

Technical Memo #5: Land Use and Transportation System Inventory

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Prepared for

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1. INTRODUCTION

This memorandum provides an inventory of transportation and environmental resources in support of the US 101 Gearhart Facility Plan process. This information provides a baseline understanding of corridor conditions, informs the development of opportunities and constraints, and serves as a foundation for later work to develop the Facility Plan and conceptual corridor improvements.

Environmental resource information is catalogued at this early stage to inform development of conceptual corridor improvements and avoid impacts early in the planning process. The environmental resource analysis considers the Facility Plan study area (not a defined project) and identifies potential resources that should be noted as the process moves forward. Further environmental work would be conducted by the Oregon Department of Transportation (ODOT) in the future during project development, including National Environmental Policy Act classification and associated environmental review.

1.1 Study Area

The study area for the Facility Plan is US 101 in Gearhart, Oregon, from Airport Road (near milepost 19.35) in the south to Ocean Home Farm Lane (near milepost 17.15) in the north. The corridor is approximately 2.2 miles long. The study area limits are approximate; the Facility Plan will consider logical termini for potential future improvements that may be slightly beyond (or within) the city limits of Gearhart.

1.2 Corridor Conditions Summary

Resource Area	Conditions Summary
Transportation System	
Population	Gearhart's population today is 1,531 and is expected to grow slightly to over 1,600 by 2040. Visitors increase the population to up to 3,500 at peak visitation periods.
Land Use	Land use in the corridor is a mix of low-density residential, commercial, and light industrial. Between Pacific Way and Gearhart Lane on the west side of US 101, there is land zoned for future residential/commercial development, though this area is likely constrained by wetlands.
Roadway Access Spacing	All segments of US 101 currently have more driveway and public street approaches than allowed to comply with the access spacing standards. Some of the US 101 segments have more than double the number of existing driveways allowable under the access spacing standards. A high number of accesses increases the risk of collisions from turning vehicles and also decreases safety for pedestrians or cyclists in the corridor.
Bridges	There are no bridges along the US 101 study corridor.

Resource Area	Conditions Summary
Public Transportation	The Sunset Empire Transportation District operates two bus lines that travel through Gearhart. The 101 line operates Monday through Friday between Astoria and Seaside, and the Pacific Connector operates on Saturdays and Sundays between Astoria and Cannon Beach. Both lines have one southbound and northbound stop on US 101 in Gearhart.
Bicycle Facilities	There are currently no dedicated bicycle facilities along the study corridor. People riding bicycles must ride in narrow, unprotected shoulders with no dedicated pavement markings or signage.
Pedestrian Facilities	The Gearhart US 101 corridor currently lacks sidewalks or other dedicated pedestrian facilities. Pedestrians must generally walk along narrow shoulders, paved or gravel strips between roadway shoulders and adjacent land uses, or along segments of paved parking lots where available.
Trails	The Oregon Coast Trail is located on US 101 at the southern end of the corridor. The Oregon Coast Bike Route (OCBR) also follows US 101 in this corridor; the OCBR Plan identified improvements to this corridor as a “critical need.”
Freight	Heavy vehicles account for approximately 5 to 6 percent of the traffic on US 101 through Gearhart during an average weekday. US 101 is classified as a Federal Truck Route and a Reduction Review Route. Federal Truck Routes generally require 12-foot travel lanes, while a review of potential reduction of vehicle-carrying capacity is required for all proposed actions on Reduction Review Routes.
Safety	From 2014 to 2018, there were 70 crashes in the corridor. 51 percent were property damage only crashes. Speeding was a factor in 9 percent of crashes while failure to yield right-of-way was responsible for 31 percent of crashes. The Gearhart Police Department has noted speeding as a concern in the corridor as well. The intersection of US 101 and Gearhart Lane in particular is a likely safety concern based on data available.
Motor Vehicle Operations	All intersections studied along the corridor currently meet mobility targets.
Environmental	
Wetlands and Waters	There are flood plains immediately to the west of the study corridor. Most of the southern part of the corridor is also located within a 100-year floodplain. Desk research and field visit findings show that there are extensive wetlands throughout the study area.
Threatened and Endangered Species	Protected salmon species are known to use Neawanna Creek and Neacoxie Creek which are near the study area. Several other threatened or endangered species are also likely to occur in the study area.

Resource Area	Conditions Summary
Cultural Resources	The study area is situated in an area known for extensive precontact shell midden deposits associated with thousands of years of use and settlement by Native Americans. No known resources are mapped as extending into the Highway 101 right-of-way but few of the sites have been formally recorded or evaluated, so overall, the extent and boundaries of most archaeological resources is unknown. Within the study area (quarter-mile buffer), 240 parcels appear to contain buildings aged 45 years or older.
Visual Impacts, Section 4(f) and Section 6(f)	Privately owned Bud's RV Park and Campground and the public North Gateway Park are both located in the corridor. North Gateway Park, the Oregon Coast Bike Route, and Oregon Coast Trail are considered Section 4(f) assets. There are no Section 6(f) properties.
Air, Noise and Energy	The study corridor is not located in a maintenance area or a non-attainment area.
Hazardous Materials	Several sites within one mile of the corridor were identified on regulatory databases; however, none of the sites are situated within the proposed corridor itself.
Geologic Hazards	US 101 is the only Lifeline Route in Gearhart, and it is designated as Tier 3 in the Oregon Highway Plan (ODOT 1999). Much of the city is within the Local Cascadia Earthquake and Tsunami area, and portions of the city and its western coast are in the distant tsunami evacuation zone.



Figure 1-1. Study Area

2. LAND USE AND POPULATION

2.1 Corridor Population

Census estimates show a permanent population in Gearhart of just over 1,500. The 2017 Gearhart TSP estimates that the population rises to over 3,500 in the summer due to visitors to the city's beachfront and golfing amenities. The population in Gearhart is approximately 95 percent White, 2.5 percent Hispanic or Latino, and 2.2 percent Asian. Approximately 20 percent of the population is under 18 years old, and 27 percent of the population is 65 or older. The Population Research Center at Portland State University estimates that the Gearhart population will increase to just over 1,600 in 2040. Table 2-1 compares the present and future demographics of Gearhart to those of Clatsop County and Oregon.

Table 2-1. Gearhart Demographic Information

Demographic	City of Gearhart		Clatsop County		State of Oregon	
	Total	Percent	Total	Percent	Total	Percent
Total Population	1,531	--	38,562	--	4,081,943	--
2040 Population	1,618	--	40,010	--	5,100,899	--
Total Families	432	--	9,631	--	1,005,869	--
Families Below Poverty Level	23	5.3%	539	5.6%	92,540	9%
Race and Ethnicity						
White, Non-Hispanic	1,451	94.8%	33,048	85.7%	3,103,557	76%
Two or More Races	8	0.5%	1,340	3.5%	149,082	4%
Hispanic or Latino	39	2.5%	3,260	8.5%	523,956	13%
Asian alone (Not Hispanic)	33	2.2%	400	1.0%	172,505	4%
American Indian and Alaska Native alone (Not Hispanic)	0	0%	116	0.3%	36,776	1%
Black or African American	0	0%	272	0.7%	74,356	2%
Youth (Under 18)	304	19.9%	7,511	19.5%	868,178	21%
Older Adults (65+)	412	26.9%	8,015	20.8%	682,546	17%

Data Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates. Population forecasts prepared on June 30, 2020 by the Population Research Center at Portland State University.

Tables: DP05 – ACS Demographic and Housing Estimates; S1702 – Poverty Status in the Past 12 Months of Families

2.2 Land Use

The majority of the city is zoned residential, with most residential areas designated as low density residential. The study area from approximately Gearhart Lane to the north city limits (see Figure 2-1) includes resort commercial, general commercial, commercial planned residential development, medium density residential, and public or semi-public zoning. Commercially zoned areas in this strip along US 101 are diverse and include dining options, a bowling alley, various retail shops, professional offices and services, and a concentration of industrial supply businesses near the southern city limits.

The area east of US 101 is generally zoned as rural agricultural, and areas to the west include park land, medium and high density residential, public and semi-public property, resort and neighborhood commercial, and aquatic conservation. Downtown Gearhart, immediately to the west of the US 101 along Pacific Way, includes a small hub of neighborhood commercial and public buildings, small shops, and the city fire station and city hall. Additionally, this area includes a large golf course, resort, and restaurant. A map of the current zoning of Gearhart can be found in Figure 2-1.

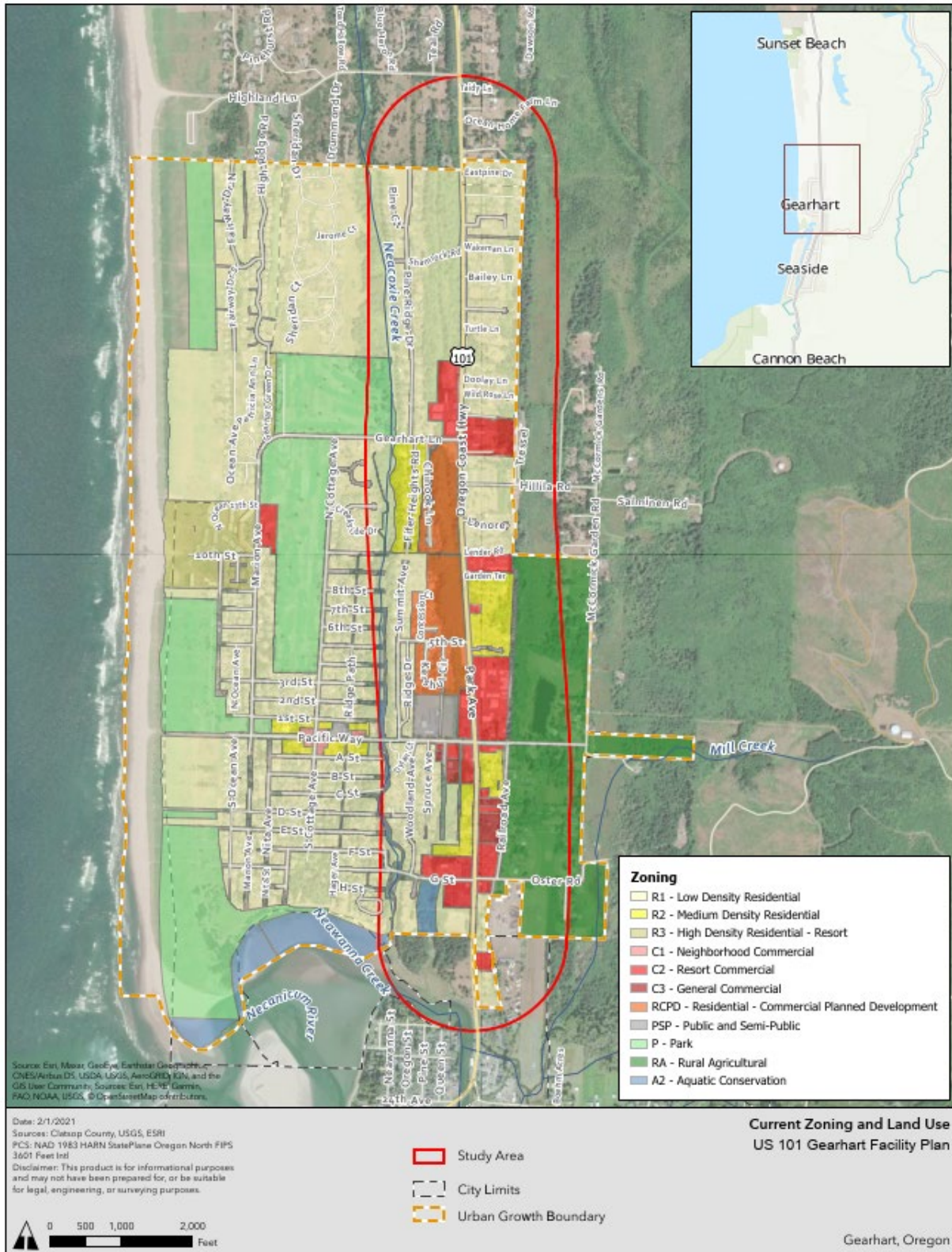


Figure 2-1. Current Zoning and Land Use

3. TRANSPORTATION SYSTEM INVENTORY

3.1 Roadway

US 101 is the major transportation route through Gearhart, running north-south, bisecting the city. It is part of the National Highway System (NHS), and it is under ODOT jurisdiction. Within Gearhart, US 101 includes a Principal Arterial federal designation (as shown in Figure 3-21), a Statewide Highway designation, and is a Federal Truck Route, a Reduction Review Route, a high clearance route, a scenic byway, and a Tier 3 lifeline route.¹

A three-lane cross section (i.e., one through lanes in each direction and a center turn lane) is maintained along US 101 at the south end (south of Pacific Way) and north end (north of Shamrock Road) of the study corridor. A four-lane cross section (i.e., two through lanes in each direction) is maintained between Pacific Way and Shamrock Road, although in some sections, left-turn lanes are provided to facilitate traffic flow. The posted speed on US 101 ranges from 40 miles per hour (mph) at the south end to 55 mph at the north end of the study corridor.

Within the study area, US 101 also connects to other east-west collector streets, including G Street-Oster Road, Pacific Way, Hillila Road, and Gearhart Lane (see Figure 3-21). A traffic signal is located at the Pacific Way intersection, while all other collector street intersections with US 101 include stop control on the side street. Other local streets or driveways that connect to US 101 along the study corridor serve local traffic needs or business access and connect with US 101 at stop-controlled intersections. Characteristics of the key roadways in the study area are summarized in Table 3-1.

The Gearhart TSP (2017) describes a preferred cross section for US 101 comprised of a three-lane configuration, with additional turn lanes at intersections as needed. The three-lane configuration shows one travel lane in each direction, a center turn lane, and bike lanes. The preferred cross section also includes a shared-use path on the east side of US 101 through Gearhart.

¹ 1999 Oregon Highway Plan, Including amendments through May 2015, Oregon Department of Transportation, 2016.

Table 3-1. Study Area Roadway Characteristics

Roadway Segment	Functional Classification	Cross Section	Posted Speed (mph)	Right-of-Way (feet)
US 101				
Airport Road to G Street-Oster Road	Principal Arterial/ Statewide Highway	3 lanes	40	80
G Street-Oster Road to Pacific Way	Principal Arterial/ Statewide Highway	3 lanes (5 lanes at Pacific Way)	40	70–80
Pacific Way to Garden Terrace Road	Principal Arterial/ Statewide Highway	4 lanes (5 lanes just north of Pacific Way)	40	80
Garden Terrace Road to Gearhart Lane	Principal Arterial/ Statewide Highway	4 lanes (5 lanes at Gearhart Lane)	45	80
Gearhart Lane to Shamrock Road	Principal Arterial/ Statewide Highway	4 lanes (5 lanes at Gearhart Lane)	45	80–85
Shamrock Road to Ocean Home Farm Lane	Principal Arterial/ Statewide Highway	3 lanes	55	80
US 101 Side Streets				
Airport Road	Local Street	2 lanes	Not Posted	Private
G Street-Oster Road	Collector Street	2 lanes	25	40–50
Pacific Way	Collector Street	2 lanes	25	60–80
5th Street	Local Street	2 lanes	Not Posted	60
Hillila Road	Collector Street	2 lanes	Not Posted	40
Gearhart Lane	Collector Street	2 lanes	35	60
Shamrock Road	Local Street	2 lanes	Not Posted	Private
Ocean Home Farm Lane	Local Street	1 lane	Not Posted	Private

Source: Oregon Highway Plan; Gearhart Transportation System Plan

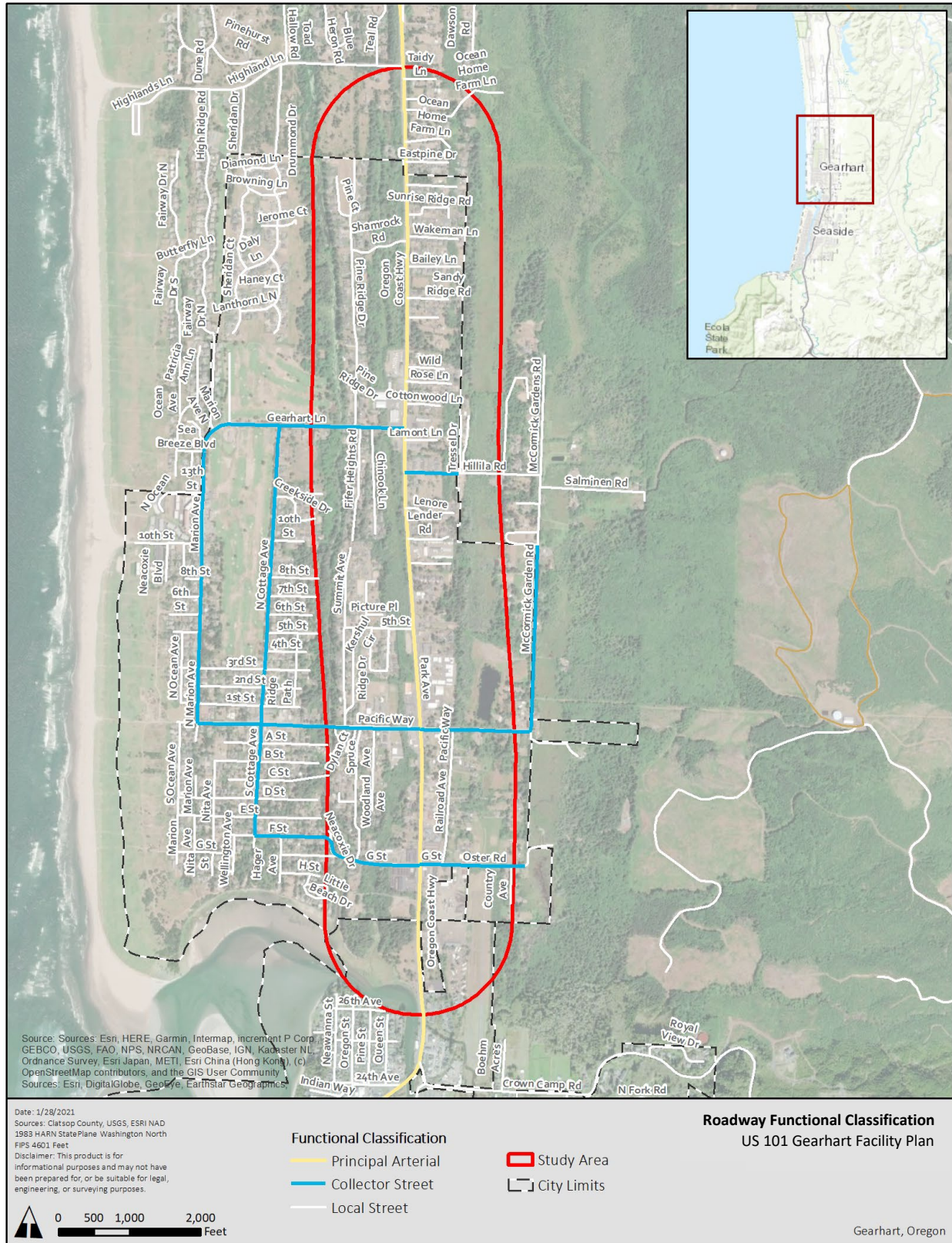


Figure 3-1. Roadway Functional Classification

3.1.1 Access Spacing

An access inventory was conducted along the US 101 study corridor comparing the number of existing approaches (driveways and public streets) to applicable ODOT access spacing standards. Table 3-2 shows the number of existing approaches for each segment of US 101 and compares it to the approximate number of driveway or public street approaches that would be allowed to fully comply with access spacing standards. As shown, all segments of US 101 currently have more driveway and public street approaches than allowed to comply with the access spacing standards. A high number of accesses increases the risk of collisions from turning vehicles and also decreases safety for pedestrians or cyclists in the corridor.

Table 3-2. US 101 Access Spacing Inventory

US 101 Segment	Segment Length (feet)	Allowed Approaches*	Number of Approaches	
			West Side	East Side
Airport Road to G Street-Oster Road	990	1	3	7
G Street-Oster Road to Pacific Way	1,890	2	10	9
Pacific Way to 5th Street	1,420	1	3	7
5th Street to Gearhart Lane	2,830	3	1	19
Gearhart Lane to Shamrock Road	2,630	3	6	13
Shamrock Road to Ocean Home Farm Lane	1,790	1	1	6

*Allowed approaches = Segment length/Access Spacing Standard

3.1.2 Bridges and Culverts

There are no bridges along the US 101 study corridor through Gearhart, although there are two bridges along US 101 over Neawanna Creek and Mill Creek just south of the city, providing the only connection between Gearhart and Seaside. US 101 has eight culverts within or just outside the study area (Table 3-3). These culverts were not inspected for this report and their conditions are unknown. However, a member of the technical advisory committee indicated that the culvert at milepost 17.99 (near Gearhart Lane) appears to be failing.

There are also three culverts in the study area, but not on US 101, that cross Neacoxie Creek located along Gearhart Lane, Pacific Way, and G Street. These crossings are the only connections between US 101 and the west side of the city.

Table 3-3. US 101 Culverts

Drainage Facility ID (DFI)	Milepost	Material	Inspection Date
D030112	17.03	HDPE Corrugated	5/26/2009
D030113	17.49	Corrugated Metal Pipe	4/23/2014
D030114	17.99	Concrete Pipe	5/26/2009
D030115	18.18	Corrugated Metal Pipe	4/23/2014
D030116	18.64	HDPE Smooth Wall	4/23/2014
D030117	18.71	HDPE Corrugated	5/27/2009
D030118	18.81	Concrete Pipe	4/24/2014
D034613	19.42	Corrugated Metal Pipe	6/27/2017

3.2 Public Transportation

The Sunset Empire Transportation District operates two bus lines that travel through Gearhart along US 101. The 101 line operates Monday through Friday between Astoria and Seaside, and the Pacific Connector (PC line) operates on Saturdays and Sundays between Astoria and Cannon Beach. Both lines have one northbound and two southbound stops on US 101 in Gearhart (Figure 3-2). The 101 line travels through Gearhart 18 times per weekday (every 49 minutes) in each direction year-round between 6:30 a.m. and 9:00 p.m.. The PC line travels through Gearhart five times each Saturday and Sunday in each direction year-round from 10:00 a.m. and 8:00 p.m. (Figure 3-2).

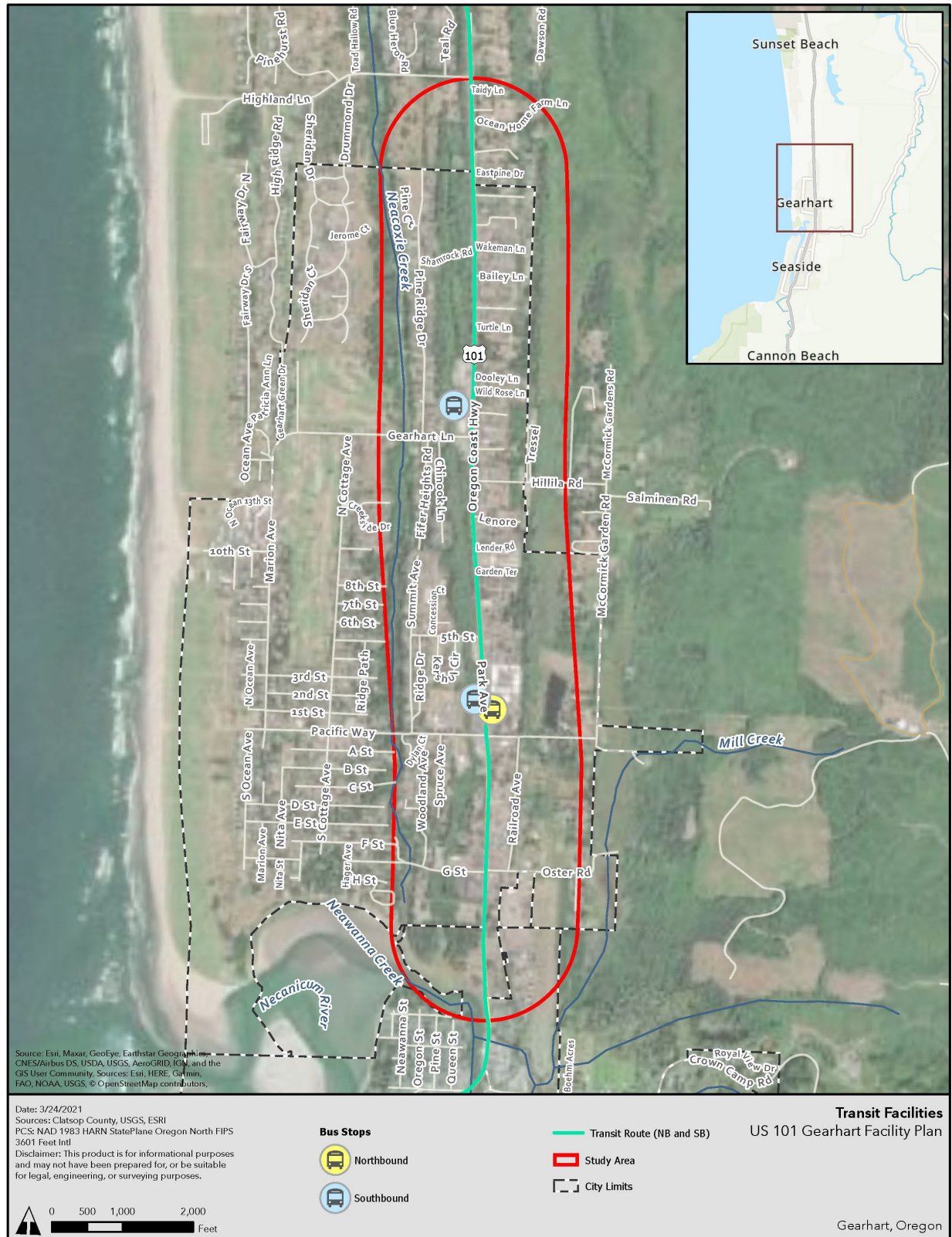


Figure 3-2. Transit Facilities

3.3 Bicycle and Pedestrian

Bicycle and pedestrian travel along US 101 is limited due to the absence of dedicated bicycle and pedestrian facilities including sidewalks, marked crossings, bicycle lanes, and multi-use paths. The following section reviews current bicycling and pedestrian conditions and deficiencies along the Gearhart US 101 corridor.

3.3.1 Bicycle Facilities

There are currently no dedicated bicycle facilities along the Gearhart US 101 corridor. Bicycle riders must ride in narrow, unprotected shoulders with no dedicated pavement markings or signage indicating the presence of bicycles.

Bicycle improvements such as on-street bikeways or off-street shared bicycle/pedestrian paths on US 101 are subject to the design criteria in the ODOT *Highway Design Manual* (ODOT 2012) and *Oregon Bicycle and Pedestrian Design Guide* (Appendix L [ODOT 2011] to the *Highway Design Manual*). The *Highway Design Manual* defines minimum design standards, however the *Blueprint for Urban Design* (ODOT 2020) will be utilized to develop solutions that fit the context.

Table 3-4 describes current ODOT standards for bicycle facilities. Per ODOT guidance, a shared-use path on US 101 would need to provide bicyclists adequate separation from fast-moving vehicle traffic on a paved surface (a shared-use path is included as part of the desired future improvements to US 101 in the Gearhart TSP). The number of at-grade crossings with streets or driveways should be limited while maintaining a balanced approach to providing access to corridor land uses. Where crossings do exist, they should be visible to drivers and provide proper traffic control for path users and motorists.

Table 3-4. Physical Standards for Bicycle Facilities

	Minimum Width (feet)	Ideal Width (feet)	Minimum Roadway Buffer (from edge of pavement) (feet)	Lateral clearance (minimum shy distance on both sides) (feet)
Shared path (two-way)	10	12	5	3
Bike lane (urban highway)	6	8	4	3

Source: ODOT 2011

3.3.2 Sidewalks

The Gearhart US 101 corridor currently lacks sidewalks or other dedicated pedestrian facilities. Pedestrians must generally walk along narrow shoulders, paved or gravel strips between roadway shoulders and adjacent land uses, or along segments of paved parking lots where available. The paved/gravel strips are located where sidewalks would typically be located in a complete urban arterial corridor.

North of Gearhart Lane, existing driveway cuts provide some minor grade separation between the roadway and the area where people walk, as shown in Photograph 3-1. However, these grade-separated segments provide marginal improvement to the



Photograph 3-1. Driveway cuts north of Gearhart Lane

pedestrian environment, as the frequent driveways create potential conflict points between pedestrians and vehicles. Multiple accesses create conflicts between motor vehicles entering or leaving a roadway and bicyclists and pedestrians riding or walking along the roadway.

Future pedestrian improvements would conform to the ODOT *Highway Design Manual* (ODOT 2012) and *Bicycle and Pedestrian Design Guide* (ODOT 2011), which would require a minimum sidewalk width of 5 feet with a 1-foot buffer or shy distance from the roadway. Sidewalks would also need to include vertical curbs, gutters, and stormwater drainage. The *Highway Design Manual* defines minimum design standards, however the *Blueprint for Urban Design* (ODOT 2020) will be utilized to develop solutions that fit the context. Table 3-5 below summarizes minimum sidewalk standards for pedestrian improvements.

Table 3-5. Minimum Sidewalk Standards

Facility Type	Minimum Width (feet)	Ideal Width (feet)
Sidewalks	5	6
Landscape buffer	1	2

Source: ODOT 2011

The preferred three-lane configuration for US 101 stated in the Gearhart TSP includes sidewalks along the west side of the corridor in areas with development or bus stops, in addition to the shared-use path on the east side. A minimum 6-foot-wide landscape strip/drainage area is designated between the roadway and shared-use path or sidewalk.

As noted in the access spacing section, there are a large number of driveways and accesses in the corridor relative to those that would be allowed under ODOT standards. Access control would also have benefits for pedestrians.

3.3.3 Crossings

There is one signalized intersection along the Gearhart US 101 corridor located at the intersection at US 101 and Pacific Way (see Photograph 3-2). The intersection includes call buttons for pedestrians crossing Pacific Way, although there is no sidewalk along the east leg of the intersection. The intersection is marked at all four crossings using standard white painted parallel lines. Curb ramps at this intersection are in poor condition, irregularly designed, and likely noncompliant with Section 405 Americans with Disabilities Act (ADA) ramp standards.

There are no other marked crosswalks along the corridor. There are also no marked crosswalks across the various parallel street and driveway crossings along the corridor.



Photograph 3-2. Pacific Way at US-101 Intersection

None of these crossing locations provides dedicated pedestrian crossing facilities, pavement markings, or pedestrian signage.

3.3.4 Curb Ramps

Curb ramps do not exist along US 101 as there are no existing sidewalks to connect them to. The corridor is, therefore, also deficient in ADA-compliant pedestrian facilities. The lack of sidewalks and curb ramps presents a challenging environment for pedestrians and those who depend on mobility assistance devices such as canes and wheelchairs.

3.3.5 Trip Generators

There are limited bicycle and pedestrian trip generators along US 101 given the arterial nature of the corridor and lack of dedicated bicycle and pedestrian facilities. However, there are a few places that attract non-motorized trips. Future investments in bicycle and pedestrian facilities should prioritize safe, accessible, and comfortable travel to and from these key destinations along the corridor. Table 3-6 below summarizes bicycle and pedestrian generators along the corridor.

Table 3-6. Bicycle and Pedestrian Trip Generators

Place	Location
Dairy Queen	US 101 and Pacific Way
Dollar General and NW Connector bus stop	US 101 just north of Pacific Way
North Coast Plaza	US 101 just north of Pacific Way
Bud's RV Park and campground	US 101 and Dooley Lane

3.3.6 Regional Trails

3.3.6.1 Oregon Coast Trail

The Oregon Coast Trail (OCT) is a 362-mile-long recreational hiking trail extending from the Columbia River to California. The trail is managed by Oregon Parks and Recreation Department (OPRD). While most of the trail is on the beach, the trail passes through 28 coastal towns, and about 10 percent of the trail is on the shoulders of US 101. The trail consists of 10 sections, including Section 1: Columbia River to Oswald West which goes through Gearhart (Figure 3-3). While most of the OCT in Gearhart is off the US 101 corridor, there is a short segment on US 101 between G Street in Gearhart to 24th Street in Seaside. There are no sidewalks or dedicated pedestrian facilities in this segment of US 101.

3.3.6.2 Oregon Coast Bike Route

The Oregon Coast Bike Route (OCBR) is a 370-mile-long scenic bike route along the US 101 corridor between Astoria and Brookings, travelling through Gearhart and Seaside. Every year, Gearhart experiences OCBR bicycle traffic as the route attracts more than 6,000 bicycle riders every year. The route was designated by the Oregon Transportation Commission and is managed by ODOT, though it is described as a primarily recreational resource providing a multi-day tour route of the Oregon Coast. Currently, the lack of dedicated bicycle infrastructure means that people ride in the narrow shoulders consisting of pavement and gravel. (People may also legally bike in the travel lane

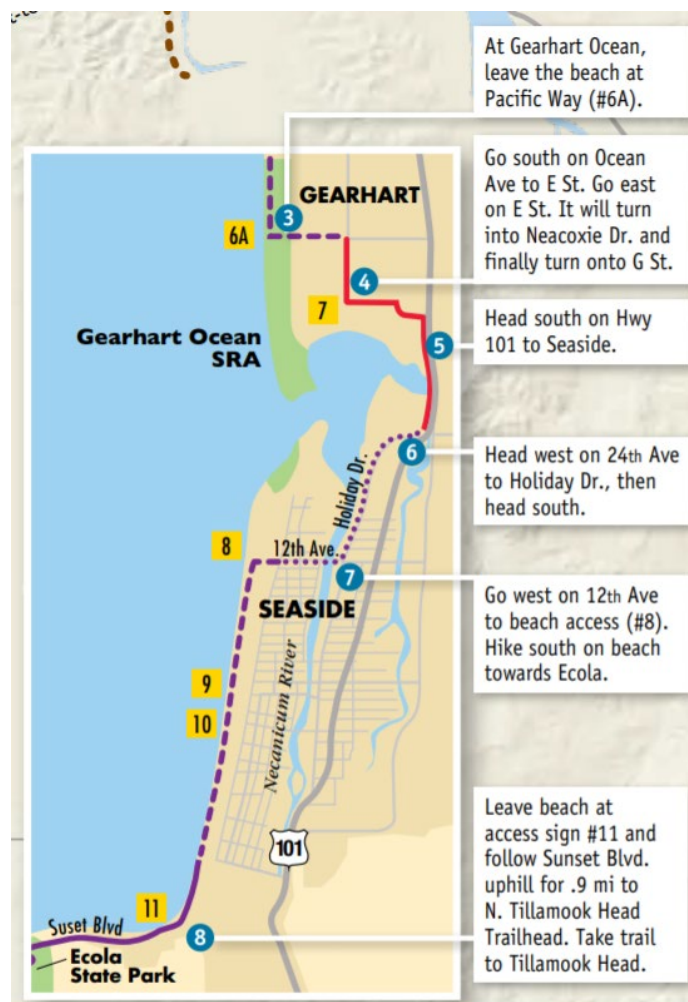


Figure 3-3. Oregon Coast Trail - Gearhart Section

where the road has no bike lane. However, this is unlikely to be comfortable or feel safe for most people and likely does not happen.) There is no OCBR signage or striping along the corridor.

ODOT's OCBR plan included a critical needs assessment of the entire route, identifying locations where bike facilities or shoulders are narrower than 4 feet in rural areas and narrower than 6 feet in urban areas.

Highest-priority areas were determined by considering:

- Widths of existing bike facilities or shoulders
- Crash history and crash risks
- Short gaps and barriers
- Overlap with the OCT

The assessment identified the Gearhart US 101 corridor as a critical needs segment and recommended widening of the roadway and shoulder, narrowing or shifting travel lanes, and adding warning or informational signage.

3.3.7 Qualitative Multimodal Assessment Summary

Following guidance in the ODOT Analysis Procedures Manual, the 2017 TSP included a qualitative multimodal assessment to determine bicycle level of traffic stress (BLTS) within the city. BLTS scores are ranked into four categories ranging “Excellent – Good – Fair – Poor” and are used as a high-level indication of the real and perceived safety and comfort of bicycling along a given segment. BLTS scores for US 101 were calculated based on the following criteria:

- Existing speed limits
- Presence of bicycle facilities
- Presence of buffers
- On-street parking
- Access
- Other street characteristics

The assessment found that bicycling conditions along US 101 ranked Poor (Figure 3-4). Although not reflected in the results of the analysis completed as part of the TSP, bicycling conditions improve slightly just north of Gearhart Lane where US 101 transitions from a five-lane to a four-lane cross section as the number of driveways and on-street parking is reduced and slightly more space becomes available for bicyclists to ride in the roadway shoulders.

As was done with the bicycle network, the 2017 TSP performed a qualitative multimodal assessment to determine pedestrian level of traffic stress (PLTS) to assess the real and perceived safety and comfort of pedestrians traveling along US 101. The following factors were used to assess the pedestrian network:

- Presence of a sidewalk or path
- Presence of a buffer zone (such as a shoulder, landscape strip, or on-street parking)
- Street lighting

- Traffic volumes
- Number of travel lanes
- Travel speeds along the adjacent roadway
- Other street characteristics

Similar to the bicycle network results, the PLTS assessment found that the walking network along US 101 ranked Poor (Figure 3-5). Walking conditions north of Gearhart Lane improve slightly where the five-lane cross section transitions to a four-lane section and where there is greater distance between pedestrians and moving traffic and fewer driveways. However, the better conditions north of Gearhart Lane were not significant enough to affect the results of the PLTS analysis.

3.4 Freight

Heavy vehicles account for approximately 5 to 6 percent of the traffic on US 101 through Gearhart during an average weekday.² Although annual truck tonnages along US 101 through Gearhart are not high enough for US 101 to be classified as an Oregon Freight Route, it is classified as a Federal Truck Route and a Reduction Review Route. Federal Truck Routes generally require 12-foot travel lanes, while a review of potential reduction of vehicle-carrying capacity is required for all proposed actions on Reduction Review Routes.

² Automatic Traffic Recorder (04-001), US 101 MP 15.90, 2.09 miles north of Dellmoor Loop Road.

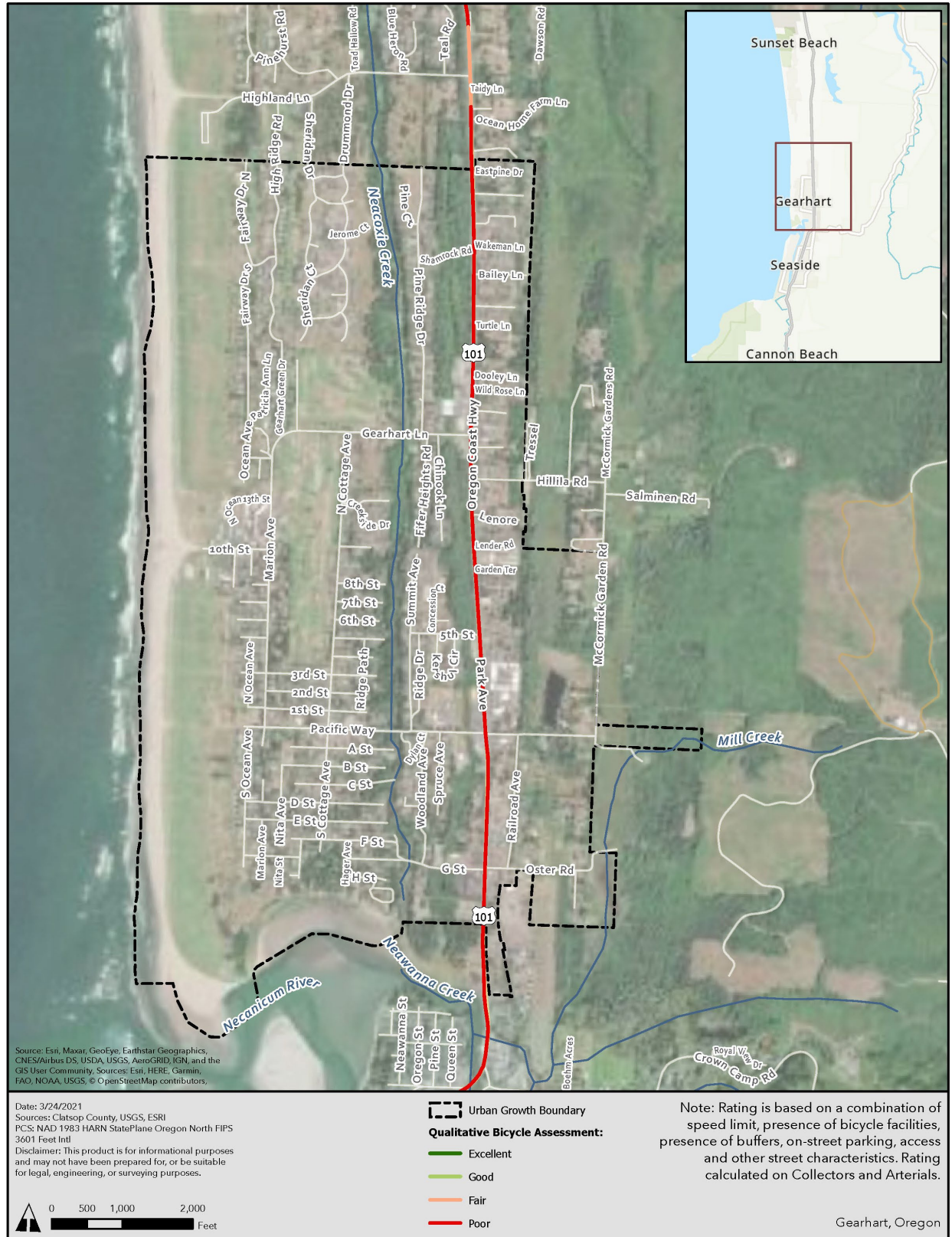


Figure 3-4. Bicycle Level of Traffic Stress (BLTS) - Gearhart Transportation System Plan (2017)



Figure 3-5. Pedestrian Level of Traffic Stress (PLTS) - Gearhart Transportation System Plan (2017)

4. SAFETY AND OPERATIONS ANALYSIS

4.1 Motor Vehicle Operations

This section summarizes the existing operational and safety analysis along the US 101 study corridor. Details of the traffic analysis methodology, including seasonal factors and volume development, are provided in Appendix A, Technical Memorandum #4 – Analysis Methodology.

Study intersections along the US 101 study corridor are listed below, including existing intersection control:

- US 101/G Street-Oster Road stop control on side streets
- US 101/Pacific Way traffic signal
- US 101/5th Street stop control on side street
- US 101/Hillila Road stop control on side street
- US 101/Gearhart Lane stop control on side street

4.1.1 Intersection Mobility Targets

All intersections under state jurisdiction must comply with the volume to capacity (v/c) ratios in the *Oregon Highway Plan* (OHP) (ODOT 1999). OHP v/c targets are typically based on highway classification and posted speeds during the 30th highest hour traffic conditions; however, the Oregon Transportation Commission has adopted alternative mobility targets for the US 101 corridor through Gearhart based on average weekday conditions. These standards require that a v/c ratio of 0.85 be maintained during an average weekday, with a peak-hour factor of 1.0.

4.1.2 Existing Operating Conditions

Historical traffic counts were obtained and adjusted to a common count year (2020) and to represent average weekday traffic conditions.³ Motor vehicle conditions were evaluated during the PM peak hour at the study intersections using the Highway Capacity Manual, 6th Edition (HCM) (TRB 2016) methodologies. As shown in Table 4-1, all study corridor intersections meet the mobility targets.

³ Gearhart Transportation System Plan, August 2017, DKS Associates.

Table 4-1. Existing 2020 Study Intersection Operations (Average Weekday PM Peak Hour)

#	Study Intersection	Traffic Control	Mobility Target	v/c	Delay (seconds)	LOS
1	US 101/G Street-Oster Road	Stop control on side streets		0.46 (NB TR)/ 0.23 (EB L)	9.4/39.6	A/E
2	US 101/Pacific Way	Traffic signal		0.36	6.9	A
3	US 101/5th Street	Stop control on side street	0.85 v/c; average weekday; peak hour factor of 1.0	0.23 (NB LT)/ 0.04 (EB L)	9.0/14.8	A/B
4	US 101/Hillila Road	Stop control on side street		0.23 (NB TR)/ 0.03 (WB L)	9.3/17.2	A/C
5	US 101/Gearhart Lane	Stop control on side street		0.22 (NB TR)/ 0.16 (EB L)	9.2/26.9	A/D

Note: Intersection operations are reported for the entire intersection at traffic signals, and for the worst major street turn movement/worst minor street turn movement at two-way stop control intersections. LOS = “level of service,” a measure of vehicle delay and driver experience, is ranked from “A” to “F”, where “A” represents free-flow conditions and “F” represents gridlock or very congested conditions.

4.2 Safety

A review of available crash data identified patterns of motor vehicle, pedestrian, and bicyclist crashes. ODOT crash data⁴ from January 2014 through December 2018 (the most recent 5 years of available data) for the US 101 study corridor through Gearhart showed a total of 70 crashes (an average of about 14 crashes a year).

None of the crashes involved pedestrians or bicycles, although one pedestrian fatality occurred beyond the study corridor, just to the south of Airport Road. A pedestrian fatality also occurred north of the study corridor near Highland Lane. A bicyclist was also involved in a minor injury crash at the same location.

There were no fatalities during the 5-year period, although two crashes caused serious injuries. The high-severity crashes are a small portion of all crashes, making up three percent of all reported crashes. About half of all crashes (51 percent) result in property damage only. Minor and possible injuries make up the remaining 46 percent.

In addition to the ODOT data, crash data provided by the Gearhart Police Department shows 68 crashes that occurred along US 101 from January 2014 through December 2018, although no information was provided on crash severities or causes. It should be noted that only the crash data reported from the ODOT Crash Analysis Unit was used in the following analysis.

⁴ ODOT crash data includes crashes with pedestrians and bicyclists, but only if a motor vehicle was involved. Crash reports are the responsibility of individual drivers and are only required in the event of death, bodily injury, or damage exceeding \$1,500. As such, low-severity crashes are generally underreported.

4.2.1 Causes of Crashes

The five most common driver errors are responsible for nearly 75 percent of all crashes along the US 101 study corridor.

- Did Not Yield Right-of-Way 31 percent
- Failure to Avoid 24 percent
- Driving Too Fast 9 percent
- Made Improper Lane Change 7 percent
- Followed Too Closely 6 percent

Risky behavior choices not only contributed to a substantial number of crashes along the US 101 corridor, but they also generally led to more severe outcomes for the people involved. Speeding or driving too fast for conditions was a factor in 6 crashes (9 percent of all crashes). The Gearhart Police Department has also noted speeding as a major concern in the corridor.

4.2.2 Intersection Safety

Crash rates provide an additional perspective on intersection safety and identify locations where people have a higher risk of being involved in a crash. Crash frequencies (the number of crashes in a period of time) tend to increase with higher vehicle traffic. With more exposure to vehicles, there are more opportunities for crashes to occur. Crash rates consider the number of crashes relative to the traffic volume at the intersection and are expressed in units of crashes per million entering vehicles. Study intersections are divided into groups of similar intersections for this analysis, called “Intersection Populations.”

Crash rates for the study intersections were calculated and compared to statewide 90th percentile crash rates published by ODOT.⁵ The 90th percentile crash rate (obtained from ODOT’s Analysis Procedures Manual Exhibit 4-1) compares an intersection’s crash history to that of other similar intersections across Oregon. Where an intersection’s crash rate is greater than this threshold, it is an indication that a problem might exist, and that further study is warranted.

The US 101/Gearhart Lane intersection has a crash rate that exceeded the 90th percentile crash rate as shown in Table 4-2. This three-leg intersection with stop control on Gearhart Lane had 11 collisions. Turning movement crashes were most common here, specifically while accessing or leaving Gearhart Lane. Failure to yield was the most common cause of crashes. One of the crashes resulted in a serious injury, two resulted in moderate injuries, and eight resulted in property damage or minor injuries. Crashes at this location may be high due to the high speeds along US 101 and driver acceptance of short gaps trying to exit and enter Gearhart Lane. Furthermore, drivers must cross three lanes of traffic to complete a left turn onto US 101 from Gearhart Lane.

⁵ The critical crash rate method and analysis of Excess Proportion of Specific Crash Types from the Highway Safety Manual was not evaluated since the reference populations were less than 5 intersections.

Table 4-2. Study Intersection Crash Rates

#	Study Intersection	Facility Type*	AADT**	Total Collisions (2014 to 2018)	Observed Crash Rate (per MEV)	90th Percentile Rate (per MEV)	Over 90th Percentile Rate
1	US 101/G Street-Oster Road	4ST	16,110	4	0.14	0.41	Under
2	US 101/Pacific Way	4SG	16,000	9	0.31	0.86	Under
3	US 101/5th Street	3ST	14,620	0	0.00	0.29	Under
4	US 101/Hillila Road	3ST	14,525	2	0.08	0.29	Under
5	US 101/Gearhart Lane	3ST	15,060	11	0.40	0.29	Over

BOLD: observed crash rate exceeds the 90th percentile rate

Note: Per MEV = Crashes per million entering vehicles

*ST = stop-controlled intersection, SG = signalized intersection

** Average Annual Daily Traffic

4.2.3 Roadway Segment Safety

Segment crash rates along the US 101 study corridor were calculated to complement the intersection-based analysis and provide a more complete picture of roadway safety. Segment crash rates are determined by dividing the number of crashes everywhere on the segment by the total vehicle traffic along the segment and are reported in crashes per million vehicle miles traveled (MVMT). The calculated crash rates were compared to the 5-year average (2014-2018) of state highway crash rates for similar highways.⁶

The state highway segment identified was found to have a crash rate lower than the Statewide Crash Rate, as shown in Table 4-3. Appendix B includes additional details, including analysis results for all segments.

Table 4-3. US 101 Segment Crash Rates

US 101 Segment	Facility Type	Distance (miles)	Total Collisions (2014 to 2018)	Observed Crash Rate (per MVMT)	Statewide Collision Rate (per MVMT)	Over Statewide Collision Rate
Airport Road to Ocean Home Farm Lane	Other Principal Arterial	2.17	70	1.07	2.96	Under

Per MVMT = Crashes per million vehicle miles traveled

⁶ Table II of the ODOT Crash Rate Book.

4.2.4 Safety Priority Index System Assessment

The Safety Priority Index System (SPIS) is a method developed by ODOT for identifying locations with potential safety problems on and off state highways. The score for each 0.10-mile segment of highway is based on 3 years of crash data considering crash frequency, rate, and severity. SPIS then ranks all segments throughout the state by score and identifies the top 5 percent and top 10 percent segments. According to the ODOT 2018 SPIS ratings (data reported between 2015 and 2017), 2017 SPIS ratings (data reported between 2014 and 2016), and 2016 SPIS ratings (data reported between 2013 and 2015), there are no locations along the US 101 study corridor through Gearhart that rank among the most hazardous sections of highways in Oregon.

5. ENVIRONMENTAL RESOURCES

This section details findings related to environmental resources in the corridor based on a desk review of available information and site visits by the study team. Integrating environmental information into this phase of the planning process is intended to result in more informed decision-making. The findings in this section are intended to support development of conceptual corridor improvements as part of the Facility Plan process by identifying known resources at this earliest stage. In all cases, a future project that emerges from the Facility Plan would be subject to more detailed environmental review under NEPA as well as local and state law.

Prior to the site visit, Parametrix evaluated the potential for wetlands, waterways, fish use, and other noteworthy natural resources to occur within the study area using publicly available information including but not limited to the following:

- US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) online interactive mapper (USFWS 2020)
- Local Wetlands Inventory (LWI) for Gearhart, Oregon (Columbia River Estuary Study Taskforce, 2011)
- US Geologic Survey (USGS) National Hydrography Dataset (NHD; USGS 2020a)
- Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA, NRCS 2020)
- USGS 7.5-minute quadrangle map (USGS 2020b)
- Oregon Department of Fish and Wildlife (ODFW) Oregon Fish Habitat Distribution and Barriers online map viewer (ODFW 2020)
- StreamNet Mapper (StreamNet 2020)
- Federal Emergency Management Agency (FEMA) flood maps (FEMA 2020)
- Aerial imagery of the study area from 1984 to 2018 (Google Earth 2020)
- USFWS Critical Habitat for Threatened and Endangered Species maps (USFWS 2020b)
- National Oceanic and Atmospheric Administration (NOAA) Protected Resources interactive map (NOAA 2020a).
- NOAA Habitat Conservation, Essential Fish Habitat map (NOAA 2020b)
- USFWS Information for Planning and Consultation (IPaC) resource list (IPaC 2020)
- Oregon Department of Fish and Wildlife Threatened, Endangered, and Candidate Species List (ODFW 2020)
- Oregon Department of Agriculture Oregon Listed Plants by County (ODA 2020)
- Oregon Biodiversity Information Center (ORBIC) Rare, Threatened and Endangered Species Records for the study area (generated December 12, 2020)
- City of Gearhart Comprehensive Plan (Gearhart City of 2019, 2020)

Parametrix scientist Irina Lapina, PWS, conducted a site visit on December 16, 2020, to inspect the site for the presence and extent of wetlands, waters, habitat for protected species, and other natural resources of special concern. General observations regarding representative habitats, vegetation

communities, wetlands and waterways conditions, and signs of avian and wildlife site use are documented in field notes. Representative site photographs are included in Appendix C.

5.1 Wetlands and Water

5.1.1 Federal Emergency Management Agency Floodplain Mapping

The FEMA floodplain map shows that the southernmost portion of the US 101 right-of-way (ROW) (from approximately Oster Road to south end of the study area) is located within a 100-year floodplain. The majority of the US 101 ROW is located outside of a 100-year floodplain. There are flood hazard areas located immediately adjacent to the west side of the US 101 ROW (Map 41007C0366F and Map 41007C0368F, effective June 20, 2018 [FEMA 2020]) (see Figure 5-1). No regulated floodway mapped within the study area (FEMA 2020).

Almost the entire southern half of the study area and a narrow part along the west boundary are located below the 100-year floodplain elevation. Anecdotally, water is known to pond on the roadway surface during high precipitation events.

5.1.2 Existing National and Local Wetlands Mapping and Databases

There are no NWI features mapped within the US 101 ROW. However, there are NWI features mapped immediately adjacent to the west of the US 101 ROW for most of its length throughout the study area (USFWS 2020). Mapped features are classified in Table 5-1 (see Figure 5-2 and Figure 5-3).

The LWI and NWI map about the same total area (acres) of wetlands in the study area. The LWI maps the same features but with more refined boundaries (see Figure 5-4 and Figure 5-5). Local wetland inventory information provided by the City of Gearhart similarly contained about the same total acreage and extent of wetlands.

The LWI maps a narrow sliver of forested wetland between Gearhart Lane and 5th Street along the west boundary of the US 101 ROW. The west edge of the highway fill limits the extent of the wetland.

The estuarine aquatic resources (Estuarine and Marine Wetlands in Figure 5-3) may be recognized by DSL as aquatic resources of special concern (OAR 141-85-0510 (3)).

Table 5-1. NWI Wetland and Waterway Features Mapped in Study Area

Wetland Type	Cowardin Code	Cowardin Classification
Estuarine and Marine Deepwater Habitat	E1UBL	Estuarine subtidal unconsolidated bottom subtidal
Estuarine and Marine Wetland	E2EM1N	Estuarine intertidal emergent persistent regularly flooded
	E2USN	Estuarine unconsolidated shore regularly flooded
	E2USP	Estuarine unconsolidated shore irregularly flooded
Freshwater Pond	PABH	Palustrine aquatic bed permanently flooded
	PUBH	Palustrine unconsolidated bottom permanently flooded
Freshwater Emergent Wetland	PEM1/SSC	Palustrine emergent wetland/scrub-shrub seasonally flooded
	PEM1A	Palustrine emergent persistent temporarily flooded
Freshwater Forested Wetland	PFOB	Palustrine forested saturated
Freshwater Scrub-Shrub Wetland	PSSC	Palustrine scrub-shrub seasonally flooded
Riverine Features	R1UBV	Riverine tidal unconsolidated bottom permanent-tidal
	R2ABH	Riverine lower perennial aquatic bed permanently flooded

Source for Cowardin Code and Classification: Cowardin et al. 1979

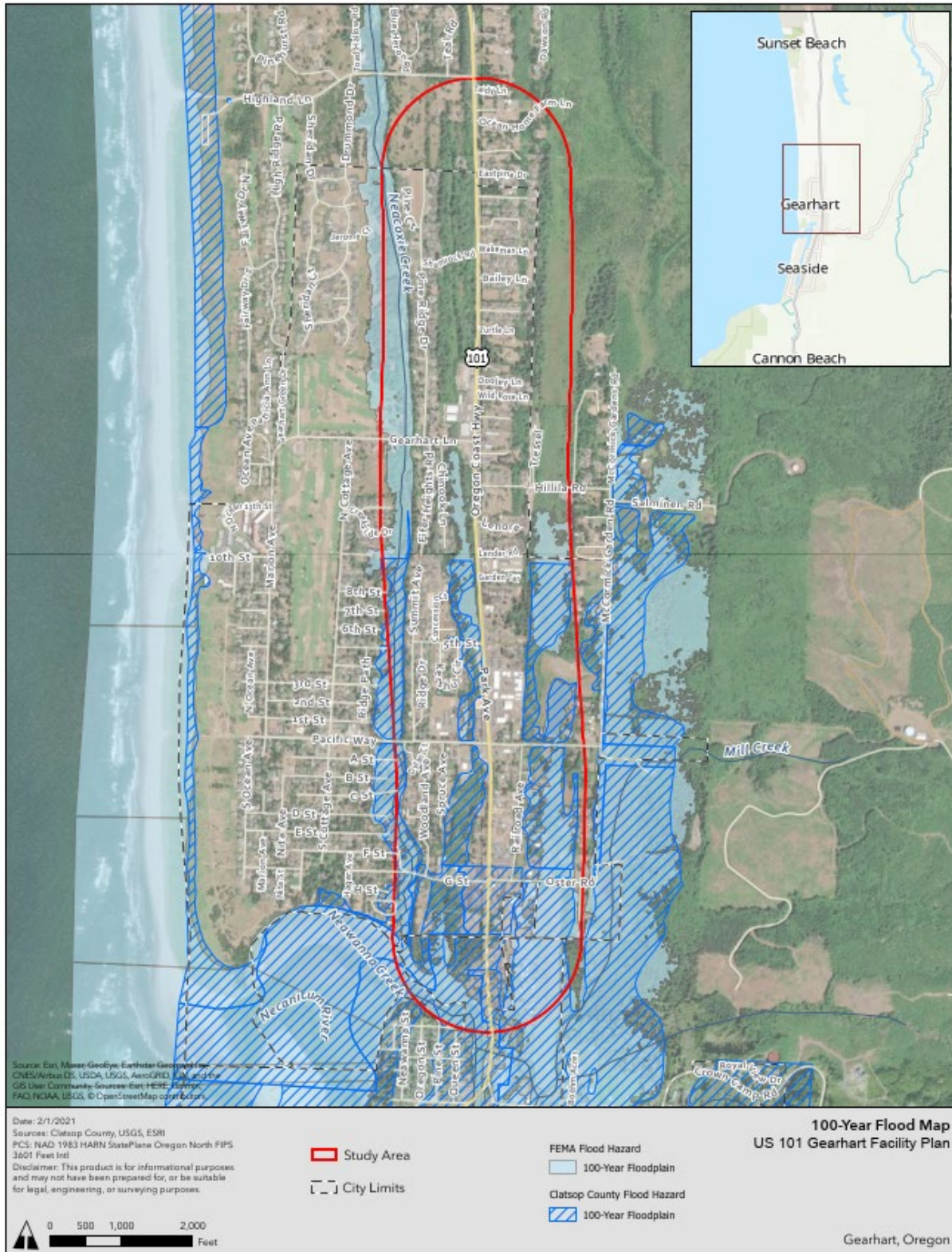


Figure 5-1. 100-Year Flood Plain



Figure 5-2. NWI Wetlands, North Segment

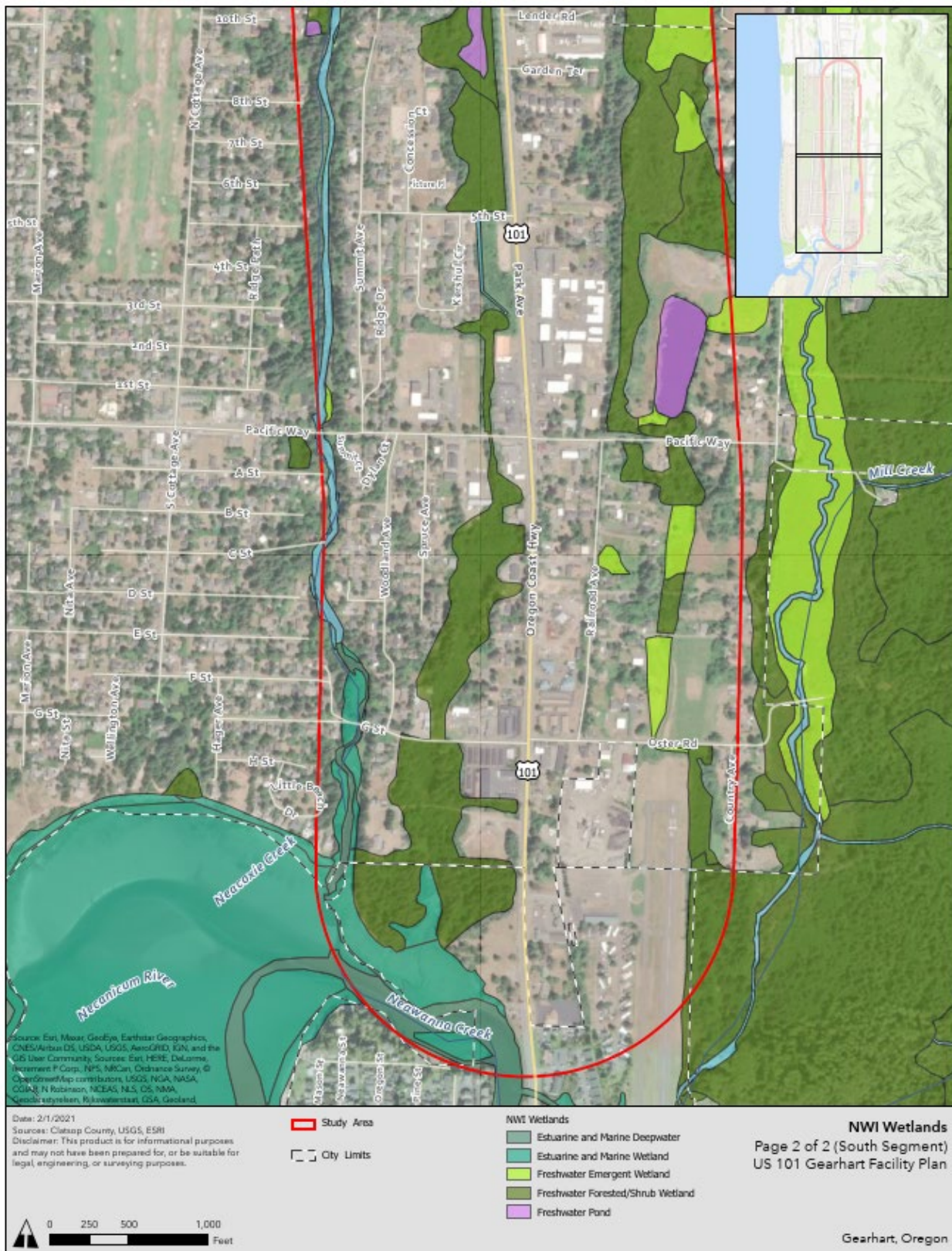
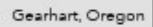


Figure 5-3. NWI Wetlands, South Segment



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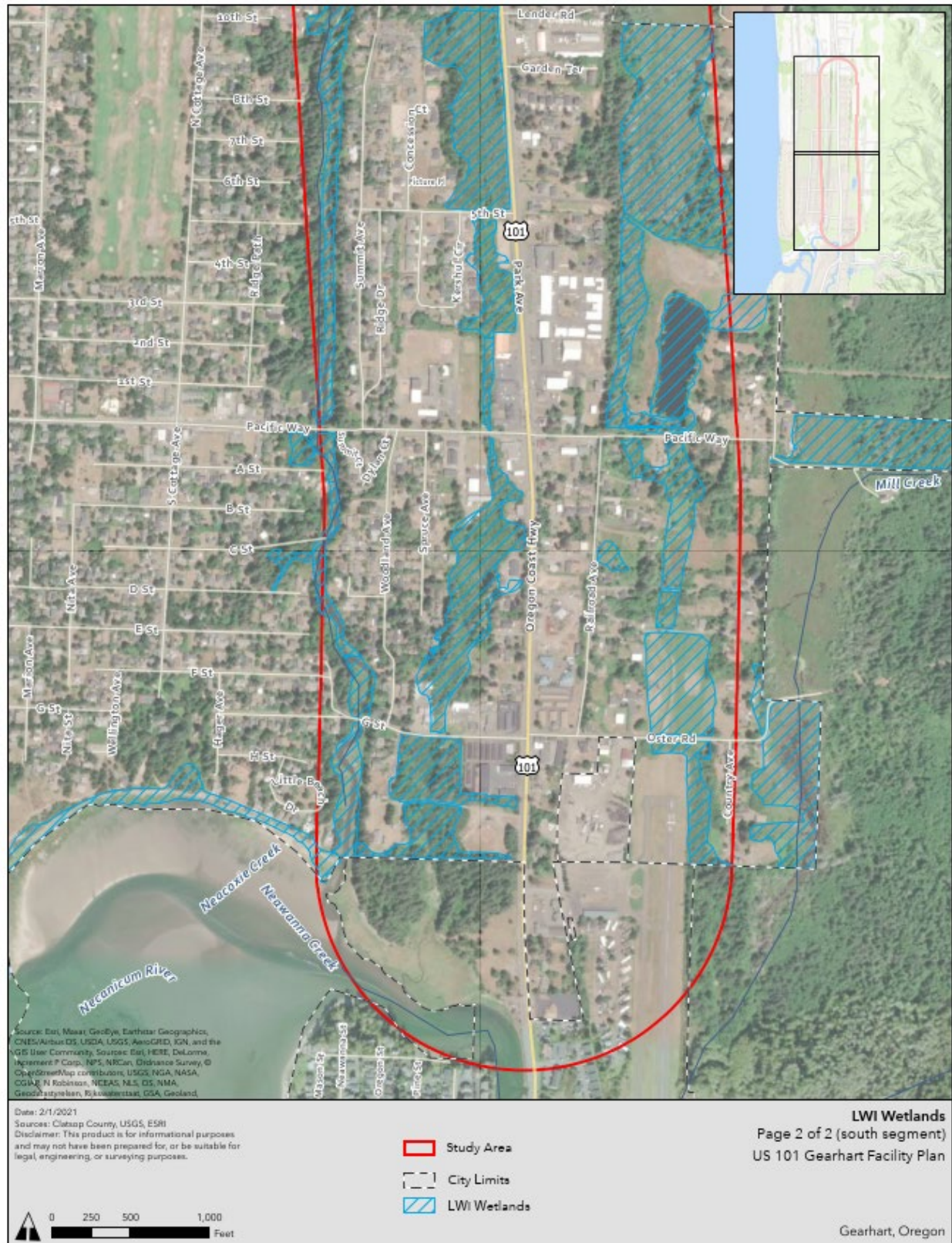


Figure 5-5. LWI Wetlands, South Segment

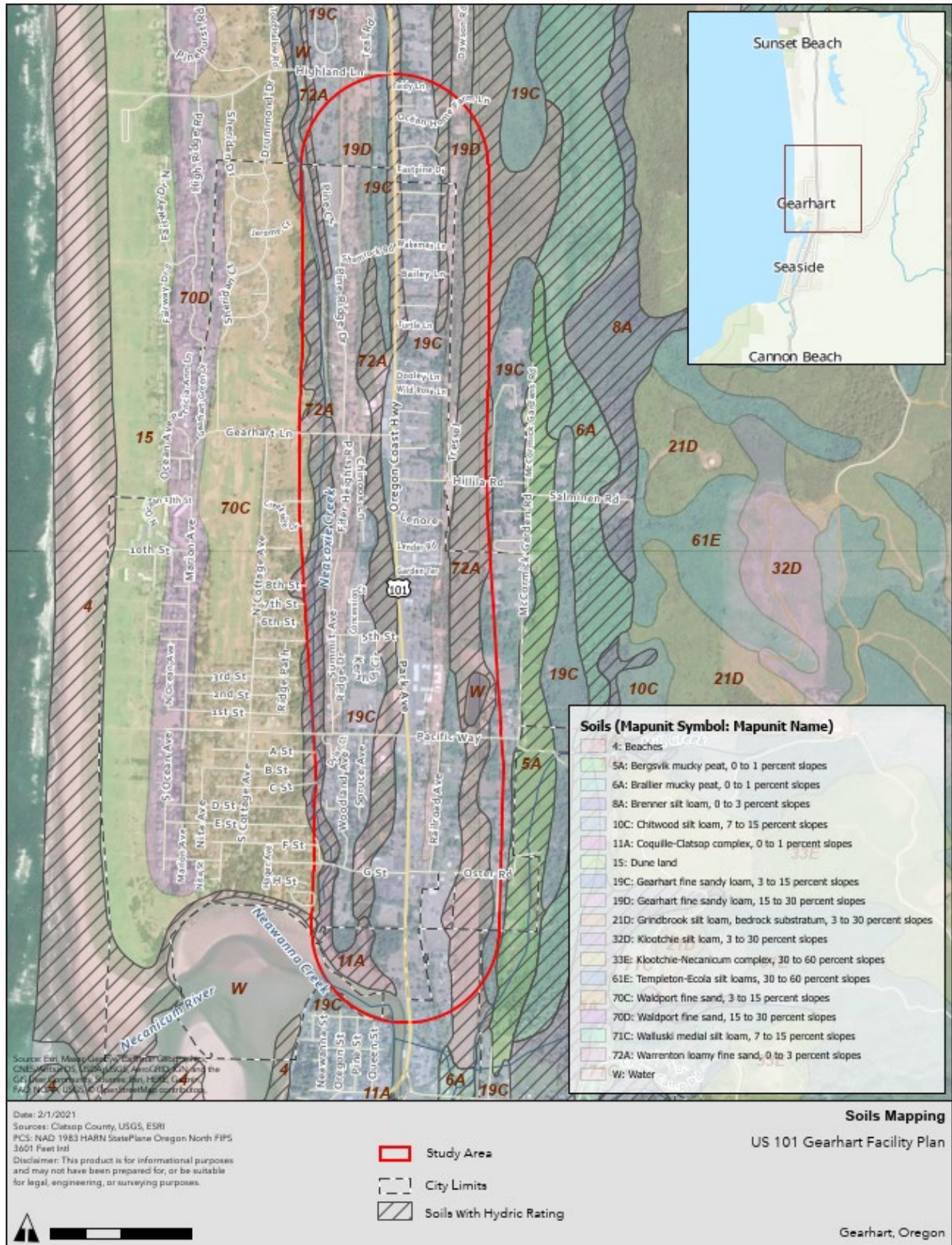


Figure 5-6. Soils Mapping

5.1.3 Fish Passage Needs

The US 101 ROW does not cross any fish-bearing waterways (ODFW 2020; StreamNet 2020), and therefore fish passage needs would not be applicable to potential projects. Historic fish usage of culverts on US 101 cannot be confirmed by available data.

There are two known human-made fish passage barriers at Neacoxie Creek within the study area (outside of the US 101 ROW): one culvert, owned by the City of Gearhart, where Gearhart Lane crosses the creek and one bridge, owned by Clatsop County, where Highlands Lane crosses the creek (Figure 5-8).

5.1.4 Waters

The study area is located within the Lower Necanicum River watershed (HUC 171002010103). Waters are depicted on Figure 5-2 and Figure 5-3.

No waterways are mapped within the US 101 ROW. Perennial waters of Neacoxie Creek are mapped in the study area (USFWS 2020; USGS 2020a; NHD 2020). Neacoxie Creek is classified as R2ABH feature (Cowardin et al. 1979). Neacoxie Creek flows south, roughly parallel to and approximately 0.25 miles west of US 101. It joins the Necanicum River in the south limits of the study area.

Neawanna Creek flows north toward the study area and drains to the Necanicum Estuary in the southern portion of the study area outside the US 101 ROW. Within the study area, Neawanna Creek is classified as E1UBL feature (Cowardin et al. 1979).

5.1.5 Water Quality

None of the waterways in the study area are listed on the Oregon 303(d) water quality list.

5.1.6 Navigation Requirements

The US 101 ROW is not within waters that have navigation requirements regulated by the U.S. Coast Guard or other agencies.

5.1.7 Goal 5 Resource Mapping

The desktop review indicated that there are no Wild and Scenic Rivers, State Scenic Waterways, Groundwater Resources, Approved Oregon Recreation Trails, Natural Areas, Wilderness Areas, Mineral/Aggregate Resources, Energy Resources, or Scenic Views and Sites that would be impacted by the project.

The Gearhart Zoning Ordinance identifies Aquatic Conservation Zone (Section 3.11) and the Freshwater Wetland and Lake Overlay Zone (Section 3.13) within the study area outside of US 101 ROW (Gearhart 2020). See Figure 5-7.

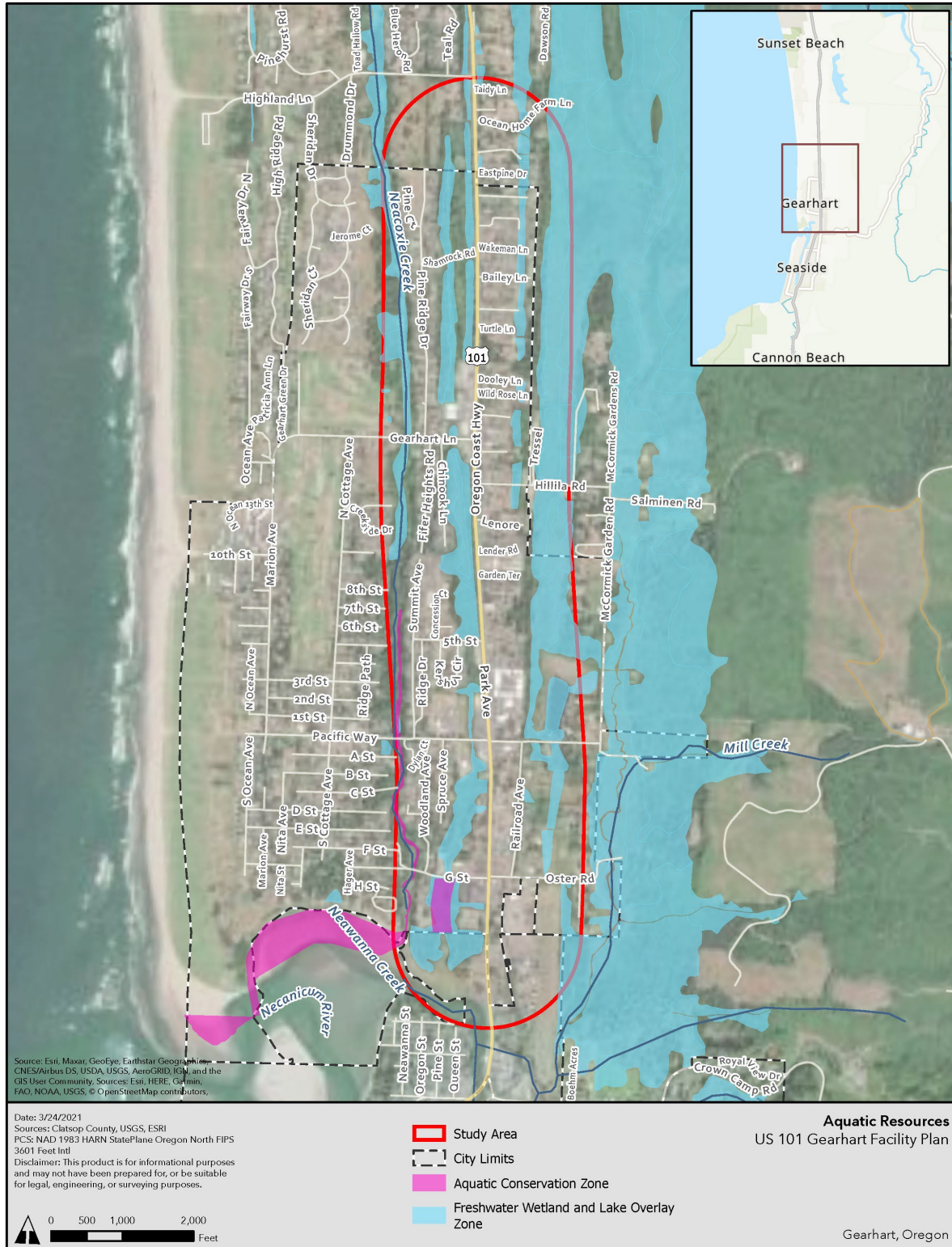


Figure 5-7. Aquatic Resources

5.1.8 Significant Natural Features Inventory

Other significant natural features that would need to be considered in potential project planning includes the following:

- The southernmost portion of the study area is in the Necanicum Estuary and the mouth of Neawanna Creek, an area which includes submerged lands and a large tidal flat surrounded by dunes and Sitka spruce forest. Necanicum Estuary is a State-designated Important Bird Area (Audubon 2020).
- The Gearhart Comprehensive Plan Goals 16 and 17 recognizes Necanicum Estuary as unique environment that needs to be protected.
- Plant species designated as noxious by the Oregon Department of Agriculture (ODA 2019) are present in the study area. Noxious weeds would require management (identification, mapping, and control) prior to ground disturbance.

5.2 Biological and Threatened and Endangered Species

5.2.1 Federally and State Listed Species

A list of species protected federally under the Endangered Species Act or by the State (ORS 496.171-496.192) that are likely to be present in the study area was compiled using ORBIC records (ORBIC 2020), the IPaC resource list (IPaC 2020), and Protected Resources interactive map (NOAA 2020a).

Table 5-2 presents a summary of protected species that are known to occur in vicinity and their occurrence potential within the study area.

Coho salmon (*Oncorhynchus kisutch*) are recorded as using Neacoxie Creek for rearing and migration. Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) are recorded as anadromous and year-round residents (StreamNet 2020; ODFW 2020; NOAA 2020a).

Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*), and Coho salmon use Neawanna Creek for rearing and migration. Coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) are recorded in Neawanna Creek as anadromous and year-round residents (StreamNet 2020; ODFW 2020; NOAA 2020a). Figure 5-8 describes known fish passage barriers in the study area.

Table 5-2. Summary of Federally and State-Listed and Sensitive Species in the Study Area

Description	Common Name (Scientific Name)	Federal Listing	State Listing	Occurrence Potential ^a
Birds	Marbled murrelet (<i>Brachyramphus marmoratus</i>)	LT	LT	Not Likely to Occur
	Northern spotted owl (<i>Strix occidentalis caurina</i>)	LT	LT	Absent
	Short-tailed albatross (<i>Phoebastria (=Diomedea) albatrus</i>)	LE	LE	Absent
	Streaked horned lark (<i>Eremophila alpestris strigata</i>)	LT	-	Absent
	Western snowy plover (<i>Charadrius nivosus nivosus</i>)	LT	LT	Present
Fish	Coastal cutthroat trout (<i>Oncorhynchus clarkii clarkii</i>)	-	S	Present
	Chum salmon (<i>Oncorhynchus keta</i>) (Pacific Coast ESU)	-	SC	Present
	Coho salmon (<i>Oncorhynchus kisutch</i>) (Oregon Coast ESU)	LT	S	Present
	Steelhead (<i>Oncorhynchus mykiss</i>) (Oregon Coast ESU, winter run)	SOC	SC	Present
Reptiles	Leatherback sea turtle (<i>Dermochelys coriacea</i>)	LE	LE	Absent
	Loggerhead sea turtle (<i>Caretta caretta</i>)	LE	LT	Absent
	Olive ridley sea turtle (<i>Lepidochelys olivacea</i>)	LT	LT	Absent
Invertebrate Animals	Oregon silverspot (butterfly) (<i>Speyeria zerene hippolyta</i>)	LT	-	Present
Vascular Plants	Pink sandverbena (<i>Abronia umbellata</i> var. <i>breviflora</i>)	SOC	LE	Present
	Bighead sedge (<i>Carex macrocephala</i>)			Not Likely to Occur

ESU = Evolutionarily Significant Unit; LE = Listed as Endangered; LT = Listed as Threatened; S = Sensitive; SC = Sensitive Critical; SOLC = Species of Concern

a Not likely to occur = Habitat is only marginally suitable or is suitable but not within species geographic range, Absent = Habitat does not meet species requirements as currently understood in the scientific community.

Various migratory birds that are protected under the Migratory Bird Treaty Act of 1918 may nest or forage in the study area. The bald eagle (*Haliaeetus leucocephalus*) is protected under the Bald and Golden Eagle Protection Act of 1940 and is known to occur in the vicinity (IPaC 2020). IPaC lists the following protected bird species that may occur in the study area (Figure 5-8):

- bald eagle (*Haliaeetus leucocephalus*)
- black oystercatcher (*Haematopus bachmani*)
- black turnstone (*Arenaria melanocephala*)
- Clark's grebe (*Aechmophorus clarkia*)
- great blue heron (*Ardea herodias fannini*)
- lesser yellowlegs (*Tringa flavipes*)
- long-billed curlew (*Numenius americanus*)
- marbled godwit (*Limosa fedoa*)
- olive-sided flycatcher (*Contopus cooperi*)
- red-throated loon (*Gavia stellata*)
- rufous hummingbird (*Selasphorus rufus*)
- semipalmated sandpiper (*Calidris pusilla*)
- short-billed dowitcher (*Limnodromus griseus*)
- whimbrel (*Numenius phaeopus*)
- willet (*Tringa semipalmata*)

5.2.2 Critical Habitat

The study area is outside the critical habitat designated by the USFWS (2020b) (Figure 5-9).

The study area in the ESA critical habitat designated by NOAA Fisheries for green sturgeon (Southern DPS) and Coho salmon (Oregon Coast ESU) (NOAA 2020a). The study area is in NOAA-designated Essential Fish Habitat for groundfish, Coho salmon, and Chinook salmon (NOAA 2020b).

Neacoxie Creek and Neawanna Creek are both State-designated Essential Salmonids Habitat (DSL 2020).



Figure 5-8. Fish Distribution and Important Bird Area

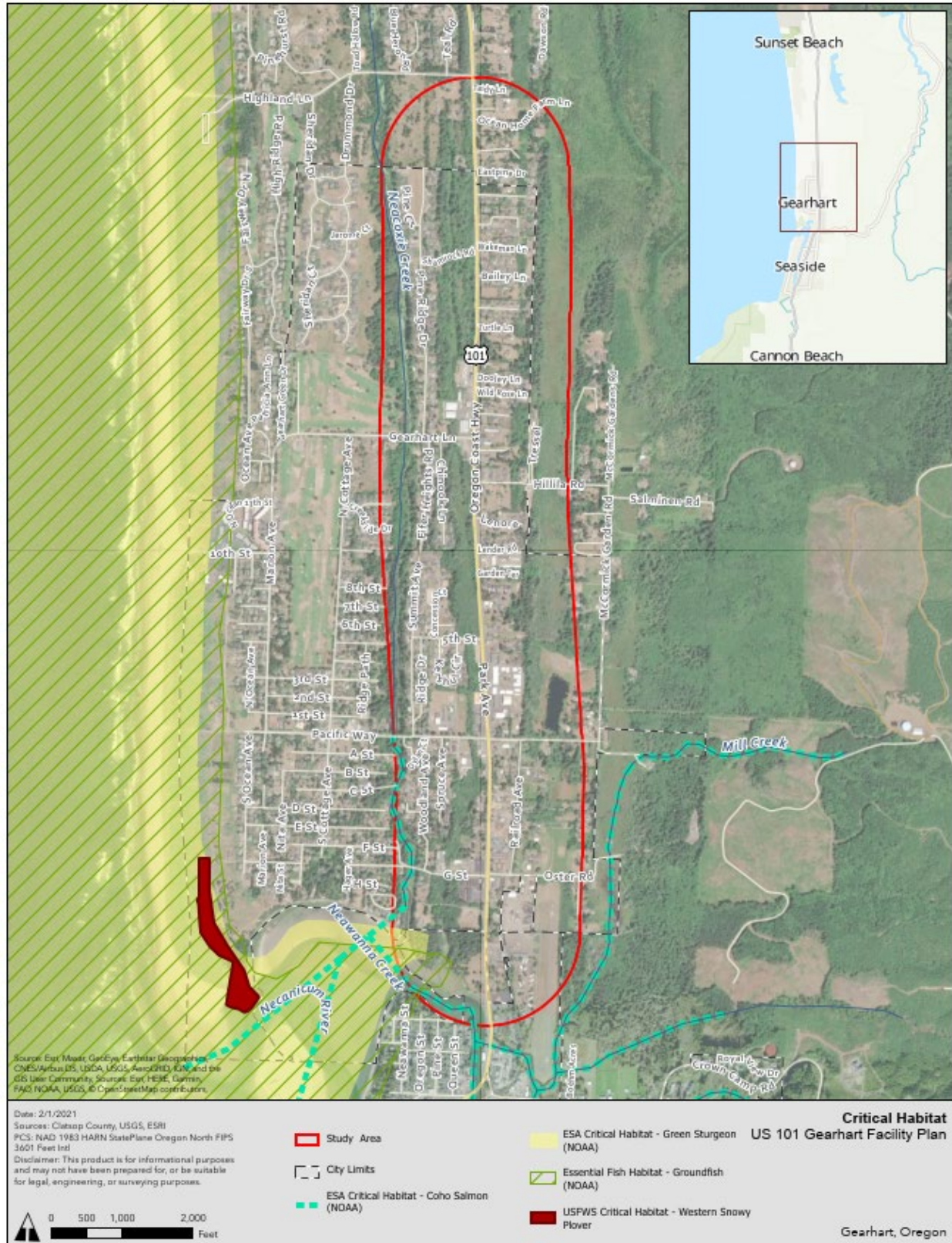


Figure 5-9. Critical Habitat

5.3 Cultural Resources

The following sections provide a summary of the findings from the cultural resources report. The full report is included in Appendix D.

5.3.1 Research Methods

HRA archaeologist Kelly M. Derr, PhD, examined the Oregon State Historic Preservation Office (SHPO) Oregon Archaeological Records Remote Access (OARRA) GIS server, which provides information about previous cultural resources studies and previously documented archaeological resources. She also reviewed historic documents to assist in identifying development trends within and around the study area and conducted a field visit to the study area in January 2021.

HRA architectural historian Libby Provost, MA, completed a desk-top review of all parcels that intersect with the study area. Provost conducted research via the Clatsop County tax assessor website and USGS maps and aerial images to identify dates for architectural resources. Provost reviewed records in the SHPO Oregon Historic Sites Database (OHSD) to determine if any architectural resources within the study area were previously surveyed, evaluated for listing, or listed in the National Register of Historic Places (NRHP). The City of Gearhart does not appear to maintain a local historic register.

5.3.2 Existing Conditions – Archaeology

The study area is situated in an area known for extensive precontact shell midden deposits associated with thousands of years of use and settlement by Native Americans (Connolly et al. 2019). According to the SHPO database there are 10 previously recorded archaeological resources within the study area (see Appendix D). None of the resources are mapped as extending into the US 101 right-of-way, but a few of the sites have been formally recorded or evaluated, so overall, the extent and boundaries of most archaeological resources is unknown. All but two of the resources are precontact shell midden deposits consisting of marine shell, charcoal, fire-cracked rock, faunal remains and, in some locations, stone artifacts. In the southwestern portion of the study area a precontact camp (Site 35CLT67) and a historic-period camp with debris scatter attributed to both early Euroamerican and Native American populations (Site 35CLT86) are also recorded.

Portions of the study area have been previously surveyed and tested for archaeological resources including the southwestern-most area within the Gateway Natural History Park (Minor 1994), the Seaside Airport (Gall and Brownell 2015), and sections of US 101 ROW (Connolly 1987; Minor and Toepel 1978). Only one of these investigations has been conducted within the last 10 years, though a comprehensive contextual statement on shell midden deposits and the US 101 corridor was recently produced (Connolly et al. 2019).

5.3.3 Existing Conditions – Aboveground

Within the study area, 240 parcels appear to contain buildings aged 45 years or older. (Although the age threshold generally required for assessment of eligibility for listing in the NRHP is 50 years of age or older, the 45-year threshold provides flexibility to accommodate for resources turning 50 during the course of project planning and construction) (see Appendix D for Table 5.3-2; Figures – Architectural Map Results). Additionally, the study area includes three bridges or culverts where roadways intersect with Neacoxie Creek, which runs parallel to the corridor. Historic-period maps indicate crossings in these locations by 1949 (USGS 1949). It is unknown if they have been rebuilt.

Research in the OHSD indicates three of the 240 parcels have been previously surveyed and recommended eligible: single-family residence at 1380 Pacific Way (1910); single-family residence and barn at 774 Pacific Way (1950); and the golf course at 707 Gearhart Loop (1892).

5.3.4 Recommendations

To determine effects of a future project, HRA recommends archaeological pedestrian survey of locations where ground disturbance is anticipated outside of the existing road prism to identify areas of high probability for containing cultural resources. High probability areas (HPAs) would require subsurface investigations to determine if intact cultural deposits are present and may be affected by the project. If ground disturbance is confined to the existing road prism, an Inadvertent Discovery Plan (IDP) should be created and followed if cultural deposits are identified during construction.

Additionally, HRA recommends all parcels that will be touched by the project and contain architectural resources 45 years of age or older be surveyed at a compliance level for potential eligibility to the NRHP. A compliance-level survey consists of identifying architectural resources that are “of age” through archival research and field observation, and the documentation of those resources. A typical compliance-level survey is carried out by an architectural historian, who photographs the exterior of the resources, notes architectural features, completes an Oregon SHPO historic property inventory form, and provides an assessment of potential effects in accordance with Oregon SHPO guidelines. The project had not been determined at the time of the preparation of this document, therefore, the number of properties that will need to be surveyed and assessed is not known.

5.4 Visual Impacts, Section 4(f), Section 6(f)

5.4.1 Visual Resources

The study area is predominantly developed and exhibits a mix of commercial and residential uses along US 101. Sparse tree and roadside herbaceous cover occur on both sides of the road. See Photograph 5-1 and Photograph 5-2 for roadside visual characteristics. All of US 101 within Oregon is considered part of the Pacific Coast Scenic Byway and is designated an All-American Road. The area within this project is guided by the goals and objectives of the Scenic Byway Management Plan for the Clatsop and Cannon Regions of the U.S. 101 Corridor in Oregon to protect, maintain, and enhance the contributing scenic features along the corridor. The only contributing feature identified by the Plan within or near to the project area is a small portion of the Necanicum and Neawanna River System and Estuary. Management objectives include preserving and protecting rivers, allowing fishing and recreation access, and creating educational opportunities (CPACT 1997).



Photograph 5-1. Intersection of Highway 101 and G Street, facing north (field survey, December 2020).



Photograph 5-2. Intersection of Highway 101 and Gearhart Lane, facing north (field survey, December 2020).

5.4.2 Section 4(f)

Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966 prohibits the Federal Transportation Administration and other USDOT agencies from using land from publicly owned parks, recreation areas (including recreational trails), wildlife and waterfowl refuges, or public and private historic properties, unless there is no feasible and prudent alternative to that use and the action includes all possible planning to minimize harm to the property resulting from such a use. It applies to projects that receive funding from or require approval by an agency of the USDOT.

5.4.2.1 Parks and Recreation Areas

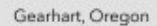
Bud's RV Park and Campground is within the study area (Figure 5-10 and Photograph 5-3). The RV park is in private ownership. Additionally, North Gateway Park is located at the southern end of the study area (Photograph 5-4). The City of Gearhart is in the process of adopting a Parks and Recreation Master Plan; however, desktop research suggests there are no planned parks or recreation projects within or near the study area that would be impacted by the proposed project (City of Gearhart 2019).

Although Bud's RV Park and Campground is within the study area, to be considered a Section 4(f) Property a park must be of national, state, or local significance and be publicly owned. The RV park is in private ownership.

North Gateway Park is a public park that may be considered a Section 4(f) Property. It features a gravel parking area, estuary viewpoint, and interpretive signage. This park is a Section 4(f) resource and impacts to the park from a future project in the corridor would need to be assessed.

A portion of the Oregon Coast Trail passes through the project area utilizing the US 101 right of way as its route in this location and is considered a Section 4(f) recreation resource. The official with jurisdiction over this recreation trail is OPRD. No developed trail as part of this facility exists within the project area.

A portion of the Oregon Coast Bike Route passes through the project area utilizing the US 101 right of way as its route in this location and because it is primarily a recreation route for bicyclists, it is considered a Section 4(f) recreation resource. The official with jurisdiction over this resource is ODOT. No developed bike path is defined within the project area.



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Photograph 5-3. Bud's RV Park and Campground, facing northwest (field survey, December 2020)



Photograph 5-4. North Gateway Park, facing northwest (Google, October 2018. Field verified December 2020).

5.4.2.2 Cultural Resources

Examples of historic sites include historic buildings, historic transportation facilities, archaeological sites, traditional cultural places, historic and archaeological districts, and historic trails. In order to qualify for protection under Section 4(f), the following criteria must be met:

- A historic site must be of national, state, or local significance and be on or eligible for listing on the NRHP.
- An archaeological site must be on or eligible for the NRHP and must warrant preservation in place.

Per HRA's recommendation, a compliance-level survey for architectural resources that are 45 years of age or older would be necessary. An archaeological pedestrian survey of locations where ground disturbance is anticipated outside of the existing road prism to identify areas of high probability for containing cultural resources is also recommended.

The cultural resources pedestrian and subsurface investigations have not yet been conducted. If any historic resources or archaeological sites are discovered upon completion of the surveys, a Section 4(f) use determination may be necessary.

5.4.3 Section 6(f)

Section 6(f) of the Land and Water Conservation Fund Act (LWCF) protects land acquired or improved with LWCF grants. Parcels purchased with LWCF grants require additional work or mitigation if they would be converted to a transportation use. While North Gateway Park is in the study area, desktop research indicates it is not subject to Section 6(f) funds (The Wilderness Society 2020). As there are no other public recreation resources within the study area, there are no properties subject to Section 6(f) funds.

5.5 Air, Noise, and Energy

5.5.1 Air

The study corridor is not located in a maintenance area or a non-attainment area. This study is being conducted to address transportation issues in the area and a future project would not be expected to result in increases in air quality contaminants; rather, it may result in a reduction in air quality contaminants due to less idling, congestion, and additional bike and pedestrian facilities. More detailed air quality analysis would be conducted during project development.

5.5.2 Noise

Future improvements to the corridor are unlikely to add substantial vehicle capacity and the predicted noise increase would be less than 1 dB throughout the corridor and no potential long-term noise impacts were identified. More detailed noise analysis would be conducted during project development.

5.5.3 Energy

No energy resources are known to occur in the study area.

5.6 Hazardous Materials

A database and reconnaissance level review was conducted to identify potential sources of hazardous substances and/or petroleum products that may include an existing release, a past release, or a material threat of a release of hazardous substances to soil, groundwater, or surface water, and evaluate if the releases could affect the environment or create significant construction impacts.

Several sites within one mile of the study area were identified on regulatory databases, including on the Oregon Department of Environmental Quality's (DEQ) Environmental Cleanup Site Information (ECSI) and Leaking Underground Storage Tank (LUST) databases; however, none of the sites are situated within the proposed project corridor (see Appendix E). A site reconnaissance was conducted in December 2020. No significant RECs were identified during the site reconnaissance.

5.7 Geologic Hazards

Per the Oregon Highway Plan Goal 1, designated emergency response routes are categorized as Tier 1, 2, and 3.

- Tier 1 routes are considered to be the most significant and necessary to ensure a functioning statewide transportation network;
- Tier 2 lifeline routes provide additional connectivity and redundancy to the Tier 1 lifeline system;
- Tier 3 lifeline routes provide additional connectivity and redundancy to the lifeline systems provided by Tiers 1 and 2.

US-101 is the only Lifeline Route in Gearhart, designated as Tier 3 in the Oregon Highway Plan. According to the Draft City of Gearhart Transportation System Plan (2017), Gearhart Loop Road, Hillila Road, Marion Avenue, Pacific Way, F Street, G Street, and Oster Road are proposed Tier 1 lifeline routes (Figure 5.6.1).

Gearhart also designates emergency priority roads and assembly areas in the event of flooding or severe weather (Figure 5-11). Figure 5-12 provides a map and information on tsunami evacuation protocol in Gearhart. Much of the city is within the Local Cascadia Earthquake and Tsunami area, and portions of the city and its western coast are in the distant tsunami evacuation zone. The inundation zone and single assembly area for a worst-case tsunami event extends east of McCormick Gardens Road; however, there are four additional optional assembly areas located at Sheridan Drive, Pine Ridge Drive, Gearhart Lane, and Summit Avenue. These optional high ground areas remain dry in 95 percent of tsunami scenarios analyzed, and have been designated in the event an individual or individuals are unable to get outside the hazard area or if there are impassable obstacles in the way.

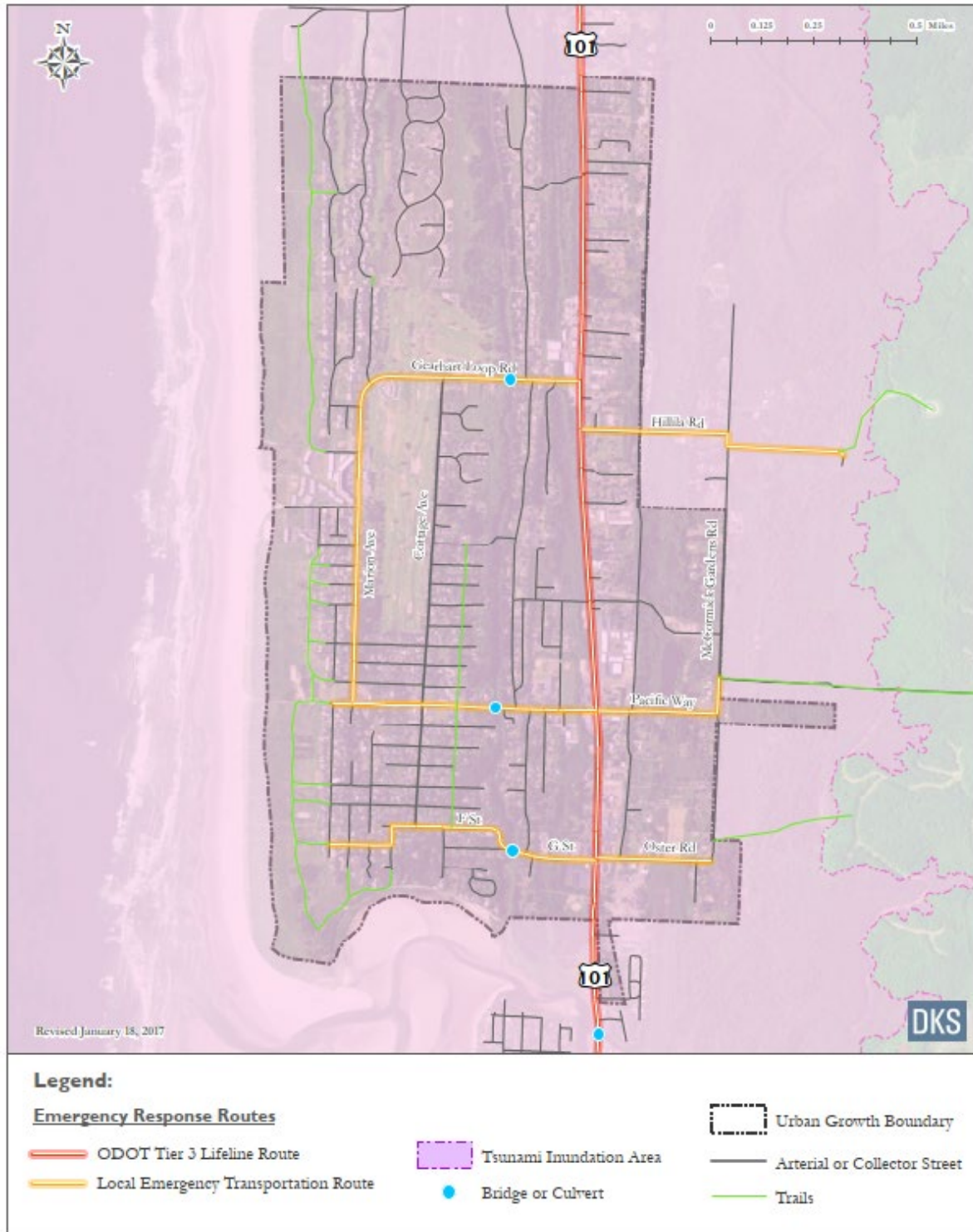


Figure 5-11. Gearhart Emergency Response Routes (DKS Associates et al. 2017)

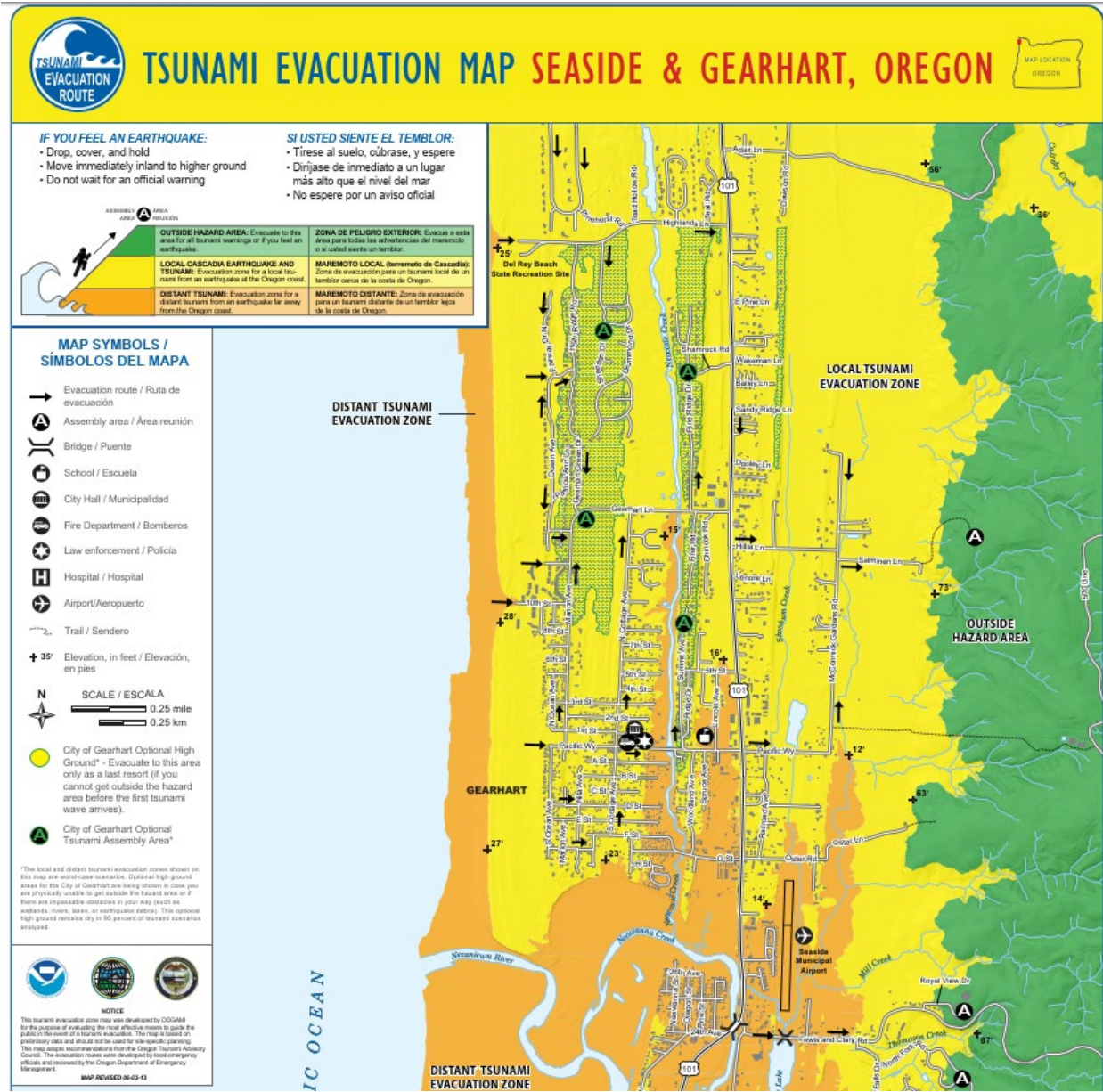


Figure 5-12. Tsunami Inundation Map (Priest et al. 2020)

6. REFERENCES

- Audubon. 2020. National Audubon Society. Important Bird Areas: Necanicum Estuary, Oregon. Available at: <https://www.audubon.org/important-bird-areas/necanicum-estuary>. Accessed December 2020.
- City of Gearhart. 2019-2021 Gearhart Master Parks & Recreation Plan. https://www.cityofgearhart.com/sites/default/files/fileattachments/general/page/4791/pmp_tasks_timeline_1.docx.pdf. Accessed December 2020.
- Columbia River Estuary Study Taskforce. 2011. Wetland delineation for Gearhart City, OR. GIS file, part of the LWI. 2011.
- Connolly, Thomas J. 1987. Archaeological Survey of the Pacific Way (Gearhart)—Dooley Bridge Section, Oregon Coast Highway (US 101) Clatsop County. Oregon Museum of Anthropology. Report on file with Oregon State Historic Preservation Office, Salem.
- Connolly, Thomas J., Julia A. Knowles, Jaime L. Kennedy, and Haden U. Kingrey. 2019. US101: Shell Midden Context Statement, Columbia River to the California Border, MP 0.0 to MP 363.1 ADA-Accessible Ramps and Crossing Signal Pushbuttons Project. University of Oregon Museum of Natural and Cultural History Report No. 2019-059. Report on file with Oregon State Historic Preservation Office, Salem.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-70/31, U.S. Fish and Wildlife Service, Washington, D.C.
- CPACT (Coastal Policy Advisory Committee on Transportation), ODOT. 1997. Scenic Byway Management Plan for the Clatsop and Cannon Regions of the U.S. 101 Corridor in Oregon. Available at <https://www.oregon.gov/odot/Programs/TDD%20Documents/PacificCoast1-Clatsop-Cannon-Management-Plan.pdf>. Accessed March 2021.
- DKS Associates, City of Gearhart, Oregon Department of Transportation, Angelo Planning Group. Gearhart Transportation System Plan. 2017. Volume 2. Available at https://www.cityofgearhart.com/sites/default/files/fileattachments/general/page/2541/2017_gearhart_transportation_system_plan_volume_2_4.pdf. Accessed December 2020.
- DSL (Department of State Lands). 2020. Essential Salmonid Habitat Map. URL: <http://www.oregon.gov/dsl/Pages/Maps.aspx>
- FEMA (Federal Emergency Management Agency). 2020. FEMA Flood Map 41007C0366F and Map 41007C0368F effective 6/20/2018. Available at: <https://msc.fema.gov/portal/home>. Accessed December 2020.
- Gall, Alexander W. and Sarah R. Brownell. 2015. Archaeological Survey of the Seaside Airport for the Seaside Airport Lighting, Signage, and Fencing Project, City of Seaside, Clatsop County, Oregon. Archaeological Services, LLC, Vancouver, WA. Report on file with Oregon State Historic Preservation Office, Salem.
- Gearhart City of. 2019. Comprehensive Plan Goals and Policies, Ordinance No. 677. Adopted February 2, 1994. With Amendments through September 2019.
- Gearhart City of. 2020. The City of Gearhart: Zoning Ordinance #684. With Amendments through January 2020 (1).

Google Earth. 2020. Aerial imagery for Gearhart City, Oregon, from 1984 to 2018. Accessed December 2020.

IPaC (Information for Planning and Consultation). 2020. IPaC Resource List. United States Fish and Wildlife Service. Available at: <https://www.fws.gov/oregonfwo/articles.cfm?id=149489416>. Generated December 12, 2020.

Minor, Rick. 1994. An assessment of Archaeological Resources within the Proposed Sahhalie Condominiums Project Area, Seaside, Clatsop County, Oregon. Heritage Research Associates, Eugene. Report on file with Oregon State Historic Preservation Office, Salem.

Minor, Rick and Kathryn Toepel. 1978. An Inventory and Evaluation of Archaeological Resources in the City of Gearhart, Clatsop County, Department of Anthropology, University of Oregon, Eugene. Report on file with Oregon State Historic Preservation Office, Salem.

NOAA (National Oceanic and Atmospheric Administration). 2020a. Protected Resources App. Available at: <https://www.webapps.nwfsc.noaa.gov/portal/apps/webappviewer/index.html?id=7514c715b8594944a6e468dd25aaacc9>. Accessed December 2020.

NOAA (National Oceanic and Atmospheric Administration). 2020b. NOAA Habitat Conservation, National Marine Fisheries Service, Habitat Protection. Available at: <https://www.habitat.noaa.gov/application/efhmapper/index.html>. Accessed December 2020.

ODFW (Oregon Department of Fish and Wildlife). 2020. Threatened and Endangered Species. Available at: https://www.dfw.state.or.us/wildlife/diversity/species/threatened_endangered_candidate_list.asp

ODA (Oregon Department of Agriculture). 2019. Noxious Weed Policy and Classification System. Noxious Weed Control Program. Available at: <https://www.oregon.gov/oda/programs/Weeds/OregonNoxiousWeeds/Pages/Law.aspx>

ODA (Oregon Department of Agriculture). 2020. Oregon Listed Plants by County. Available at: <https://www.oregon.gov/ODA/programs/PlantConservation/Pages/ListedPlants.aspx>. Accessed December 2020.

ODFW (Oregon Department of Fish and Wildlife). 2020. Oregon Fish Habitat Distribution and Barriers web map. Available at: https://nrimp.dfw.state.or.us/FHD_FPB_Viewer/index.html. Accessed December 2020.

ODOT (Oregon Department of Transportation).

1999. Oregon Highway Plan. <https://www.oregon.gov/ODOT/Planning/Documents/OHP.pdf>.

2011. Highway Design Manual – Appendix L: Bicycle and Pedestrian Guide. https://www.oregon.gov/odot/Engineering/Documents_RoadwayEng/HDM_L-Bike-Ped-Guide.pdf

2012. Highway Design Manual. <https://www.oregon.gov/odot/Engineering/Pages/Hwy-Design-Manual.aspx>

2020. Blueprint for Urban Design. https://www.oregon.gov/odot/Engineering/Documents_RoadwayEng/Blueprint-for-Urban-Design_v1.pdf

ORBIC (Oregon Biodiversity Information Center). 2020. Rare, Threatened and Endangered Species in the vicinity of study area. Institute for Natural Resources, Portland State University, Portland, Oregon. Generated December 10, 2020.

Oregon Department of Environmental Quality. Environmental Cleanup Site Information Database. Available at <https://www.oregon.gov/deq/hazards-and-cleanup/env-cleanup/pages/ecsi.aspx>. Accessed December 2020.

Oregon Department of Environmental Quality. Leaking Underground Storage Tank Cleanup Site Database. Available at <https://www.deq.state.or.us/lq/tanks/lust/LustPublicLookup.asp>. Accessed December 2020.

Oregon Historic Sites Database.

2021a 1380 Pacific Way, Gearhart, Clatsop County. Electronic document, http://heritagedata.prd.state.or.us/historic/index.cfm?do=v.dsp_siteSummary&resultDisplay=663888, accessed January 13, 2021.

2021b 774 Pacific Way, Gearhart, Clatsop County. Electronic document, http://heritagedata.prd.state.or.us/historic/index.cfm?do=v.dsp_siteSummary&resultDisplay=663084, accessed January 13, 2021.

2021c Gearhart Golf Links, Gearhart, Clatsop County. Electronic document, http://heritagedata.prd.state.or.us/historic/index.cfm?do=v.dsp_siteSummary&resultDisplay=663864, accessed January 13, 2021.

2021d 3359 Hwy 101, Gearhart, Clatsop County. Electronic document, http://heritagedata.prd.state.or.us/historic/index.cfm?do=v.dsp_siteSummary&resultDisplay=650029, accessed January 13, 2021.

Priest, G.R., Stimley, L.L., Madin, I.P., and Watzig, R.J. Open-File Report O-15-02, Local tsunami evacuation analysis of Seaside and Gearhart, Clatsop County, Oregon. Available at <https://www.oregongeology.org/pubs/ofr/p-O-15-02.htm>. Accessed December 2020.

StreamNet. 2020. Fish Data for the Northwest – Interactive Mapper. Available at: <http://www.streamnet.org/>. Accessed December 2020.

TRB (Transportation Research Board). 2016. Highway Capacity Manual, Sixth Edition. Transportation Research Board, Washington, D.C.

U.S. Census Bureau. 2014-2018. American Community Survey 5-Year Estimates. Population forecasts prepared on June 30, 2020 by the Population Research Center at Portland State University. Accessed January 2021.

United States Geological Survey (USGS). 1949. Gearhart, Oregon. 1:24,000. U.S. Department of the Interior. Electronic document, <http://historicalmaps.arcgis.com/usgs/>, accessed January 2021.

USDA NRCS (U.S. Department of Agriculture, Natural Resources Conservation Service). 2020. Web soil survey online interactive mapper. Available at: <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.

USFWS (US Fish and Wildlife Service). 2020a. National Wetlands Inventory (NWI) online interactive mapper. Available at: <http://www.fws.gov/wetlands/>

USFWS (U.S. Fish and Wildlife Service). 2020b. Critical Habitat for Threatened and Endangered Species.

Available at:

<http://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77>.

The Wilderness Society. Mapping the Land and Water Conservation Fund. Available at

<https://www.wilderness.org/articles/article/mapping-land-and-water-conservation-fund-lwcf>. With data through 2014. Accessed December 2020.

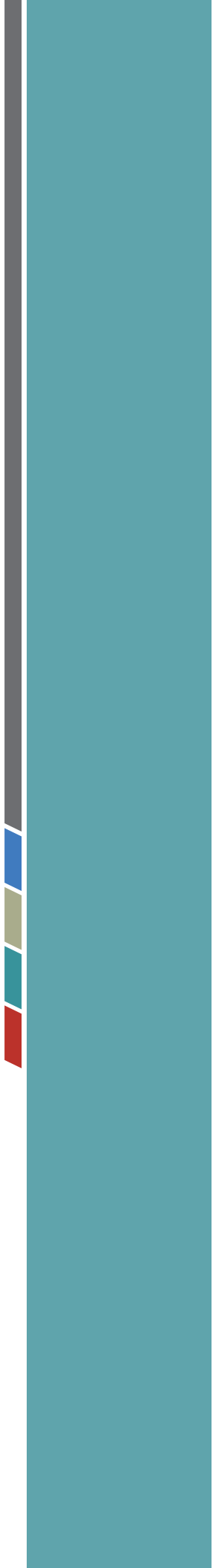
Appendix A

Analysis Methodology



Appendix B

Synchro Diagrams



Appendix C

Field Visit Summary and Photos



Appendix D

Cultural Resources Report



Appendix E

Hazardous Materials



