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Technical Memorandum #3: Existing and Future Transportation Conditions

January 18, 2023 Project# 27003.007

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RE: OR 6: Wilson River Highway Corridor Study (HB 4053)

OR 6: Wilson River Highway Corridor Study (HB 4053)

This memorandum documents existing and future conditions related to the OR 6: Wilson River Highway Corridor Study (HB 4053). The study limits for the project are from mile point (MP) 1.0 to 49.0. Throughout the memorandum, the study corridor will be referenced as "OR 6 study corridor".

OR 6 is a rural Oregon Department of Transportation (ODOT) highway that connects the Oregon Coast via the City of Tillamook to the greater Portland metro area via the City of Banks. Over the years, the physical and functional conditions of the corridor have worsened, and this comprehensive corridor study seeks to identify the best solutions to address the needs for the corridor and surrounding community.

Contents

TRANSPORTATION SYSTEM INVENTORIES

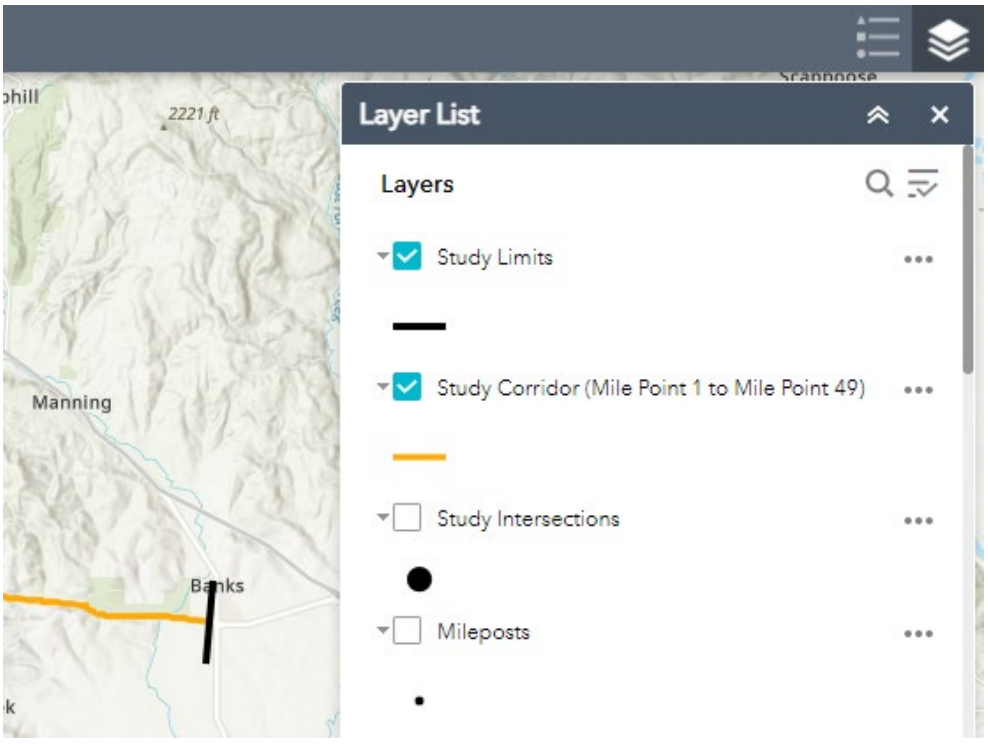
This section summarizes existing data and transportation inventories of the study corridor.

Navigating the Online Map

Due to the length of the OR 6 study corridor and to simplify legibility of the associated geographic information system (GIS) data, an online map was created to compile the inventory for the project. The map can be accessed here: https://kai.maps.arcgis.com/apps/webappviewer/index.html?id=9083ecabf0844319a031390986ef9040

When you first use the link, allow time for the app to load due to the amount of data that is provided. The legend and layer list can be found in the top right corner.

You can toggle layers on and off by using the checkmark next to their name in the layer list. For more information about a layer, use the three-dot icon to the right of the layer name in the layer list.



Online Map Image: Example of Interactive Map and Layer List

Area Context

The online map includes topography and campground information, illustrating the context and development potential of the corridor. Land use information was also reviewed from Washington and Tillamook counties.

Topography

The OR 6 study corridor traverses challenging terrain that includes steep grades and frequent elevation changes. Specifically, the corridor from MP 5 to MP 41 traverses major ridges, rivers, and creeks. The corridor includes several active slides, which are further discussed in the Geotechnical Context section of this memorandum.

Online Map Image: Study Corridor

Zoning

The eastern portion of the OR 6 study corridor east of MP 32.91 is in Washington County. The image below is from the County's Intermap app online that allows review of zoning: https://wcgis1.co.washington.or.us/Html5Viewer/index.html?viewer=Intermap.

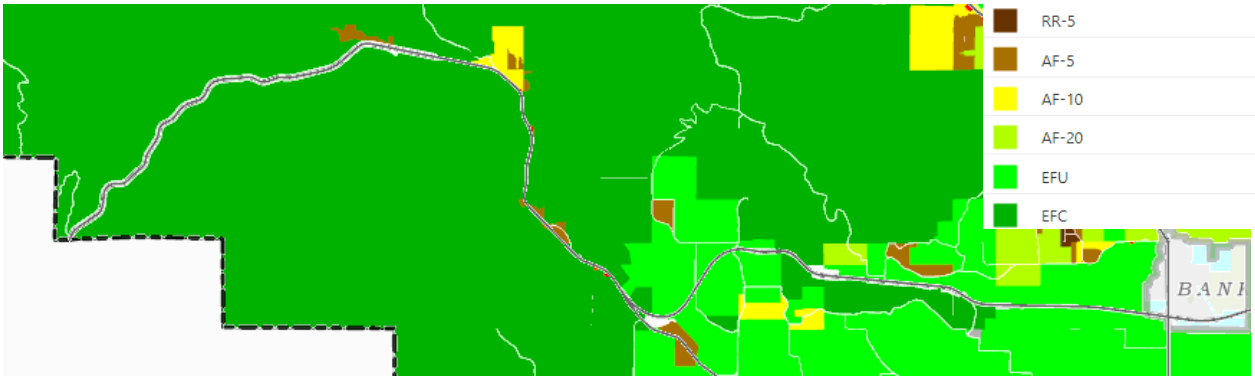


Image from Washington County Intermap

As shown, there are primarily two land use types along the Washington County portion of the corridor:

- Exclusive Forest and Conservation (EFC) shown in dark green and
- Exclusive Farm Use (EFU) shown in light green.

There are a few pockets of Agriculture and Forest (AF) uses including:

- AF-10 shown in yellow and
- AF-5 shown in brown.

The western portion of the corridor west of MP 32.91 is located in Tillamook County, which also provides an interactive online map to review zoning, as shown below: http://tillamookcountymaps.co.tillamook.or.us/geomoose2/geomoose.html.

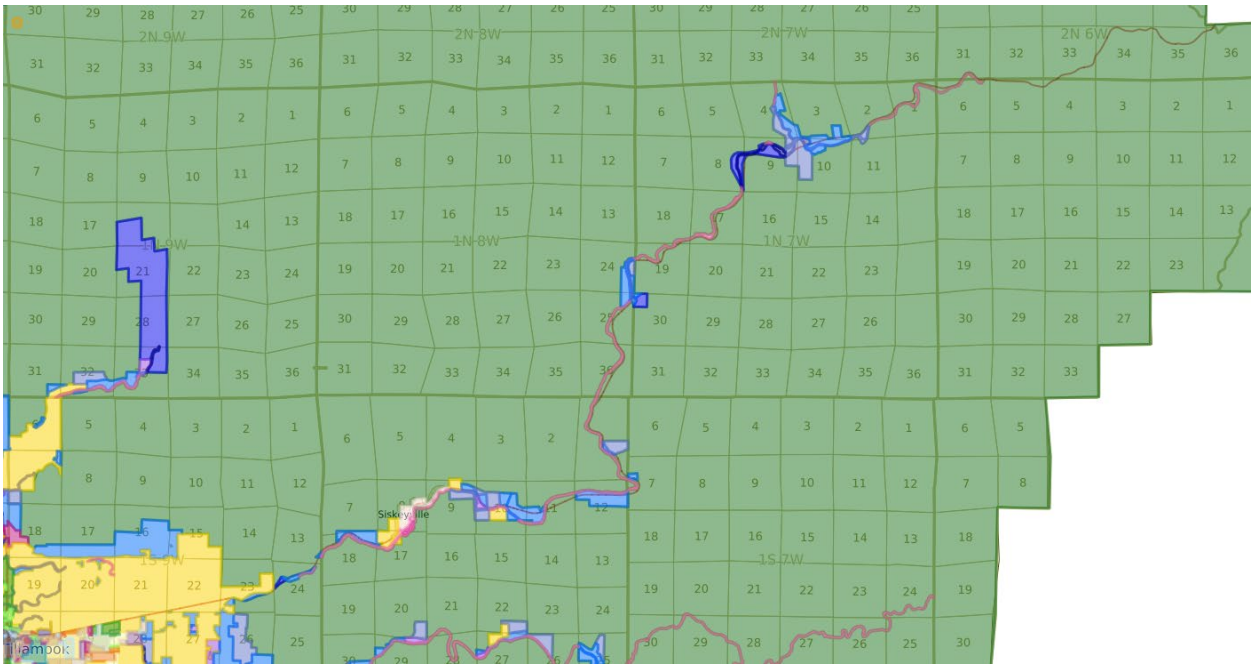


Image from Tillamook County Online Map

As shown, there is primarily one zoning designation in the Tillamook County portion of the corridor:

- Forest (F) shown in green.

There are a few pockets of farm, residential, and commercial land uses including:

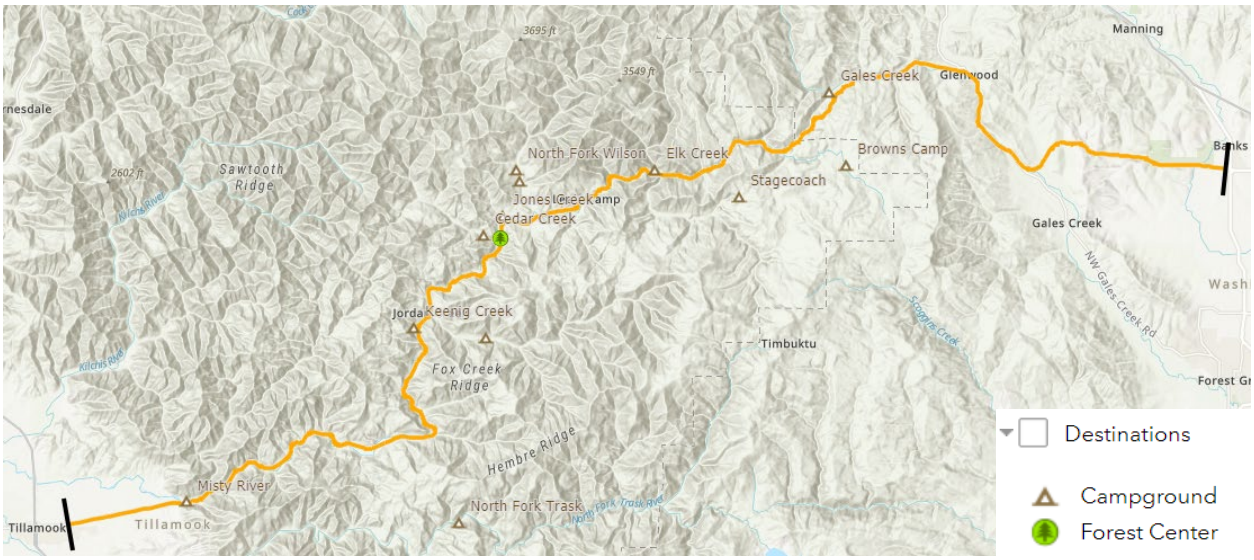
- Farm (F-1) shown in yellow,
- Rural Residential 2 Acre (RR-2) shown in light blue,
- Community Single Family Residential (CSFR) shown in white,
- Community Commercial (CC) shown in pink
- Recreation Management (RM) shown in dark blue, and
- Small Farm and Woodlot 20 Acre (SFW-20) shown in light purple.

As shown in the Washington County and Tillamook County zoning maps, the land use designations along the OR 6 study corridor are primarily forest and agricultural, allowing minimal development. The corridor is anticipated to remain a primarily rural corridor.

Locations of Campgrounds

As shown through the online map, there are many campgrounds and forest centers located in the middle portion of the OR 6 study corridor, both on the north side and south side of the roadway. The densest spacing of access to campgrounds and forest centers occurs between

MP 21 and MP 24, where Cedar Creek, North Fork Wilson, Diamond Mill, and Jones Creek campgrounds are located. Recreational uses include camping, hiking, and fishing.



Online Map Image: Locations of Campgrounds on the OR 6 Study Corridor

ODOT Broadband Plan

As identified in the Oregon Department of Transportation (ODOT) Broadband Strategy & Implementation Plan, which is a general document that does not provide specific recommendations for actions, the OR 6 study corridor is located within a rural portion of the State that is currently underserved by broadband. The majority of the corridor is rated as "underserved" or "unconnected" to broadband. This results in limited communication for all users of the corridor and impacts emergency response times to incidents and crashes along the OR 6 corridor.

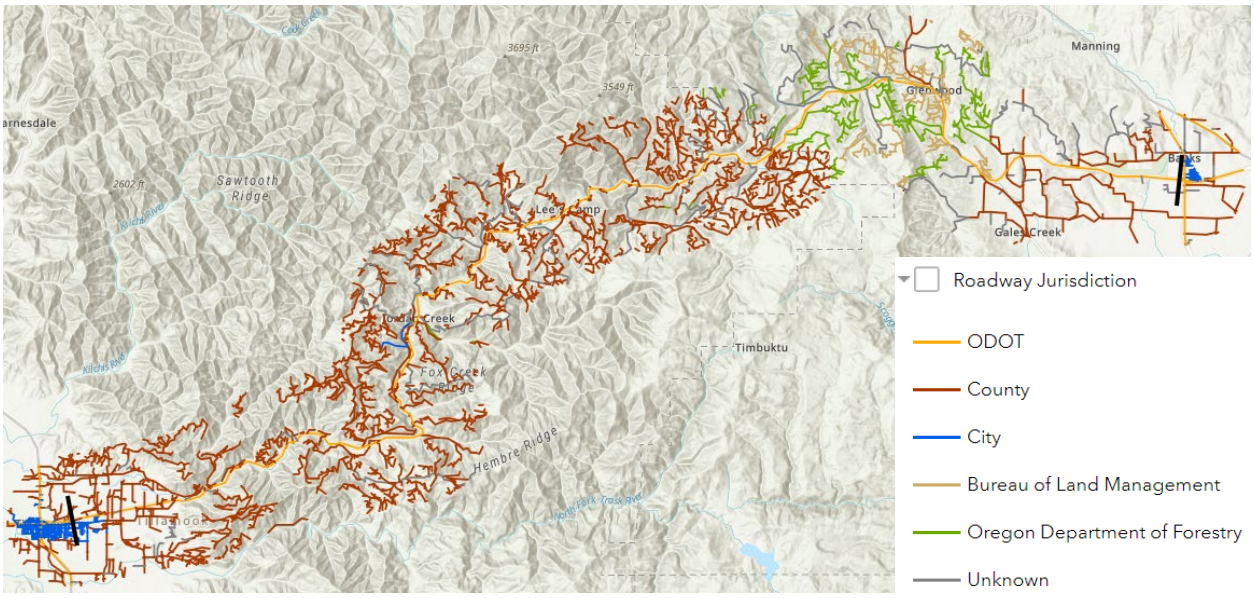
Roadway Inventory

The online map includes an inventory of roadway attributes and classifications for the OR 6 study corridor as described below. Data for download was obtained from the ODOT ftp site or provided directly from ODOT, and therefore, some aspects may not match what is shown in ODOT's TransGIS online application.

Roadway Jurisdiction

OR 6 is a Regional Highway and Scenic Byway owned and operated by ODOT. The roadways intersecting with the OR 6 study corridor are owned and operated by Tillamook County, Washington County, the City of Tillamook, the City of Banks, Bureau of Land Management,

and Oregon Department of Forestry. The online map includes roadways within a 2-mile buffer of the OR 6 study corridor, the majority of which are under Tillamook County jurisdiction.



Online Map Image: Roadway Jurisdiction Within 2 Miles of OR 6 Study Corridor

Freight Amenities, Designations, and Restrictions

Based on ODOT's TransGIS online app, the entire OR 6 study corridor has the following freight designations:

- Oregon Highway Plan (OHP) freight route
- High clearance route
- Reduction review route
- National network - state

In addition, there are no weigh in motion sites on the OR 6 study corridor.

Roadway Lanes

The online map shows the number of lanes on OR 6 (to inform location of passing lanes), locations of turn lanes, and location and width of shoulders. Although not symbolized in the interactive map, the team also reviewed ODOT's inventory of lane width data in TransGIS. In general, the lane widths on OR 6 are 12 to 13 feet wide. There are two travel lanes (one in each direction) along the majority of the corridor. On the west end (MP 1 to 2.7), there are three to four lanes. There are passing lanes located between MP 15 and MP 46 at the following locations:

- Eastbound passing lane locations:

- MP 16.29 to MP 16.43 (approximately 740 feet) (overlaps with westbound passing lane, resulting in a 4-lane cross-section for this segment)
- MP 25.80 to MP 26.72 (approximately 4,980 feet)
- MP 30.88 to MP 31.85 (approximately 5,200 feet)
- MP 32.20 to MP 32.82 (approximately 2,980 feet)
- MP 43.20 to MP 43.90 (approximately 3,710 feet)

- Westbound passing lane locations:

  - MP 15.97 to MP 16.43 (approximately 2,430 feet)
  - MP 33.53 to MP 33.78 (approximately 1,310 feet)
  - MP 34.40 to MP 34.66 (approximately 1,370 feet)
  - MP 35.45 to MP 35.70 (approximately 1,370 feet)
  - MP 44.25 to MP 45.38 (approximately 5,990 feet)

There are several left-turn and right-turn lanes present throughout the OR 6 study corridor between MP 1.70 and MP 22.31. Turn lane locations include:

- Left-turn lane locations

  - MP 1.80 to MP 1.94 (approximately 700 feet) for westbound traffic to the western Wilson River Loop intersection
  - MP 1.94 to MP 2.08 (approximately 730 feet) for eastbound traffic to the eastern Wilson River Loop intersection
  - MP 2.46 to MP 2.52 (approximately 350 feet) for eastbound traffic to Olsen Road
  - MP 2.53 to MP 2.58 (approximately 260 feet) for westbound traffic to Olsen Road
  - MP 4.22 to MP 4.28 (approximately 320 feet) for westbound traffic to Fairview Road
  - MP 22.17 to MP 22.23 (approximately 310 feet) for eastbound traffic to Tillamook Forest Center
  - MP 22.61 to MP 22.65 (approximately 210 feet) for eastbound traffic to Jones Creek Road

- Right-turn lane locations

  - MP 1.70 to MP 1.80 (approximately 530 feet) eastbound traffic to the south leg of Wilson River Loop
  - MP 2.08 to MP 2.11 (approximately 150 feet) westbound traffic to the north leg of Wilson River Loop
  - MP 22.23 to MP 22.31 (approximately 420 feet) for westbound traffic to Tillamook Forest Center
  - Although not a right-turn lane, there is an exit ramp from OR 6 to NW Gales Creek Road at approximately MP 42.22.

Shoulders are present throughout the OR 6 study corridor, ranging from 1 to 8 feet wide. Locations with narrow shoulders of 1-3 feet include:

- Westbound MP 0.98 to MP 4.13
- Eastbound MP 5.82 to MP 6.00
- Eastbound MP 11.77 and MP 11.84
- Eastbound MP 16.31 to MP 16.43
- Eastbound MP 42.33 to MP 42.40

Posted and Observed Speed

The posted speed is 55 mph for the entire length of the OR 6 study corridor.

ODOT shared a 2015 speed zone investigation on OR 6 from Timber Road to Gales Creek (MP 38.82 to MP 42.34). The investigation was prompted by two separate citizen requests to lower the posted speed for this segment. As stated in the document: "Five spot speed checks showed the average 85th percentile speed to be 64 mph. Seventy eight percent of the cars are traveling within the pace limits of 55 - 64 mph."

Based on the investigation, including 85th percentile speed data, ODOT recommended retaining the existing speed limit of 55 mph.

Roadway Curves

Based on ball bank data from ODOT, there are 124 curves along the OR 6 study corridor. Curves with average calculated speeds of 60 MPH or less and that do not have curve warning signs include (available MP data shown is for Point of Curve and Point of Tangent):

- Eastbound (with curve ID X.10)
  - Curve 82.10 (MP 31.18 to MP 31.30) (under 50 mph)
  - Curve 83.10 (MP 31.31 to MP 31.51) (under 50 mph)
- Westbound (with curve ID X.20)
  - Curve 75.20 (MP 29.74 to MP 29.89) (under 55 mph) – curve is located within a series of curves, with a prior curve warning sign
  - Curve 80.20 (MP 30.94 to MP 31.07) (under 55 mph)
  - Curve 81.20 (MP 31.08 to MP 31.18) (under 55 mph)
  - Curve 82.20 (MP 31.18 to MP 31.30) (under 50 mph) – curve is located within a series of curves, with a prior curve warning sign

Online Map Image: Average Calculated Speed for Curves along OR 6 Study Corridor

Online Map Image: Curves with Posted Curve Warning Signs along OR 6 Study Corridor

Pavement Conditions

Based on data from ODOT, the pavement conditions for the OR 6 study corridor range from very good to poor. The segments with poor pavement conditions include:

- MP 4.40 to MP 11.80
- MP 32.96 to MP 35.20

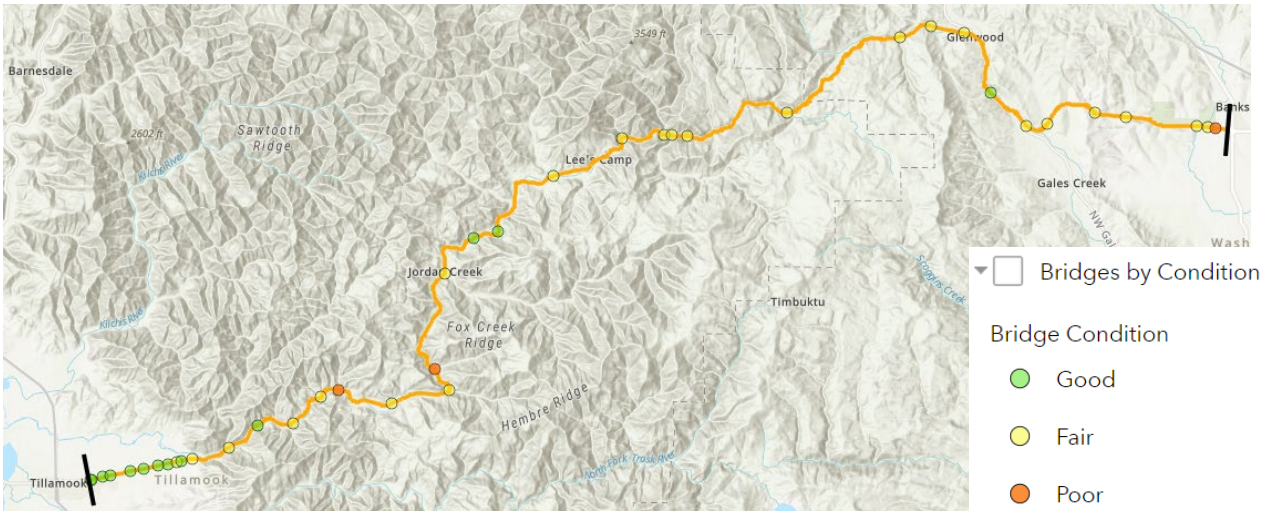
Online Map Image: Pavement Conditions on the OR 6 Study Corridor

Bridge Inventory

The online map includes an inventory of bridges along the OR 6 study corridor as described below.

Bridge and Culvert Locations

As shown though the online map, there are 39 bridges or culverts located throughout the OR 6 study corridor.



Online Map Image: Bridge and Culvert Locations on OR 6 Study Corridor

Bridge Condition

As shown through the online map, 13 locations have a bridge condition rating of good, 23 fair, and three poor. The poor condition bridges are located at the following locations:

- MP 10.00
- MP 14.53
- MP 48.57

Bridge Railing Condition

Bridge railings are a barrier on sides of bridge to contain and redirect any vehicles that are deviating from the bridge alignment. They may also include handrails and railings for pedestrians and bicycles. Based on ODOT's Bridge Inspection Coding Guide (July 2022), bridge railing components may include the bridge rail itself, protective screenings, rail anchorage, rail spindles/balusters, rails attached to curbs or guardrails, and rails attached to sidewalks or decks. As shown through the online map, approximately 14 locations have a bridge rail condition rating of meeting standards, four not meeting standards, and 21 do not have a rating. The bridges with rail conditions not meeting standards are located at the following locations:

- MP 5.78
- MP 23.64
- MP 27.69
- MP 36.61

Pedestrian, Bicycle, and Transit Inventory

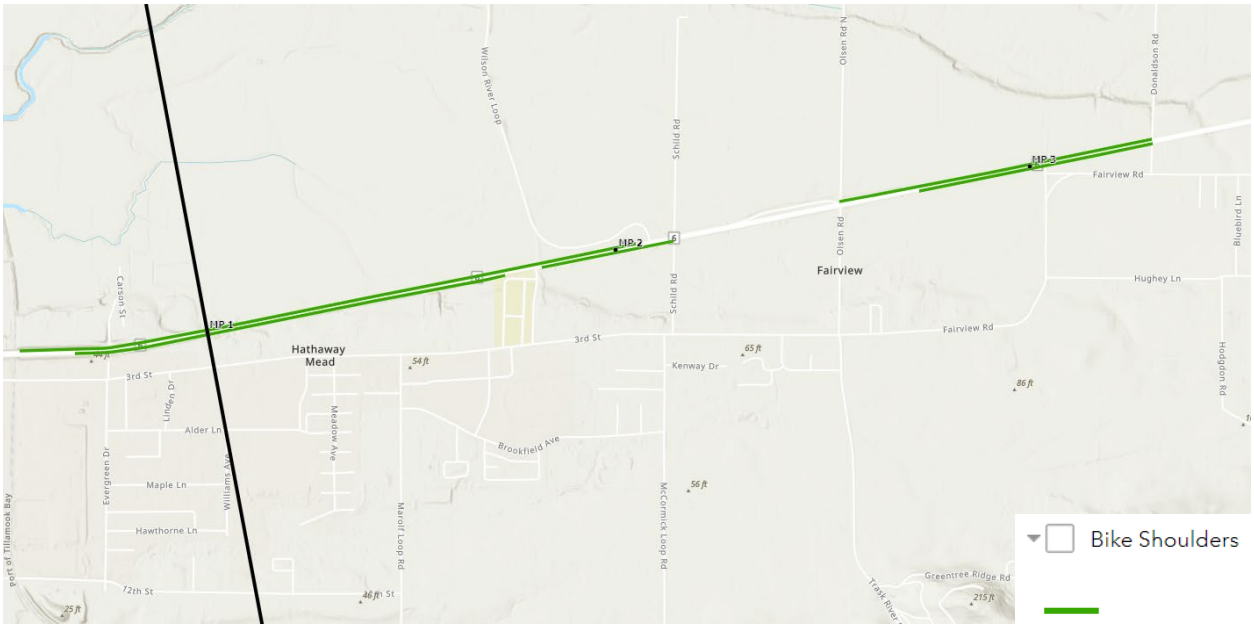
The online map includes an inventory of pedestrian, bicycle, and transit facilities for the OR 6 study corridor as described below.

Bicycle and Pedestrian Facilities

There are no pedestrian facilities along the OR 6 study corridor. The only dedicated bicycle facilities are bicycle shoulders located near the City of Tillamook from study limits to MP 4. In addition to these dedicated facilities, there are shoulders throughout the OR 6 study corridor, as described above. Locations with wide shoulders of 7 feet or greater include:

- Eastbound MP 1.02 to MP 1.70
- Eastbound MP 1.80 to MP 2.52
- Eastbound MP 2.63 to MP 4.22
- Eastbound MP 6.68 to MP 7.04
- Eastbound MP 22.02 to MP 22.35

- Eastbound MP 27.99 to MP 28.14
- Eastbound MP 41.74 to MP 42.33
- Eastbound MP 42.40 to MP 43.15
- Eastbound MP 43.95 to MP 49.08
- Westbound MP 6.68 to MP 49.08



Online Map Image: Bicycle Shoulder Locations on the OR 6 Study Corridor

At each end of the OR 6 study corridor, ODOT has major bicycle routes that provide regional connectivity. The Oregon Coast Bike Route travels through Tillamook, with both the primary and the alternative/scenic routes designated approximately one mile west of the western study limits at the intersection of OR 6 and US 101. The trailhead for the Banks-Vernonia State Trail is located approximately one mile north of the eastern study limits at the intersection of NW Banks Road and NW Sellers Road.

Transit Routes and Stops

Tillamook County Transit District (TCTD) operates Route 5 (Coastliner Tillamook – Portland) along OR 6 with three stops located on the OR 6 study corridor between MP 22 and MP 26 and highlighted below.

- Bus Stop ID 3059: Forest Center
  - MP 22.2
  - No shelter provided
  - Located in the Tillamook Forest Center parking lot, providing space for a bus to pull out of traffic for pick up and drop off

  - Parking available nearby

- Bus Stop ID 848772: Lee's Camp Store
  - MP 23.7
  - No shelter provided
  - Located outside Lee's Camp Store, providing space for a bus to pull out of traffic for pick up and drop off
  - Parking available nearby

- Bus Stop ID 2335760: King's Mountain Trail (Flag Stop)
  - MP 25.2
  - No shelter provided
  - Located adjacent to the King's Mountain Trailhead parking lot, providing space for a bus to pull out of traffic for pick up and drop off
  - Parking available nearby

The service provides two daily trips on both weekdays and weekends, running between Tillamook Transit Center and Union Station in Portland.

Online Map Image: Transit Stop Locations on the OR 6 Study Corridor

ODOT's Active Transportation Needs Inventory

ODOT's 2021 Active Transportation Needs Inventory (ATNI) project was an initial phase of work supporting Key Initiative 1: Defining the Network of the Oregon Bicycle and Pedestrian Plan Implementation Work Program. The project activities included an inventory of active transportation facilities along state highways and evaluation of the gaps and deficiencies to prioritize facility segments. ODOT hosts an online map of the results that can be found at the following link:

https://kai.maps.arcgis.com/apps/MapSeries/index.html?appid=fd738594718a403aa58d5faa033fc044.

The prioritization results are based off the following weighted evaluation factors:

- Safety
- Connectivity
- Demand
- Equity
- Stakeholder input
- Existing conditions

Pedestrian Statewide Prioritization Results

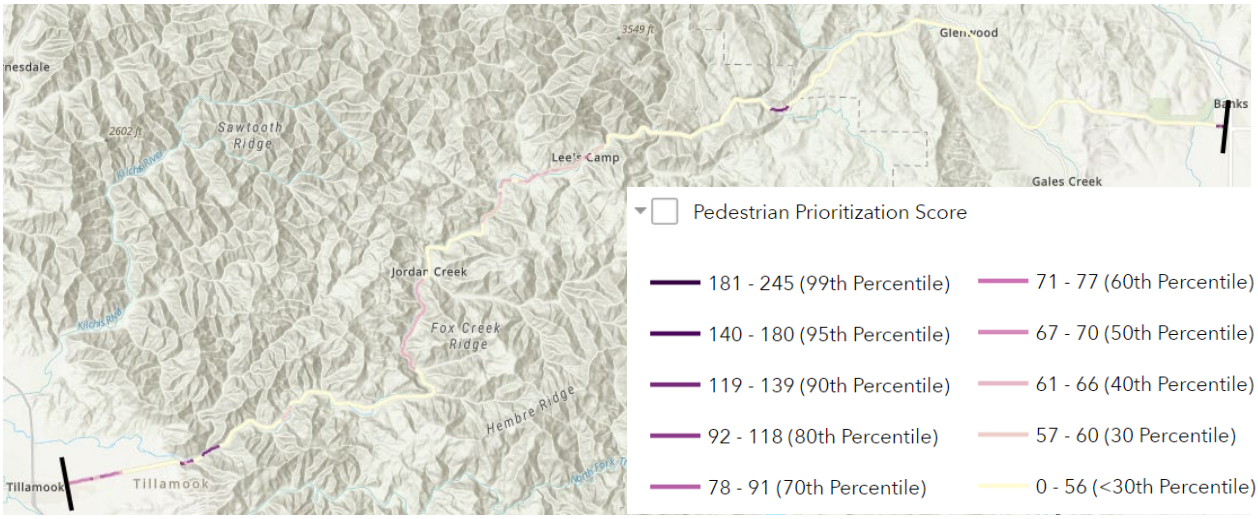
The pedestrian prioritization results shown through the online map use segmentation based on the statewide analysis. Visit ODOT's ATNI online map for further information about the statewide analysis: https://kai.maps.arcgis.com/apps/MapSeries/index.html?appid=fd738594718a403aa58d5faa033fc044.

Connectivity scores prioritize segments based on whether it is a smaller gap within an otherwise complete system. Demand scores prioritize segments that provide access to essential destinations, access to transit, and/or that are bicycle tourism routes or connections to those routes.

No segments on the OR 6 study corridor are within the 99th or 95th percentiles for the statewide analysis. The highest scores for the OR 6 study corridor were in the 90th and 80th percentiles for the state, including:

- 90th percentile for statewide results (scores of 119 to 139)
  - MP 32.00 to MP 32.20, which has a higher prioritization score compared to adjacent segments due to the connectivity score
  - MP 48.90 to MP 49.00, which has a higher prioritization score compared to adjacent segments due to the connectivity score and demand score
- 80th percentile for statewide results (scores of 92 to 118)
  - Several segments between MP 4.40 and MP 6.10, which have higher prioritization scores compared to adjacent segments due to the connectivity scores
  - MP 31.80 to MP 32.00, which has a higher prioritization score compared to adjacent segments due to the connectivity score

- MP 32.20 to MP 32.40, which has a higher prioritization score compared to adjacent segments due to the connectivity score
- MP 48.70 to MP 48.80, which has a higher prioritization score compared to adjacent segments due to the connectivity score and demand score



Online Map Image: Pedestrian Prioritization Score Along the OR 6 Study Corridor

Bicycle Statewide Prioritization Results

The bicycle prioritization results shown through the online map use segmentation based on the statewide analysis. Visit ODOT's ATNI online map for further information about the statewide analysis: https://kai.maps.arcgis.com/apps/MapSeries/index.html?appid=fd738594718a403aa58d5faa033fc044.

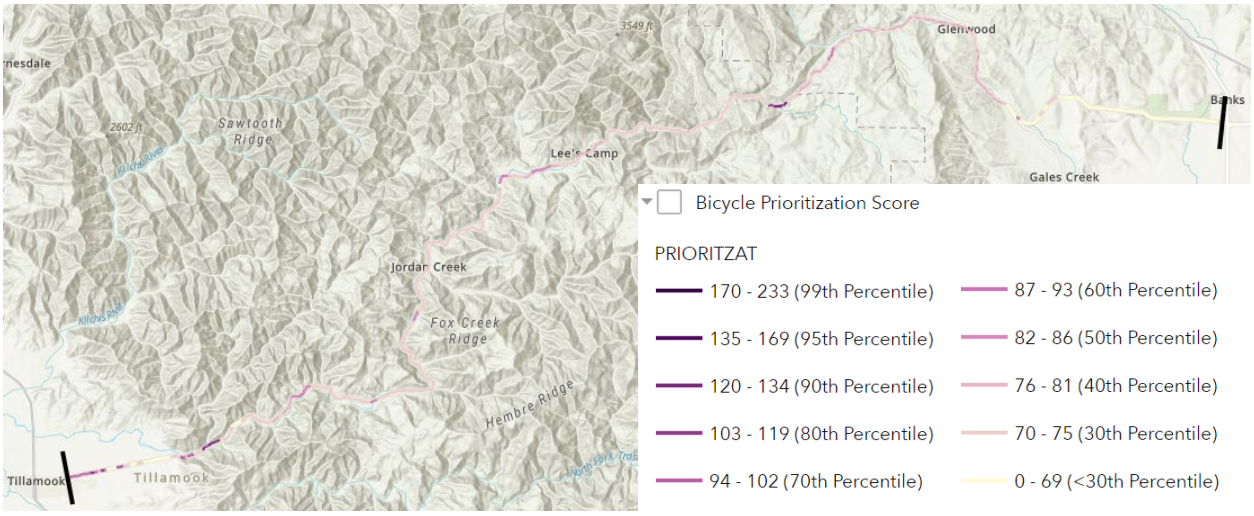
Connectivity scores prioritize segments based on level of comfort of the bicycle facilities (bicycle level of traffic stress) and based on whether it is a smaller gap within an otherwise complete system. Existing conditions scores prioritize segments with gaps or deficiencies in the existing bicycle facilities.

No segments on the OR 6 study corridor are within the 99th or 95th percentiles for the statewide analysis. The highest scores for the OR 6 study corridor were in the 90th and 80th percentiles for the state, including:

- 90th percentile for statewide results (scores of 120 to 134)
  - MP 5.70 and MP 5.90, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores

- MP 32.00 and MP 32.20, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores

- 80th percentile for statewide results (scores of 103 to 119)
  - MP 1.70 to MP 2.10, which has a higher prioritization score compared to adjacent segments due to the connectivity score and existing conditions score
  - MP 5.50 and MP 5.60, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores
  - MP 5.90 and MP 6.10, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores
  - MP 31.80 and MP 31.90, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores
  - MP 32.30 and MP 32.40, which has a higher prioritization score compared to adjacent segments due to the connectivity scores and existing conditions scores



Online Map Image: Bicycle Prioritization Score Along the OR 6 Study Corridor

ODOT's Pedestrian and Bicycle System Safety Risk Analysis

As part of the Oregon Pedestrian and Bicycle Safety Implementation Plan, ODOT implemented the National Cooperative Highway Research Program (NCHRP) Research Report 893 (Systemic Pedestrian Safety Analysis) methodology in 2020. This methodology uses risk factors to complete a systemic safety analysis aimed at identifying high risk locations for pedestrian and bicycle crashes along the state highway system. Systemic safety, opposed to the traditional review of crash history, allows practitioners to proactively identify high risk sites for potential safety improvements based on risk factors that often correlate to locations with low frequency but high injury crashes. The risk factors were included as a component of the safety evaluation criteria for the ATNI prioritization scores.

Pedestrian Statewide Risk Factors

For ODOT's statewide systemic safety analysis completed in 2020, the pedestrian risk factors used within rural areas included:

- Principal Arterial
- Number of Lanes (>=Four Lanes)
- Posted Speed (>=35mph)
- Other Zoning
- Proximity to Schools (one mile)
- Proximity to Transit Stops (1/4 mile)

The pedestrian risk factor results shown through the online map use segmentation based on the statewide analysis. Visit ODOT's ATNI online map for further information about the statewide analysis: https://kai.maps.arcgis.com/apps/MapSeries/index.html?appid=fd738594718a403aa58d5faa033fc044.

The highest overall rural pedestrian risk factor scores for the OR 6 study corridor were in the highest 20 percent and 40 percent for the state, including:

- Top 20% of risk factors for the state (scores of 3.49 to 5.50)
  - MP 14.66 to MP 17.77, which has a higher risk factor compared to adjacent segments due to presence of passing lanes
- Top 40% of risk factors for the state (scores of 2.49 to 3.48)
  - MP 2.15 to MP 2.28, which has a higher risk factor compared to adjacent segments due to presence of four travel lanes
  - Several segments between MP 20.91 and MP 24.86, which has a higher risk factor compared to adjacent segments due to proximity to transit stops and park/forest land uses
  - MP 47.76 to MP 48.97, which has a higher risk factor compared to adjacent segments due to proximity to Banks Middle and High Schools

Online Map Image: Pedestrian Risk Factors Along the OR 6 Study Corridor

Bicycle Statewide Risk Factors

Similar to the pedestrian risk factor screening, ODOT completed a statewide systemic safety analysis for bicycle risk factors in 2020. The risk factors used as part of the bicycle analysis for rural areas included:

- Principal Arterial
- Posted Speed (>=35mph)
- Proximity to Schools (one mile)
- Proximity to Transit Stops (1/4 mile)
- High Population over the Age of 64

The bicycle risk factor results shown through the online map use segmentation based on the statewide analysis. Visit ODOT's ATNI online map for further information about the statewide analysis: https://kai.maps.arcgis.com/apps/MapSeries/index.html?appid=fd738594718a403aa58d5faa033fc044.

No segments on the OR 6 study corridor are within the top 20 percent for the statewide rural bicycle risk factor analysis. The following segments had overall rural bicycle risk factors within the top 40 percent for the state (scores of 2.49 to 3.48):

- MP 22.11 to MP 22.56, which has a higher risk factor compared to adjacent segments due to proximity to transit and high population over age of 64
- MP 23.44 to MP 23.94, which has a higher risk factor compared to adjacent segments due to proximity to transit and high population over age of 64

Online Map Image: Bicycle Risk Factors Along the OR 6 Study Corridor

TransGIS Data

Several datasets regarding equipment were not available for download from ODOT's FTP site and could not be added to the online map at this time. Therefore, ODOT's TransGIS online app was reviewed to summarize existing conditions where available. [1]

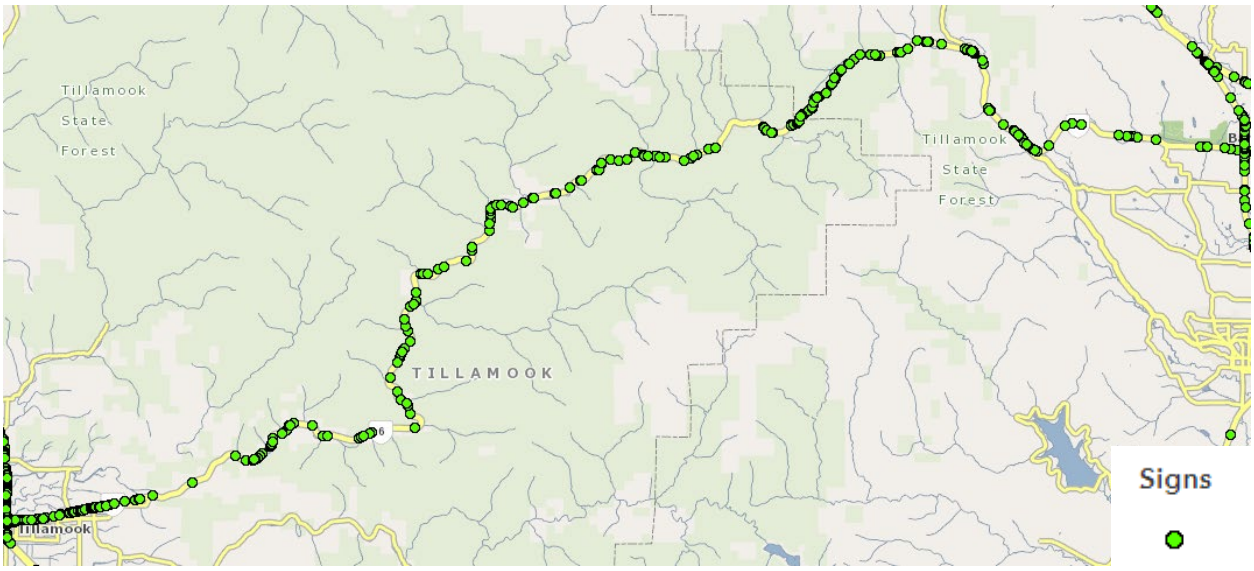
Additionally, several datasets that were specified in the scope were not available for download and were not available to review through TransGIS. These datasets also could not be added to the online map at this time and include:

- Pavement markings
- Access spacing
- Right-of-way
- Cell phone service coverage

Traffic Signs

ODOT's TransGIS includes a "Signs" layer under the "Equipment – Highway" section. A complete sign inventory that can be queried by sign type is requested from ODOT to better understand the sign assets on the OR 6 study corridor.

[1] Traffic volume information is further discussed in the Existing and Future Conditions section of this memorandum.



TransGIS Image: Location of All Inventoried Signs Along OR 6 Study Corridor

Intelligent Transportation System Equipment

Based on ODOT's TransGIS, the Intelligent Transportation System (ITS) equipment along the OR 6 study corridor includes the following devices:

ITS – Weather Systems

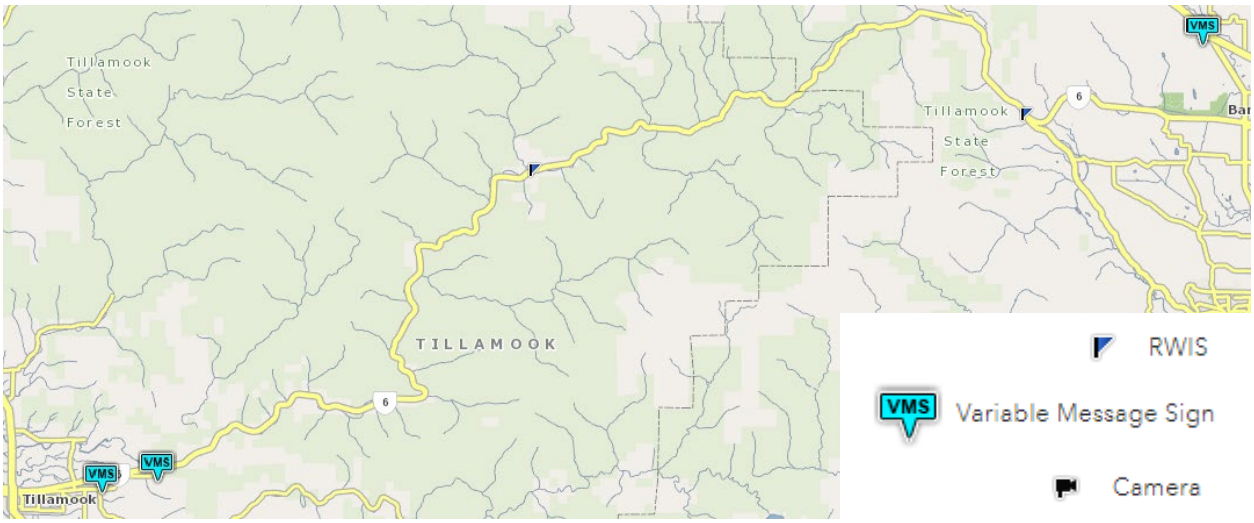
- Roadway weather information system (RWIS) at MP 23.65
- RWIS at MP 42.25

ITS – Signs

- Variable message sign (VMS) at MP 2.57
- RWIS at MP 4.20

ITS – Cameras

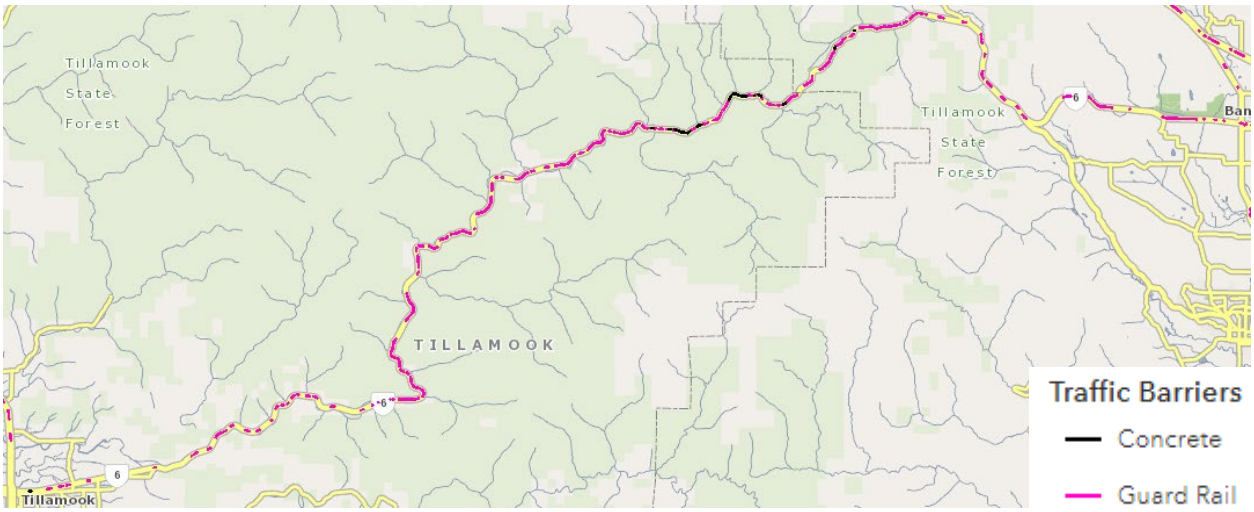
- Camera at MP 2.57
- Camera at MP 4.20
- Camera at MP 23.50
- Camera at MP 42.25



TransGIS Image: ITS Equipment Along the OR 6 Study Corridor

Traffic Barriers

Based on TransGIS, traffic barriers are provided along one or both sides of the roadway for much of the OR 6 study corridor. Guard rail is the most common type of traffic barrier along the corridor, with concrete traffic barriers along the outside of the roadway occurring as well between MP 27 and MP 36.



TransGIS Image: Traffic Barriers Along the OR 6 Study Corridor

Americans with Disability Act Infrastructure

Based on TransGIS, Americans with Disability Act (ADA) ramps are provided at two intersections on the westernmost end of the OR 6 study corridor: the intersection with the southern leg of Wilson River Loop (MP 1.8) and the intersection with the northern leg of Wilson River Loop (MP 2.1). The ADA ramps included in TransGIS are all reported as poor condition.

TransGIS Image: ADA Ramps Along the OR 6 Study Corridor

Environmental Resources Inventory

The online map shows environmental resources for the OR 6 study corridor as described below. These will be important to account for during project development.

Critical Habitat

Critical habitat is defined in the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA), as specific geographic areas essential for the conservation of a threatened or endangered (i.e., ESA-listed) species that may require special management considerations or protection. Certain actions may be restricted within critical habitat if federal funding, permits, licenses, authorizations, or actions occur or are required. The ESA specifically prohibits the destruction and adverse modification of critical habitat as a whole – i.e., specific actions in a portion of a species' critical habitat cannot destroy or adversely modify that critical habitat such that the species' continued existence is jeopardized (84 FR 44976).

Critical habitats designated for ESA-listed terrestrial species and non-anadromous aquatic species are under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Critical habitats designated for ESA-listed marine and anadromous species are under the jurisdiction of the National Marine Fisheries Service (NMFS).

The online map includes all critical habitats (both linear and polygonal) managed by USFWS and NMFS along the OR 6 study corridor and surrounding areas.

Locations of Concern

Critical habitat for marbled murrelet (Brachyramphus marmoratus) overlaps OR 6 at MP 6.5 and MP 7.0, and it is within ¼-mile of OR 6 between MP 4.0 and MP 8.3.

Critical habitat for steelhead (Oncorhynchus mykiss) occurs in the mainstem of Gales Creek, North Fork Gales Creek, South Fork Gales Creek, Bateman Creek, and Beaver Creek. Highway OR 6 is closest to these waterways from MP 34.7 to MP 42.8.

Critical Habitat for Coho salmon (O. kisutch) occurs in the Trask River, Hoquarten Slough, Dougherty Slough, Hughey Creek, Little North Fork Wilson River, Hatchery Creek, Kansas Creek, Fall Creek, Fox Creek, Jordan Creek, Wolf Creek, Cedar Creek, Jones Creek, Ben Smith Creek, mainstem Wilson River, North Fork Wilson River, South Fork Wilson River, Elk Creek, Idiot Creek, Devils Lake Fork, Drift Creek, Elliott Creek, and Deyoe Creek. Highway OR 6 is closest to these waterways from MP 3.8 to MP 32.2.

Permitting Implications

Actions that may affect these species could be covered under The Federal-Aid Highway Program (FAHP) programmatic Biological Opinion (BO) if they are partially or wholly funded by the FAHP. The Standard Local Operating Procedures for Endangered Species (SLOPES V) programmatic BO, administered by the U.S. Army Corps of Engineers, may also be used for aquatic species if (1) the FAHP programmatic BO is not used, and (2) a Section 404 permit is required (described in the National Wetlands Inventory [NWI] section below). Programmatic consultation could take up to 60 days.

If the FAHP or SLOPES V programmatic BOs cannot be used, and proposed actions may affect ESA-listed species, then ESA compliance must be achieved through an individual consultation. Compliance documentation will need to assess the current condition of the ESA-listed species, and then list measures to minimize adverse impacts on them and their habitat to demonstrate that the project will not jeopardize the continued existence of the ESA-listed species or result in adverse impacts on critical habitat. An individual consultation could take 135 days or more after ESA compliance documentation is submitted to NMFS and the USFWS.

Hillshade

A hillshade is a two-dimensional cartographic surface that appears to be three dimensional by creating shadows from a hypothetical light source (typically in the northwest). The hillshade surface used in the online map is derived from a mosaic of separate hillshade surfaces, each derived from a digital terrain model with a 3-by-3-foot resolution, whose elevation data was collected using lidar (light detection and ranging). The Oregon Department of Geology and Mineral Industries (DOGAMI) maintains and updates this mosaic so that the most recently collected lidar-derived hillshades replace older ones in areas of overlap. Hillshade is a helpful tool for identifying areas that may require Section 404 permitting (described below).

National Wetlands Inventory Wetlands

The USFWS began designing and compiling the NWI in 1974 to establish a comprehensive database of the characteristics, location, and extent of the Nation's wetlands and deep-water habitats to better track gains and losses over time and inform decisions that could affect these resources. The Emergency Wetlands Resources Act of 1986, as amended (16 U.S.C. 3901 et seq.), provided specific deadlines to create digital and hard-copy maps of wetlands within the conterminous United States, and to report on the status and trends of wetlands every 10 years. The wetlands layer available in the online map shows the most current features mapped in the NWI.

Locations of Concern

The following locations are areas where OR 6 overlaps mapped NWI features:

MP 2.28	MP 16.44	MP 32.00
MP 3.81	MP 16.78	MP 32.55
MP 4.01	MP 18.02	MP 32.64
MP 4.55	MP 19.81	MP 36.11
MP 5.19	MP 20.71	MP 36.57
MP 5.75-5.79	MP 21.41	MP 36.75
MP 6.91	MP 21.55	MP 37.61
MP 7.23-7.32	MP 21.98	MP 38.61
MP 7.52	MP 23.30	MP 39.61
MP 8.56	MP 23.38	MP 40.87
MP 9.31	MP 23.58-23.61	MP 41.38
MP 9.51	MP 24.02	MP 42.34
MP 9.73	MP 25.14	MP 43.04-43.12
MP 9.99	MP 25.23	MP 43.97
MP 11.78-11.82	MP 25.34	MP 44.91
MP 12.11	MP 25.50	MP 45.29-45.49
MP 12.61	MP 26.2	MP 45.80
MP 13.33	MP 26.49	MP 46.89
MP 13.58	MP 27.67	MP 47.73
MP 13.62-13.63	MP 27.89	MP 47.90
MP 14.52	MP 28.38-28.39	MP 48.01
MP 14.63	MP 29.18	MP 48.56-48.66
MP 15.48	MP 30.73	

However, it's important to understand that NWI features were coarsely mapped by the USFWS using old 7.5-minute quad topographic maps and, as such, wetlands could be anywhere along the OR 6 corridor because of its location in the landscape (i.e., mostly paralleling waterways or abutting agricultural areas along valley bottoms). Therefore, all areas with proposed actions outside of the existing roadway should be assessed in the field to determine the presence or absence of jurisdictional wetlands and waters.

Permitting Implications

Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. 1344) (CWA), regulates the removal of material from, and the addition of fill to, waters of the U.S., including wetlands. The U.S. Army Corps of Engineers (USACE) is the agency responsible for administering the Section 404 permitting process and enforcing permit provisions nationwide. At the state level, the

Oregon Department of State Lands (DSL) regulates removal and/or fill from or into Waters of the State, including wetlands, per Oregon's Removal-Fill Law (ORS 196.795-990).

Removal-Fill permits would need to be issued by both the DSL and the USACE for impacts to intermittent or perennial waters, or any adjacent wetlands. Typically, there is a 50 cubic yard threshold for DSL Removal-Fill permits (i.e., a permit is not required if the cumulative removal and fill is less than 50 cubic yards); however, this threshold does not apply where there is essential salmonid habitat (described below).

The DSL and USACE Removal-Fill permitting processes requires all wetlands and waters to first be delineated, described in a wetland delineation report, and then the wetland/waters boundaries must be concurred with by the DSL. This requires time to delineate on-site wetlands and waters and assemble the report, and then up to 120 days for DSL review and concurrence. A Joint Permit Application (JPA) would then need to be submitted to the DSL and USACE to receive the Removal-Fill permit authorizing wetland/waters impacts. This process may take 70-150 days (i.e., approximately 30 days to complete and submit the permit to agencies, plus 40-120 days for review and public comment).

The CWA 401-C certification is administered by the Oregon Department of Environmental Quality (DEQ) to authorize water quality impacts on Waters of the U.S. under CWA Section 401-C. Application for a CWS 401-C Certification from DEQ can be done by submitting the same JPA prepared for DSL and USACE permits. This certification could be concurrent with the USACE Removal-Fill permit (if coordination between USACE and DEQ occurs prior to USACE authorization), or in 35 days after USACE authorization. If the project is authorized under an Individual Permit, DEQ has up to 1 year to issue a decision. Construction cannot start until DEQ approval is obtained.

National Hydrography Dataset

The National Hydrography Dataset (NHD) contains GIS data that represents the nation's surface waters systems (streams, rivers, canals, ponds, lakes, and reservoirs). Knowing where NHD features are and how they are connected can help minimize impacts on Waters of the U.S. and State, and on ESA-listed species that may inhabit or rely on them. The online map shows NHD GIS features along the OR 6 study corridor and surrounding areas.

Soils

The Soil Survey Geographic Database (SSURGO) contains groups of soils with unique properties, where each group is known as a map unit (MU), and each MU has a unique abbreviation (MU symbol) and name. These MUs have been mapped by the National Cooperative Soil Survey, a nationwide partnership of agencies and entities (federal, regional,

state, local, and private), and are updated as new data becomes available. Map unit attributes include water capacity, hydric rating, and frequency of flooding; as well as information regarding suitability for uses such as agriculture, woodland, rangeland, building site development, and other engineering uses. The SSURGO is managed by the National Resources Conservation Service, an agency of the United States Department of Agriculture. The online map shows soil MUs along the OR 6 study corridor and surrounding areas.

Locations of Concern

Soils with a hydric rating of 66 or more are considered hydric soils. These areas do not always correspond to field observations but are still a useful tool in desktop analysis to identify areas that are likely to have wetland conditions. Hydric soil MUs occur at the following locations along OR 6:

- MP 42.99-43.11
- MP 45.39-47.73
- MP 48.21-48.70

Permitting Implications

See the NWI Wetlands Section above for a detailed description of wetlands and waters permitting.

Essential Salmonid Habitat

Essential Salmonid Habitat (ESH) is a shortened name for Essential Indigenous Anadromous Salmonid Habitat, which is further defined in OAR 141-102-00200 as:

(1) "Essential" means those portions of a stream reach that fill all or part of the basic or indispensable spawning or rearing needs of indigenous anadromous salmonids and are those areas necessary to prevent the depletion of indigenous anadromous salmonids. Such areas include "spawning habitat" and "rearing habitat" as defined below under sections (3) and (4) of this rule.

(2) "Indigenous anadromous salmonid" means chum, sockeye, Chinook and Coho Salmon, and steelhead and cutthroat trout, that are members of the family of Salmonidae and are listed as sensitive, threatened or endangered by a state or federal authority.

(3) "Spawning Habitat" includes areas where eggs are deposited and fertilized. For some species, including salmonids, this also includes areas where gravel emergence occurs and where at least some juvenile development occurs.

(4) "Rearing Habitat" includes areas outside primary spawning habitats where juvenile fish take up residence during some stage of juvenile development and use the area for

feeding, shelter, and growth. Some migration also occurs as juvenile and adult fish move between the ocean and spawning grounds.

The online map shows ESH along the OR 6 study corridor and surrounding areas.

Locations of Concern

Waterways designated as ESH include the Trask River, Hoquarten Slough, Dougherty Slough, Hughey Creek, Little North Fork Wilson River, Sylvan Creek, Kansas Creek, Fall Creek, Fox Creek, Jordan Creek, Ryan Creek, Wolf Creek, Cedar Creek, Jones Creek, Scotty Creek, Ben Smith Creek, mainstem Wilson River, North Fork Wilson River, South Fork Wilson River, Moore Creek, Elk Creek, Fern Roack Creek, Idiot Creek, Devils Lake Fork, Drift Creek, Elliott Creek, Deyoe Creek, Gales Creek, North Fork Gales Creek, South Fork Gales Creek, Beaver Creek, Bateman Creek, Sadd Creek, Cedar Canyon Creek, and West Fork Dairy Creek. These waterways are near OR 6 at the following locations:

- MP 3.8
- MP 4.4-32.2
- MP 36.0-42.8
- MP 46.5-46.6
- MP 47.9-48.1

Permitting Implications

Removal or fill of any quantity from a waterway designated as ESH (or an adjacent wetland) requires a DSL permit (ORS 196.810). See the NWI Wetlands section for more information on the Removal-Fill Permit process.

Geotechnical Context

The online map shows geotechnical context for the OR 6 study corridor as described below. The project team limited the datasets shown via the online map by only including data that is at least partially within a 1,000-foot offset of the OR 6 study corridor. Figure 1 presents a plan view of the study limits with the existing data layers that is discussed in this section.

Unstable Slope Locations

ODOT created the Unstable Slopes Program to analyze slopes adjacent to state highways for potential impacts that a failure could cause. The project team downloaded all 76 unstable slope location points along with their associated description data fields from ODOT's TransGIS database along the OR 6 study corridor to include in the interactive map. ODOT provides up to 70 categories of description data fields for each unstable slope point, including the following:

- Failure hazard level rated from low, medium, and high;
- The primary type of slope instability (fill failure, landslide, rockfall, debris flow);
- The impact the failure would have on OR 6 travel conditions; and
- The frequency of roadway impact.

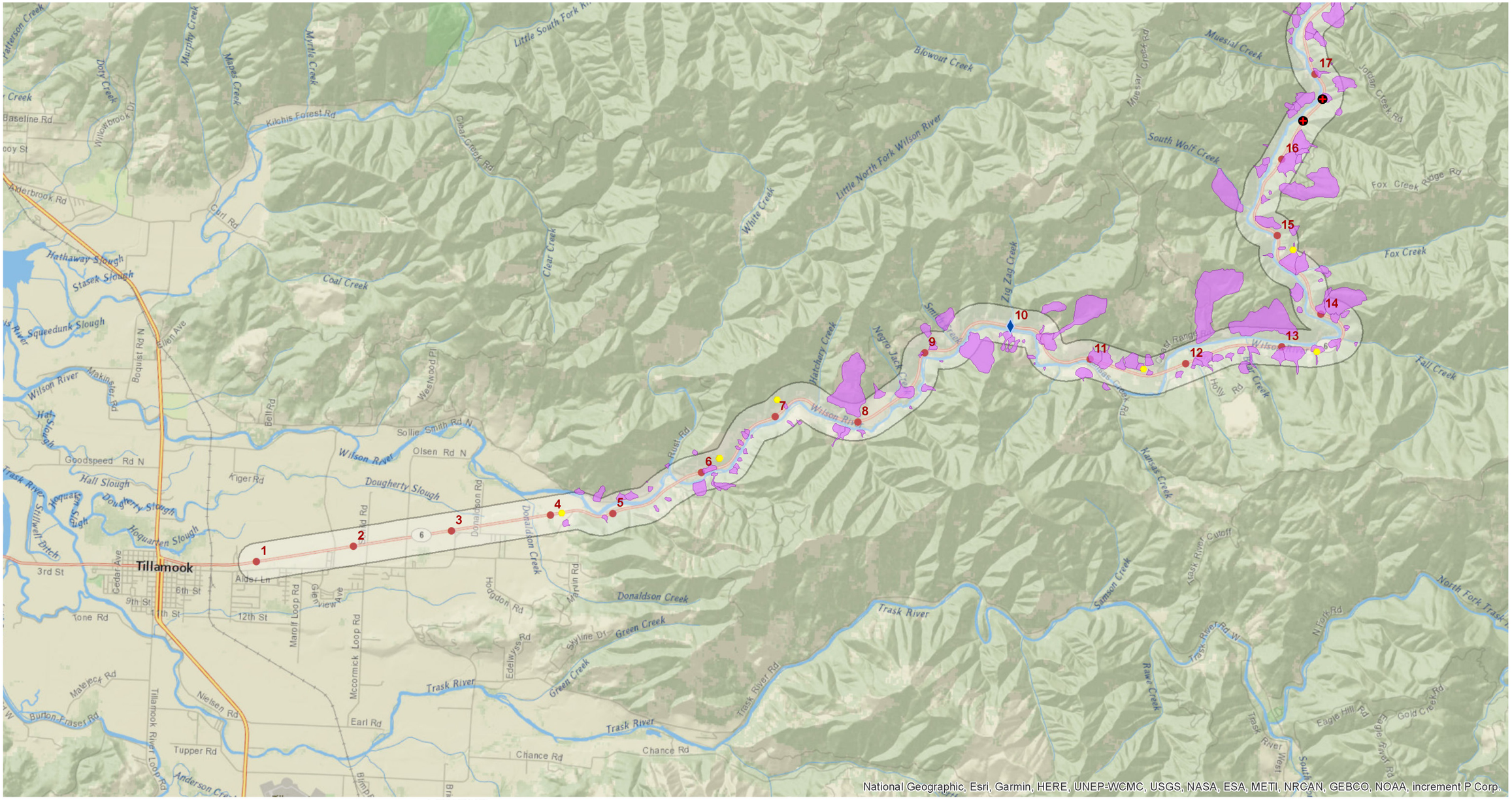
DOGAMI's Statewide Landslide Information Database for Oregon (SLIDO) is a compilation of landslides within Oregon that have been identified on published maps. SLIDO includes the unstable slopes mapped by ODOT, but also identifies an additional 28 unstable slope points along the OR 6 study corridor through various geologic publications. These 28 locations have inconsistent description data fields compared to ODOT's more standardized Unstable Slopes Program.

The project team maintained the failure hazard level color scheme for the 76 ODOT unstable slopes and have distinguished between the 28 SLIDO unstable slope points, indicating they are not associated with ODOT's failure hazard level system. The project team also distinguished between the fill slope failures and the native slope failures to separate instabilities more associated with underlying geologic conditions.

Mapped Landslide Deposits

DOGAMI's SLIDO also includes mapped landslide deposits that have been identified on published geologic maps. Within the study limits, the existing OR 6 alignment runs nearby 267 mapped landslide deposits. DOGAMI has included up to 33 categories of description data associated with each slide deposit, including the following:

- The primary type of slope movement;
- The age of deposition, broken into deposition occurring within the last 150 years and historic (deposition occurred greater than 150 years ago); and
- The geologic unit the landslide deposit occurred in.



LEGEND

- Past Shannon & Wilson Project Location
- Past ODOT Project Approximate Location

ODOT Unstable Slopes - Native Material Failure Hazard

- High
- Medium
- Low

ODOT Unstable Slopes - Fill Failure Failure Hazard

- High
- Medium
- Low

- Additional Landslide Location from SLIDO
- Mapped Landslide Deposit from SLIDO
- Reviewed Area
- Milepost

0 0.5 1 2

Scale in Miles

NOTES

1. See memorandum text for information about data sources.

OR6: Wilson River Highway Corridor Study
Washington and Tillamook Counties, Oregon

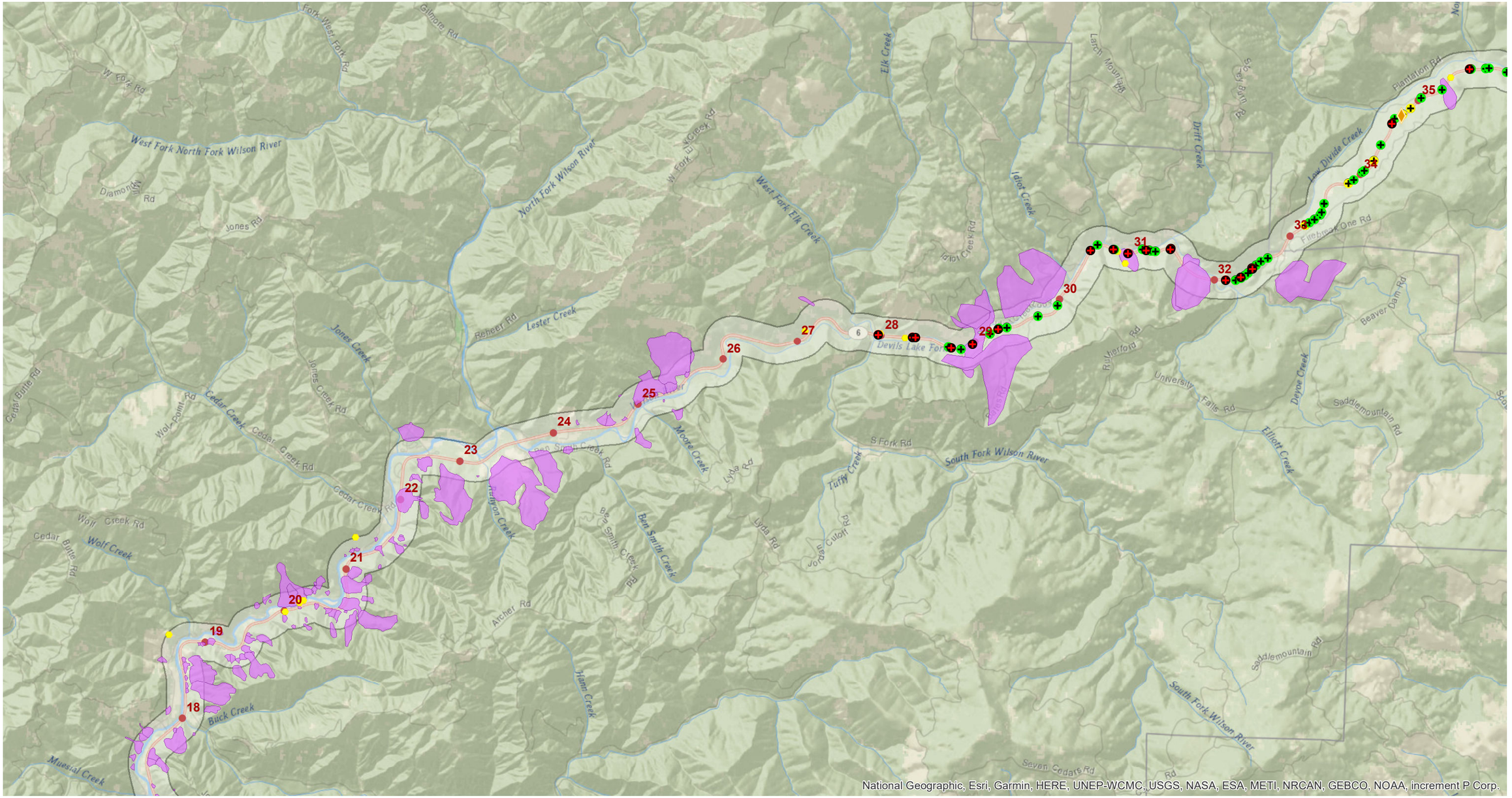
EXISTING DATA

December 2022 109149

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1
Sheet 1 of 3

Filename: P:\GIS\PDX\109000s\109149_ODOT R2 OR6 Wil\Avmxd\SitePlan2.mxd Date: 12/1/2022 Login: AEH



LEGEND

- Past Shannon & Wilson Project Location
- Past ODOT Project Approximate Location

ODOT Unstable Slopes - Native Material Failure Hazard
- High
- Medium
- Low

ODOT Unstable Slopes - Fill Failure Failure Hazard
- High
- Medium
- Low

- Additional Landslide Location from SLIDO
- Mapped Landslide Deposit from SLIDO
- Reviewed Area
- Milepost

0 0.5 1 2
Scale in Miles

NOTES
1. See memorandum text for information about data sources.

OR6: Wilson River Highway Corridor Study
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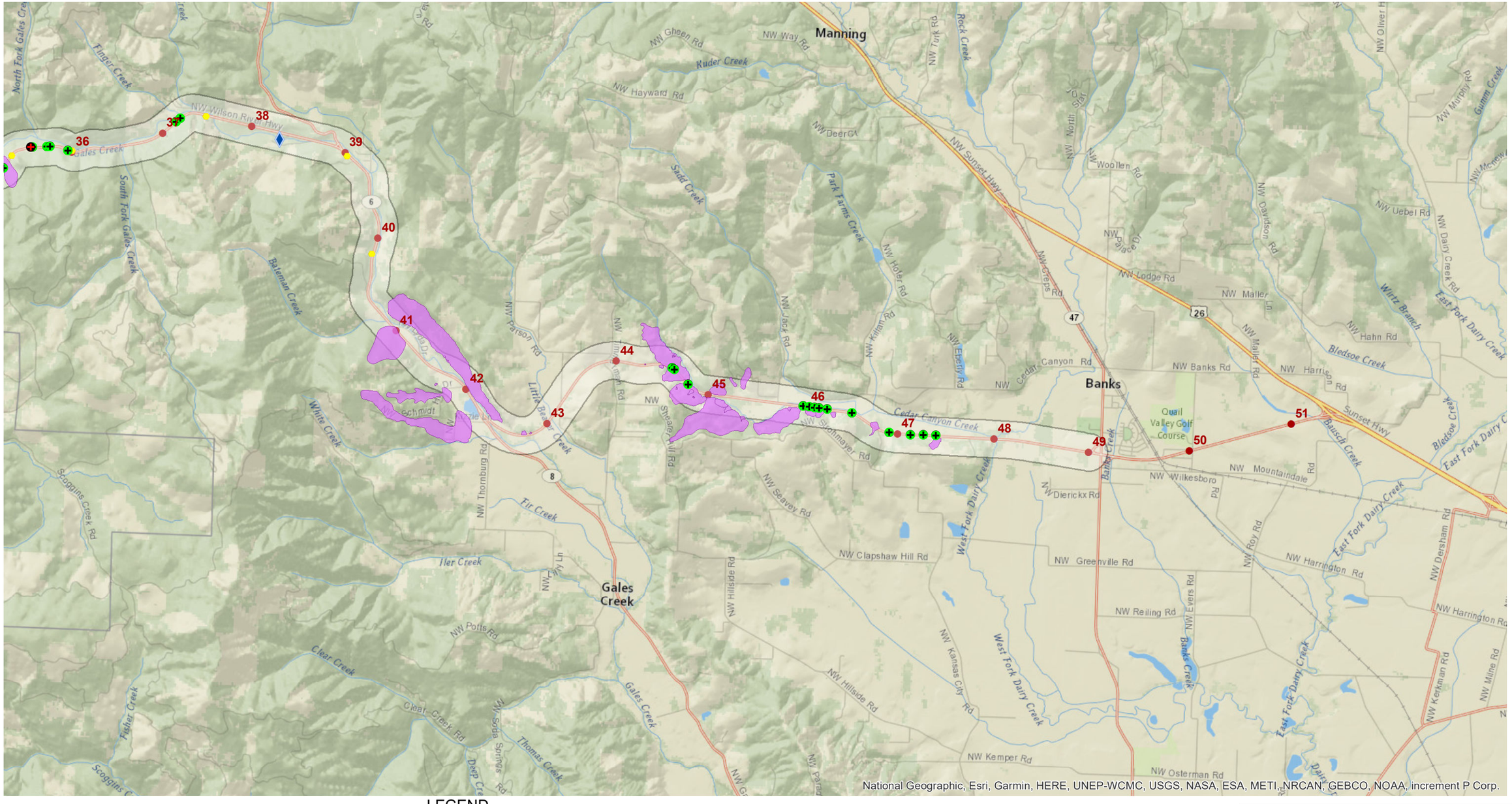
FIG. 1
Sheet 2 of 3

Filename: P:\GIS\PDX\109000s\109149_ODOT R2 OR6 Wil\Avmxd\SitePlan2.mxd Date: 12/1/2022 Login: AEH



LEGEND

- Past Shannon & Wilson Project Location
- Past ODOT Project Approximate Location

ODOT Unstable Slopes - Native Material Failure Hazard

- High
- Medium
- Low

ODOT Unstable Slopes - Fill Failure Failure Hazard

- High
- Medium
- Low

- Additional Landslide Location from SLIDO
- Mapped Landslide Deposit from SLIDO
- Reviewed Area
- Milepost

0 0.5 1 2

Scale in Miles

NOTES

1. See memorandum text for information about data sources.

OR6: Wilson River Highway Corridor Study
Washington and Tillamook Counties, Oregon

EXISTING DATA

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FIG. 1
Sheet 3 of 3

Filename: P:\GIS\PDX\109000s\109149_ODOT R2 OR6 Wil\Avmxd\SitePlan2.mxd Date: 12/1/2022 Login: AEH

Existing Projects

The project team included the approximate locations of three projects with available geotechnical information for along the OR 6 corridor. The project team has provided geotechnical recommendations for two projects along the alignment:

1. OR 6 Zig Zag Creek Project, MP 9.89
    a. ODOT proposed replacing or upgrading an existing culvert carrying surface water from Zig Zag Creek under an OR 6 roadway embankment to an outfall near the Wilson River. The culvert was replaced to enlarge the cross-sectional area to both reduce the buildup of debris within the culvert as well as provide potential fish passage up Zig Zag Creek from Wilson River.
    b. ODOT performed three geotechnical borings at the project site in 2014 and three additional geotechnical borings in 2020.
2. Gales Creek Camp Riverbank Failure, Approximate MP 38.5
    a. Gales Creek, running parallel to OR 6 near Glenwood, Oregon, progressively scoured into the face of a creek bank near an existing structure. The project team provided geotechnical recommendations to assist in protecting the structure from future scour-induced slope instability.
    b. The project team performed one geotechnical boring at the project site in 2016.

ODOT has also provided us their Advanced Investigation Geotechnical Report for an active landslide complex affecting the OR 6 corridor:

3. OR 6: MP 34.8 Landslide
    a. ODOT provided geotechnical recommendations and landslide mitigation alternatives for a group of landslides affecting the OR 6 highway corridor from approximate MP 32 to 37.
    b. ODOT performed six geotechnical borings at the project site, installing piezometers within four of the borings, and inclinometers in five of the borings.

Summary of Transportation Inventories Data

Table 1 summarizes the inventory items identified in the scope of work including the data source, the document section that describes the item, and whether it is included in the online map. Traffic volume information is further discussed in the Existing and Future Conditions section of this memorandum.

Table 1: Transportation Inventories Data

Data Scoped to be Included in Inventory Memorandum	Data Provided by ODOT or Able to Be Downloaded from ODOT's FTP Site?	Section Where Data is Summarized	Included in Online Map
Bridge and culvert locations and condition, including bridge asphalt and bridge rail conditions	Yes	Transportation System Inventories	Yes
Pavement conditions	Yes	Transportation System Inventories	Yes
Crash history and rate for the five most recent years of available complete data	Yes	Safety Analysis	Yes
SPIS data from three most recent SPIS lists	Yes	Safety Analysis	No
ADA infrastructure	**No, but viewable on TransGIS map**	Transportation System Inventories	No
Bicycle and pedestrian facilities	Yes	Transportation System Inventories	Yes
Traffic signs	**No, but viewable on TransGIS map. Additional information provided.**	Transportation System Inventories	Yes
Pavement markings	**No**	None	No
Roadway lane configuration and widths (passing lane locations, turn lane locations, shoulders)	Yes	Transportation System Inventories	Yes
Traffic volumes	Yes	Existing and Future Traffic	Yes

Data Scoped to be Included in Inventory Memorandum	Data Provided by ODOT or Able to Be Downloaded from ODOT's FTP Site?	Section Where Data is Summarized	Included in Online Map
	(Counts were collected for study intersections)	Operations Conditions	
Posted speed data	Yes	Transportation System Inventories	Yes
Observed speed data	Yes, speed study for one location provided	Transportation System Inventories	No
Freight volumes	Yes (Counts were collected for study intersections)	Existing and Future Traffic Operations Conditions	No
Transit stops	Yes	Transportation System Inventories	Yes
ITS equipment	**No, but viewable on TransGIS map**	Transportation System Inventories	No
Traffic barriers	**No, but viewable on TransGIS map**	Transportation System Inventories	No
Freight amenities, designations, and restrictions	**No, but viewable on TransGIS map**	Transportation System Inventories	No
Access spacing	**No**	None	No
Environmental conditions (wetlands, critical habitat, hydric soils, flowlines, hillshade, etc.)	Yes	Transportation System Inventories	Yes
Topography	Yes	Transportation System Inventories	Yes
Geotechnical inventory and inventory of unstable slopes	Yes	Transportation System Inventories	Yes

Data Scoped to be Included in Inventory Memorandum	Data Provided by ODOT or Able to Be Downloaded from ODOT's FTP Site?	Section Where Data is Summarized	Included in Online Map
Locations of key destinations such as campgrounds	No, available datasets were compiled	Transportation System Inventories	Yes
Roadway network indicating jurisdictions of roadways intersecting with OR 6	Yes	Transportation System Inventories	Yes
Zoning	No, but available via County online maps	Transportation System Inventories	No
Right-of-way	**No**	None	No
Cell phone service coverage	**No**	None	No
ODOT's Active Transportation Needs Inventory	Yes	Transportation System Inventories	Yes
ODOT's Bicycle and Pedestrian Statewide Risk Factors	Yes	Transportation System Inventories	Yes
Summary of geotechnical information from ODOT's current on-going study near MP 33	Yes	Transportation System Inventories	No
ODOT Broadband Plan (may be in Draft Format)	Available online	Transportation System Inventories	No

EXISTING AND FUTURE TRAFFIC OPERATIONS CONDITIONS

This section summarizes the existing and future traffic operations of the study corridor. The analysis investigates both segment and intersection operations for key areas along the 48-mile corridor (MP 1.0 to 49.0). Appendix A provides the Methodology Memorandum, which further documents assumptions and methods used for this analysis.

Project Area and Analysis Scenario

The OR 6 corridor encompasses 48 miles of roadway from Tillamook in Tillamook County to Banks in Washington County. The corridor was analyzed under two traffic operation scenarios: Existing 2022 and Future 2044 (assuming 2024 build year). The existing scenario evaluated the corridor per its current condition as exists today. The future scenario evaluated the corridor per its expected future condition based on estimated growth rates and baseline assumption of no significant improvements with regards to operational capacity. Holistic segment analysis for the whole corridor and individual intersection analysis for three key intersections were completed. Key attributes of the study corridor and intersecting study roadways are described in Table 2 and the intersections are listed below.

- OR 6/Wilson River Loop Road (East)
- OR 6/Timber Road
- OR 6/Gales Creek Road

Table 2: Study Area Roadway Characteristics

Roadway	Jurisdictional Ownership	Functional Classification	Number of Lanes	Posted Speed
OR 6 (Wilson River Highway)	ODOT	Rural Minor Arterial	2 (with passing lanes)	55 mph
Wilson River Loop Road (East)	Tillamook County	Major Collector	2	45 mph
Timber Road	Washington County	Major Collector	2	55 mph (Assumed)
Gales Creek Road	Washington County	Minor Arterial	2	50 mph

ODOT Mobility Targets

The three study intersections are located on an ODOT facility, therefore the operating conditions for all intersections and roadway segments must meet the ODOT mobility targets. OR 6 is classified as a Regional Highway and Freight Route, with the roadway context of Rural Lands. According to the 1999 Oregon Highway Plan (OHP)[2], this provides an **OHP Mobility Target of volume to capacity (v/c) ≤ 0.70 for the highway and v/c ≤ 0.75 for the side streets.**

The 2023 Highway Design Manual (HDM)[3] provides v/c ratio values that seek to provide mobility solutions that are the best investment when looking at 20-year design life solutions. This provides an **HDM Mobility Target of v/c ≤ 0.65 for the highway and v/c ≤ 0.70 for the side streets.** These targets should only be used for new construction or major intersection modifications.

ODOT does not specify any level of service (LOS) standard for highway segments, which is the typical evaluation metric for highway segment analysis.

Existing and Future Traffic Volumes

Traffic counts were collected, and adjustment factors were applied as documented below per the ODOT Analysis and Procedures Manual (APM)[4] to develop Existing 2022 and Future 2044 volumes for traffic analysis.

Existing 2022 Traffic Volumes

New intersection turning movement counts (TMC) and roadway tube counts were collected in the summer and fall of 2022 to develop the 30th highest hour volumes (30 HV). Traffic count data is provided in Appendix B. Due to an error in data collection[5], the traffic counts used for final evaluation spanned multiple dates. For locations with multiple days of available data, the analysis was based on an average of three consecutive days without issues or abnormalities. The locations and dates in Table 3 reflect the traffic data utilized for analysis.

[2] Table 6, Policy 1F, Oregon Highway Plan, Oregon Department of Transportation, 1999.
[3] Table 1200-1, Part 1200, Highway Design Manual, Oregon Department of Transportation, January 2023.
[4] Chapter 5 and 6, Analysis Procedures Manual, Oregon Department of Transportation, June 2022.
[5] The initial turning movement counts were incorrectly conducted at OR 6/S Fork Gales Creek Road. Due to this error, counts had to be redone in October at the intersection of OR 6/Gales Creek Road.

A separate peak hour was determined for each location along the 48-mile corridor. Intersections near the extents of the corridor closest to urban areas experience their peak hour during the evening travel period, while the intersection and roadway tube count in the rural portion of the corridor experience their peak hour during midday hours.

Seasonal adjustment factors were applied to the collected traffic counts to represent the 30 HV. Seasonal adjustment factors for the four locations, which can be seen in Table 3, all differ due to their various collection dates in August, September, and October. An Automatic Traffic Recorder (ATR) is present along the corridor allowing the On-Site ATR Method to be used to determine the adjustment factors.

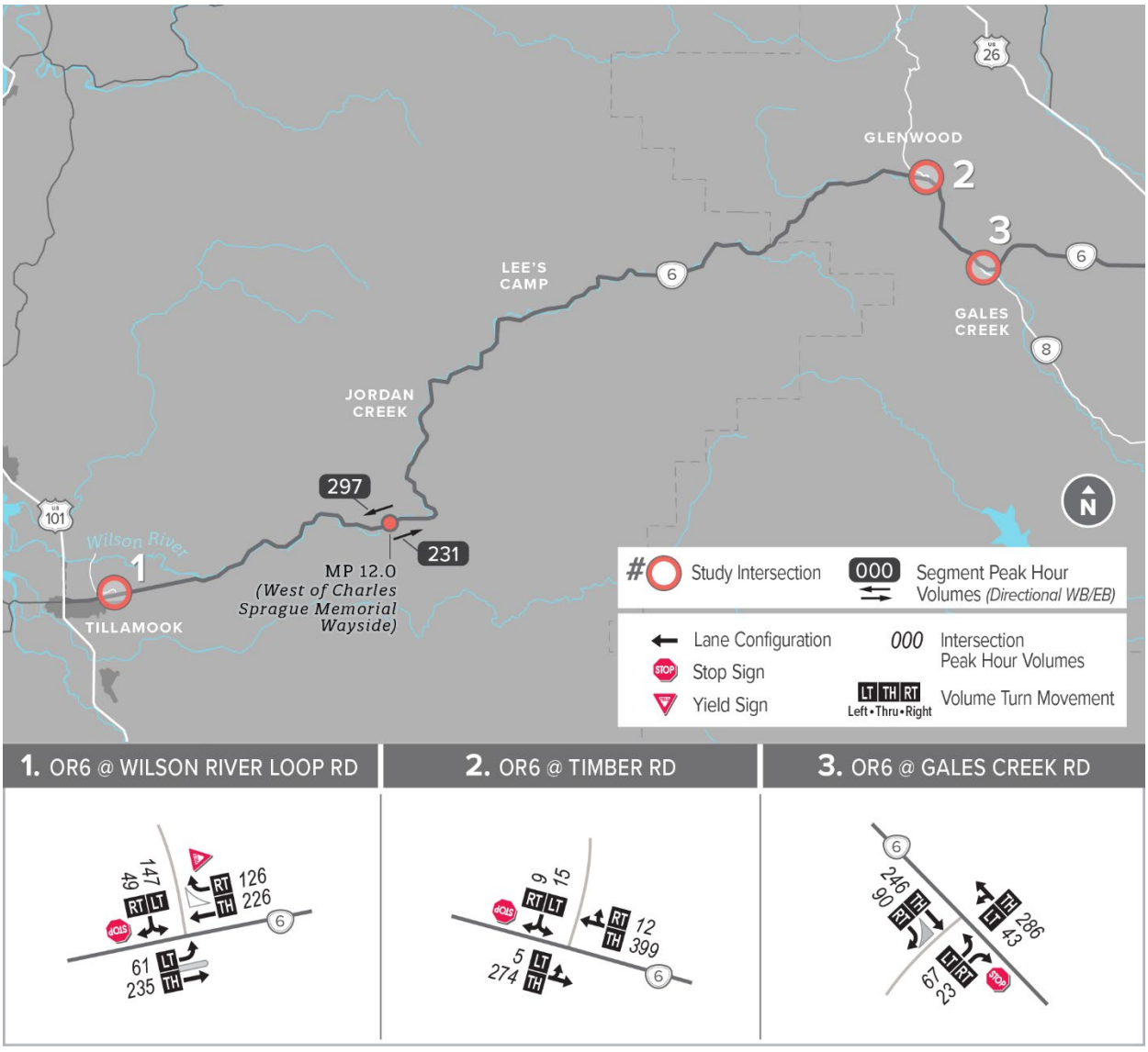
The final Existing 2022 traffic volumes are shown in Figure 2.

Table 3: Data Collection and Analysis Information

Location	Data Collection Type	Data Collection Date	Analysis Peak Hour	Seasonal Adjustment Factor	Yearly Growth Rate [c]
Charles Sprague Memorial Wayside (MP 12)	Roadway Tube	Tuesday, August 30th – Thursday September 1st	2:00pm	1.15 [a]	1.20%
OR 6/Wilson River Loop Road (East)	Intersection TMC	Thursday, August 25th	3:55pm	1.03	1.20%
OR 6/Timber Road	Intersection TMC	Thursday, August 25th	1:25pm	1.03	1.20%
OR 6/Gales Creek Road	Intersection TMC	Wednesday, October 12th	4:00pm	1.53 [b]	1.20%

a Since the roadway tube counts span the end of August and beginning of September, an average of the August and September seasonal adjustment factors is used.
b A seasonal adjustment factor greater than 1.30 is typically not recommended by ODOT due to the possibility of turning movement variations not being representative. Due to data collection challenges, however, this is the only data available. The project team has verified that the adjusted volumes are reasonable and are consistent with the nearby Timber Road intersection.
c The yearly growth rate is used in calculating the future traffic volumes, which are described below..

Figure 2: Existing 2022 (Peak Hour) Traffic Volumes

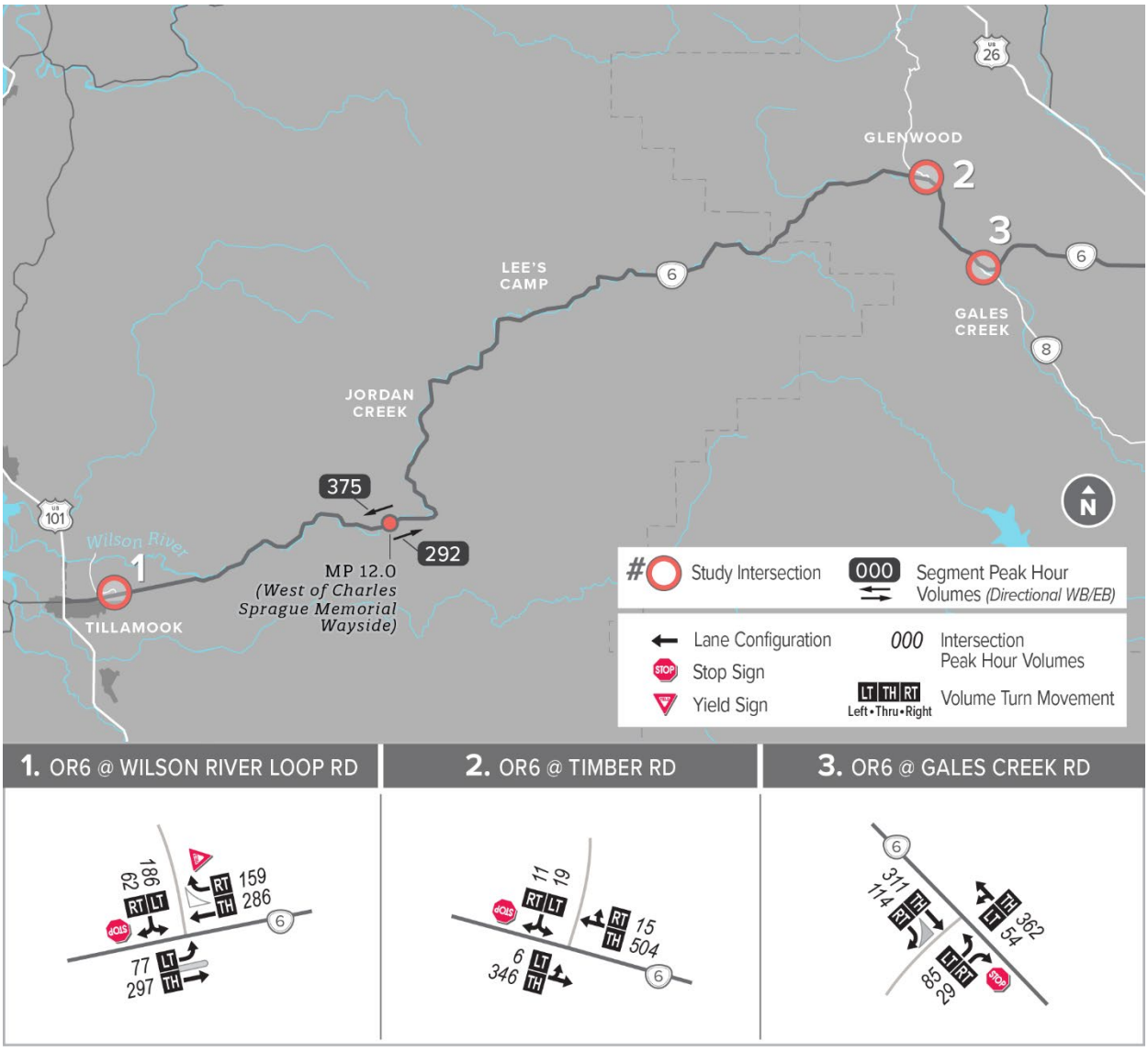


Future 2044 Traffic Volumes

Future traffic volumes were established by applying a growth factor which accounts for a yearly linear growth rate over the 22-year time period difference and establishes new background traffic volumes. The 1.20% growth rate, which is also shown in Table 3, was calculated utilizing the ODOT Future Highway Volume Table. Key growth rates along the corridor at the study intersections were averaged to determine the blanket growth rate for the study intersections and segment.

The final Future 2044 traffic volumes are shown in Figure 3.

Figure 3: Future 2044 (Peak Hour) Traffic Volumes



Traffic Operations

Intersection and segment traffic operations were determined for the study intersections and segments as described below for both the existing and future scenarios.

Intersection Operations

Existing and future traffic operations at the study intersections were determined for the associated peak hour based on the Highway Capacity Manual (HCM) 6th Edition methodology. The results were then compared with ODOT's mobility targets in the Oregon Highway Plan (OHP) and Highway Design Manual (HDM). Table 4 lists the estimated v/c ratio, delay, and LOS of each study intersection. Intersection operations reports are provided in Appendix C.

At the OR 6/Wilson River Loop Road (East) intersection, the median acceleration lane for the southbound left movement was not modeled as Synchro does not have the ability to model that type of movement. In addition, while the southbound approach has a flared stop bar that would allow both a left-turning and right-turning vehicle to attempt to turn at the same time, the approach was conservatively modeled as a single lane. Therefore, the actual operations at the intersection will be better than what is documented in the analysis results.

As shown, all three study intersections currently meet and are expected to continue to meet the ODOT Oregon Highway Plan mobility targets into the future. As no major intersection modifications are proposed under the future conditions, the HDM mobility targets do not apply.

Table 4: Existing and Future Peak Hour Intersection Operations

Intersection	OHP and HCM Mobility Targets	Existing (2022)			Future (2044)		
		V/C Ratio	Delay (Secs)	LOS	V/C Ratio	Delay (Secs)	LOS
Unsignalized Movements: Major (Minor)							
OR 6/Wilson River Loop Road (East)	v/c ≤ OHP: 0.70 (0.75)	0.05 (0.46)	19.1	A (C)	0.07 (0.72)	36.1	A (E)
OR 6/Timber Road		0.01 (0.06)	13.5	A (B)	0.01 (0.09)	16.2	B (C)
OR 6/Gales Creek Road		0.04 (0.19)	16.2	A (C)	0.05 (0.31)	22.2	A (C)

TWO-WAY STOP CONTROLLED INTERSECTION:
Delay = Critical Movement Approach Delay (secs)
v/c = Movement Volume-to-Capacity Ratio, major (minor)
LOS = Movement Level of Service, major (minor)

Queuing Analysis

A 95th percentile queuing analysis was performed using the ODOT Queue Length Estimation tool for Two-Way STOP Controlled Intersections under both the existing and future peak hour conditions to evaluate the potential for queue blocking or spillback along the highway per the

ODOT Analysis Procedures Manual (APM).[6] The queue lengths and associated storage lengths are shown in Table 5 below. Intersection queuing reports are provided in Appendix D.

As shown, no existing dedicated turning storage lengths are expected to be exceeded under the existing or future traffic volumes. However, the major shared through-left lanes at Timber Road and Gales Creek Road show projected queue lengths of approximately 75 ft during the peak hour.

Table 5: Data Collection and Analysis Information

Intersection	Movements		Available Storage	Existing (2022) 95th Percentile	Future (2044) 95th Percentile
OR 6/Wilson River Loop Road (East)	Major EB	Left	600 ft	30 ft	35 ft
	Minor SB	Left-Right	-	200 ft [a]	245 ft [a]
OR 6/Timber Road	Major EB	Left-Through	-	70 ft	80 ft
	Minor SB	Left-Right	-	40 ft	50 ft
OR 6/Gales Creek Road	Major WB	Left-Through	-	75 ft	85 ft
	Minor NB	Left	-	75 ft	85 ft
		Right	50 ft	35 ft	40 ft

a Due to the inability to model all aspects of this minor approach's full turning movements using the ODOT tool, the actual queues at the intersection will be shorter than what is documented.

Left Turn Lane Criteria

Consideration for dedicated left-turn lanes at the Timber Road and Gales Creek Road intersections were evaluated due to the estimated queue lengths reported above and associated safety concerns of high speed (55 MPH speed limit) through moving traffic conflicting with slowing or stopped left turning vehicles on the highway. The necessity for left-turn lanes on major road approaches at unsignalized intersections is based on guidance provided in the ODOT Analysis Procedures Manual (APM)[7] and the ODOT Highway Design Manual (HDM).[8]

[6] Chapter 12.5, Analysis Procedures Manual, Oregon Department of Transportation, June 2022.
[7] Left Turn Lane Criteria, Chapter 12, Analysis Procedures Manual, Oregon Department of Transportation, June 2022.
[8] Left Turn Lanes, Part 506, Highway Design Manual, Oregon Department of Transportation, January 2023.

The guidance provides three criteria to consider for the installation of left-turn lanes: Volume, Crash, and Special Case. Meeting a criterion does not require a turn lane to be installed but is a minimum requirement for one to be considered. Appendix E contains the intersection left-turn lane volume curves.

As shown in Table 6 below, the Gales Creek Road/OR 6 intersection meets the volume and crash criteria for a westbound left-turn lane based on both the Existing and Future peak hour volumes. While the volume or crash criteria is not met for the Timber Road/OR 6 intersection due to the number of left-turning vehicles in the peak hour being less than 10, the APM recognizes that "careful consideration [is to] be given to installing a left turn lane due to the increased potential for rear-end collisions in the through lanes" for instances where the mainline volumes are high.

Table 6: Left-Turn Lane Criteria

Criteria	High-Level Explanation	Criterion Met?			
		Timber Road/ OR 6		Gales Creek Road/ OR 6	
		Existing Peak Hour	Future Peak Hour	Existing Peak Hour	Future Peak Hour
Volume	Based on speed and volume of approaching and opposing vehicles; minimum of 10 left turns	No [a]	No [a]	**Yes**	**Yes**
Crash	History of crashes susceptible to correction by a left-turn lane (just one of several crash criteria that must be evaluated)	No		**Yes**	
Special Case	Unique traffic cases like the presence of railroad crossings or geometric constraints	No		No	

a Number of left-turning vehicles is less than 10, but through volume may justify consideration of installing a left-turn lane based on APM guidance cited in the preceding paragraph.

Segment Operations

Roadway operations of the two-lane highway were determined for the associated peak hours under each scenario and direction of travel based on the HCM 7th Edition methodology. HCM 7th Edition methodology for two-lane highway analysis evaluates Follower Density to determine

the LOS of a highway facility, with a higher number of followers per mile equating to a higher LOS.

A conservatively representative 1-mile section of the highway with a 5% upgrade (in both directions) and no passing allowed (Passing Constrained) was utilized for the analysis. The mean free flow speed (FFS) was determined from the tube counts during low-demand conditions for the eastbound and westbound directions. Table 7 presents the estimated LOS for the roadway per direction of travel and volume set. The difference in operations is primarily due to differences in volume and heavy vehicle percentages, as the traffic counts indicated a higher volume and percentage of heavy vehicles in the westbound direction. Segment operations reports are provided in Appendix F.

As shown, while there are no mobility standards to compare to, the conservative estimate of the highway currently functions at LOS B or below for both directions under existing conditions and is expected to operate at LOS C or below for both directions under future conditions.

Table 7: Existing and Future Peak Hour Segment Operations

Roadway	Mobility Standard	Existing LOS (2022)		Future LOS (2044)	
		Westbound	Eastbound	Westbound	Eastbound
OR 6	N/A	B (2.8 followers/mile)	A (1.8 followers/mile)	C (4.1 followers/mile)	B (2.7 followers/mile)

Traffic Operations Conditions Summary

An evaluation of the segment and study intersection operations on the OR 6 study corridor between MP 1.0 and 49.0 indicate there are no capacity deficiencies in the study area under current (2022) or estimated future (2044) traffic volumes. The findings of the existing and future operations analysis of the OR 6 corridor are presented below:

- **Data Collection:** Turning movement and segment counts were collected in August, September, and October of 2022 at the following locations:
  - OR 6/Wilson River Loop Road (East)
  - OR 6/Timber Road
  - OR 6/Gales Creek Road
  - OR 6 at MP 12.0 (segment count)

- **Existing Conditions:** All study intersections operate below ODOT mobility targets, existing turn lane storage is adequate for estimated queue lengths, and criteria is met for a dedicated westbound left turn lane at the Gales Creek Road intersection. The segment analysis indicates the available highway capacity is adequate for existing 2022 traffic demand.
- **Future Conditions:** All study intersections are expected to operate below OHP mobility targets, existing turn lane storage is adequate for future estimated queue lengths, and criteria is met for a dedicated westbound left turn lane at the Gales Creek Road intersection. The segment analysis indicates the available highway capacity is adequate for future 2044 traffic demand.

SAFETY ANALYSIS

This section summarizes the existing safety performance of the OR 6 study corridor which extends from the City of Tillamook to the City of Banks (MP 1.0 to 49.0).

Safety Analysis

The safety performance analysis and findings presented in the memorandum are based on the most recent five years of final reported crash data published by Oregon Department of Transportation (ODOT), which includes data from 1/1/2016 to 12/31/2020. A supplemental discussion at the end of this memorandum summarizes details of fatal and serious injury crashes reported in 2021 based on preliminary crash records. All data from 2016 – 2021 was provided by the ODOT Crash Analysis & Reporting Unit.

Crash severity in this memorandum is described using the internationally recognized KABCO injury scale (Table 8).

Table 8: KABCO Definitions

KABCO Injury Level	Severity Description
K	Fatal
A	Serious (Incapacitating) Injury
B	Minor Injury
C	Possible Injury
O	Property Damage Only (PDO)

According to Oregon law, crash reports are required when damages associated with the crash exceed a minimum dollar value. The reporting threshold increased from $1,500 to $2,500 on January 1, 2018. This change occurred in the middle of the study period and should be taken into consideration when evaluation fluctuations in total and property damage only (PDO) crash frequency.

Basic Crash Statistics

Between 2016 and 2020, 428 crashes were reported along the study corridor. Of those crashes, seven resulted in a fatality and 25 resulted in serious injuries. The total number of crashes per year has fluctuated over the study period, as has the number and proportion of fatal and serious injury crashes. Crashes are rare and random events. It is standard practice to analyze five years of data to account for this fluctuation.

Table 9: Crash Frequency by Severity and Year (2016-2020)

	KABCO Crash Severity Level					
Year	Fatal	Injury A	Injury B	Injury C	PDO	Total
2016	0	4	19	21	41	85
2017	3	8	15	25	44	95
2018	1	7	22	24	45	99
2019	3	5	18	15	46	87
2020	0	1	16	20	25	62
Total	***7***	***25***	***90***	***105***	***201***	***428***

Crash Types

The most common crash type reported on the study corridor was fixed object (192 crashes or 45%), with ditches and guardrail being the most common objects struck. Other prevalent crash types include rear-end (14%), turning (13%), and animal (10%). Although head-on crashes accounted for only 3% of all crashes, they resulted in a notable proportion of high-severity crashes, making up 50% of all fatal crashes and 12% of serious injury crashes. A breakdown of all crash types per severity level is provided in Table 10.

Table 10: Crash Type by Severity (2016-2020)

	KABCO Crash Severity Level					
Type	**Fatal**	**Injury A**	**Injury B**	**Injury C**	**PDO**	**Total**
Fixed Object	2	12	44	48	86	192
Rear-end	1	2	15	20	24	62
Turning	0	3	11	15	27	56
Other[1]	0	1	3	7	36	47
Sideswipe-Meeting	0	2	6	6	9	23
Non-collision (Overturn)	1	2	6	5	8	22
Head-on	3	3	3	3	1	13
Sideswipe-Overtaking	0	0	1	0	5	6
Angle	0	0	1	0	2	3
Backing	0	0	0	0	3	3
Pedestrian	0	0	0	1	0	1
Total	***7***	***25***	***90***	***105***	***201***	***428***

1 44 of 47 crashes classified as “Other” involved a vehicle striking an animal (primarily deer or elk)

Contributing Factors

The primary contributing factors that were attributed to recorded crashes included "Too Fast for Conditions" (28%), "Other Improper Driving" (12%), and "Other" (11%). When considering only fatal and serious injury crashes, the most commonly reported primary contributing factors were "Other Improper Driving" (19%), "Left of Center (Crossed Centerline)" (19%), and "Fatigue" (16%). A percentage breakdown of the top primary contributing factors per severity level are provided in Table 11. Driver impairment from alcohol or drugs was reported in approximately 6% (27 crashes) of all crashes and 16% (5 crashes) of fatal or serious injury crashes.

Table 11: Top 5 Reported Contributing Factors (2016-2020)

Contributing Factor	KABCO Crash Severity Level					
	Fatal	Injury A	Injury B	Injury C	PDO	Total
Too Fast for Conditions	0.0%	0.7%	5.8%	9.1%	11.9%	27.5%
Other Improper Driving	0.5%	0.9%	2.6%	2.6%	5.8%	12.4%
Other	0.0%	0.2%	0.9%	1.4%	8.4%	10.9%
Fatigue	0.2%	0.9%	1.6%	2.3%	2.3%	7.3%
Failure to Yield	0.0%	0.2%	0.7%	1.6%	2.6%	5.1%

Less than 5% of crashes were attributed to the following contributing factors (listed in decreasing order of percentage): Following too closely, inattention, left-of-center, failure to avoid, reckless driving, improper turning, careless driving, improper overtaking, speed, phantom, illness, passing a stop sign, tire failure, improper lane change, disregarding a traffic control device, wrong way driving, mechanical defect, obstructed view, steering defect, pedestrian in roadway, and load shift.

Weather, Lighting, and Time of Day

Approximately 74% of all crashes occurred during clear or cloudy conditions. Approximately 15% of all crashes occurred in rain, which holds consistently across all crash severities. While 5% of all crashes occurred during snow events, zero fatal or serious injury crashes occurred in the snow.

While related to weather conditions, roadway surface conditions can be wet, icy, or snowy even if it is not actively raining or snowing. Approximately 60% of all crashes occurred on dry pavement, while 24% occurred on wet pavement. Icy pavement was indicated in 13% of all crashes, but in only 4% of serious injury crashes and zero fatal crashes.

Crash records indicate that approximately 65% of all crashes occurred during daylight conditions while 35% occurred during dark, dawn, or dusk conditions. However, 100% of fatal crashes and 84% of serious injury crashes occur during daylight conditions.

As shown in Figure 4, the highest percentage of crashes occurred between the hours of 10:00 AM and 6:00 PM. These hourly trends are consistent with observed peaks in traffic volume.

Figure 4: Percentage of Crashes and Daily Traffic by Time of Day

EPDO Evaluation

The Equivalent Property Damage Only (EPDO) evaluation is a network screening strategy that accounts for both crash frequency and crash severity. Each crash severity level is assigned a weighting factor which is typically derived from the relative societal cost. ODOT's Safety Priority Index System (SPIS) applies a modified EPDO method, in conjunction with exposure (traffic volume), to screen the entire statewide transportation system. Consistent with the SPIS evaluation, the following EPDO weighting factors were applied:

- Fatal & Serious (Injury A) Crash – 100
- Minor (Injury B) or Possible (Injury C) Crash – 10
- Property Damage Only (PDO) Crash – 1

Using these weighting factors, a fatal or serious injury crash is equivalent to 100 PDO crashes, for example. An EPDO value is assigned to each crash in the study area, and EPDO values are aggregated for all crashes occurring at an individual location (either intersection or short segment, typically 0.10 miles long). For this evaluation, the EPDO score is calculated for each consecutive 0.10-mile interval from MP 1.0 to MP 49.0 (not using a sliding window). Locations are then ranked within the study area by EPDO score. Table 12 presents the results of the EPDO evaluation, and further detail about the crashes at these locations is included at the end of the memo in Table 16.

Table 12: EPDO Evaluation Results

Corridor Statistic	EPDO Score
Corridor Average per Segment	10.92
Corridor 95th Percentile[1]	110
Locations Exceeding 95th Percentile Milepoint (Description)	**EPDO Score**
MP 33.3-33.4 (Horizontal Curve + Pull Out)	212
MP 2.0-2.1 (Wilson River Loop East Intersection)	177
MP 41.4-41.5 (Horizontal Curve)	141
MP 5.8-5.9 (Rush Road Intersection)	131
MP 33.9-34.0 (Horizontal Curve)[2]	120
MP 10.5-10.6 (Horizontal Curve)	120
MP 31.4-31.5 (Horizontal Curve)	120
MP 33.8-33.9 (Horizontal Curve)[2]	113
MP 24.1-24.2 (Elk Meadows Lane Intersection)	111

1 95th percentile value of the EPDO scores for all 0.1-mile-long segments on the corridor.
2 Denotes that an adjacent segment is also on the list.

Critical Crash Rate Calculations

Crash rates are another indicator of safety performance that accounts for crash frequency and exposure (traffic volume) but does not account for crash severity. The purpose of comparing calculated (actual) crash rates with critical crash rates is to identify sites where crashes occur at a higher frequency than expected and should be flagged for further investigation. Table 13 and Table 14 show the results of the evaluation of the three study intersections as well as the entire study segment, respectively.

The analysis utilizes a few key metrics. The intersection types were determined by their respective geometries, traffic control, and land use, while the segment types were determined by their respective land uses and functional classification. The crash rate is then calculated based on crash frequency and vehicle volume, with crash rates at intersections given in units of

crashes per million entering vehicles (crashes/MEV) and crash rates for segments given in units of crashes per million vehicle miles traveled (crashes/MVMT). The Calculated Crash Rates are then compared to a Critical Crash Rate (if a reference population is applicable) and the Statewide Comparison Crash Rates, which contain statewide average crash rates for each of the last five years and are published annually by the ODOT Crash Analysis and Reporting (CAR) Unit. Statewide Comparison crash rates for intersections can be found in Exhibit 4-1 in the ODOT Analysis Procedures Manual[9] and Statewide Comparison crash rates for segments can be found in Table II on the ODOT Crash Statistics and Reports website.[10]

It is important to note that the crash rate comparison accounts only for crash frequency and does not account for crash severity. In other words, fatal and serious injury crashes have the same weighting as a PDO crash in the crash rate calculation. Critical crash rate comparisons should be used in conjunction with other safety performance metrics, such as EPDO, SPIS, and high-severity crash patterns, to identify locations warranting further safety evaluation and treatment.

The number of crashes per intersection includes crashes coded as occurring at the intersection or as being intersection related. Total entering volume was estimated using PM peak hour turning movement counts at the intersection that were adjusted using the ratio of peak hour to daily volumes observed in the corridor segment counts (approximately 9%).

As shown, the intersections of OR 6/Wilson River Loop and OR 6/Gales Creek Road have crash rates that exceed the statewide comparison crash rate.

Table 13: Intersection Crash Rate Results

Intersection	Grouping Type	Daily Entering Volume[1]	Number of Crashes (5 Years)	Statewide Comparison Crash Rate (90th Percentile)	Calculated Crash Rate
OR 6/Wilson River Loop East	Rural 3ST	9,100	15	0.475	**0.903**
OR 6/Timber Road	Rural 3ST	7,700	1	0.475	0.071
OR 6/Gales Creek Rod	Rural 3ST	8,000	8	0.475	**0.548**

Bold/Highlighted = Calculated Rate Exceeds the Statewide Comparison Crash Rate
1 Volumes listed are based on intersection and segment traffic counts collected in Fall 2022 (see Appendix A).

[9] Analysis Procedures Manual, Oregon Department of Transportation, Updated 2020.
[10] Crash Statistics & Reports, Oregon Department of Transportation, Oregon.gov.

ODOT segment comparison crash rates include all crashes along highway segments, including crashes occurring at intersections. Because of this, the corridor was divided into four segments of 12 miles each for crash rate calculations and comparison to the statewide segment crash rate for similar rural minor arterial highways. As shown in Table 14, the corridor crash rates are below the statewide comparison rate for rural minor arterial roadways.

Table 14: Segment Crash Rate Results

Segment	Grouping Type	Average Daily Traffic[1]	Segment Length (Miles)	Number of Crashes (5 Years)	Statewide Comparison Crash Rate (90th Percentile)	Calculated Crash Rate
MP 1.0 – MP 13.0	Rural Minor Arterial	6,300	12	127	1.22	0.920
MP 13.1 – MP 25.0	Rural Minor Arterial	6,300	12	83	1.22	0.602
MP 25.1 – MP 37.0	Rural Minor Arterial	6,300	12	118	1.22	0.855
MP 27.1 – MP 49.0	Rural Minor Arterial	6,300	12	100	1.22	0.725

Bold/Highlighted = Calculated Rate Exceeds the Statewide Comparison Crash Rate
1 Volumes listed are based on intersection and segment traffic counts collected in Fall 2022 (see Appendix A).

ODOT State Highway SPIS Reports

The Safety Priority Index System (SPIS) is the ranking system developed by ODOT to identify potential safety problems on state highways. SPIS scores are developed based upon crash frequency, severity (not including PDOs), and rate for a 0.01 mile or variable length segment along the state highway over a rolling three-year window, which creates a prioritized list of the top 15% of statewide SPIS sites for each region. For this project, the three most recent SPIS cycle lists were reviewed: SPIS 2020 (2017-2019 crashes), SPIS 2019 (2016-2018 crashes), and SPIS 2018 (2015-2017 crashes)

Table 15 summarizes the locations identified as SPIS sites in 2018, 2019, or 2020.

Table 15: SPIS Rankings

Milepoint (Location Description)	SPIS 2020 (2017-2019 Crashes)	SPIS 2019 (2016-2018 Crashes)	SPIS 2018 (2015-2017 Crashes)
MP 2.02-2.11 (Near Wilson River Loop East Intersection)	**Top 10%**	Top 15%	-
MP 25.10-25.18 (Near Kings Mountain Trailhead Access)	-	-	Top 15%
MP 33.35-33.44 (Horizontal Curve)	**Top 10%**	-	-
MP 33.85-33.93 (Horizontal Curve)	-	**Top 10%**	Top 15%
MP 37.43-37.50 (Tangent with Pull-out Area)	-	-	**Top 10%**
MP 41.49 (Horizontal Curve and Driveway)	Top 15%	-	-

Discussion of 2021 Crash Reports

As of the writing of this memorandum, ODOT published crash data is only available through 2020. However, preliminary information indicates a substantial increase in fatal and serious injury crashes in 2021. It should be noted that the increase observed on this corridor is consistent with statewide and national trends that indicate an increase in high-severity crashes following pandemic-induced changes in travel patterns and driver behavior. The following sections summarize the ODOT preliminary crash data for the seven fatal and seven serious injury crashes that were reported in 2021. It is important to note that all attributes of the preliminary data, including crash locations, crash types, crash severity, and contributing factors (including impairment), are subject to change until the final dataset released.

Fatal Crashes

- 7 fatal crashes: 4 head-on, 2 fixed object, 1 sideswipe-meeting
- Primary Contributing Factors: Left of Center (5), Too Fast for Conditions (2)
- Impairment: Drugs Involved (3), Drugs and Alcohol Involved (2)
- Locations (crash type): MPs 6.0 (head-on), 8.5 (head-on), 26.0 (head-on), 30.7 (sideswipe-meeting), 33.4 (fixed object), 33.5 (fixed object), 37.3 (head-on)

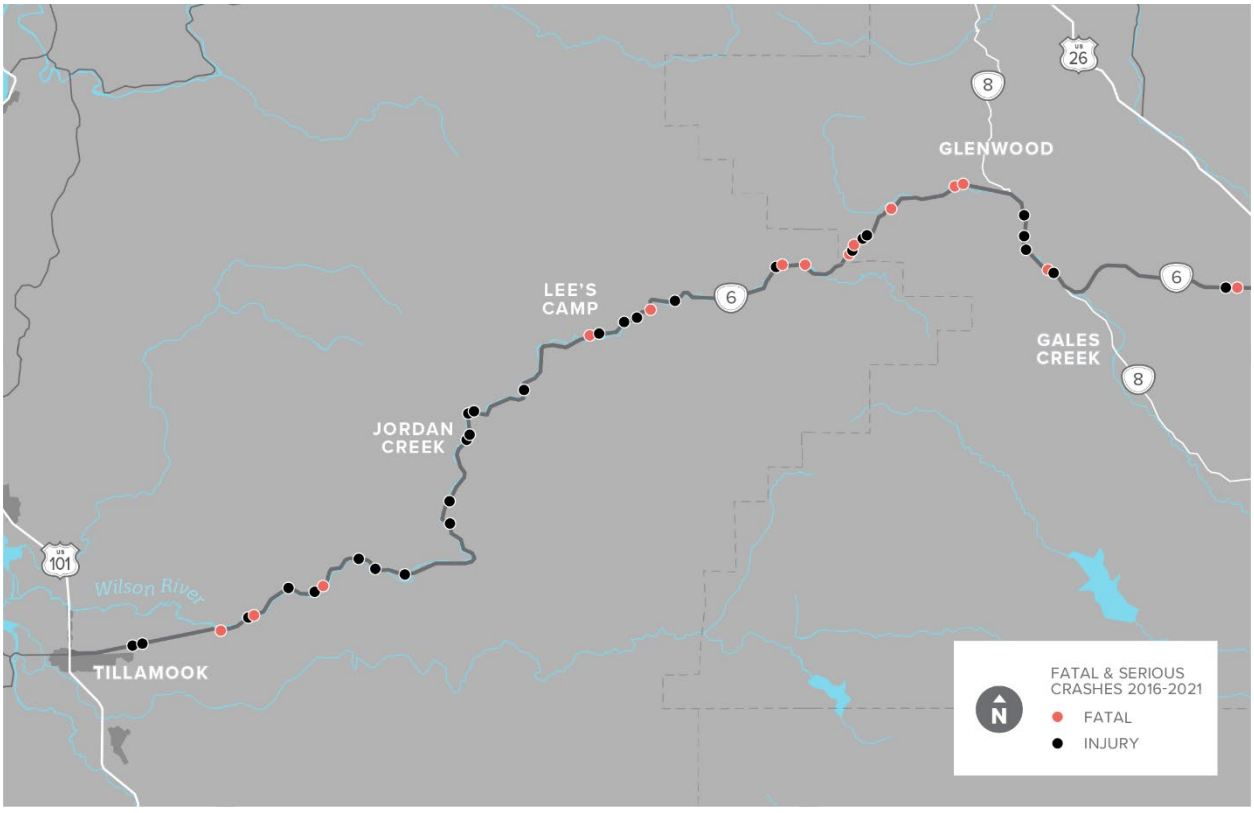
Serious Injury Crashes

- 7 serious injury crashes: 2 fixed object, 2 rear-end, 1 sideswipe, 1 turning, 1 backing
- Primary Contributing Factors: Inattention (4), Other Improper Driving (1), Careless Driving (1), Improper Turning (1)
- Impairment: No drug or alcohol involvement reported
- Locations (crash type): MPs 6.0 (fixed object), 15.1 (sideswipe-meeting), 18.8 (fixed object), 20.8 (rear-end), 40.4 (backing), 41.7 (1 rear-end, 1 turning)

Locations with multiple fatal or serious injury crashes in 2021: 2 serious injury crashes occurred near MP 41.7 (a horizontal curve with pull-out area); 1 fatal and 1 serious injury crash occurred near MP 6.0 (a tangent section with a wide shoulder)

Figure 5 shows a map of the study corridor with all reported fatal and serious injury crash locations since 2016, including those in 2021.

Figure 5: Map of Fatal and Serious Injury Crashes (2016-2021)



Safety Analysis Summary

Table 16 and Figure 6 below identifies the study area intersections and segments that were flagged in the safety performance evaluation based on EPDO, crash rates, or SPIS. Special

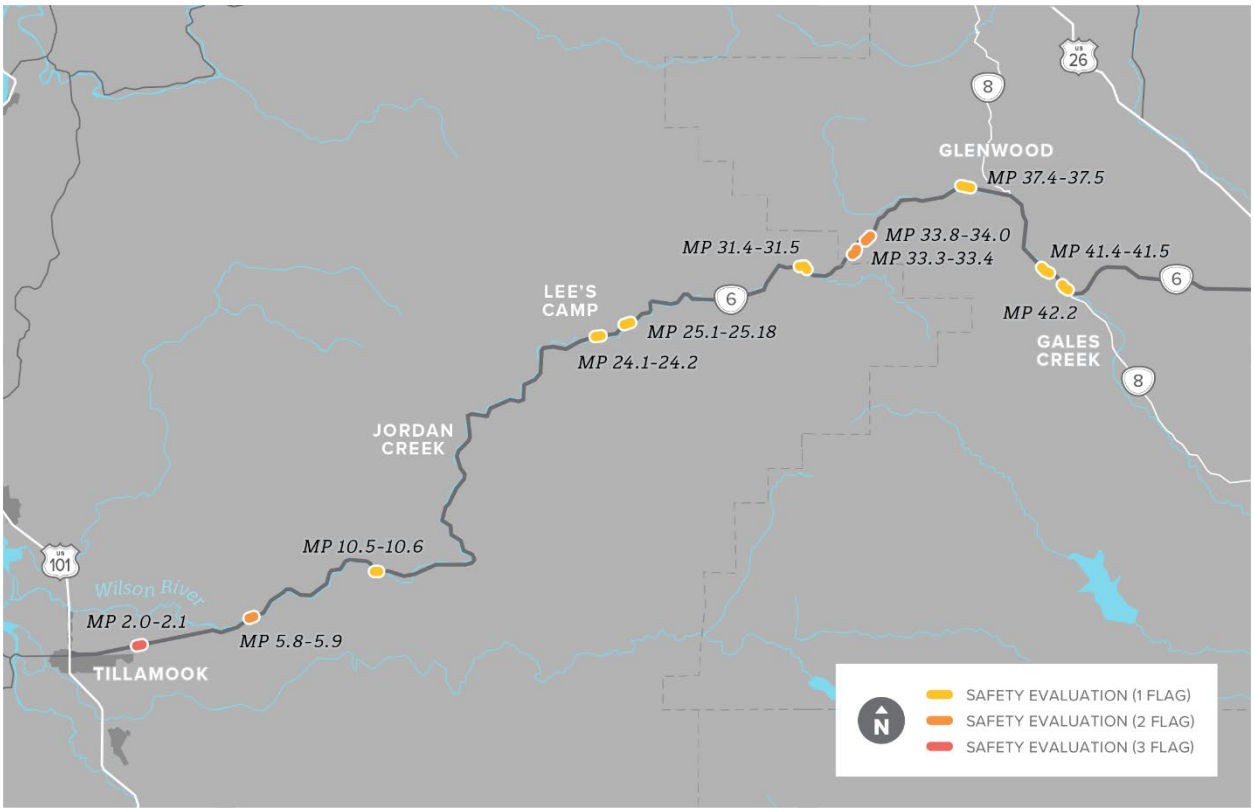
consideration should be given to incorporate proven safety countermeasures during the development of alternatives for those locations that were flagged in multiple evaluations.

Table 16: Study Area Safety Performance Evaluation Summary

Locations	Exceeds 95th Percentile EPDO Score?	Exceeds Expected Crash Rate?	ODOT SPIS Site?	2016-2020 Crash Details
MP 2.0-2.1 (Wilson River Loop East Intersection)	**Yes**	**Yes**	**Yes**	15 total crashes (1 INJ A); 14 turning, 1 fixed object; 5 on wet roads; 8 involved SBL, 3 involved NBR; 2 in Dark
MP 33.3-33.4 (Horizontal Curve and Pull-out)	**Yes**	-	**Yes**	5 total crashes (2 INJ A); all fixed object; 3 on wet/icy roads; 4 EB/1WB
MP 33.8-34.0 (Horizontal Curve)	**Yes**	-	**Yes**	8 total crashes (2 INJ A); 3 fixed object, 3 overturning, 1 sideswipe-meeting, 1 head-on; 6 on wet/icy roads; 6 involved EB
MP 41.4-41.5 (Horizontal Curve)	**Yes**	-	**Yes**	6 total crashes (1 Fatal); 4 fixed object, 1 sideswipe-meeting, 1 turning; 5 on wet/icy roads; EB/WB even split
MP 5.8-5.9 (Rush Road Intersection)	**Yes**	-	-	5 total crashes (1 INJ A); 3 rear-end, 1 turning, 1 fixed object; 1 on wet roads; All rear-end and turning EB, Fixed object WB; 2 in Dark
MP 10.5-10.6 (Horizontal Curve)	**Yes**	-	-	3 total crashes (1 INJ A); 2 fixed object, 1 overturn; 2 on wet/icy roads; All WB
MP 24.1-24.2 (Elk Meadows Lane Intersection)	**Yes**	-	-	3 total crashes (1 INJ A); 1 animal, 1 turning, 1 fixed object; 1 on wet roads; All WB; All in Dark

Locations	Exceeds 95th Percentile EPDO Score?	Exceeds Expected Crash Rate?	ODOT SPIS Site?	2016-2020 Crash Details
MP 25.10-25.18 (Near Kings Mountain Trailhead Access)	-	-	**Yes**	3 total crashes (1 INJ A); 2 rear-end, 1 fixed object; All EB
MP 31.4-31.5 (Horizontal Curve)	**Yes**	-	-	3 total crashes (1 Fatal); 1 fixed object, 1 overturn, 1 sideswipe; 1 in Dark; 2 WB, 1 EB
MP 37.43-37.50 (Tangent with Pull-out Area)	-	-	**Yes**	2 total crashes (1 Fatal); 1 fixed object, 1 head-on; 1 on icy roads in dark; Fixed object was WB
MP 42.2 (Gales Creek Intersection)	-	**Yes**	-	8 total crashes (0 F+A); 4 turning, 2 fixed object, 1 rear-end, 1 angle; 4 on wet roads; 2 in dark; 5 involved left turns (4 NBL, 1 EBL)

Figure 6: Map of Locations Flagged in Safety Performance Evaluation



NEXT STEPS

The information summarized in this memorandum will be used in conjunction with public input and advisory committee members input to develop a comprehensive Corridor Safety Related Issues Summary of potential issues in Technical Memorandum #4.

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