan. The Deployment Plan Chapter describes the types of ITS strategies considered in Washington County, a complete list of projects, locations, and costs. Figure 4 shows the study area for the ITS Plan Update. The area encompasses all of Washington County including cities and rural areas.

FIGURE 4. WASHINGTON COUNTY VICINITY MAP

CURRENT CONDITIONS

This chapter provides an overview of the current transportation system conditions in Washington County and an inventory of the physical, operational, traffic safety, and travel characteristics of the transportation corridors in the study area.

THIS CHAPTER INCLUDES THREE SECTIONS:

- ACCOMPLISHMENTS SINCE 2014
- TRAFFIC CONDITIONS
- RELEVANT PLANS

ACCOMPLISHMENTS SINCE 2014

Expanding Washington County's communications network and deploying additional ITS equipment has allowed County staff to better manage, monitor, and operate the transportation system. Since 2014, Washington County has completed or partially completed 43 of 61 projects (70 percent). Of the $32 million in projects identified, the County has delivered $17 million for only $5.6 million—a significant cost savings realized through partnering and leveraging grants. The following examples are just a snapshot of the impact these projects have had on the County, its partnering agencies, and the traveling public in the past five years.

PARTNERING

When Washington County partners with other agencies, it leverages construction and operating costs, while expanding and improving the county-wide network.

The County's partnerships with ODOT, cities, Tri-Met, and the Hillsboro School District are a prime example of successful partnering. Together, they installed fiber optic communications throughout the county now shared among multiple jurisdictions. This connected network creates a redundant and reliable system architecture while expanding capacity for all agencies.

INCIDENT MANAGEMENT AND RESPONSE

One key set of projects that improved incident management and response time in Washington County was the installation of fiber optic connections to cameras and controllers at intersections. High-speed fiber communications enable traffic engineers to observe traffic operations and make changes to signal timing from a remote location. Before signals were connected to the network, staff would have to drive out to the signal to investigate an incident. Through the connected network, staff can more accurately monitor the system and respond to incidents in real time from their desktops, improving efficiency and response times. These efficiencies are especially impactful during lane closures and after crashes occurring during peak travel time.

Figure 5 shows a picture of the County Traffic Operations Center (TOC), where staff are able to monitor the transportation system.

FIGURE 5. COUNTY TRAFFIC OPERATIONS CENTER (TOC) INCIDENT MANAGEMENT

EVENT MANAGEMENT

Washington County hosts numerous large community events throughout the year that draw large crowds and significant volumes of traffic. Managing event traffic allows attendees to arrive on time and safely. In addition to the County's incident management and response efficiency improvements, a more connected fiber optic network also allows County staff to be more responsive to event traffic and manage it remotely from the Traffic Operations Center (TOC).

One particular series of events that benefits from the connected fiber optic network and real-time event traffic management are the baseball games played by the minor league baseball team based in Hillsboro, the Hillsboro Hops. Prior to the projects implemented by the 2014 ITS Plan, the City of Hillsboro would shut off traffic signals near the stadium and have law enforcement direct traffic entering and exiting the stadiums. Following a fiber optic network connection in 2018 to the traffic signal nearest to the stadium, the City was able to deploy modified signal timing on game days to ensure efficient and safe movements of the increased volume and monitor using pan-tilt-zoom (PTZ) cameras for real-time traffic management. Similar management strategies leveraging ITS investments are used for the Washington County fair, AirShow, Tigard Balloon Festival, and other traffic generating events.

Figure 6 shows the site for Hillsboro Hops games, where crowds benefit from the improved signal efficiency made possible by connection to an extensive fiber optic network.

TRAVELER INFORMATION

ODOT's TripCheck website provides roadside camera images and detailed information about Oregon road traffic congestion, incidents, weather conditions, and construction. Washington County is able to support this hub for traveler information by providing ODOT access to 100 County-owned cameras for the TripCheck camera database.

FIGURE 6. RON TONKIN FIELD, HOME TO THE HILLSBORO HOPS BASEBALL TEAM

TRAFFIC SIGNAL MAINTENANCE

With a connected traffic signal system, engineers are notified immediately when there are issues concerning signal performance and maintenance. County engineers and technicians are alerted immediately when a traffic signal outage occurs, allowing them to check signals remotely before sending out a technician. Response times have dramatically improved and County resources are being deployed more efficiently, improving traffic conditions for all roadway users.

A summary of the County's ITS devices and their period of installation is shown in Table 2. Figure 8 maps existing ITS devices in the county.

FIGURE 7. WASHINGTON COUNTY-OWNED TRAFFIC SIGNAL AT THE CORNER OF NE EVERGREEN PARKWAY AND NE CENTURY BOULEVARD

TABLE 2. EXISTING DEVICES AND PROJECTS COMPLETED IN THE PAST FIVE YEARS

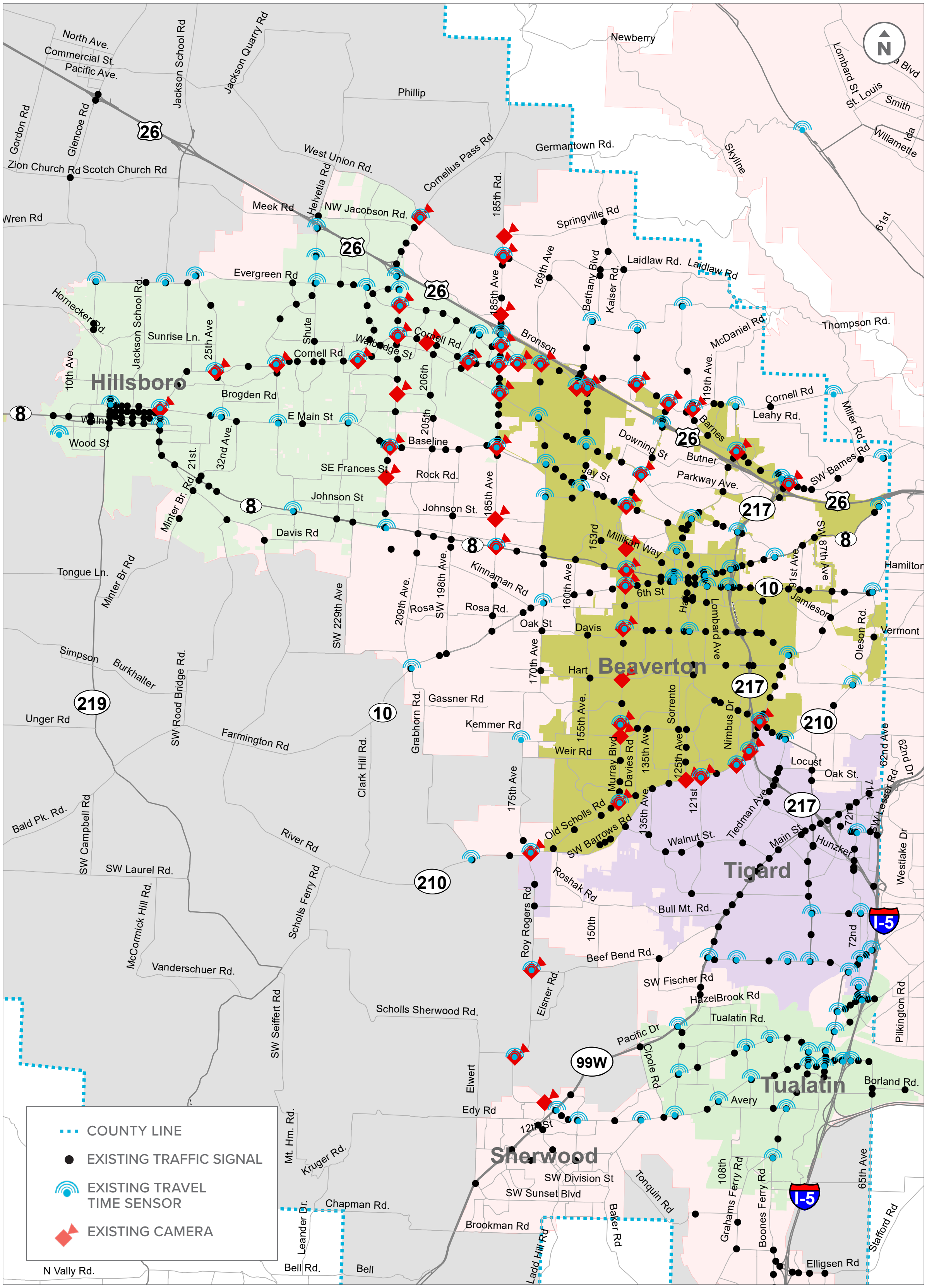
ITS CATEGORY	NUMBER OF DEVICES	
	PRIOR TO 2014	2019
Fiber Optic Communication	44 miles	110 miles
Remote Traffic Signal Access	55	200 owned and maintained
System Monitoring Cameras	11	100
Travel Time Readers	0	130
Remote School Zone 20 Beacon Access	0	All 150
Automated Snow Zone Beacons	0	All 9

BIKE AND PEDESTRIAN TREATMENTS AT TRAFFIC SIGNALS

Washington County strives to provide safe and effective traffic operations for all roadway users, particularly vulnerable pedestrians and cyclists. Pedestrian and bicycle specific treatments are in place or being established to support national and local standards and guidance per the Manual on Uniform Traffic Control Devices (MUTCD) and Americans with Disabilities Act (ADA). Since 2014 the County has achieved the following:

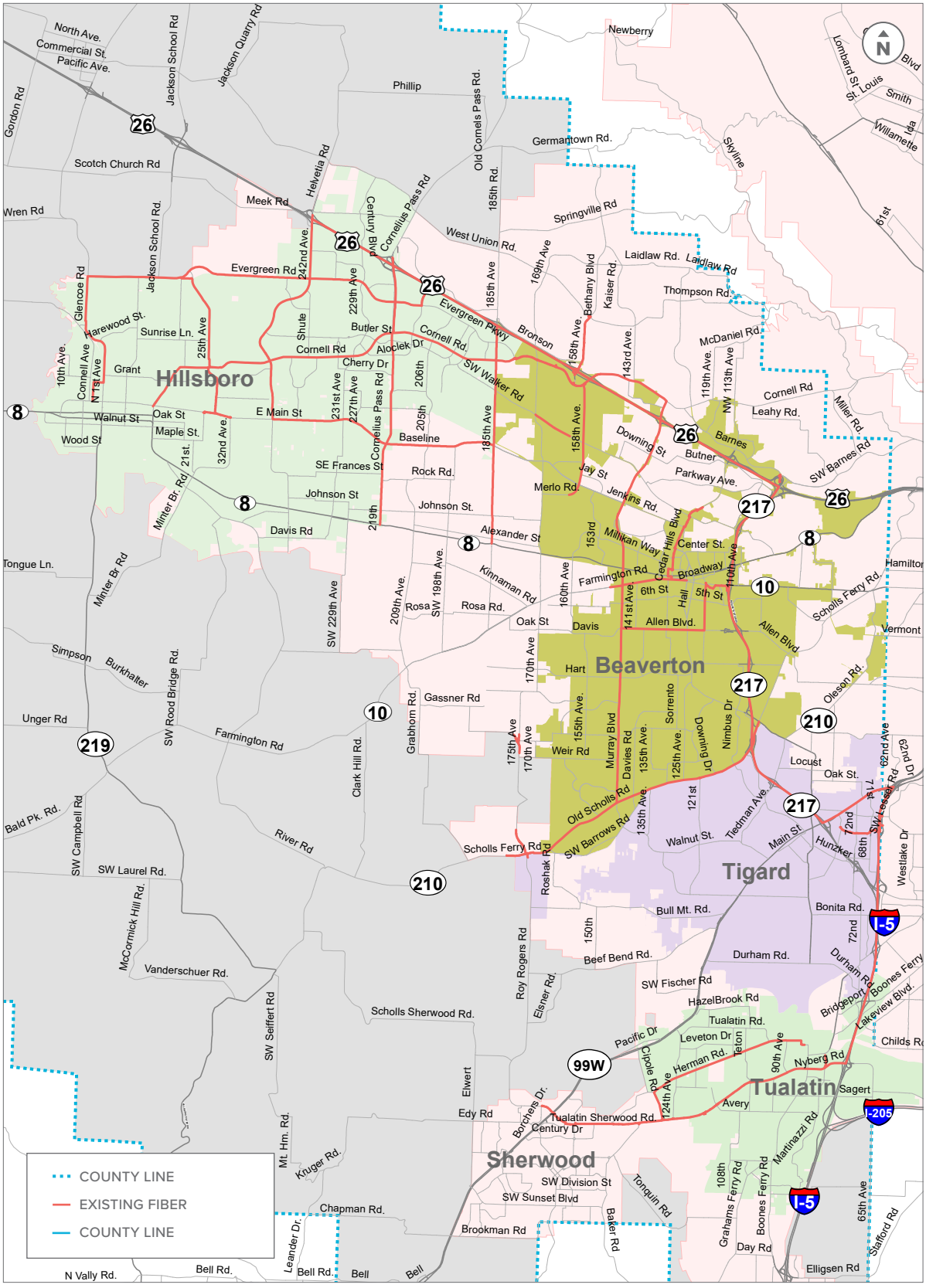
- **ADA compliant pedestrian signal countdown** indications at all County-owned signals to enhance pedestrian safety and efficiency.
- **Rectangular rapid flash beacons** installed at numerous strategic striped pedestrian crossing locations (three-lane cross-section or less) to enhance pedestrian and bicycle safety.
- **Signalized pedestrian crossings** installed at numerous strategic locations, such as arterial - trail crossings, (typically 4-lane cross-section or more) to enhance pedestrian and bicycle safety.
- New traffic signals now receive ADA compliant **countdown pedestrian signal heads and audible/ accessible pedestrian push button systems (APS)** to aid visually- and hearing-impaired pedestrians.
- Centrally-managed **School Zone 20 mph Beacon System** implemented to allow for rapid changes and reduced agency resource expenditure. Contributes to safer and better mobility within County-owned school zones.
- Implemented **leading pedestrian interval (LPI)/ advance walk**, signal timing treatments at strategic locations to separate permissive vehicle movements from the pedestrian walk indication, reducing vehicle-bicycle-pedestrian conflicts and enhancing safety.
- Successful pilot testing/implementation of **conditional pedestrian detection** at curb and within crosswalk to support future smart pedestrian timing treatments of green extension (to enhance safety), and service call cancellation (to enhance mobility and safety), known as Smart Adaptive Pedestrian Treatment.
- Implemented of **bike-specific conditional signal detection (thermal video)** at strategic locations to provide longer minimum greens and passage/ carryover time for cyclists to enhance the safety for cyclists navigating signalized intersections.
- Installed equipment (EcoCounters) to count pedestrians and bicycles at the north and south legs of the Rock Creek Trail.

FIGURE 8. EXISTING ITS EQUIPMENT



Please see Figure 9 for existing fiber optic communications.

FIGURE 9. EXISTING FIBER OPTIC COMMUNICATIONS



TRAFFIC CONDITIONS SUMMARY

Congested corridor sections/bottlenecks and high-frequency collision locations provide the greatest opportunities to implement ITS field elements that will produce a noticeable benefit. Using travel time sensors, the county is beginning to measure congestion at the corridor level to monitor real time conditions, calculate performance measures, and compile historical trends. This section documents existing congestion locations and high-frequency collision locations.

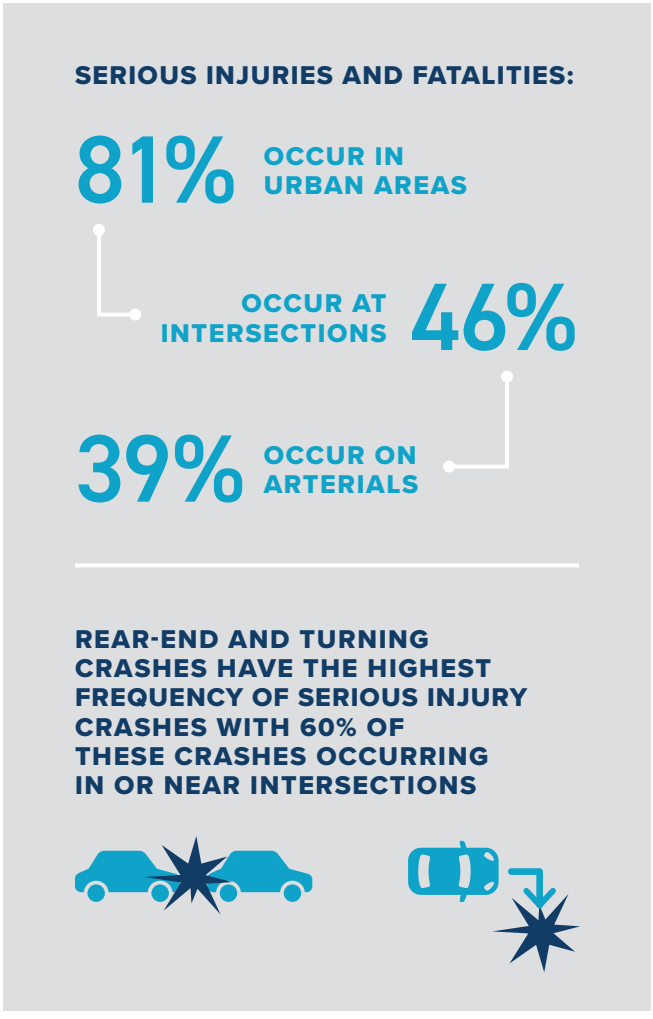
EXISTING CONGESTION AND HIGH CRASH CORRIDORS

The 2016 Washington County Transportation Safety Action Plan (TSAP) identified congested corridors that correspond with a high number of serious injury and fatality crashes, shown in Figure 10. Tualatin Valley Highway and NW 185th Avenue experience the highest rate of annual crashes per mile in the county. Congested County corridors include:

- NE Cornell Road
- NW 185th Avenue
- OR 99W (Pacific Highway)
- OR 217
- SW Murray Boulevard
- Tualatin Valley Highway

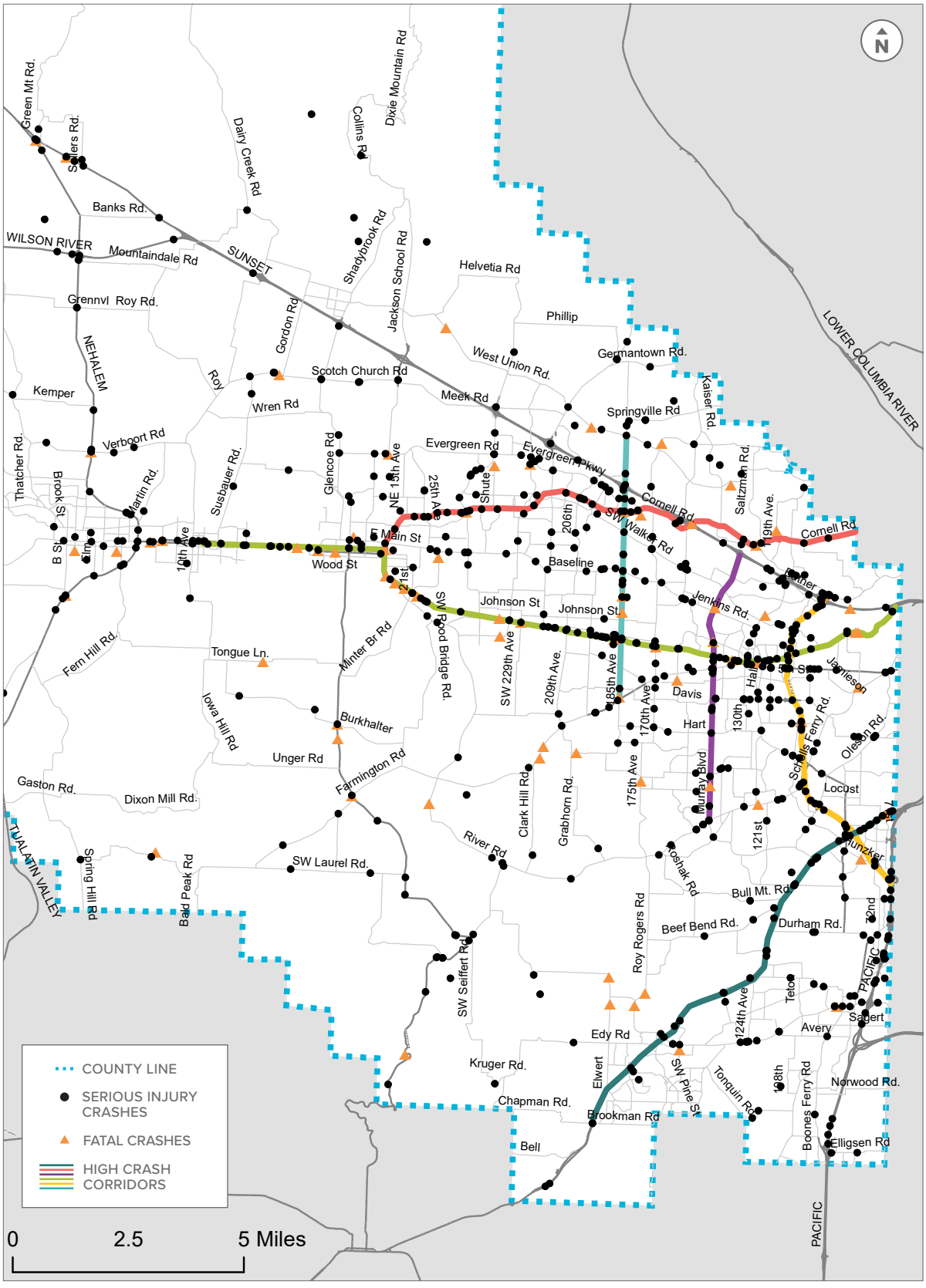
Implementation of ITS strategies and devices along these corridors is expected to improve operations and minimize the frequency and severity of crashes. ITS treatments improve safety in the following ways:

- Smoothing out traffic flow, reducing sudden starts and stops that result in rear-end crashes
- Providing traveler information such as travel times, levels of congestion, and road closures, so drivers can anticipate delays rather than being caught off guard and responding with impatience
- Adjusting signal operations to maximize roadway efficiency
- Alerting drivers of pedestrians and bicyclists



Source: Washington County Transportation Safety Action Plan, September 2016, https://www.co.washington.or.us/LUT/TrafficSafety/transportation-safety-action-plan.cfm

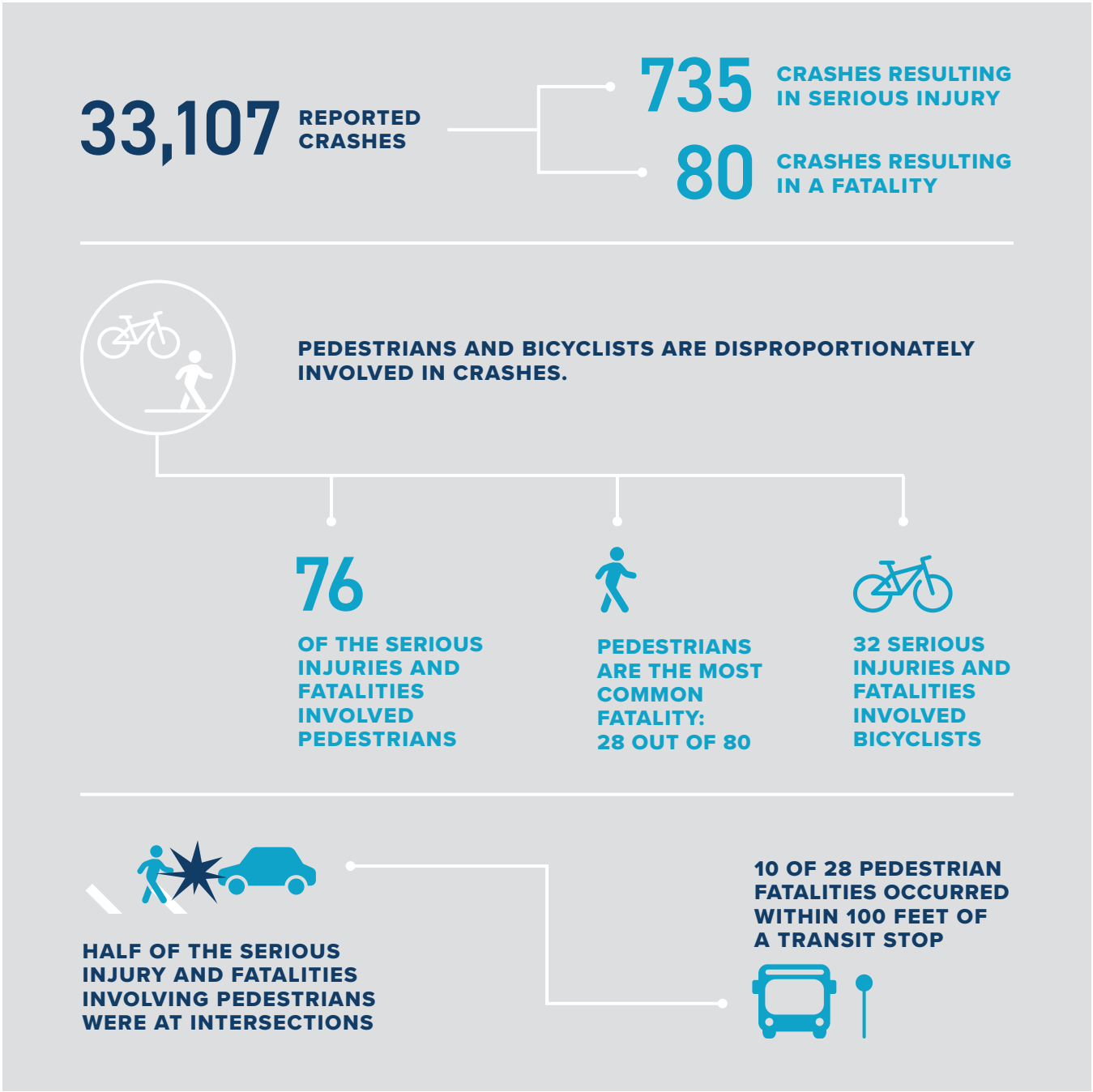
FIGURE 10. WASHINGTON COUNTY HIGH CRASH CORRIDOR MAP



Source: Washington County Transportation Safety Action Plan, 2016

CRASH SUMMARY AND CRASH TYPES

ITS technologies that improve safety to drivers, bicyclists, and pedestrians are expected to reduce the frequency of conflicts and the severity of injuries when conflict occurs. The TSAP data from 2010 to 2014 shows that intersections and transit stops experience a higher rate of conflict, indicating that initial solutions be targeted at these locations.



Source: Washington County Transportation Safety Action Plan, September 2016, https://www.co.washington.or.us/LUT/TrafficSafety/transportation-safety-action-plan.cfm

RELEVANT PLANS

Statewide and regional ITS plans that are relevant to the County's ITS Plan Update include:

- Regional Transportation System Management and Operations Plan 2010-2020, Metro, 2010
- ODOT Region 1 Intelligent Transportation System Plan, 2012
- Oregon Statewide ITS Architecture and Operational Concept Plan, ODOT, 2012
- Washington County 2005 ITS Plan and 2014 Update
- Regional ITS Architecture and Operational Concept Plan for the Portland Metropolitan Area, TransPort, 2016
- Washington County Transportation System Plan (TSP), 2018

Notably, the 2018 Washington County Transportation System Plan (TSP) identifies major intersections and key refinement areas that could be candidates for ITS strategies that are directly applicable to the study area of interest for this plan update.

DEPLOYMENT PLAN

The Deployment Plan includes descriptions of the ITS strategies selected for Washington County, recommended upgrades to the communications infrastructure, and a list of ITS projects for implementation over the next five to ten years. The goal of these projects is to improve the County's ability to provide for the equitable movement of people and goods, and to improve the safety and reliability of the transportation system for all of Washington County's residents and businesses. The ITS strategies are grouped into the following categories:

TRAFFIC CONTROL AND OPERATIONS

BICYCLE AND PEDESTRIAN

RURAL

TRAVELER INFORMATION

EMERGING TECHNOLOGY

Some of the projects in the Deployment Plan include strategies from multiple categories along an entire corridor. These corridors are identified in this plan as "Safe and Smart Corridors." Safe and Smart Corridors may include updated controllers, adaptive signal systems, safety analytics hardware and software, and transit signal priority. The complete list of Safe and Smart Corridors and their project elements is provided in Table 2.

TRAFFIC CONTROL AND OPERATIONS

These technologies are designed to improve the ability for traffic engineers to monitor and operate the system, often from a remote location such as a Traffic Operations Center. Example projects include upgrading traffic controllers, detection systems, cameras, high-speed communications, adding priority for transit and freight, and gathering data for performance management. All of the project types in Traffic Control and Operations support incident and emergency management because these systems allow engineers to create priority evacuation routes and respond in real time to incidents. Creating power and communications redundancy is a key strategy that supports the traffic operations systems for emergency management situations.

BICYCLE AND PEDESTRIAN

These technologies are designed to improve safety for pedestrians and bicyclists. Examples include enhanced detection, modifications to signal phasing, automated pedestrian or cyclist detection at signal, and audible commands.

RURAL

These technologies are designed to enhance safety for all roadway users in rural environments where speeds may be faster, weather elements may have a greater effect on roadway conditions, and visibility may be compromised. Examples include overheight detection, flood warning systems, and curve warning systems.

TRAVELER INFORMATION

These strategies include a wide range of technologies that provide time-sensitive messages to inform decision making. Examples include route information via a smartphone app, variable message signs indicating travel times to downstream locations, and advisory speed signs during congested conditions. Traveler information can also be considered those strategies identified in the Rural category above.

EMERGING TECHNOLOGIES

These strategies enable Washington County to prepare for and make use of connected vehicle technologies that will enhance safety and mobility for all roadway users. Examples of projects include updating roadway sensors to communicate with connected vehicles, automated performance reporting and response, and software development to manage big data.

TRAFFIC CONTROL AND OPERATIONS ITS STRATEGIES

KEY PRIORITIES

- Continue to upgrade traffic signal controllers to Advanced Transportation Controllers (ATC) and implement Automated Traffic Signal Performance Measures (ATSPMs)
- Continue to work with ODOT's TripCheck Travel Information Portal (TTIP) to publish Signal Phase and Timing (SPaT) data for connected vehicle applications
- Program traffic signals for Transit Signal Priority (TSP) to improve TriMet bus reliability and efficiency throughout the County
- Equip and program traffic signals to extend green times for heavy vehicles (truck signal priority) to improve safety, operations, and pavement life
- Expand the number of traffic monitoring cameras at key intersections
- Implement safety analytics systems and automate turn movement counts at key intersections
- Continue to build out fiber optic communications infrastructure and maintain partnerships with other local agencies

BENEFITS

- Improves the efficiency of the operation and coordination of transportation systems by integrating multi-jurisdictional arterial and freeway systems
- Reduces travel times, arterial delays, and fuel consumption by coordinating traffic signals
- Improves agency response to signal timing changes and to the evaluation of signal timing complaints by providing the ability to monitor signal timing and make changes remotely

FIGURE 11. MULTIMODAL ACTIVITY IN WASHINGTON COUNTY

- Reduces response times for incident management
- Improves on-time reliability and increases passenger throughput for the transit agencies
- Supports regional operations and planning efforts to better target future policies and system improvements

EXAMPLE PROJECTS

- Safe and Smart Corridors
- Upgrades to ATC controllers on Greenburg Road, Barrows Road, 170th Avenue/173rd Avenue
- Expansion of high-speed fiber communications on Bridgeport Road, Forest Grove, and others
- Communications redundancy
- Power redundancy

BICYCLE AND PEDESTRIAN ITS STRATEGIES

KEY PRIORITIES

- Advance successful pilot projects into practice including conditional pedestrian detection and bicycle-specific conditional detection
- Implement Smart Adaptive Pedestrian Treatments
- Continue to install pedestrian signal countdown timers and audible pedestrian push buttons that are fully compliant with the American Disability Act (ADA) requirements
- Continue to deploy bicycle and pedestrian counters at multi-use trails and use data to improve and grow active transportation infrastructure
- Expand use of leading pedestrian interval (LPI)/ advanced walk
- Continue to centrally manage school zone 20 beacon system

BENEFITS

- Improves operations and safety for bicycles at traffic signals, and provides information to bicyclists so they can make informed decisions
- Improves pedestrian safety and access for vulnerable pedestrians and improves the pedestrian experience
- Enhances bicycle and pedestrian facility access and connections

FIGURE 12. CYCLIST AND MOTOR VEHICLE SHARING THE ROAD THROUGH AN INTERSECTION

EXAMPLE PROJECTS

- Traffic Signal Modernization in smaller cities (Forest Grove, Tigard, Tualatin, Sherwood, Durham, Cornelius) that include upgraded pedestrian and bicycle detection
- Continued research on the applicability of technology-based enhancements for pedestrian and bicycle safety
- Regional TIGER ATM Grant ITS bicycle detection
- Cornelius Pass Road ATCMTD

FIGURE 13. PEDESTRIAN/BICYCLE DETECTION USING EMBEDDED SENSORS, OR THERMAL/VIDEO TECHNOLOGY TO IMPROVE SAFETY

RURAL ITS STRATEGIES

KEY PRIORITIES

- Apply and adapt ITS technologies to enhance safety and mange rural roads
- Half of the counties roads are rural
- Install the following warning systems where safety and operation can be improved:
  - Curve speed warning systems (CSW)
  - Intersection conflict warning systems (ICWS)
  - Snow Sign Activation System (SSAS)
  - Flood warning systems
  - Road weather information systems (RWIS)
- Expand installation of driver feedback signs
- Improve connected vehicle technology and cellular-based traveler information systems to identify and broadcast warning information

BENEFITS

- Provides information to travelers to change route or reduce speeds during adverse weather conditions
- Improves safety by reducing crashes
- Improves maintenance resource allocation
- Improves travel time reliability and reduces delays in remote areas
- Reduces vehicle speeds as vehicles approach an intersection

FIGURE 14. (TOP LEFT) ROADWAY WEATHER INFORMATION SYSTEM, (TOP RIGHT) OVERHEIGHT WARNING FLASHES WHEN APPROACHING VEHICLE EXCEEDS HEIGHT LIMIT FOR UNDERPASS, (BOTTOM) GATE AT FERN HILL ROAD CAN BE CLOSED WHEN ROADWAY FLOODS

EXAMPLE PROJECTS

- Laurelwood Length Restriction and Speed Warning System
- Weather stations at Hagg Lake in Gaston and the Banks-Vernonia Trail in Manning
- Automated Flood Warning System at Susbauer and Hornecker Roads
- Overheight warning systems at train trestles crossings on Grahams Ferry Road and Helvetia Road

TRAVELER INFORMATION ITS STRATEGIES

KEY PRIORITIES

- Continue to push open data to regional and statewide clearinghouses (ODOT TripCheck, Portland State University Portal, etc.)
- Continue to share open transportation data with other partner agencies (PSU, ODOT, local cities, emergency services, etc.)
- Share real-time traffic information with emergency dispatch
- Share traffic monitoring video with other agencies
- Improve centralized emergency vehicle pre-emption and GPS

BENEFITS

- Supports the dissemination of real-time traveler information and improves visual information for decision makers and travelers
- Increases the viability of alternate modes and routes, and satisfaction with the transportation network
- Creates the potential to reduce delays and improve travel time reliability

EXAMPLE PROJECTS

- Detection for travel time and speed monitoring
- Sharing data with TripCheck website
- Installation of CCTV cameras and video sharing
- Travel time collection at Elligson Road I-5 ramps
- Overheight vehicle detection at train trestles[3]

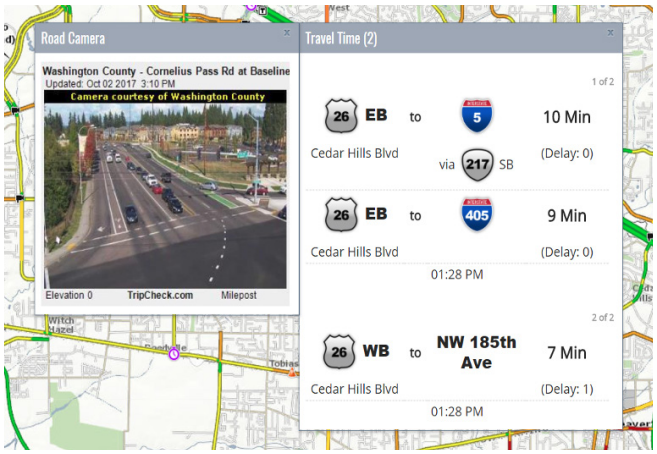


FIGURE 15. (TOP) VARIABLE MESSAGE SIGN ON OR-217 SOUTHBOUND, (MIDDLE) TRIPCHECK CAMERAS AND TRAVEL TIME, (BOTTOM RIGHT) DYNAMIC CURVE WARNING SYSTEM ON SCHOLLS FERRY ROAD WEST OF MOUNTAINSIDE HIGH SCHOOL

[3] These projects are also rural ITS applications.

EMERGING TECHNOLOGY ITS STRATEGIES

KEY PRIORITIES

- Leverage emerging big data and automated analytics platforms
- Share Signal Phase and Timing (SPaT) data with ODOT TripCheck
- Broadcast connected vehicle warning from roadside infrastructure or work zones
- Share pedestrian and bicycle presence information with connected vehicles
- Increase the type and reliability of traveler information using a variety of media and the integration of technologies
- Integrate and coordinate data from emerging technology for parking, curb management, and alternate mobility modes (e-scooters, e-bikes, eVOTL, and others) to support mobility hubs, system operations, and performance measurement

BENEFITS

- Enhances travel experience and increases safety with improved services and accurate information, creating a more dependable transportation system
- Reduces fuel consumption, energy use, and congestion by using real-time data to quickly resolve traffic congestion and optimize the flow
- Provides agencies with the ability to better monitor critical infrastructure and develop efficient processes to minimize operating costs and improve system capacity

FIGURE 16. ELECTRIC VEHICLE CHARGING STATION

EXAMPLE PROJECTS

- Roadside Connected Vehicle System and Internet of Things System
- Autonomous Vehicle Enabling Systems—Big Data
- Dashboard for automated performance reporting
- Automated Safety Analytics

PROPOSED PROJECTS

The list of projects in the Deployment Plan include incomplete projects from the 2014 ITS Plan and new projects developed by the project stakeholders and Washington County. The new projects were identified based on institutional knowledge, public requests, regional initiatives, and emerging technology. The proposed projects were presented to the public in an online open house. Projects recommended in the Deployment Plan are shown in Figures 17 and 18, and documented in Table 3. The following information is provided for each project:

- CORRIDOR NAME
- PROJECT NUMBER
- PROJECT NAME
- PROJECT TYPE/THEME
- PROJECT DESCRIPTION
- CAPITAL COST
- ANNUAL O&M COST

The cost estimates included with each project are based on current ITS project experience and costs found through various ITS resources available through the Federal Highway Administration (FHWA) and ITS America. The capital costs associated with each project include mark-up for design, mobilization, construction management, and contingency. The operations and management (O&M) costs for each project represent an annual cost once the project has been deployed.

FIGURE 17. PROPOSED PROJECT LOCATIONS

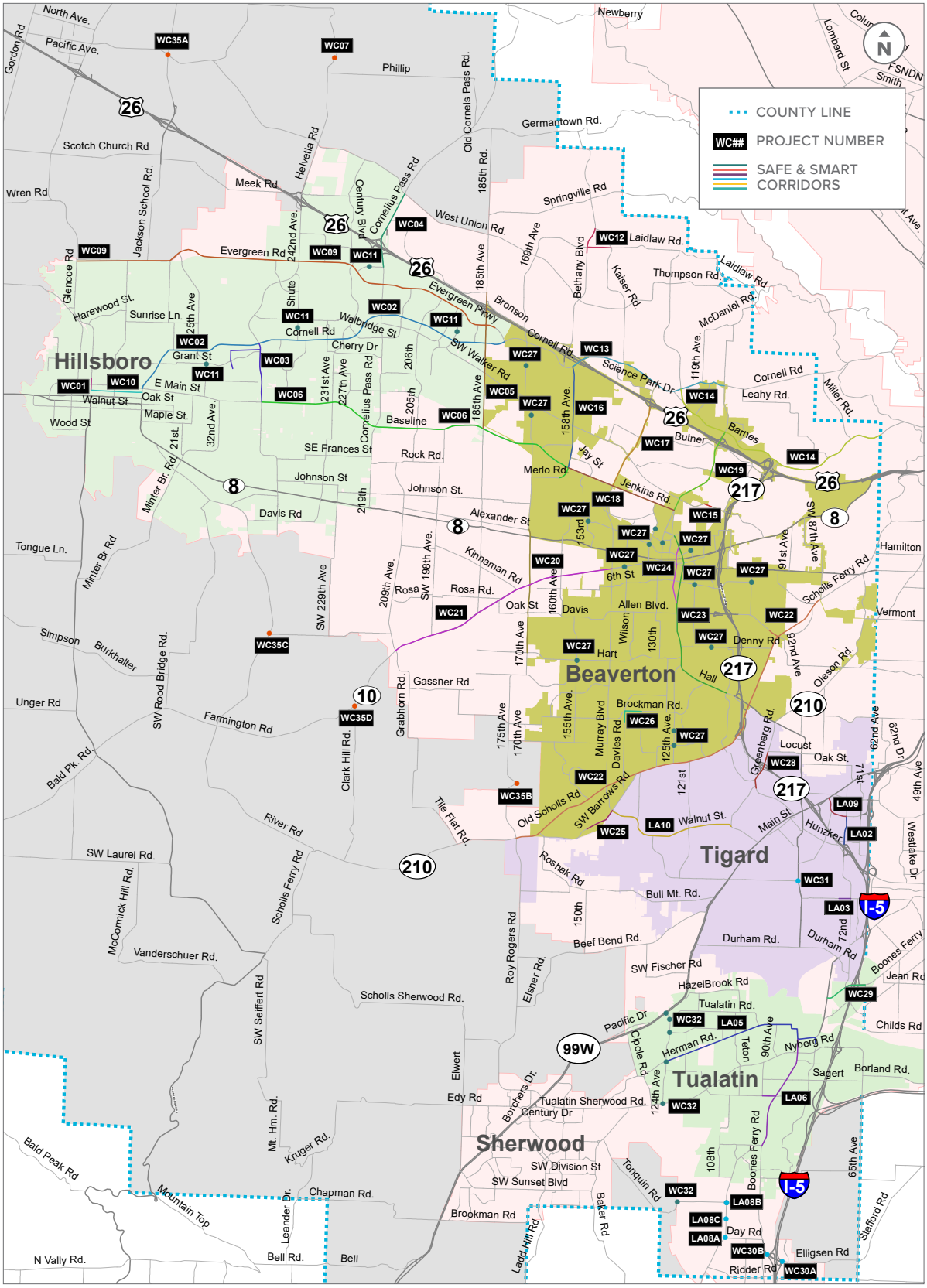


FIGURE 18. FIBER OPTIC COMMUNICATIONS

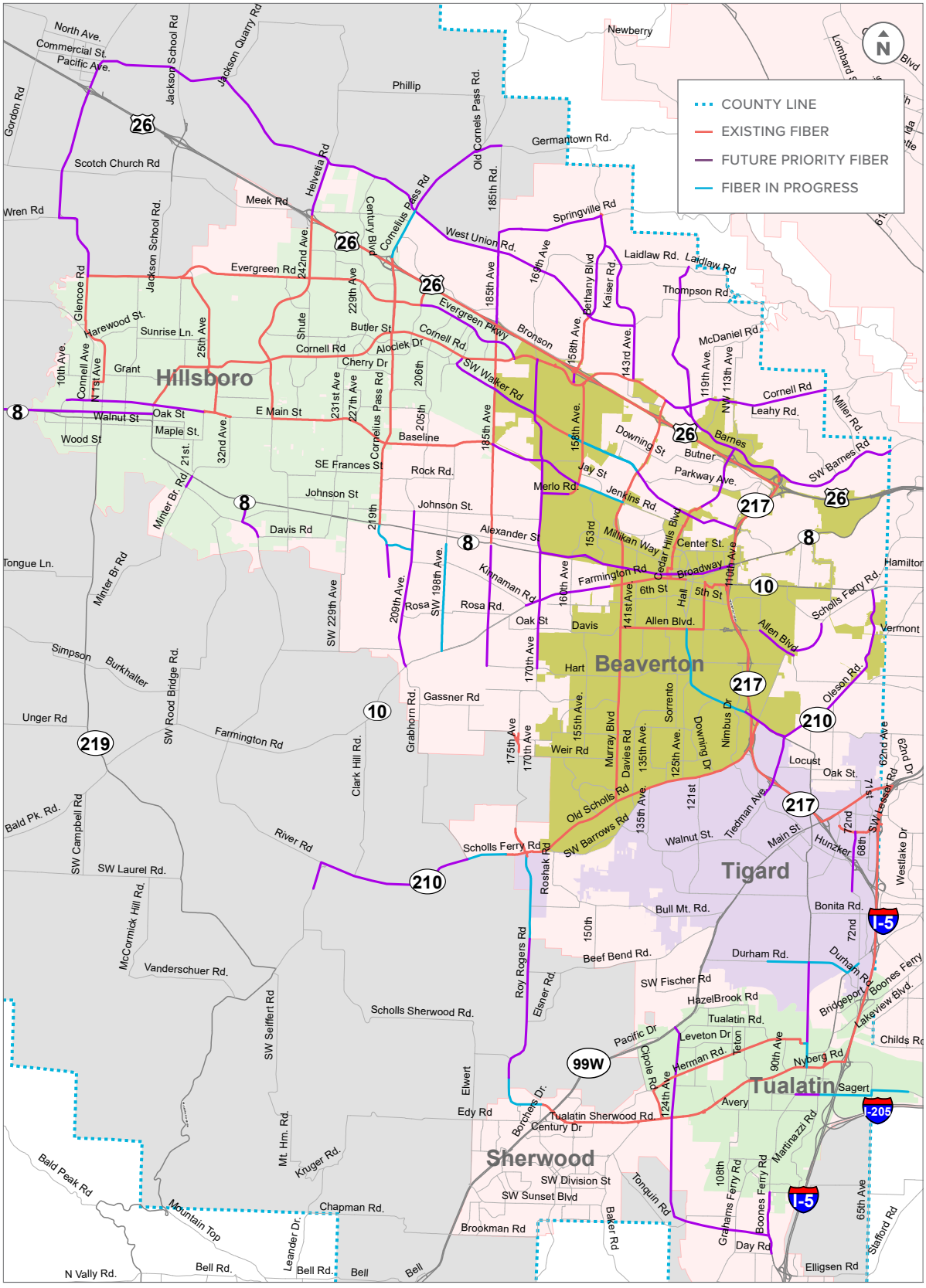


TABLE 3. PROPOSED PROJECTS

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
HILLSBORO AREA ITS PROJECTS						
1st Avenue	**WC01**	**1st Avenue**	Traffic Operations: Communications	• EOC: Use existing twisted pair on 1st Avenue from Lincoln Street to Washington Street • Wireless: Install communications link between 1st Avenue/Washington Street and 10th/Washington Street *Note: Use of existing City of Hillsboro spare twisted pair between 1st Avenue/ Washington Street and Cornell Road/Washington may be an alternative to installing wireless communications, or installing new conduit to the communications room in the parking garage between Adams and Washington may be another alternative.*	$15,000	$450
Cornell Road	**WC02**	**Cornell Road West Safe and Smart Corridor (Main to US 26)**	"Safe and Smart Urban Corridor" with CCTV, smart signals, adaptive signal, communications, ATSPM, and safety analytics	• Upgrade to ATC controller from Grant to 34th and Aloclek to 106th (16 signals) • Smart Signals: Install enhanced detection, connected vehicle/transit and freight priority; and/or adaptive treatments from 10th Avenue to US 26 • Install new CCTV cameras and middle switch between 10th Avenue and Brookwood Parkway (six signals) • Install new CCTV cameras and middle switches between Brookwood Parkway and Cornelius Pass Road (nine signals) • Fiber: Install new fiber optic cable from Main St to 25th Avenue/Brookwood to Cornelius Pass/Aloclek Drive to Evergreen Parkway • Upgrade traffic signal systems to ATSPM on Cornell Road from 10th Avenue to Evergreen Parkway; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals	$4,180,000	$125,400
Cornell Road	**WC03**	**Cornell Road East Safe and Smart Corridor (US 26 to Miller)**	"Safe and Smart Urban Corridor" with CCTV, smart signals, adaptive signal, communications, ATSPM, and safety analytics	• Upgrade to ATC controller from 153rd to Miller Road (10 signals) • Smart Signals: Install enhanced detection, connected vehicle/transit and freight priority; and/or adaptive treatments from 153rd to Miller Road • Install new CCTV cameras and middle switch between 153rd Avenue and Miller Road (10 signals) • Fiber: Install new fiber optic cable from US 26 to Miller Road • Upgrade traffic signal systems to ATSPM on Cornell Road from 153rd Avenue to Evergreen Parkway; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals	$3,760,000	$112,800

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Cornelius Pass Road	**WC04**	**Cornelius Pass Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with adaptive signal, smart signals, communications, ATSPM and safety analytics	• Smart Signals: Install enhanced detection, ATC controllers, connected vehicle, truck and transit priority treatments from West Union Road to TV Highway • Fiber: Install new fiber optic cable from US 26 to West Union and TV Highway to Kinnaman • Upgrade traffic signal systems to ATSPM on Cornelius Pass Road between Johnson Street and Germantown Road; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • Adaptive: Install adaptive signal system from West Union Road to TV Highway (19 signals)	$1,500,000	$45,000
185th Avenue	**WC05**	**185th Avenue Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with adaptive signal, smart signals, ATSPM, safety analytics, and TSP	• Upgrade to ATC controller from Springville to Farmington (23 signals) • Smart Signals: Install enhanced detection, connected vehicle and/or adaptive system treatments from Rock Creek Boulevard to Baseline Road • Upgrade traffic signal systems to ATSPM on 185th Avenue between Farmington Road and Springville Road; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • Truck and transit signal priority for Route 52 • Adaptive: Install adaptive signal system from Rock Creek Boulevard to Baseline Road (23 signals)	$2,640,000	$79,200
Baseline Road	**WC06**	**Main Street/ Baseline Road/ Jenkins Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, ATSPM, and safety analytics	• Upgrade to ATC controllers from 1st Avenue to Hocken Boulevard (28 signals) • EOC: Use existing twisted pair on Jenkins Road from Century Boulevard to 158th Avenue, and on Merlo Road from Jenkins Road to the TriMet Merlo Garage driveway • Fiber: Install new fiber optic cable on Washington (10th to Main), Main (10th to Brookwood), and Baseline (185th to 158th) • Upgrade traffic signal systems to ATSPM on Baseline/Jenkins Road between Brookwood Avenue and 158th Avenue, allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • TSP for Route 47, 88, and 62	$3,940,000	$118,200

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Helvetia Road	**WC07**	**Helvetia Road Overheight Detection**	Traveler Information: Overheight detection, VMS	• Overheight detection at Helvetia Road	$400,000	$12,000
Wren Road	**WC08**	**Wren Road Conflict Warning**	Traveler Information: Conflict warning, VMS	• Intersection conflict warning message sign on Wren Road at Susbauer Road	$400,000	$12,000
Evergreen Road	**WC09**	**Evergreen Road Signals**	Traffic Operations: ATC controllers and TSP	• Upgrade to ATC controllers from Glencoe to Town Center (17 signals) • TSP for Route 46 and 47	$500,000	$15,000
Washington Street	**WC10**	**Washington Street Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controllers from 2nd to 9th (eight signals)	$60,000	$1,800
Greater Hillsboro	**WC11**	**Greater Hillsboro Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controllers at Imbrie/Fred Meyer, Stucki/Thorncroft, Shute/Airport, 28th/Veterans (four signals)	$40,000	$1,200
BEAVERTON AREA ITS PROJECTS						
Bethany Boulevard	**WC12**	**Bethany Boulevard Signals**	Traffic Operations: Communications, ATC controllers, and TSP	• Upgrade to ATC controllers from Springville Road to Oak Hills (six signals) • Smart Signals: Install enhanced detection, connected vehicle/transit and freight priority; and/or adaptive treatments • Fiber: Install new fiber optic cable on Bethany, from West Union to NW Springville Road • Upgrade traffic signal systems to ATSPM on Bethany from Cornell to Springville • Truck and transit signal priority for Route 67	$1,539,000	$46,170

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Barnes Road	**WC13**	**Barnes Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, smart signals, ATSPM, and safety analytics	• Upgrade to ATC controller from Cornell Rd to Burnside (15 signals) • Smart Signals: Install enhanced detection, ATC controllers, connected vehicle, and/or adaptive signal systems from Cornell Road to Washington-Multnomah County line • Fiber: Install new fiber optic cable on Barnes Road from Cedar Hills to Burnside • Upgrade traffic signal systems to ATSPM on Barnes Road between Cornell Road and SW Laehy Road (13 intersections); allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • Transit Signal Priority for Route 20 and 62 • Integrated corridor management with US 26	$3,902,000	$117,060
Walker Road (East)	**WC14**	**Walker Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, smart signals, ATSPM, and safety analytics	• Smart signals: Install enhanced detection, ATC controllers, connected vehicle (eight intersections) • Fiber: Install new fiber optic cable from 185th to Schendel; and from Murray to Highway 217	$2,872,000	$86,160
158th Avenue	**WC15**	**158th Avenue**	Traffic Operations: Communications, ATC controllers, and TSP	• Upgrade to ATC controller from Waterhouse to Menlo Garage (nine signals) • Smart signals: Install enhanced detection, ATC controllers, connected vehicle • Truck and transit priority for Route 67	$855,000	$25,650
Murray Boulevard	**WC16**	**Murray Boulevard Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with adaptive signals, smart signals, communications, ATSPM, safety analytics, and TSP	• Upgrade to ATC controller from Cornell Road to Scholls Ferry Road (17 signals) • Smart Signals: Install enhanced detection, connected vehicle and/or adaptive signal system from US 26 to Scholls Ferry Road • Fiber: Install new fiber optic cable on Murray Boulevard from Cornell to US 26, and from Scholls Ferry to Barrows • Upgrade traffic signal systems to ATSPM on Murray Boulevard between US 26 and Farmington Road; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • TSP for Route 62 • Adaptive: Install adaptive signal system from US 26 to Scholls Ferry Road	$2,431,000	$72,930

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Jenkins Road	**WC17**	**Jenkins Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, ATSPM, and safety analytics	• Smart Signals: Install enhanced detection, connected vehicle and/or adaptive signal system • Fiber: Install new fiber optic cable on Jenkins Road from 158th Avenue to Cedar Hills Boulevard • Upgrade traffic signal systems to ATSPM on Jenkins Road between 158th Avenue and Cedar Hills Boulevard; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals	$1,891,000	$56,730
Cedar Hills Boulevard	**WC18**	**Cedar Hills Boulevard Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, ATSPM, and safety analytics	• Fiber: Install new fiber optic cable from Barnes Road to Jenkins Road • Upgrade traffic signal systems to ATSPM on Cedar Hills Boulevard between SW Hall Boulevard and SW Walker Road; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals	$1,874,000	$56,220
170th Avenue	**WC19**	**170th/173rd Avenues**	Traffic Operations: Communications, ATC controllers, and TSP	• Upgrade to ATC controller from Walker to Bany (eight signals) • Fiber: Install new fiber optic on 170th/173rd Avenues from Cornell to Bany Road • Smart signals: Install enhanced detection, connected vehicle, and/or adaptive signal system • Truck and transit priority for Route 88	$3,260,000	$97,800
Farmington Road	**WC20**	**Farmington Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with communications, ATSPM, and safety analytics	• Upgrade to ATC controller from 209th to 149th (seven signals) • Smart Signals: Install enhanced detection, connected vehicle, and/or adaptive signal system • Fiber: Install new fiber optic cable from 149th to 209th • Upgrade traffic signal systems to ATSPM on Farmington Road between SW Walker Road and 209th Avenue; allows for monitoring of the County transportation system using archived historical operations data and analysis tools • Install hardware/software for safety analytics at traffic signals • Truck and transit priority for Route 52 and 88	$2,981,000	$89,430

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Scholls Ferry Road	**WC21**	**Scholls Ferry Road Safe and Smart Corridor**	"Safe and Smart Urban Corridor" with adaptive signals, smart signals, and communications	• Upgrade to ATC controller from 147th to Barrows and Denney to Beaverton-Hillsdale Highway (eight signals) • Smart Signals: Install enhanced detection, ATC controllers, connected vehicle, and/or adaptive signal system from 175th Avenue to Allen Boulevard • Fiber: Install new fiber optic cable on Allen Boulevard from the City of Beaverton Maintenance Building to Scholls Ferry Road and on Scholls Ferry Road from Allen Boulevard to Denney Road • Fiber: Install new fiber optic cable on Scholls Ferry Road/Old Scholls Ferry Road from Laurelwood Avenue to Allen Boulevard • Fiber: Install new fiber optic cable on Scholls Ferry Road, from Denney to Olson; from Tile Flat to Mountainside High School • Truck and transit priority for Route 56 and 92 • Adaptive: Install adaptive signal system from 175th Avenue to Allen Boulevard	$3,005,000	$90,150
Barrows Road	**WC22**	**Barrows Road Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controller from Big Als to Walnut (four signals)	$32,000	$960
Brockman Street	**WC23**	**Brockman Street Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controller from Bridletrail to Davies (four signals)	$32,000	$960
Greater Beaverton	**WC24**	**Greater Beaverton Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controller at 125th/Conestoga, 125th/Longhorn, 155th/Davis, 173rd/Five Oaks, Denney/King, Hart/155th, Hocken/Millikan, Jenkins/Mall B, Lombard/5th, Lombard/Millikan, Millikan/153rd, Western/5th, 170th/Lisa, Farmington/142nd, Hocken/Hall, Cedar Hills/Dawson (16 signals)	$125,000	$3,750
TIGARD/TUALATIN/SHERWOOD AREA ITS PROJECTS						
Greenburg Road	**WC25**	**Greenburg Road Signals**	Traffic Operations: ATC controller and TSP	• Upgrade to ATC controller from Garden Home to Tiedeman (nine signals) • Smart Signals: Install enhanced detection, ATC controllers, connected vehicle, and/or adaptive signal system • Fiber: Install new fiber optic cable on Greenburg from Locust to Tiedeman • Install hardware/software for safety analytics at traffic signals • TSP for Routes 76 and 78	$919,000	$27,570

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Bridgeport Road/Upper Boones Ferry Road	**WC26**	**Bridgeport Road**	Traffic Operations: Communications, ATC controllers, and TSP	• Upgrade to ATC controllers (6 signals) • Smart Signals: Install enhanced detection, connected vehicle, and/or adaptive signal system • Fiber: Install new fiber optic cable on Bridgeport Road from Upper Boones Ferry Road to 65th Avenue • TSP for Routes 96, 76, and 97	$200,000	$6,000
Grahams Ferry Road	**WC27**	**Grahams Ferry Road Overheight Detection**	Traveler Information: Overheight detection	• Upgrade overheight detection on Grahams Ferry Road	$88,000	$2,640
SW McDonald Street	**WC28**	**SW McDonald Street Detection**	Traveler Information: Detection for travel time and speed monitoring	• Install detection for travel time and speed monitoring at SW McDonald Street and SW Hall Boulevard	$103,000	$3,090
124th Avenue/ Basalt Creek Parkway	**WC29**	**124th Avenue Signals**	Traffic Operations: ATC controllers	• Upgrade to ATC controllers from 99W to Grahams Ferry Road (six signals) • Smart Signals: Install enhanced detection, connected vehicle and/or adaptive signal system • Fiber: Install new fiber optic cable on 124th/Basalt Creek from 99W to Grahams Ferry Road, on Grahams Ferry Road from Basalt Creek to Day Road, on Day Road from Grahams Ferry Road to Boones Ferry Road • Upgrade traffic signal systems to ATSPM	$4,184,000	$125,520
Boones Ferry Road	**WC30**	**Boones Ferry Road Communication**	Traffic Operations: Communication Installation	• Fiber: Install new fiber optic cable on Boones Ferry from Grahams Ferry to Day Road	$501,000	$15,030
COUNTYWIDE/RURAL ITS PROJECTS						
Regional	**WC31**	**Remote Traffic Signals**	Traffic Operations: Communications	• Cellular: Install communications to approximately 25 remote traffic signals	$18,000	$540
Regional	**WC32**	**CCTV Cameras**	Traveler Information: CCTV	• Install approximately 22 CCTV cameras throughout Washington County to expand network coverage	$370,000	$11,100

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Regional	**WC33**	**Curve and Intersection Warning Systems**	Traveler Information: VMS	• Install new roadway detectors to monitor traffic approaching rural intersections and install new electronic warning signs to warn vehicles of approaching cross traffic at: WC33A - 175th Avenue/High Hill Lane WC33B - River Road/Rosedale Road	$2,488,000	$74,640
Laurelwood	**WC34**	**Laurelwood Length and Speed Warning System**	Traveler Information: Detection, VMS	• Install a system on Laurelwood Road that uses roadway detectors and electronic warning signs to alert commercial drivers of approaching length restrictions and to alert all drivers of potentially dangerous speeds in approach to geometric conditions	$1,088,000	$32,640
Regional	**WC35**	**Weather Stations**	Traveler Information: RWIS	• Install road weather information systems (RWISs) to collect atmospheric and pavement data at key sites throughout the county to support maintenance decisions and traveler information: WC35A - Gaston at Hagg Lake WC35B - Manning at trailhead to Banks-Vernonia Trail	$1,250,000	$37,500
Regional	**WC36**	**Flood Warning System**	Traveler Information: Detection, VMS	• Susbauer between Long and Hornecker Roads	$444,000	$13,320
Regional	**WC37**	**Traffic Signal Modernization**	Traffic Operations: ATC controller, pre-emption, detection, and pedestrian	• Washington County performs traffic signal maintenance and supports operations for local jurisdictions that lack staffing and expertise (Forest Grove, Tigard, Tualatin, and Sherwood). Some local jurisdictions have ODOT signals that are low on ODOT's funding priority (Durham, Cornelius). Many of their systems are antiquated and not consistent with current Washington County practice. Items such as signal controllers, traffic signal cabinets, emergency vehicle pre-emption, bicycle detection, countdown pedestrian crossing timers, and signal displays would be replaced.	$600,000	$18,000
Regional	**WC38**	**Roadside Connected Vehicle System and Internet of Things System**	Emerging Technologies: Connected Vehicle Application	• Connected vehicle radio, IoT router, machine vision, and big data enabling equipment deployment	$5,000,000	$150,000
Regional	**WC39**	**Autonomous Vehicle Enabling Systems – Big Data**	Emerging Technologies: Connected Vehicle Application	• Backend software to process, query, and report results from big data as information	$500,000	$15,000

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Regional	**WC40**	**Traffic Incident Management**	Traffic Operations: Incident/ Emergency Management	• Interagency video and control systems integration for 911 dispatch, failsafe power systems for ITS and signals	$1,300,000	$39,000
Regional	**WC41**	**Countywide Back-Up Power Project**	Traffic Operations, Incident/ Emergency Management: Battery back-up systems and LED switch outs	• Install battery back-up systems at 150 countywide strategic locations for enhanced mobility and safety during widespread power outage events	$984,000	$196,800
Regional	**WC42**	**Dashboard for Automated Performance Reporting**	Emerging Technologies: Automated performance reporting	• Develop an automated performance reporting system for data from ATSPM project(s), and/or travel time system	$200,000	$6,000
Regional	**WC43**	**System Verification and Validation**	Emerging Technologies: System Verification and Validation	• Project would support independent research and evaluation needs through partners such as universities, pooled fund studies, and collaborative efforts to test and document effectiveness of next generation traffic and ITS-related sensors and systems	$500,000	$15,000
LOCAL AGENCY ITS PROJECTS						
Local Agency	**LA01**	**Forest Grove: Traffic Signals**	Traffic Operations: Communications	• EOC: Use existing twisted pair on Pacific Avenue from B Street to Hawthorne Street, on 19th Street from Main Street to Hawthorne Street, and on Main Street from Pacific Avenue to 19th Street • Wireless: Install communications link between WSC radio tower and the new Forest Grove EOC network • Cellular: Install communications to Pacific Avenue/Maple Street traffic signal	$124,000	$3,720
Local Agency	**LA02**	**Tigard: 72nd Avenue**	Traffic Operations: Communications	• Fiber: Install new fiber optic cable from Dartmouth Street to the OR 217 southbound ramps/Varns Street • EOC: Use existing twisted pair from Bridgeport Road to the Bridgeport Village access (north) • Wireless: Install communications link between the Bridgeport Village access (north) and Durham Road	$1,371,000	$41,130

TABLE 3. PROPOSED PROJECTS, *CONTINUED*

CORRIDOR	PROJECT NUMBER	PROJECT NAME	PROJECT TYPE/THEME	PROJECT DESCRIPTION	CAPITAL COST	ANNUAL O&M COST
Local Agency	**LA03**	**Tigard: Bonita Road**	Traffic Operations: Communications and ATC controller	• Upgrade to ATC controllers from 74th to 72nd (two signals) • Wireless: Install communications link from 72nd Avenue to 74th Avenue	$31,000	$930
Local Agency	**LA04**	**Tigard: Traffic Signals**	Traffic Operations: Signal communications	• Cellular: Install communications to approximately five remote traffic signals	$4,000	$120
Local Agency	**LA05**	**Tualatin: Herman Road**	Traffic Operations: Communications	• Wireless: Install communications link from 124th Avenue to Herman Road/ Tualatin Road • EOC: Use existing twisted pair from Herman Road/Tualatin Road to Boones Ferry Road/Martinazzi Avenue	$29,000	$870
Local Agency	**LA06**	**Tualatin: Boones Ferry Road**	Traffic Operations: Communications and detection for travel time and speed monitoring	• Fiber: Share existing Sherwood and PGE fiber optic cable on Boones Ferry Road from Tualatin Road to Grahams Ferry Road and on Avery Street from Boones Ferry Road to 95th Avenue • Fiber: Install new fiber optic cable on Upper Boones Ferry from Martinazzi to Bridgeport • Install detection for travel time and speed monitoring at SW Boones Ferry Road and SW Day Road *Note: Provide connection to Washington County LUT fiber optic cable installed with Project LA07, if installed prior to Project LA08*	$543,000	$16,290
Local Agency	**LA07**	**Sherwood: Traffic Signals**	Traffic Operations: Communications	• Fiber: Share existing Sherwood and Washington County LUT fiber to connect three remote traffic signals to the Tualatin City Hall	$20,000	$600
Local Agency	**LA08**	**Tigard: Dartmouth Road Signals**	Traffic Operations: ATC controller	• Upgrade to ATC controllers from Costco to 72nd (three signals)	$24,000	$720
Local Agency	**LA09**	**Tigard: Walnut Street**	Traffic Operations: ATC controller and TSP	• Upgrade to ATC controllers from Barrows to Tiedeman (six signals) • TSP for Route 45	$47,000	$1,410