

TECHNICAL MEMORANDUM

DATE: April 13, 2021
TO: Gail Henrikson, Clatsop County
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SUBJECT: Final Technical Memo #3: Existing Conditions
CC: Michael Duncan, ODOT
PROJECT NUMBER: 2742395111
PROJECT NAME: Clatsop County TEFIP

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INTRODUCTION

This memorandum provides an overview of the existing conditions that relate to development of the Clatsop County Tsunami Evacuation Facilities Improvement Plan (TEFIP). Relevant plans and policies from the federal, state, county, and local levels are summarized to provide a planning context for the project. This memorandum describes existing evacuation routes and trail networks in the project area, along with a discussion of gaps and potential opportunities. These were considered by looking at existing facilities superimposed with the tsunami inundation zones developed by the Oregon Department of Geology and Mineral Industries (DOGAMI). Also included in this memorandum are a summary of land uses, natural and cultural resources, and demographics of the project area. This information is intended to support the next steps of analyzing evacuation route options and developing recommendations.

A web map was developed in conjunction with this memorandum to provide a comprehensive inventory of the existing conditions data referenced in the memo, as well as landslide risk, liquefaction susceptibility, and other useful information for the planning of tsunami evacuation facilities.

The companion web map can be accessed here:

<https://parametrix.maps.arcgis.com/apps/webappviewer/index.html?id=3032fee8990f42269beb1302fd9ba3e9>

In the process of preparing this memorandum, the consultant team found few existing trails well-suited to serve as evacuation facilities. Additionally, there are areas of concern where evacuation routes are currently too long to allow timely evacuation.

PLAN AND POLICY REVIEW

This section of the memorandum provides plan and policy context for Clatsop County and the State of Oregon, consistent with the Oregon Tsunami Land Use Guide.¹ This review summarizes relevant regional, state, county, and local plans, policies, and documents, as well as fiscal opportunities and constraints as identified in local and state plans.

Clatsop County

- Tsunami Hazard Overlay Zone (not adopted)
- Comprehensive Land Use Plan (1980)
- Clatsop County Transportation System Plan (2015)
- Clatsop County Parks and Recreational Lands Master Plan (2006)
- Clatsop County Resiliency Project – Public Works Facility Relocation Project (ongoing)
- Clatsop County Multi-Jurisdictional Natural Hazards Mitigation Plan (adopted March 2021)

Statewide

- Oregon Statewide Planning Goals
- Statewide Transportation Improvement Program (STIP)
- Oregon Transportation Plan and modal plans

¹ Department of Land Conservation and Development, *Preparing for a Cascadia Subduction Zone Tsunami: A Land Use Guide for Oregon Coastal Communities* (2015) https://www.oregon.gov/lcd/Publications/TsunamiLandUseGuide_2015.pdf

- Oregon Bicycle and Pedestrian Plan (2016)
- Oregon Freight Plan (2017)
- Oregon Highway Plan and amendments (1999-2019)
- Oregon Public Transportation Plan (2019)
- Oregon State Rail Plan (2014)
- Oregon Transportation Options Plan (2015)
- Oregon Transportation Safety Action Plan (2016)
- Oregon Resilience Plan (2013) and policies
- Transportation Planning Rules - OAR Chapter 660, Division 12
- ODOT Highway Design Manual (2012)
- ODOT Blueprint for Urban Design (2019)
- Oregon Bicycle and Pedestrian Safety Implementation Plan (2014)
- Methods to Determine Locations of Tsunami Vertical Evacuation Shelters (2012)

Local Jurisdictions

- Astoria Comprehensive Plan (updated 2016)
- Astoria Transportation System Plan (2013)
- Astoria Trails Master Plan (2013)
- Astoria Parks and Recreation Comprehensive Master Plan (2016)
- Warrenton Comprehensive Plan (updated 2011)
- Warrenton Transportation System Plan (2019)
- Warrenton Trails Master Plan (2008)
- Gearhart Comprehensive Plan (updated 2019)
- Gearhart Transportation System Plan (2017)
- Gearhart Natural Hazard Mitigation Plan (2014)
- Gearhart Parks Master Plan (*plan in development)
- Seaside Comprehensive Plan (updated 2019)
- Seaside Transportation System Plan (2011)
- Seaside Parks Master Plan (2018)
- Cannon Beach Comprehensive Plan (updated 2017)
- Cannon Beach Transportation System Plan (*plan in development)
- Cannon Beach Parks and Trails Master Plan (2017)
- Cannon Beach Tsunami Evacuation Routes & Assembly Areas (2015)

Federal and Other

- Americans with Disabilities Act (ADA)
- Title VI of the Civil Rights Act (1964)
- Title 49 of the Code of Federal Regulations (CFR) Part 21, Nondiscrimination in Federally Assisted Programs of the Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964
- Presidential Executive Order 12898 – Federal Actions to Address Environmental Justice to Minority Populations and Low-Income Populations

- Presidential Executive Order 13166 – Improving Access to Services for Persons with Limited English Proficiency
- U.S. Department of Transportation Order 5610.2 – Order to Address Environmental Justice in Minority Populations and Low-Income Populations

Table 1. County Plans, Policies and Statutes

Plan, policy, or document	Relevance to the TEFIP
Tsunami Hazard Overlay Zone (not adopted)	<ul style="list-style-type: none"> • Clatsop County had previously engaged in a process to develop a Tsunami Hazard Overlay Zone to guide future development within the tsunami hazard area. However, the concept was not adopted.
Comprehensive Land Use Plan (1980)	<ul style="list-style-type: none"> • Guides future land use across unincorporated Clatsop County; update underway in 2021. Policy framework and designated land use will be considered in trail and route analysis.
Clatsop County Transportation System Plan (2015)	<ul style="list-style-type: none"> • Planned trail projects and existing lifeline route designations will be included in analysis. • Includes summary of funding constraints and existing/expected funding sources. An estimated 94% of the County's aspirational project expenses will not be funded. Funding comes from County and State sources.
Clatsop County Parks and Recreational Lands Master Plan	<ul style="list-style-type: none"> • Inventories the existing conditions of parks, trails, and recreational resources in the County. • Establishes goals, objectives, and strategies for improvements. • Outlines a broad list of potential funding strategies. • Recommends actions to improve parks, connect with communities, link recreational resources with trails, and fund the parks. • Plan will be consulted as routes are analyzed to better understand trail and park conditions. Plan will also be considered for potential overlap with recommended actions and funding strategies.
Clatsop County Multi-Jurisdictional Natural Hazards Mitigation Plan (adopted March 2021)	<ul style="list-style-type: none"> • Provides guidance for hazards mitigation and jurisdictional coordination. Identifies risk profile for each community and unincorporated areas; establishes mitigation strategies; identifies Community Lifelines (essential government services and functions). Highest priority near-term projects: <ul style="list-style-type: none"> ○ Develop effective tsunami evacuation infrastructure and planning, policy, signage, and structures. ○ Support adaptation of County's two hospitals vulnerable to earthquake/tsunami. ○ Reduce or eliminate damage to critical facilities, services, equipment. Mitigate risk of earthquake and tsunami to County's critical facilities.

Table 2. State Plans, Policies and Statutes

Plan, policy, or document	Relevance to the TEFIP
Oregon Statewide Planning Goals	<ul style="list-style-type: none"> • TEFIP will be developed in compliance with Statewide Planning Goals.
Statewide Transportation Improvement Program (STIP)	<ul style="list-style-type: none"> • Potential funding source for future TEFIP projects. In general, the STIP includes projects of regional significance.

Plan, policy, or document	Relevance to the TEFIP
<p>Oregon Transportation Plan, mode plans, and topic plans</p> <ul style="list-style-type: none"> • Oregon Bicycle and Pedestrian Plan (2016) • Oregon Freight Plan (2017) • Oregon Highway Plan and amendments (1999-2019) • Oregon Public Transportation Plan (2019) • Oregon State Rail Plan (2014) • Oregon Transportation Options Plan (2015) • Oregon Transportation Safety Action Plan (2016) 	<ul style="list-style-type: none"> • Oregon's mode and topic plans provide policy support for all elements of the transportation system. Projects that emerge from the TEFIP will support Oregon goals and policies. It is unlikely that a TEFIP project would conflict with these plans, though potential conflicts will be documented.
<p>Oregon Resilience Plan (2013) and policies</p>	<ul style="list-style-type: none"> • Assesses the potential impacts and disruptions from a major Cascadia seismic event. • Considers risks to and resiliency strategies for eight specific subject areas, including Coastal Communities and Transportation. • Recommends actions to increase resiliency in such an event, including: <ul style="list-style-type: none"> ○ Plan to mitigate and seismically retrofit vulnerable infrastructure, such as bridges and roads near landslides. ○ Inventorying transportation facilities that provide access to schools and hospitals. ○ Plan and stockpile temporary bridges for emergency use after an event. ○ Develop plans with coastal communities and hospitality businesses to take care of visitors in a seismic event. ○ Modify room taxes to develop funding for mitigation efforts.
<p>Transportation Planning Rules - OAR Chapter 600, Division 12</p>	<ul style="list-style-type: none"> • Implements Statewide Planning Goal 12 (Transportation), which intends to promote the development of multimodal transportation systems that are safe, convenient, and efficient. • Requires transportation projects be coordinated among affected governments. To facilitate coordination, transportation system plans (TSPs) may need to be amended or updated to include new projects identified in this planning process.
<p>Oregon Bicycle and Pedestrian Safety Implementation Plan (2014)</p>	<ul style="list-style-type: none"> • Provides a toolbox of low-cost strategies to reduce the number and severity of crashes involving people walking and biking. Plan to incorporate strategies to improve route safety. • ODOT is in the process of updating for 2021.
<p>Methods to Determine Locations of Tsunami Vertical Evacuation Shelters (2012)</p>	<ul style="list-style-type: none"> • Guidebook will be used by team to determine high-level needs for vertical evacuation structures.

Table 3. Local Plans, Policies and Statutes

Plan, policy, or document	Relevance to the TEFIP
Astoria	

Plan, policy, or document	Relevance to the TEFIP
Astoria Comprehensive Plan (updated 2016)	<ul style="list-style-type: none"> Describes Astoria's land use goals and sets policies to achieve them.
Astoria Transportation System Plan (2013)	<ul style="list-style-type: none"> Sets goals for the City's transportation system and identifies projects, policies, and standards to work toward those goals. Plans for a horizon 2035 horizon year. Identifies potential funding sources for implementation.
Astoria Trails Master Plan (2013)	<ul style="list-style-type: none"> Recommends actions to improve trail system based on feedback from public engagement. Inventories existing trails and proposes new trails for better connectivity. Recommends prohibiting motorized trail use.
Astoria Parks and Recreation Comprehensive Master Plan (2016)	<ul style="list-style-type: none"> Assesses the City's current parkland and facilities, identifies community needs, and recommends improvements. Identifies potential funding sources for implementation.
Warrenton	
Warrenton Comprehensive Plan (updated 2011)	<ul style="list-style-type: none"> Guides the City for future land use and development with goals, policies, and plan strategies. Includes trails within the transportation element and a tsunami evacuation map.
Warrenton Transportation System Plan (2019)	<ul style="list-style-type: none"> Identifies goals and objectives for the City's transportation system. Recommends projects to serve a 2040 horizon year. Includes trail projects that would bolster the evacuation route network. BP13, for example, is a new trail from the KOA to NW Warrenton Drive following the NW 11th Street alignment and would provide direct access to high ground from Hammond. Lists current revenue sources and potential additional future sources.
Warrenton Trails Master Plan (2008)	<ul style="list-style-type: none"> Sets goals for a comprehensive trail network. Identifies implementation actions to improve existing trails. Proposes new trails.
Gearhart	
Gearhart Comprehensive Plan (updated 2019)	<ul style="list-style-type: none"> Defines land use goals and policies for the City. Includes recommendations to improve tsunami resilience, including collaborating with the County to establish land above the inundation zone for tsunami evacuation, identifying inter-jurisdictional evacuation routes, and enhancing bicycle and pedestrian evacuation routes.
Gearhart Transportation System Plan (2017)	<ul style="list-style-type: none"> Establishes goals and recommends projects based on available funding. Plans for a 2040 horizon year. Identifies tsunami evacuation routes and projects that will enhance infrastructure on evacuation routes. Recommends further analysis and planning to improve evacuation system. Lists current revenue sources and potential additional future sources.
Gearhart Natural Hazard Mitigation Plan (2014, 2021 Update)	<ul style="list-style-type: none"> An addendum to the Clatsop County Multi-Jurisdiction Natural Hazard Mitigation Plan that provides a set of actions to reduce the risk from natural disasters. Recognizes the need for and recommends the development of disaster evacuation routes.

Plan, policy, or document	Relevance to the TEFIP
Gearhart Parks Master Plan*	<ul style="list-style-type: none"> • Gearhart is in the process of developing a parks master plan for 2021.
Seaside	
Seaside Comprehensive Plan (updated 2019)	<ul style="list-style-type: none"> • Defines land use goals and policies for the City. • Encourages the development of a trail system.
Seaside Transportation System Plan (2011)	<ul style="list-style-type: none"> • Establishes goals and recommends projects and policies for the City's transportation system. Prioritizes improvements to evacuation routes. • Plans for a 2030 horizon year. • Lists current revenue sources and potential additional future sources.
Seaside Parks Master Plan (2018)	<ul style="list-style-type: none"> • Inventories existing park facilities. • Articulates a vision for the City's parks system with long- and short-term goals based on public input.
Cannon Beach	
Cannon Beach Comprehensive Plan (updated 2017)	<ul style="list-style-type: none"> • Defines vision for the City and policies to control and promote development. • Considers the development of a sidewalk and path system.
Cannon Beach Transportation System Plan*	<ul style="list-style-type: none"> • Cannon Beach does not have a transportation system plan but is in the process of developing one for 2022. The project team will coordinate closely with the TSP planning process.
Cannon Beach Parks and Trails Master Plan (2017)	<ul style="list-style-type: none"> • Plans for a nature trail and disaster facilities at the South Wind site southeast of the City. • Plans for tsunami evacuation wayfinding trail signs.
Cannon Beach Tsunami Evacuation Routes & Assembly Areas (2015)	<ul style="list-style-type: none"> • Provides pedestrian evacuation routes and identifies assembly areas for the City.

* Plan is in development.

Table 4. Federal Plans, Policies and Statutes

Plan, policy, or document	Relevance to the TEFIP
Americans with Disabilities Act (ADA)	<ul style="list-style-type: none"> • ADA standards will be considered during development of trail alternatives.
U.S. Department of Transportation (USDOT) Policies on Environmental Justice (EJ) and related policies: <ul style="list-style-type: none"> • Title VI of the Civil Rights Act (1964) • Title 49 of the Code of Federal Regulations (CFR) Part 21, Nondiscrimination in Federally Assisted Programs of the Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964 • Executive Order 12898 – Federal Actions to Address 	<ul style="list-style-type: none"> • TEFIP will ensure public involvement plan and outreach activities comply with EJ rules through the following actions: <ul style="list-style-type: none"> ○ Identify EJ populations residing in Clatsop County. ○ Engage existing community organizations such as advocacy groups that work with or serve Title II, Title VI, and Environmental Justice populations. ○ Host community events to solicit feedback from Title II, Title VI, and EJ populations. ○ Ensure the planning process does not result in projects that have a disproportionate negative impact on Title II, Title VI, and EJ populations, such as displacing or creating barriers between them and the rest of the community.

Environmental Justice to
Minority Populations and Low-
Income Populations

Executive Order 13166 – Improving
Access to Services for Persons with
Limited English Proficiency

County Fiscal Summary

The FY 2019-20 adopted budget includes \$121.59 million projected revenues and an operating budget of \$97.42 million. Within the operating budget, \$38.47 million (39.5 percent of the funds) are dedicated to land use, housing and transportation, economic development, and capital; and of that, 40.7 percent is allocated to General Roads (road maintenance and construction), 33.7 percent to Capital Projects, and 1.0 percent to Bike Paths.²

Transportation Funding Sources

The Clatsop County TSP indicates ODOT is likely to have \$8 million to \$10 million in state discretionary funds available for new transportation projects in the County between 2015 and 2035, although this funding is not currently dedicated or committed. The County expects to have approximately \$4 million to spend on priority transportation improvement projects in this timeframe. The funding available represents 6% of the project costs of the TSP's aspirational transportation project list. These funding estimates do not include federal sources that may be available, including the Highway Safety Improvement Program, Emergency Management funding, and future federal infrastructure spending, among others. Earthquake and tsunami preparedness are among federal infrastructure priorities.

Public Works Funding Sources

Funding sources from the Public Works Road District can only be spent on County roads. These are roads that the Board of Commissioners have approved for road maintenance. This funding could be targeted and budgeted if improvements are to be made on County roads for evacuation routes.

The Transient Room Tax is a potential source of revenue for County roads. The Tax collects approximately \$50,000 per year that can be used on public roads or right of way projects. The County must use 75 percent of these funds in the Arch Cape area. The remaining 25 percent may be used in other parts of the County. Currently the County has \$56,000 in the account that can be used on other public road projects.

For bicycle and pedestrian facilities, the County has a Bicycle Path Fund received from the State that can be used in a public right of way if the project involves pedestrian or bicycle trails or paths. This fund collects approximately \$30,000 per year and the County currently has \$122,900 in the fund.

The County cannot fund any projects on private property.

² "Clatsop County's Open Budget, Adopted Budget for FY2019-2020," Clatsop County, accessed March 25, 2021.
<http://budget.co.clatsop.or.us/#!/year/default>

INVENTORY OF EVACUATION ROUTES AND TRAILS

This section provides an inventory of existing evacuation routes and known trails in the project area. These were analyzed to identify gaps in the networks, potential vulnerabilities, and opportunities for improvements. In addition to the maps included in this section, the inventory and analysis are mapped in detail in the companion web map, available [here](#). For this section, relevant GIS layers can be found in the first data tab (Inventory Data).

Inventory of Evacuation Routes and Trails of Clatsop County

Designated Evacuation Routes

Clatsop County has roads designated as evacuation routes. These may be signed, as seen in Photograph 1, and often, but not always, lead out of the XXL inundation zone. Designated evacuation routes are illustrated in Figure 1, Figure 2, and Figure 3.

Designated evacuation routes in unincorporated Clatsop County use roadways. The road network has relatively few east-west connections, which is often the most direct route to higher ground. Additionally, several long bodies of water are oriented parallel to the coast north of Gearhart, inhibiting east-west connections. Existing bridges over these waterways were built before current seismic standards and may be vulnerable to an earthquake and its effects (including liquefaction).

Trails

Known existing trails are mapped in Figure 1, Figure 2, and Figure 3. Few trails are positioned to make practical evacuation routes. One such trail is the Fort to Sea Trail that connects Fort Clatsop National Memorial with Sunset Beach State Recreation Area. The Fort to Sea Trail provides a relatively direct route to high ground from Sunset Beach where there are no roads. It could also provide a route for the residents of the community on US 101 near Camp Rilea. The trail uses a bridge over Sunset Lake.



Photograph 1. Tsunami Evacuation Route Sign Outside Seaside (Source: Google Streetview)

The Oregon Coast Trail that leads into the north portion of Oswald West State Park may provide a way for people in Arch Cape to get out of the inundation zone, though the landslide risk is high at this segment of the Oregon Coast Trail. An alternative route that heads south on the street grid may be more desirable because it is more direct, offers more space to congregate, and has a lower landslide risk.

The trail system in Ecola State Park is fully outside the inundation zone and does not connect to where people will be evacuating. Much of the park is also in an area of moderate to high landslide risk. Most of the trails in Fort Stevens State Park are within the boundaries of the City of Warrenton, as are the small areas of high ground where it would be safe to assemble.

Based on input from Advisory Committee members, two additional trail opportunities have been identified for exploration:

- Arch Cape Community Forest – the community of Arch Cape is acquiring many hundreds of acres of forest land for a community forest in 2022. The effort will include formal planning for recreational and ecological resources within the forest. Existing logging roads could be designated and upgraded to trails that serve as evacuation routes, where appropriate.
- Delaura Beach Road provides access to the beach near Camp Rilea and could be improved as an evacuation route. Road improvements have not been planned or made because the route crosses a wetland, but the route exists and provides an existing connection from the beach.

Assembly Areas

Tsunami assembly areas are designated along the coastal areas of the County and are shown in Figure 1, Figure 2, and Figure 3. Many of these are in areas with moderate to high landslide risk or in areas highly susceptible to liquefaction. Assembly areas are concentrated near populated areas and most are within incorporated cities. Those in unincorporated Clatsop County are near Arch Cape (seven locations), near Sunset Lake and Camp Rilea (four locations), and south of Astoria near the Lewis and Clark River and the Youngs River (seven locations). The portion of the coast from Gearhart north to Fort Stevens is relatively flat and close to sea level. Assembly areas here are located on narrow ridges or small hills that are projected to be just above the inundation level. Those ridges in the north portion of Gearhart are below the inundation level.

Additional Evacuation Route Resources

DOGAMI has also developed evacuation maps to show locations of high ground and directions for getting there for the entire coastal area of Clatsop County. These show the inundation area, assembly areas, and arrows pointing to the nearest high ground. The maps use existing roads and may or may not use designated evacuation routes. DOGAMI's "Beat the Wave" maps take this a step further by looking at areas in more detail and estimating the speed one must travel to escape the inundation zone. Beat the Wave maps are developed for Seaside, Gearhart, and Warrenton and the Clatsop Spit. Beat the Wave analysis is included in the web map for these four communities.

The City of Cannon Beach created a series of pedestrian evacuation route maps for each of the City's neighborhoods³. Routes lead to designated assembly areas. This evacuation network is contained within the incorporated City.

³ The City of Cannon Beach, "Tsunami Evacuation: Pedestrian Route Maps" (2012)
<https://www.ci.cannon-beach.or.us/emergencymanagement/page/tsunami-evacuation-pedestrian-route-maps>

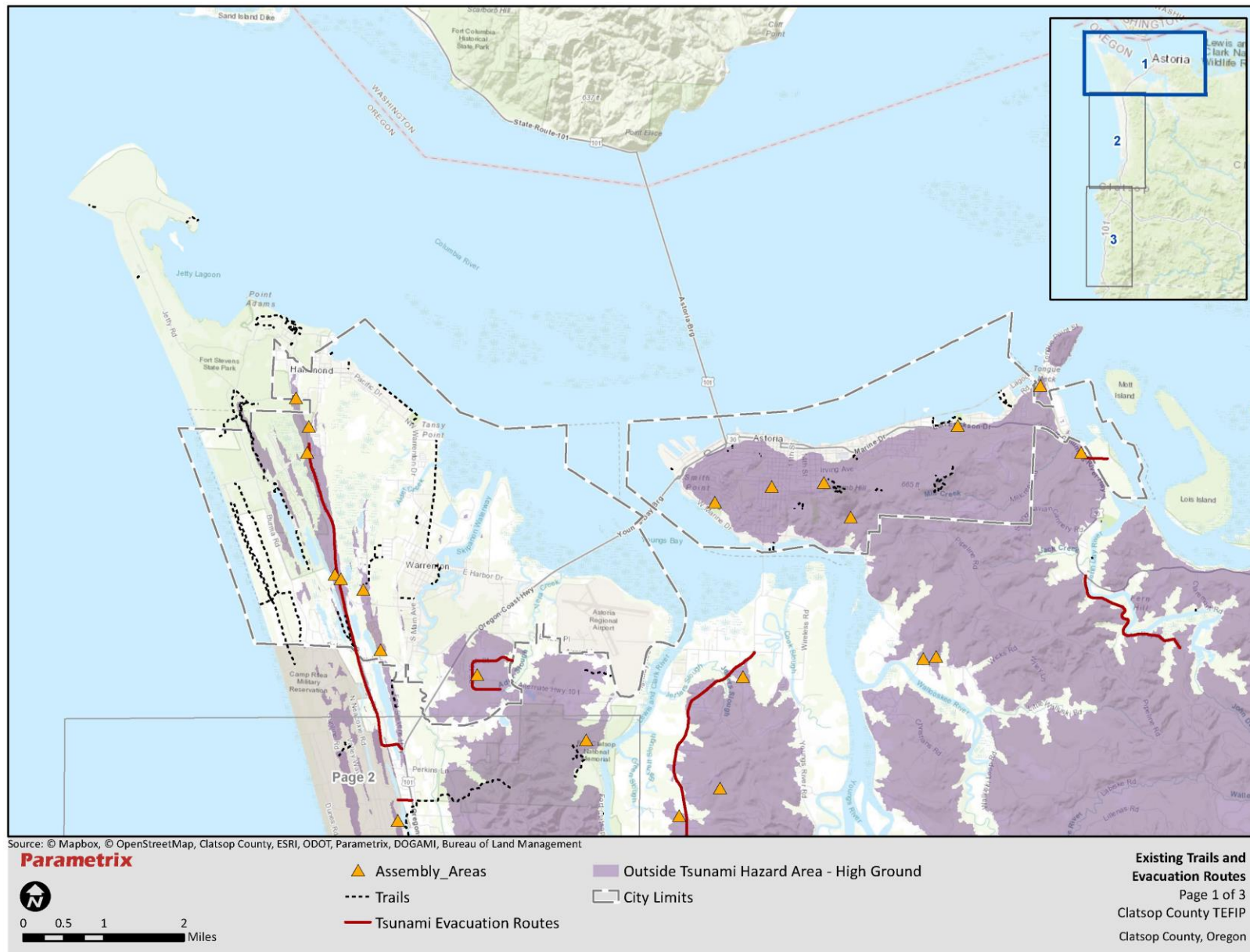


Figure 1. Existing Trails and Evacuation Routes: North Area

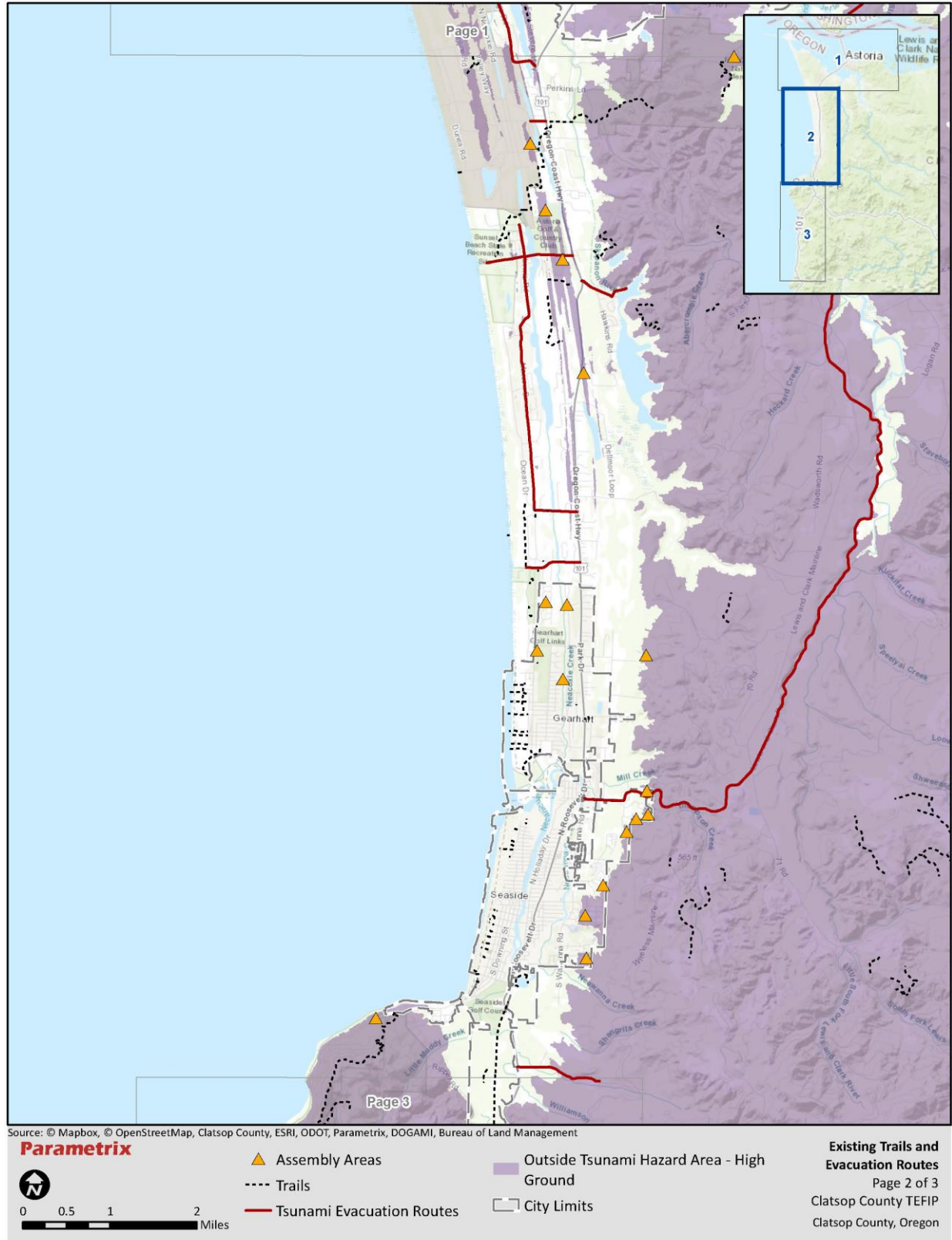


Figure 2. Existing Trails and Evacuation Routes: Central Area

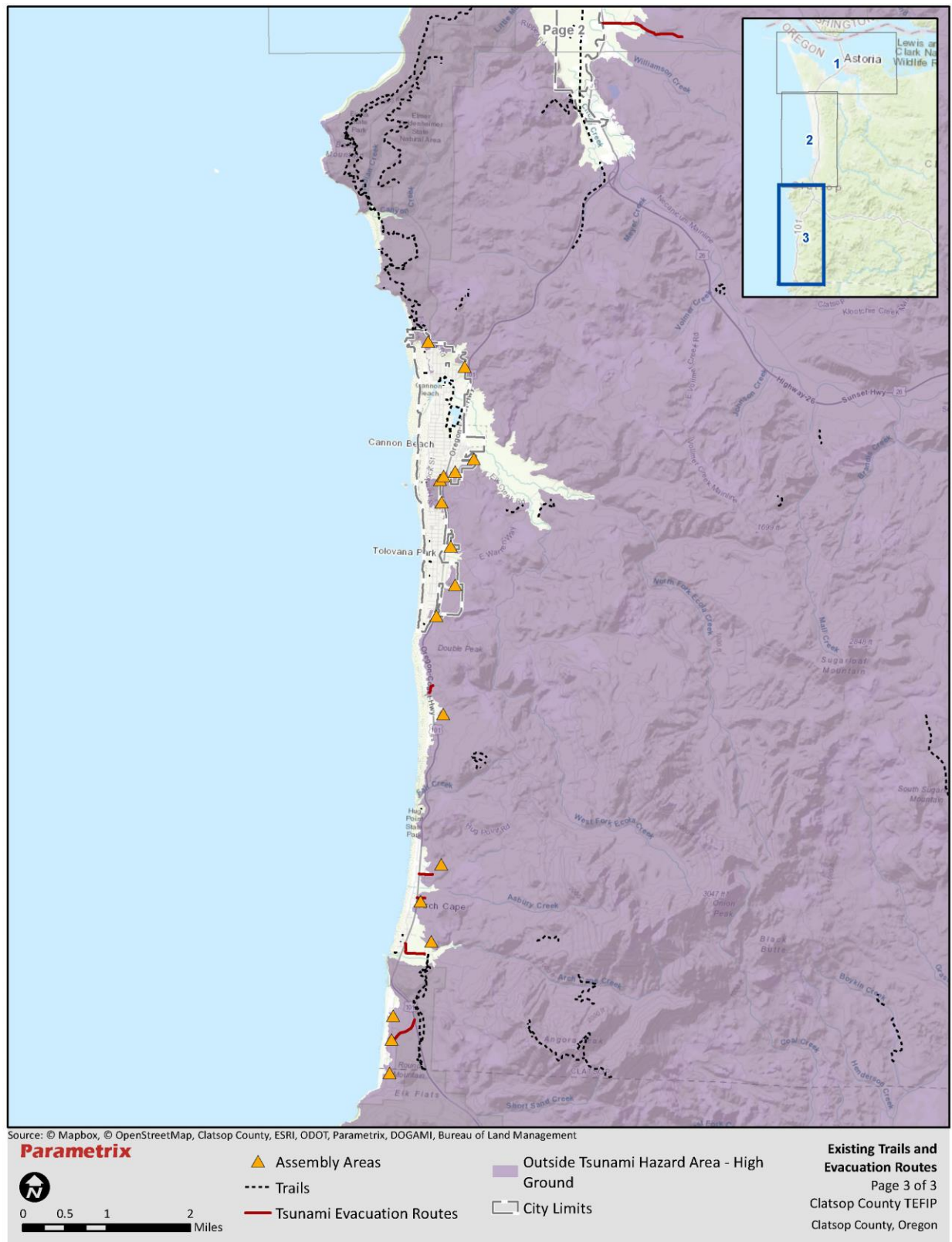


Figure 3. Existing Trails and Evacuation Routes: South Area

Gaps in the Evacuation Route Network

This section catalogs the gaps found in the existing roadway and trail networks for providing effective evacuation. Gaps are organized by three types:

- Areas of Concern
- Network Gaps
- Potentially Vulnerable Bridges and Culverts

These are illustrated in Figure 4, Figure 5, and Figure 6, and mapped in detail in the companion web map.

Areas of Concern

Clatsop County's evacuation routes are based on the existing road network, which does not provide adequate egress from the inundation zone from all coastal areas. Table 5 identifies these "areas of concern," where timely evacuation is unlikely, particularly for vulnerable populations. Areas of concern take into account:

- The distance needed to travel to escape the inundation zone.
- Whether the evacuation route relies on potentially vulnerable bridges.
- The adequacy of assembly areas (those in C-01 are located on small areas that are just above the inundation level).
- Whether these insufficiencies are compounded by liquefaction and/or landslide susceptibility.

Much of the project area, especially elevations above the inundation zone, have moderate to high landslide risk (see [web map](#)). Each assembly area will need to consider landslide risk and mitigation strategies.

Table 5. Areas of Concern

#	Map	Note
C-01	Figure 5 (Central)	The area north of Gearhart is relatively flat and low-lying. This requires travelling long distances to reach high ground. The land has a high risk of liquefaction. High ground and designated assembly areas are on narrow strips of land that are just above the projected inundation zone. Most streets and trails run north-south, with few east-west routes through this area. Sunset Lake, West Lake, Cullaby Lake, Neacoxie Creek, and other water bodies create barriers for east-west travel. Neighborhoods east of Hwy 101 may need to travel west to reach the nearest high ground.
C-02	Figure 4 (North)	The Clatsop Spit is low lying and requires travelling a long distance to reach high ground. The land has a moderate to high risk of liquefaction. This area has few residents but is a popular place to visit.
C-03	Figure 4 (North)	This community on the peninsula defined by the Lewis and Clark River and Jeffers Slough is surrounded by water and has a long way to travel to reach high ground. The land has a high risk of liquefaction.

C-04	Figure 4 (North)	This community on the peninsula defined by Youngs River and Knowland Slough is surrounded by water and has a long way to travel to reach high ground. The land has a high risk of liquefaction.
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Network Gaps

Trails in the unincorporated County that could also work as evacuation routes do not always lead directly to high ground or may not easily connect to nearby communities. Table 6 lists gaps in the trail network that, if addressed, could serve as evacuation routes, as well as gaps in the evacuation route network that could be served by trails.

Table 6. Gaps in the Trail System or Evacuation Route Network

#	Map	Note
G-01	Figure 5 (Central)	Fort to the Sea Trail could connect to higher ground at ridge.
G-02	Figure 5 (Central)	Consider new connection to the east from this neighborhood east of US 101 and near the south end of Camp Rilea. Consider using existing forest road. Existing assembly area is on narrow strip of high ground to the west across 101 and wetlands.
G-03	Figure 5 (Central)	Evacuation route ends in inundation zone. Needs to extend to high ground. Serves Glenwood Community. Consider new facility connecting north to nearby high ground and avoids crossing US 101.
G-04	Figure 5 (Central)	Evacuation route in this area west of Sunset Lake is much too long before it connects to higher ground. Consider a route east or to vertical evacuation structures.
G-05	Figure 5 (Central)	Existing evacuation route on Highlands Lane ends within inundation zone.
G-06	Figure 6 (South)	Carnahan Road ends within inundation zone. A short extension to the north would get people to high ground. Existing route requires walking much further to the south.
G-07	Figure 6 (South)	Evacuation route at the south end of Arch Cape ends within inundation zone. Connection needed. Evacuation route ends within inundation area - need connection to higher ground
G-08	Figure 5 (Central)	A trail would provide a fast connection to higher ground. This area has a high risk of landslide.

Potentially Vulnerable Bridges

The bridges and culverts along evacuation routes are vital for providing movement. However, most of these structures were built before current seismic standards and are likely vulnerable to a tsunami-causing earthquake. Table 7 lists the bridges and culverts on existing or potential routes. These structures were not inspected for this planning effort.

Table 7. Potentially Vulnerable Bridges

#	Map	Bridge Name	Road/ Trail	Crosses	Year Built	Condition	Sufficiency Rating (2019)	Owner	Notes
B-01	Figure 5 (Central)	Fort-to-Sea-Trail-Pedestrian Culvert	Fort to Sea Trail	US 101	2005	Good	N/A	ODOT	Fort to Sea Trail could make a good evacuation route. Culvert provides a crossing under US 101. Culvert is potentially seismically vulnerable. A detour is possible if culvert fails.
B-02	Figure 5 (Central)	Arch Bridge at Sunset Lake	Fort to Sea Trail	Sunset Lake	2006	Good	N/A	Corps of Engineers (Military)	Fort to Sea Trail could make a good evacuation route. Bridge is potentially seismically vulnerable. Bridge not in database.
B-03	Figure 5 (Central)	Sunset Lake Bridge	Sunset Beach Ln	Sunset Lake	1963	Fair	39.3	Clatsop County	Vital link for evacuating community west of Sunset Lake
B-04	Figure 5 (Central)	Cullaby Creek Bridge	Carnahan Park Rd	Cullaby Creek	1964	Fair	71.0	Clatsop County	On east edge of inundation zone, east of Sunset Lake. Could be an evacuation connection for the Glenwood Community.
B-05	Figure 5 (Central)	Maki Bridge	Loundsberry Ln	Cullaby Slough	1976	Fair	70	Clatsop County	East of Surf Pines. Could be a link to high ground to the east.
B-06	Figure 5 (Central)	Neacoxie Cr Bridge	Highlands Ln	Neacoxie Ck	1975	Fair	86.7	Clatsop County	Just north of Gearhart. Important for evacuating community west of Neacoxie Creek.
B-07	Figure 5 (Central)	Neawanna Creek, Hwy 9	US 101	Neawanna Creek	1930	Fair	49	ODOT	Important route for evacuating the north end of Seaside (high ground is outside city limits)
B-08	Figure 5 (Central)	Stanley Creek, Lewis and Clark Rd	Lewis and Clark Rd	Stanley Creek	2005	Good	96.7	Clatsop County	East edge of Seaside, leads to higher ground.
B-09	Figure 6 (South)	Rippet Rd Bridge	Rippet Ln	Circle Ck	[Unknown, not in available data]		76.1	Clatsop County	South edge of Seaside. Allows quick evacuation of one or two homes
B-10	Figure 4 (North)	Unknown Culvert (likely County-owned)	Lewis and Clark Rd (just south of Astoria)	[Unknown, not in available data]					Potential culvert location. This culvert is not in ODOT's database but was inferred from LIDAR data. This is a critical location for evacuating a large area.

Opportunities to Improve Evacuation Routes

Opportunities exist to improve the evacuation network by enhancing existing trails to better serve evacuations, by creating short trail connections, or by locating new assembly areas. Opportunities are listed Table 8 and mapped in Figure 4, Figure 5, and Figure 6.

Table 8. Opportunities to Improve Evacuation Routes

#	Map	Note
O-01	Figure 4 (North)	Trail provides opportunity for evacuation route in Fort Stevens State Park. Connects road (in inundation area) to higher ground. Consider improving trail as evacuation route.
O-02	Figure 4 (North)	Existing trail is an opportunity for an evacuation route in Fort Stevens State Park. Unpaved trail intersects with road leading to higher ground.
O-03	Figure 5 (Central)	Opportunity for new assembly area east of US 101 at the south end of Camp Rilea. Already connected by road/path visible in aerial. Privately owned.
O-04	Figure 5 (Central)	Structure over the creek just south of Sunset Lake appears to be a foot bridge. Could provide an east-west trail connection. Privately owned.
O-05	Figure 5 (Central)	Potential for an assembly area at Polo Ridge Road.
O-07	Figure 6 (South)	Potential for assembly area at the south end of Seaside.
O-08	Figure 6 (South)	Parcels are platted but appear undeveloped. Opportunity to plan evacuation routes before parcels are developed.
O-09	Figure 6 (South)	Potential connection to high ground for the Arch Cape community with platted but undeveloped Oceanview Ln.

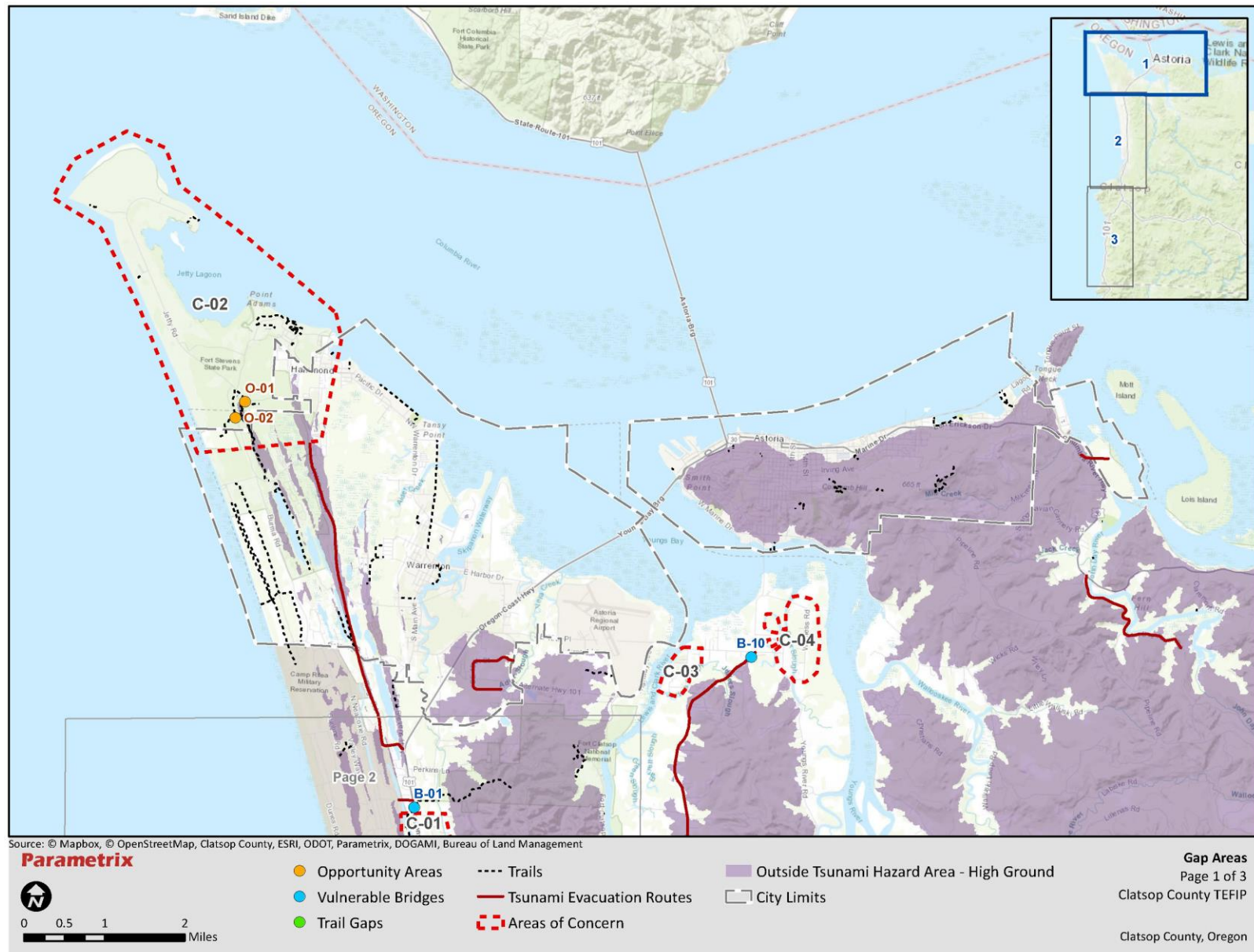


Figure 4. Gaps and Opportunities: North Area

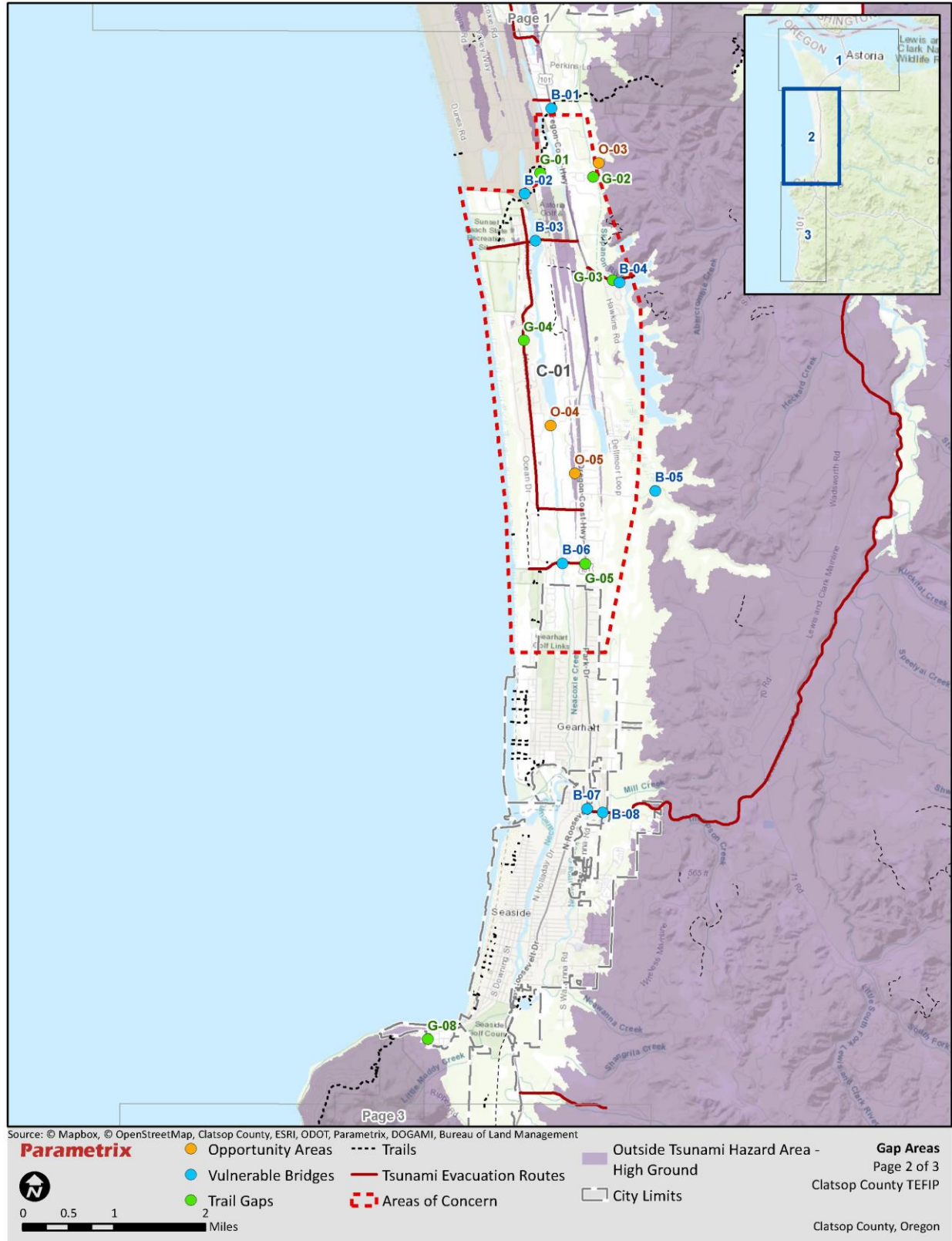


Figure 5. Gaps and Opportunities: Central Area

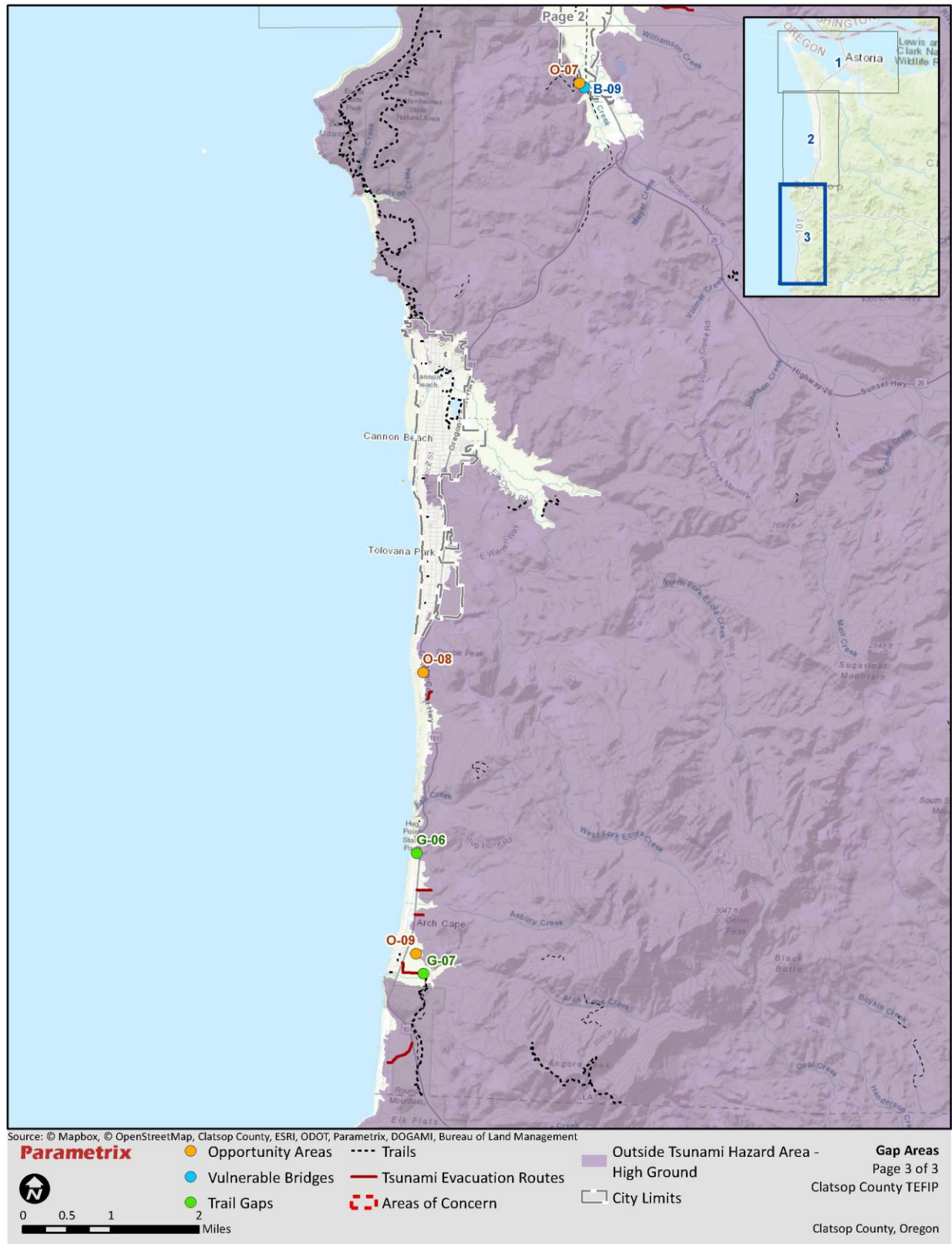


Figure 6. Gaps and Opportunities: South Area

NATURAL AND CULTURAL RESOURCES

The project study area overlaps with many natural and cultural resources. These are reviewed at a high level here. Future project development will require further study.

Available data for natural and cultural resources are shown on the companion web map, available [here](#). Relevant GIS layers can be found in the second data tab (Natural and Cultural Resources).

Table 9. Natural and Cultural Resources

Resource	Notes
Land Use Goal 5 Resources	Many resources protected by Goal 5 are inconsistent with evacuation route siting, particularly if the trail requires a structure. However, some resources, such as Recreation Trails, Natural Areas, and Open Space, could support a trail.
Regulatory floodplains	Floodplains tend to follow waterways inland, such as the Necanicum River, the Skipanon Waterway, the Lewis and Clark River, and the Youngs River. The lower elevation areas of Seaside, Gearhart, and Warrenton are also within floodplains. The tsunami inundation zone largely overlaps with floodplain areas.
Levees, including locations and geometries	Levees have been constructed adjacent to waterways throughout the project area. These are potentially vulnerable to both earthquake and tsunami.
Wetlands and non-wetland waters	A large portion of the project area is covered by wetlands and non-wetland waters. These areas are environmentally sensitive and are almost fully within the tsunami inundation zone.
Endangered Species Act and Oregon-listed sensitive species	Preliminary research reveals 11 endangered species, 3 critical habitats, and 40 migratory bird species that intersect the project area. ⁴
Hazardous materials sites	Preliminary research reveals 87 environmental cleanup sites ⁵ and 392 leaking underground storage tanks ⁶ in Clatsop County. Further investigation is needed in a future phase of project development to understand specific impacts related to each project.

⁴ "Information for Planning and Consultation," U.S. Fish & Wildlife Service, accessed March 29, 2021.
<https://ecos.fws.gov/ipac/location/G2GHOLCLBBC23JJXBGNPTMF7HE/resources>

⁵ "Environmental Cleanup Site Information Database," Oregon Department of Environmental Quality, accessed March 29, 2021.
<https://www.deq.state.or.us/lq/ECSI/ecsiquery.asp>

⁶ "Leaking Underground Storage Tanks (LUST) Database," Oregon Department of Environmental Quality, accessed March 29, 2021.
<https://www.deq.state.or.us/lq/tanks/lust/LustPublicLookup.asp>

Resource	Notes
Historic, cultural, and archaeological resources and sites	The areas of Clatsop County along the coast and Columbia River have been important for centuries and are home to historic landmarks and parks. These areas are historical territories of the Clatsop, Nehalem, and Chinook tribes, ⁷ and, are expected to have archaeologically, historically, or culturally significant resources located throughout. Future projects must consider these resources as the projects are developed.
Topographical information, including steep and unstable slopes	Steep or unstable slopes are common near coastal areas. These pose substantial challenges for evacuation routes. Steep slopes may be insurmountable to people walking or biking. Unstable slopes are prone to develop landslides in a seismic event.
Public lands	Publicly owned lands present an opportunity for evacuation routes or assembly areas that will not require new right of way. Routes through public lands may require the jurisdictions to develop memoranda of understanding.
Tsunami inundation data	Tsunami inundation data was developed by DOGAMI. This planning effort considers the tsunami zone from the most severe event: a “local” earthquake, also called the Cascadia “XXL” scenario.

DEMOGRAPHICS

Population Estimates

Population estimates were developed for the project area, Clatsop County, and the State of Oregon (

⁷ “Our home on native land,” Native Lands Digital. Accessed March 29, 2021. <https://native-land.ca/>

Table 10). Mapped demographic data can be accessed on the web map, available [here](#). Relevant GIS layers can be found in the third data tab (Demographics).

The project area population includes Census block groups that are within or intersect the project area boundary and exclude the populations within the incorporated cities of Cannon Beach, Seaside, Gearhart, Warrenton, and Astoria. Some block groups on the east edge of the project area are large and extend outside the project area. These block groups are included because it is assumed that most people within them live closer to the coast, and therefore inside or near the project area.

Table 10. Population Estimates

	Project Area	Clatsop County	State of Oregon
Total Population	6,481 *	39,102	4,129,803
Age 17 and Under	17.7% *	19.1%	21.0%
Age 65 and Over	23.2% *	21.4%	17.2%
At or Below 200% of the Federal Poverty Level	19.8%	32.7%	30.8%
Limited English Proficiency	0.7%	1.2%	2.5%
People with Disabilities	18.4%	18.5%	14.0%
Race and Ethnicity			
Hispanic (All Races)	5.8% *	8.5%	13.0%
American Indian/Alaska Native	0.9% *	0.4%	0.9%
Black/African American	1.0% *	0.8%	1.8%
Asian	1.6% *	1.0%	4.3%
Pacific Islander	0.2% *	0.3%	0.4%
White	87.7% *	85.5%	75.7%
Other Race	0.2% *	0.0%	0.1%
Multiple Races	2.7% *	3.5%	3.7%

Sources:

* 2020 ESRI Estimates

All others: American Community Survey 5-Year Estimate 2015-2019

Environmental Justice Populations

For the purposes of the Clatsop County TEFIP, members of Title VI and Environmental Justice communities include:

- Black, Indigenous, and people of color (includes non-white Hispanic and Latino)
- Youth (age 17 and younger) and seniors (age 65 and older)
- Low-income (defined as percentage of households with an income ratio of 2.0 and under the poverty line)
- Limited English proficiency households

Population estimates indicate the portion of residents who identify as Black, Indigenous, or as persons of color is generally lower than the state as a whole. One exception is the population of American Indian/Alaska Native, which is 0.9 percent for both the project area and for Oregon. The youth population is relatively low for the project area, less than 18 percent. However, nearly one quarter of the population is over age 65, with higher concentrations along the coast north of Gearhart through the Clatsop Spit. The portion of low income residents is below 19 percent, which is less than Clatsop County or Oregon. Less than one percent of project area residents have limited English proficiency.

Vulnerable Populations

Vulnerable and special needs populations are members of the community who experience access, functional or medical care needs and who may require assistance before, during, and after an emergency incident. In the case of evacuations, examples of individuals who have access and functional needs that may make evacuation challenging include:

- Individuals who experience mobility challenges (e.g., those with physical disabilities, the elderly, children).
- Individuals who are blind or have low vision.
- Individuals who are deaf or hard of hearing.
- Individuals with limited English proficiency.

As indicated in

Table 10, over 40 percent of the population is either under age 18 or over age 64. Additionally, 18.4 percent of individuals live with at least one disability. To better understand how many community members may have access or functional needs, Table 11 lists the portion of the project area population that experience disabilities related to mobility, vision, or hearing. This is not a comprehensive list of disabilities (it does not include cognitive disabilities, for example), and some individuals may experience more than one.

Table 11. Individuals in the Project Area with Ambulatory, Hearing, or Vision Disability

Disability Status	
People with Ambulatory Difficulty	4.3%
People with Vision Difficulty (Age 5 and Over)	5.2%
People with Hearing Difficulty	4.6%

Source: American Community Survey 5-Year Estimate 2015-2019

Visitors

The Oregon Coast is a popular tourist destination and can host many visitors in addition to the residents. According to a recent study for Travel Oregon, over 1.7 million visitors spent at least one night in Clatsop County in 2019.⁸ This number is not specific to coastal areas and does not include day use visitors. Also, the number of visitors in the project area fluctuates with the seasons. Visitors are likely less familiar with the risk of tsunamis, evacuation procedures, and the geography of the area. Visitors may also not speak English. These are important considerations for the provision of evacuation facility capacity, as well as evacuation information and wayfinding.

⁸ Dean Runyan Associates, *Oregon Travel Impacts, 1992-2019* (2020). <https://industry.traveloregon.com/wp-content/uploads/2020/04/ORImp19.pdf>