Comprehensive Flood Hazard Management Plan

TETRA TECH

PERTEET

August 2023

Cowlitz County Comprehensive Flood Hazard Management Plan

August 2023

PREPARED FOR

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LIST OF ACRONYMS

ADA—Americans with Disabilities Act

BLS—(U.S.) Bureau of Labor Statistics

BRIC—Building Resilient Infrastructure and Communities

CDID—Consolidated Diking Improvement District

CFR—Code of Federal Regulations

cfs—cubic feet per second

CRS—Community Rating System

DFIRM—Digital Flood Insurance Rate Map

DMA—Disaster Mitigation Act

DNR—Department of Natural Resources

ERP— Emergency Response Plan

ESA—Endangered Species Act

FCAAP—Flood Control Assistance Account Program

FEMA—Federal Emergency Management Agency

FIRM—Flood Insurance Rate Map

FMA—Flood Mitigation Assistance

GIS—Geographic Information System

Hazus—Hazards, United States-Multi Hazard

HMGP—Hazard Mitigation Grant Program

IPCC—Intergovernmental Panel on Climate Change

NAVD—North American Vertical Datum

NFIP—National Flood Insurance Program

NIMS—National Incident Management System

NOAA—National Oceanic and Atmospheric Administration

NRCS—Natural Resources Conservation Service

NWS—National Weather Service

SFHA—Special Flood Hazard Area

SWOO—strength, weakness, opportunity, or obstacle

USGCRP—U.S. Global Change Research Program

WRIA—Water Resource Inventory Area

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EXECUTIVE SUMMARY

Flooding has been an ongoing hazard in Cowlitz County. Flood events that caused enough damage to trigger Presidential disaster declarations have occurred 10 times since 1964. Data and observed conditions show that the frequency and intensity of flood events nation-wide are increasing. In light of this, the County has updated its comprehensive flood hazard management plan, which was originally developed in 1988.

The updated *Cowlitz County Comprehensive Flood Hazard Management Plan* (The Flood Plan) recommends regional policies, programs, and projects to reduce the risk to people and property from river flooding, alluvial fans and channel migration in Cowlitz County. The Flood Plan presents a long-term vision for managing all flood hazards within Cowlitz County and recommends specific near-term actions to achieve that vision. It recommends actions Cowlitz County and cities in the county may take to reduce flood risks and to protect, restore or enhance riparian and aquatic ecosystems.

How the Flood Plan Was Prepared

The plan was developed following the guidelines for flood planning presented by the Federal Emergency Management Agency (FEMA) for its Community Rating System (CRS). Cowlitz County does not currently participate in the CRS, but the 10-step CRS planning process CRS is recognized nationally as a best-management-practice for flood hazard management planning

- Planning process steps:
  - Step 1, Organize
  - Step 2, Involve the public
  - Step 3, Coordinate
- Risk assessment steps:
  - Step 4, Assess the hazard
  - Step 5, Assess the problem
- Mitigation strategy steps:
  - Step 6, Set goals
  - Step 7, Review possible activities
  - Step 8, Draft an action plan
- Plan maintenance steps:
  - Step 9, Adopt the plan
  - Step 10, Implement, evaluate and revise.

COWLITZ COUNTY PROFILE

Cowlitz County is located in southwest Washington along the lower portion of the Cowlitz River and the Columbia River (see Figure 3-1.). With an area of 1,166 square miles, it is the 28th largest of Washington's 39 counties. There are five incorporated municipalities in the county: Castle Rock, Kelso, Woodland (partially in Clark County), Kalama and Longview. Longview is the largest city in the county and Kelso serves as the county seat. The Washington State Office of Financial Management estimated Cowlitz County's population at 112,350 as of 2022, making it the 12th largest county by population in the state. The Washington Office of Financial Management estimates a population of 130,993 in Cowlitz County by 2050, a 15.5 percent increase from 2020.

The patterns of development in Cowlitz County are diverse. There are large uninhabited forest and open space areas. There are also extensive areas with scattered rural homes, marked with occasional small farms and rural community centers. The rural and remote landscape dominating the county contrasts with the urban/suburban

activity of the County's cities and rural communities along Interstate 5, which bisects the county and connects it to Portland and Seattle. Most of the County's land base is under private ownership although significant areas are state forests and a portion of the Mount St. Helens National Volcanic Monument associated with the Gifford Pinchot National Forest is within the County.

COWLITZ COUNTY FLOOD HAZARD

Common Characteristics of Flooding in the County

Flooding in southwestern Washington, including Cowlitz County, is most frequently the result of coastal storms or heavy rains resulting in one to several days of precipitation. Major floods usually result from a combination of intense rainfall and snowmelt after the watershed has been saturated from prior rainfall.

Columbia River floods generally are an annual event that occurs in spring when the snow melts in the mountains. During spring floods, the Columbia River remains above flood stage for 30 to 90 days. Winter flood-stage periods are of much shorter duration, though there has been winter flooding in the County with magnitudes comparable to that of the larger spring floods. Flooding from rivers and smaller creeks in the Cowlitz, Kalama, and Lewis River basins generally occurs from November through January. The low-lying communities of Kalama and Woodland are impacted by high water levels in the Columbia, which prevent the discharge of their stormwater, exacerbating other flooding conditions in the planning area.

The most problematic secondary hazard associated with flooding is bank erosion, which in some cases can be more harmful than actual flooding. Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers or storm sewers.

Major Historical Flood Events and Potential Future Flood Frequency

Cowlitz County has been subject to many natural disasters, primarily flooding. The historical record of flooding in Cowlitz County is available for the period since substantial population centers became established. In that time, major floods have been recorded on the Columbia, Cowlitz, Coweeman, Kalama, Lewis, and Toutle Rivers.

The eruption of Mount St. Helens (in neighboring Skamania County) on May 18, 1980, sent a 200-foot-thick lahar (flow of melted ice and snow, mud, and debris) flow down the Toutle River Valley into the Cowlitz River. Roads and bridges disappeared along with any structures and vehicles in the way. The flows were so dramatic that the bottom of the Cowlitz silted up, raising the river 12 feet. Sediment also filled the Columbia, preventing ships from reaching or leaving Portland for more than a week.

Recent history has shown that Cowlitz County can expect an average of one episode of minor river flooding each winter. Large, damaging floods typically occur every two to five years. Urban portions of the county annually experience nuisance flooding related to drainage issues. The future frequency of flooding may change from historical frequencies as a result of climate change. As the climate continues to warm, increased evaporation will result in more moisture in the atmosphere, which may intensify rainfall events. In addition, some areas may experience shifts in the timing and duration of rainy seasons due to warming climate. Warmer temperatures may cause earlier and faster snowmelt, altering the timing of water availability downstream.

Location

Flooding in the planning area has been extensively documented by gage records, high water marks, damage surveys and personal accounts. This documentation was the basis for the December 16, 2015, Flood Insurance Rate Maps generated by FEMA for the planning area (Federal Emergency Management Agency 2015). The flood hazard risk assessment for this plan evaluated five areas mapped by FEMA: the 10-percent, 2-percent, 1-percent, and 0.2-percent annual chance floodplains, and the "area with reduced risk due to levee." The levee-protected area is considered to be protected against flooding for the 1-percent-annual-chance event, but it is still susceptible to flooding in the event of a larger flood that causes levees to be overtopped.

CURRENT FLOOD MANAGEMENT PRACTICES

County and City Plans and Regulations

The County's Comprehensive Plan has adopted goals, objectives, policies and actions with regards to frequently flooded areas. These plan components strive to steer future trends in development away from increasing flood risks in Cowlitz County. Cowlitz County's critical areas regulations regulate how development and redevelopment can safely occur on lands that contain critical areas.

Additionally, Cowlitz County and its cities participate in the National Flood Insurance Program (NFIP) and have adopted flood damage prevention ordinances in response to its requirements. Cowlitz County has committed to maintaining its good standing under the NFIP through actions identified in this plan.

Flood Hazard Management Administration Practices

The Cowlitz County Flood Plan Steering Committee opted to perform a review of all municipalities within the planning area to assess the degree of consistency in their flood hazard management administration practices. The review assessed the floodplain administration capabilities of the County and each city by evaluating 57 floodplain management programmatic applications in four categories. Based on that assessment, it classified communities as green, yellow, or red:

- **Green (score in the 80th percentile or higher)—**Community is ready to move forward to participate in FEMA's Community Rating System (CRS)
- **Yellow (score in 50th to 79th percentile)—**Community is close but might want to consider some resilience recommendations
- **Red (score in the 49th percentile or lower)—**Significant issues must be addressed before applying to the CRS

All jurisdictions evaluated currently participate in the NFIP and are in full compliance and good standing under that program. None of the jurisdictions currently participate in the CRS program.

No city or the County scored in the green level (80th percentile or higher) in any of the categories. The average overall score was 50.06 percent (yellow). The highest total score was 54.85 percent and the lowest was 47.09 percent. While the results show that none of the programs appear ready to join the CRS program, they do show a degree of consistency between the County and the five city floodplain management programs. There was a less than 10 percent differential between the high and low score.

Flood Protection Measures

Flood-control structures have been constructed in Cowlitz County since devastating floods in 1933 and 1948. These flood protection measures include extensive levee systems along the Cowlitz, Columbia, Coweeman, Kalama, and Lewis Rivers River, and the Coal Creek Slough. Further protection is provided by numerous other bank protection and levee projects. A combination floodwall and dike along the west bank of the Lewis River protects most of the City of Woodland. After the May 1980 Mount St. Helens eruption, the U.S. Army Corps of Engineers conducted a massive program of improving the Cowlitz River levee systems and dredging the deposited sediment from Cowlitz and Toutle River channels.

In addition to the levees, communities maintain a network of drainage ditches, sloughs, drains, and pump stations to remove local runoff. Some of these facilities remove surface drainage and levee seepage.

Flood storage dams and sediment retention structures provide flood protection at locations in the Columbia, Cowlitz, Toutle, and Lewis River basins.

Flood Threat Recognition Systems

The Cowlitz County flood threat recognition system consists, in part, of precipitation and U.S. Geological Survey stream gages at strategic locations in the county that constantly monitor and report rainfall and stream levels. To assess the flood threat along the major rivers in the county, the stream gage information is fed into a National Weather Service (NWS) river forecasting program. This program creates a forecast of the amount of flow expected in the stream for the next 10 days (measured in cubic feet per second), which can then be compared to the flood stages at those locations. For locations that do not have stream gages or river forecasts, the NWS also provides Doppler radar data and weather/flood forecast information that can determine other types of flood risk across the county, such as flash flooding, small stream flooding, etc. All of this information is analyzed to evaluate the flood threat and possible evacuation needs.

RISK ASSESSMENT

The Flood Plan assesses the risk of the flood hazard in Cowlitz County. Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards such as flooding. It determines two key parameters based on location relative to flood hazard areas:

- Exposure to the flood hazard—Whether the location is within an area likely to experience flooding
- Vulnerability of exposed facilities—How much damage or injury a flood event is likely to cause at the location

Table ES-1 summarizes key countywide findings of the risk assessment.

Table ES-1. Area and Structures Within the 1% Annual Chance Floodplain by Municipality

	10% Annual Chance Flood	2% Annual Chance Flood	1% Annual Chance Flood	0.2% Annual Chance Flood	Levee-Protected Areas
Exposure Results					
Population Exposed	309	1,265	5,062	6,935	48,405
Number of Structures Exposed	112	380	1,564	2,188	16,744
Total Value of Exposed Structures and Their Contents	$81.9 million	$173. 7 million	$1.08 billion	$1.49 billion	$21.7 billion
Number of Critical Facilities Exposed	11	16	69	80	151
Vulnerability Results					
Persons Displaced	117	773	2,803	3,606	43,656
Persons Requiring Publicly Provided Short-Term Shelter	8	36	146	200	1,776
Estimated Damage to Structures and Their Contents	$16,473,452	$42,556,654	$158,562,758	$346,021,129	$3,893,099,379
Average Damage to Critical Facilities as % of Total Value (Structure)	—	—	17.99%	23.59%	16.02%
Average Damage to Critical Facilities as % of Total Value (Contents)	—	—	62.21%	47.15%	47.15%

GOALS AND OBJECTIVES

The Flood Plan identifies the following goals and objectives for reducing long-term vulnerabilities to flooding in the planning area:

- Goals
  - Save lives and reduce public exposure to flood risk.
  - Maintain sustainable operation of identified critical facilities.
  - Reduce or prevent damage to public and private property.
  - Improve the cost effectiveness of flood hazard management.
  - Leverage natural and beneficial floodplain processes.
- Objectives
  - Continually improve understanding of the location and potential impacts of flooding, vulnerabilities, community development patterns, and measures needed to protect public life, safety, and property.
  - Work cooperatively with federal, state, regional, and local agencies and stakeholders to plan for and understand the impacts of flooding.
  - Create and maintain partnerships among all levels of government and the whole community to coordinate mutually beneficial mitigation strategies.
  - Identify mitigation projects that provide the highest degree of flood protection and damage reduction, are cost effective, provide protection to property, including critical facilities, and mitigate impacts on the environment.
  - Consider floodplain management policies that promote resiliency and sustainable operations of identified critical facilities.
  - Utilize the best available data, science and local knowledge to consider current and future conditions in planning for flood and inundation hazards.
  - Integrate floodplain management goals and objectives into other plans and programs within the planning area that can support or enhance floodplain management within Cowlitz County.

- Provide feasible, cost-effective flood hazard protection that strives to enhance or restore the natural and beneficial floodplain function.
- Enhance all facets of emergency response capabilities, including mitigation of vulnerable critical facilities and infrastructure.
- Sustain continuity of local emergency and government operations, including the operation of identified critical facilities, during and after a disaster.
- Promote and enhance outreach and education efforts by state, regional and local agencies with flood hazard plans and programs to actively encourage engagement of stakeholder groups such as homeowners, private sector businesses, and nonprofit community organizations.
- Encourage flood hazard mitigation measures that result in the least adverse effect on the natural environmental and that use natural processes.

POLICIES

The Flood Plan presents policies that provide a framework for making decisions about flood hazard management in Cowlitz County. These policies also provide guidance for decision-making at the program and project level and define the level of discretion Cowlitz County has available in flood management decisions. The policies are divided into six categories:

- General
- Flood hazard area land use
- Flood risk reduction
- River channel maintenance
- Flood warning and response
- Funding and financing.

The policies are intended to be consistent with any and all water resource policies in the *Cowlitz County Comprehensive Plan*, which directs land use and growth in unincorporated Cowlitz County.

RECOMMENDED MITIGATION ACTIONS

The Flood Plan identified actions that will provide flood hazard mitigation benefits. For each action, priorities were developed for implementing the action and for seeking grants to fund the action. Table ES-2 summarizes the number of recommended actions by priority and type of action.

Table ES-2. Number Mitigation Actions by Type and Priority

	Number of Actions					
	Implementation Priority			Grant Pursuit Priority		
	High	Medium	Low	High	Medium	Low
Prevention Actions	5	9	0	2	3	9
Property Protection Actions	2	6	1	2	5	2
Public Education Actions	1	3	1	1	3	1
Natural Resource Protection Actions	0	5	4	0	5	4
Emergency Services Actions	4	9	1	1	6	7
Structural Projects	4	7	3	3	5	6
Climate Resilience Actions	0	1	1	0	1	1
Capacity Building Actions	3	6	2	3	5	3

PART 1—PLANNING PROCESS AND PROJECT BACKGROUND

1. INTRODUCTION

1.1 WHY PREPARE THIS PLAN

Prior to the late 1960s, the typical approach to flooding in the U.S. focused on constructing flood-control works, such as dams, levees and seawalls, and providing disaster relief to victims when flooding occurred. This approach did little to discourage unwise development near waterways and may actually have encouraged such development in some instances. At the same time, due to the high risk and seasonal nature of flooding, insurance companies were unable to provide flood insurance that was affordable to most Americans. Under these circumstances, government expenditures on flood disaster relief rose steadily over the years.

Flood hazard mitigation is a way to reduce or alleviate the loss of life, personal injury, and property damage that can result from flooding through long- and short-term strategies. It involves strategies such as planning, policy changes, programs, projects, and other activities that can mitigate the impacts of floods. The responsibility for flood hazard mitigation lies with many, including private property owners, business, industry, and local, state and federal government.

In 1968, the U.S. addressed the escalating cost of flood disaster relief by creating the National Flood Insurance Program (NFIP). The NFIP establishes an agreement between local communities and the federal government—if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks, then the federal government will make flood insurance available within the community as a financial protection against flood losses. The NFIP is administered by the Federal Emergency Management Agency (FEMA). All communities that participate in the NFIP must adopt and enforce minimum standards for managing construction and development in designated "special flood hazard areas." Communities that achieve a higher level of safety and protection than provided by the minimum standards can participate in the NFIP's Community Rating System (CRS) to obtain discounts on flood insurance premiums.

The *Cowlitz County Comprehensive Flood Hazard Management Plan* (The Flood Plan) recommends regional policies, programs, and projects to reduce the risk to people and property from river flooding, alluvial fans and channel migration in Cowlitz County. This plan presents a long-term vision for managing all flood hazards within Cowlitz County and recommends specific near-term actions to achieve that vision. The Flood Plan recommends actions Cowlitz County and cities in the county may take to reduce flood risks and to protect, restore or enhance riparian and aquatic ecosystems.

Cowlitz County and all of its five cities participate in the NFIP. Flooding has been an ongoing hazard in the County. Flood events that caused enough damage to trigger Presidential disaster declarations have occurred 10 times since 1964. Data and observed conditions show that the frequency and intensity of flood events nation-wide are increasing. In light of this, the County developed this update to its Comprehensive Flood Hazard Management Plan, originally developed in 2007. All citizens and businesses of Cowlitz County are the ultimate

beneficiaries of this plan. The plan's goals and recommendations lay the groundwork for development and implementation of local mitigation activities and partnerships.

1.2 COWLITZ COUNTY'S PLANNING AUTHORITY

The Revised Code of Washington (RCW, Section 86.12.210) authorizes county legislative bodies in Washington to adopt comprehensive flood control management plans for any drainage basin wholly or partially within the county. The Flood Plan must meet NFIP participation requirements (44 CFR Part 60.3) and Washington Department of Ecology flood hazard management requirements (Chapter 86.26 RCW, Chapter 86.16 RCW and Washington Administrative Code (WAC) Chapter 173-145). The Cowlitz County Comprehensive Flood Hazard Management Plan will be adopted by reference in the Cowlitz County Comprehensive Plan for protection of frequently flooded areas, as required by Washington's Growth Management Act. The Comprehensive Flood Hazard Management Plan also functions as the updated flood hazard portion of the Cowlitz County Regional Hazard Mitigation Plan, which was adopted for compliance with the federal Disaster Mitigation Act of 2000, 44 CFR, Part 201.6.

1.3 GUIDELINES FOR FLOOD HAZARD MANAGEMENT PLANNING

The first priority for this plan is to benefit the people who live and work in unincorporated Cowlitz County by providing protection against potential flooding. The plan follows the guidelines for flood planning presented by FEMA for the CRS program. The following 10-step planning process advocated by the CRS is recognized nationally as a best-management-practice for flood hazard management planning, even for communities not participating in the CRS program (see Appendix A for details):

- Planning process steps:
  - Step 1, Organize
  - Step 2, Involve the public
  - Step 3, Coordinate
- Risk assessment steps:
  - Step 4, Assess the hazard
  - Step 5, Assess the problem
- Mitigation strategy steps:
  - Step 6, Set goals
  - Step 7, Review possible activities
  - Step 8, Draft an action plan
- Plan maintenance steps:
  - Step 9, Adopt the plan
  - Step 10, Implement, evaluate and revise.

1.4 HOW TO USE THIS PLAN

This Flood Plan is organized into the following primary parts, which follow the organization of the CRS steps for floodplain planning:

- Part 1—Planning Process and Project Background
- Part 2—Risk Assessment
- Part 3—Mitigation Strategy
- Part 4—Plan Maintenance

Each part includes elements identified in the CRS's 10 steps. Appendices at the end of the plan include information to support the main content of the plan.

2. PLAN DEVELOPMENT METHODOLOGY

This chapter describes the primary steps used to develop this Flood Plan:

- Form a planning team
- Establish a steering committee
- Define the planning area
- Coordinate with other agencies
- Review existing programs
- Engage the public in development of the Flood Plan.

2.1 FORMATION OF THE PLANNING TEAM

This planning project was initiated and overseen by Cowlitz County Building and Planning. Cowlitz County hired Tetra Tech, Inc. to assist with development and implementation of the plan. The Tetra Tech project manager reported directly to the Cowlitz County project manager. A planning team was formed to lead the planning effort (CRS Step 1), made up of the following members:

- Adam Trimble, Senior Policy Outreach Planner, County Project Manager
- Larry Hembree, Department of Emergency Management Director
- Laura Gresset, Assistant Policy Outreach Planner
- Lorraine Fuller, GIS Specialist II
- Chris Andrews, PE, Project Engineer
- Scott Neves, Department of Emergency Management Coordinator
- Rob Flaner, Tetra Tech, Project Manager
- Christina Wollman, Perteet, Senior Planner
- Carol Baumann, Tetra Tech, Risk Assessment lead

2.2 THE STEERING COMMITTEE

A steering committee was formed to oversee the planning effort. The members of this committee included key Cowlitz County staff, residents, and other stakeholders. The planning team assembled a list of candidates representing interests within the planning area that could have recommendations for the plan or be impacted by its recommendations. Table 2-1 lists the 36-member Steering Committee organized for this plan update effort.

Table 2-1. Steering Committee

Name	Department/Agency	Governmental[a]	Non-Governmental[b]
Adam Trimble	Cowlitz County Building and Planning	X	
Larry Hembree	Cowlitz County Department of Emergency Management	X	
Laura Gressett	Cowlitz County Building and Planning	X	
Chris Andrews	Cowlitz County Public Works	X	
Scott Neves	Cowlitz County Department of Emergency Management	X	
Lorraine Fuller	Cowlitz County Building and Planning	X	
Patrick Harbison	Cowlitz County Public Works	X	
Susan Eugenis	Cowlitz County Public Works	X	
Jim Williams	Cowlitz County Building and Planning	X	
Devin Mackin	Kelso Public Works	X	
Michael Kardas	Kelso Community Development	X	
Adam Smee	Kalama Building & Planning	X	
Kelly Rasmussen	Kalama Public Works	X	
Ken Hash	Longview Public Works	X	
David Lukaczer	Woodland Community Development	X	
Tracy Coleman	Woodland Public Works	X	
Travis Goddard	Woodland Community Development	X	
David Vorse	Castle Rock Public Works	X	
Nathan Worthington	Tacoma Power		X
Monique Rabideau	WSDOT		X
Aaron Yanez	WSDOT		X
Amy Boyd	Port of Longview		X
Tim Karnoski	Port of Longview		X
Jennifer Wray-Keene	Port of Woodland		X
James Gordon	Cowlitz Indian Tribe		X
Christina Donehower	Cowlitz Indian Tribe		X
Steve West	Lower Columbia Fish Recovery Board		X
Bill LeMonds	Cowlitz Fire District #6		X
Janel Skreen	Lower Columbia EDU		X
Nolan Wheeler	Lower Columbia EDU		X
George L Fornes	Washington Department of Fish and Wildlife		X
Amy Blain	Consolidated Diking Improvement District #1		X
Bill Fashing	Cowlitz-Wahkiakum Council of Governments		X
Dell Hillger	Beacon Hill Water and Sewer District		X
Matthew Gerlach	Washington Department of Ecology		X
Mark Smith	Cowlitz County Planning Commission		X

The makeup of this committee strove for equitable distribution of governmental and non-governmental representation, defined as follows:

a. "Governmental" refers to representatives of Cowlitz County or city government associated with County or city permit authority, who are responsible for the development and enforcement of County or city plans, programs, codes and standards.

b. "Non-governmental" refers to any stakeholder not affiliated with the permit authority of Cowlitz County or cities who could have a stake in the outcome and directives of this plan.

Among governmental representatives on the Steering Committee, the County strove for representation across the categories of mitigation defined by the CRS program: preventive measures, property protection, natural resource protection, emergency services, structural flood control projects and public information. Table 2-2 shows the Steering Committee governmental members' representation by these categories.

Table 2-2. Category Representation of Governmental Steering Committee Members

Name	Preventive Measures	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information
Adam Trimble	X	X				X
Larry Hembree	X	X		X		X
Laura Gressett	X	X				X
Chris Andrews	X	X			X	
Scott Neves				X		
Lorraine Fuller	X	X	X			X
Patrick Harbison	X	X	X		X	X
Susan Eugenis	X	X	X	X	X	X
Jim Williams	X	X	X		X	X
Devin Mackin	X	X			X	
Michael Kardas	X	X			X	X
Adam Smee				X		X
Kelly Rasmussen	X	X			X	
Ken Hash	X	X	X	X	X	X
David Lukaczer	X	X	X			X
Tracy Coleman	X	X	X	X	X	X
Travis Goddard	X	X	X		X	X
David Vorse	X	X			X	

The Steering Committee met several times prior to the consultant being contracted. During these initial meetings, the committee established leadership roles, procedures, and ground rules. The Steering Committee agreed to meet bi-monthly or as needed throughout the course of the plan's development. The planning team facilitated each Steering Committee meeting, which addressed a set of objectives based on an established work plan. The Steering Committee met 12 times from December 2021 through April 2023. Meeting agendas, notes and attendance logs are provided in Appendix B. All Steering Committee meetings were open to the public and advertised as such on Cowlitz County website under the Building and Planning Department and on the Cowlitz County Flood Hazard Management Plan website.

2.3 DEFINING THE PLANNING AREA

The planning area was defined as all incorporated and unincorporated areas of Cowlitz County. Some background information that was analyzed for the plan is available only at a countywide level, without breakdowns for incorporated and unincorporated areas. This information is identified as such where it is presented in the plan. Information that is specific to either incorporated or unincorporated areas—such as flood hazard modeling results and areas addressed by proposed mitigation actions—is generally indicated as applying to one area or the other.

2.4 COORDINATION WITH OTHER AGENCIES

Opportunities for involvement in the planning process were provided as described below to neighboring communities, local and regional agencies involved in floodplain management, agencies with authority to regulate development, businesses, academia, and other private and nonprofit interests (CRS Step 3).

2.4.1 Agency Participants

The following agencies, as direct stakeholders within the planning area, were invited to participate in the plan development. Whether they participated or not, they were kept apprised of plan development milestones:

- Cowlitz County Emergency Management
- Cowlitz County Public Works:
  - Building & Safety Division
  - Stormwater Planning Division
  - Community Government Relations Group
  - Stormwater Maintenance Division
  - Disaster Services Group
  - Stormwater Engineering Division
- Washington Department of Fish and Wildlife
- Washington Department of Ecology
- Washington State Department of Transportation
- Washington State Department of Natural Resources
- Port Districts
- Municipalities
- Levee/Diking Districts
- Cowlitz County Fire Districts
- Cowlitz County Community Emergency Response Team
- Special Districts
- School Districts
- Consolidated Diking Improvement District #1

2.4.2 Agency Notifications

As adjacent local jurisdictions or state jurisdictions in addition to those participants listed above, the following agencies were also kept apprised of the Flood Plan update process via e-mailed meeting announcements, meeting agendas, and meeting minutes, and received notice of the draft plan comment period and State Environmental Policy Act (SEPA) process:

- Washington State Department of Ecology
- Washington State Department of Natural Resources
- Washington State Department of Fish and Wildlife
- Washington State Department of Archaeology and Historic Preservation
- Washington State Department of Health
- PacifiCorp
- Washington State Parks
- Cowlitz County Historic Preservation Commission
- Cowlitz County Health Officer
- Cowlitz County Environmental Health Unit
- Cowlitz County Noxious Weed Control Board
- Cowlitz-Wahkiakum Council of Governments
- City of Woodland Community Development
- City of Castle Rock Community Development
- City of Longview Community Development
- City of Kalama- City Administrator

- Washington State Department of Transportation
- Washington State Department of Commerce
- U.S. Army Corps of Engineers
- Fire District #1,2,3,5,6,7
- Clark-Cowlitz Fire Rescue
- Cowlitz 911
- Silver Lake Flood Control District, Lexington Flood Control District, Consolidated Diking Improvement District #2
- Cowlitz County Assessor
- Cowlitz County Deputy Director/ Building Official
- Cowlitz County Public Works
- Cowlitz County Parks and Recreation
- Cowlitz County Sherriff
- School Districts
- Beacon Hill Water and Sewer District
- City of Kelso Community Development
- Port of Woodland
- Port of Kalama
- Port of Longview
- Consolidated Diking Improvement District #1
- Cowlitz PUD No. 1
- Southwest Clean Air Agency
- Cowlitz Indian Tribe
- Yakama Nation
- Warm Springs Tribe
- Squaxin Indian Tribe

2.4.3 Pre-Adoption Review

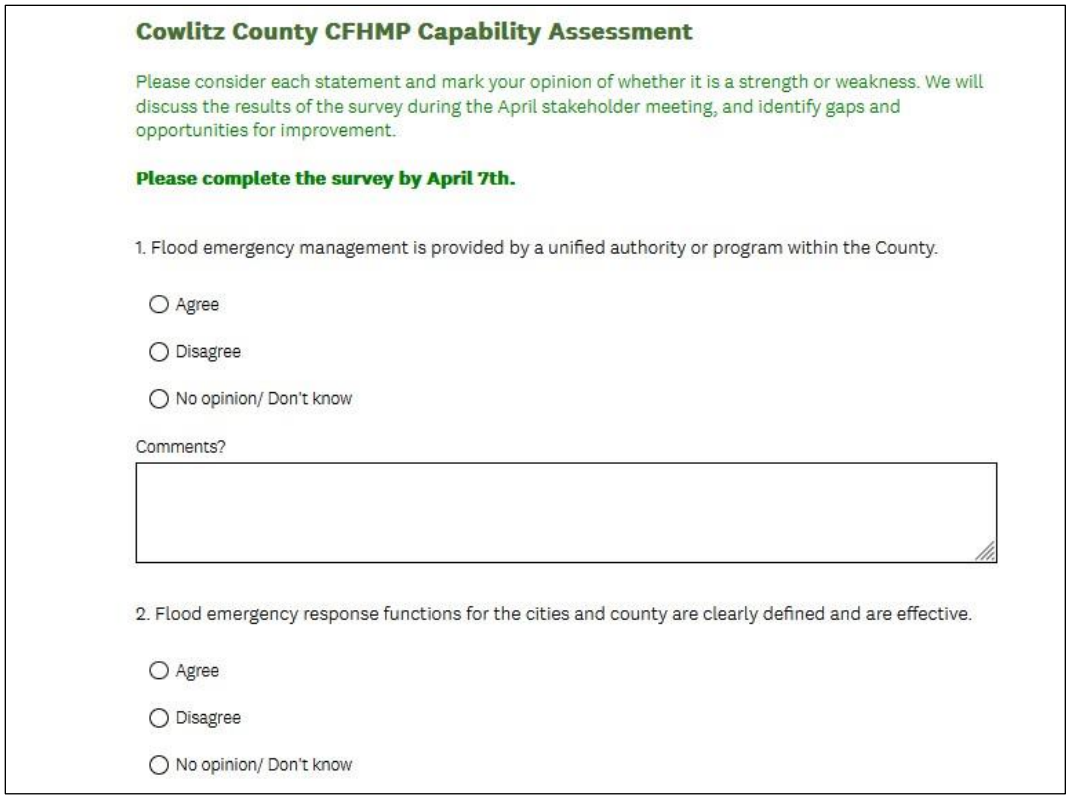
All the agencies listed above were provided an opportunity to review and comment on this plan, primarily through the Flood Plan website. All agencies were sent an e-mail message informing them that the draft plan was available for review.

2.5 REVIEW OF EXISTING PROGRAMS

The planning effort included review and incorporation as appropriate of existing plans, studies, reports and technical information. Chapter 4 of this plan provides a review of laws and ordinances in effect that can affect mitigation actions, including an assessment of all Cowlitz County regulatory, technical and financial capabilities to implement flood hazard mitigation actions. In addition, the following programs can affect flood hazard mitigation in Cowlitz County:

- Cowlitz County 2017 Comprehensive Plan
- Cowlitz County 2019 Comprehensive Emergency Management Plan
- Cowlitz County Capital Improvement Programs
- Cowlitz County Hazard Mitigation Plan

As part of this step, Steering Committee members were asked to provide feedback to the planning team on their opinion of the strengths and weaknesses of the County's current capabilities in managing floodplains. Prior to the April 12, 2023, meeting, the Steering Committee took a survey to support a capability assessment exercise during the meeting. The survey reviewed 30 core capability statements (see Figure 2-1). The results were used as a discussion starting point during the meeting. The exercise asked members to determine if each capability was a strength, weakness, opportunity, or obstacle (SWOO). Results were documented as shown in Figure 2-2. They were used to enhance the catalog of alternatives the County considered for mitigation actions in the plan (see Section 13.1). A summary of the results of this exercise can be found in Appendix B.



Cowlitz County CFHMP Capability Assessment

Please consider each statement and mark your opinion of whether it is a strength or weakness. We will discuss the results of the survey during the April stakeholder meeting, and identify gaps and opportunities for improvement.

Please complete the survey by April 7th.

1. Flood emergency management is provided by a unified authority or program within the County.

- ◯ Agree
- ◯ Disagree
- ◯ No opinion/ Don't know

Comments?

2. Flood emergency response functions for the cities and county are clearly defined and are effective.

- ◯ Agree
- ◯ Disagree
- ◯ No opinion/ Don't know

Figure 2-1. SWOO Survey

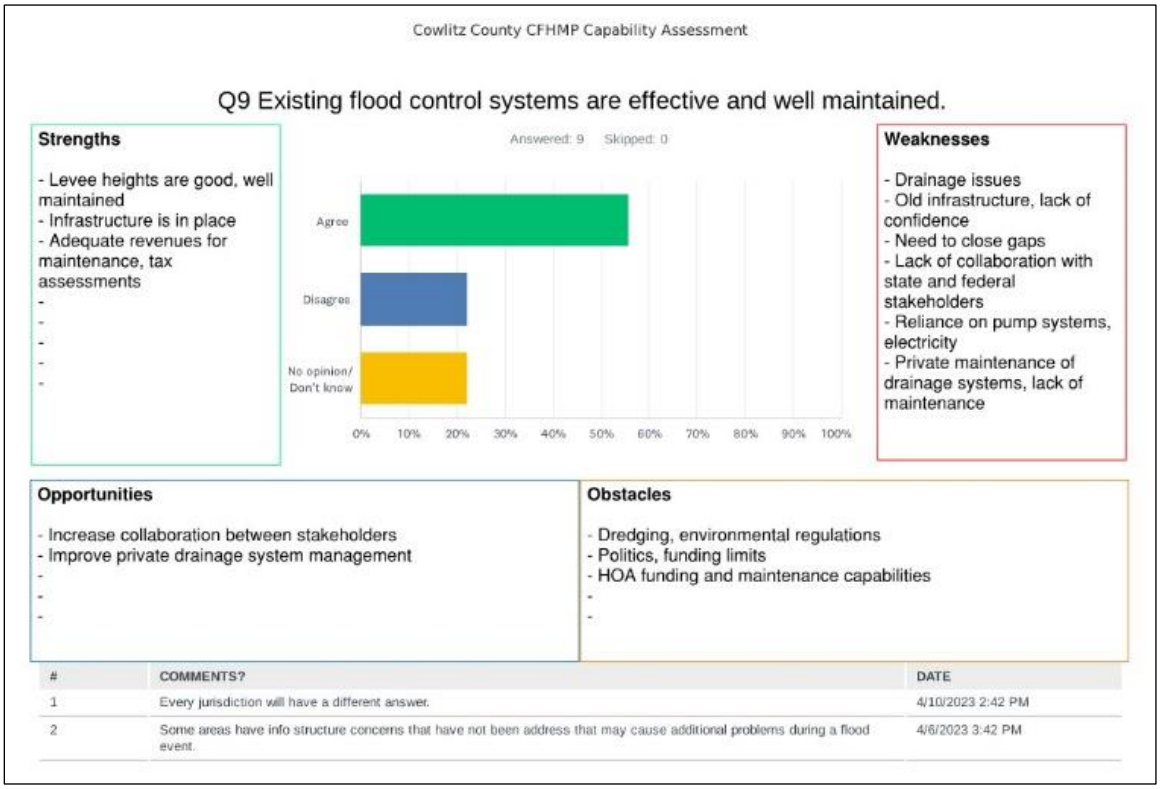


Figure 2-2. SWOO Discussion

2.6 PUBLIC INVOLVEMENT

Broad public participation in the planning process helps ensure that diverse points of view about local needs are considered and addressed. CRS credits are available for providing opportunities to comment on disaster mitigation plans during the drafting stages and prior to plan approval, as well as for optional public involvement activities (CRS Step 2).

2.6.1 Strategy

The strategy for involving the public in this plan emphasized the following elements:

- Include members of the public on the Steering Committee.
- Attempt to reach as many residents as possible using multiple media.
- Use a survey to determine public perception of flood risk and support of mitigation actions.
- Identify and involve stakeholders
- Conduct public meetings to invite the public's input.

Stakeholders and the Steering Committee

Stakeholders are the individuals, agencies and jurisdictions that have a vested interest in the recommendations of this plan. The effort to include stakeholders in this process included stakeholder participation on the Steering Committee. Stakeholders targeted for this process included:

- Community representatives
- Cowlitz County agencies responsible for activities relevant to floodplain management
- Environmental advocacy groups
- Local disaster preparedness and response entities
- Owners and operators of businesses within the floodplain

CRS Step 2 awards credit for a planning process conducted through a committee that includes members of the public and/or non-governmental stakeholders. The 36-member Steering Committee includes 18 non-governmental stakeholders (50 percent).

Flood Hazard Management Plan Website

At the beginning of the development of the current plan, a Flood Plan page was developed on Cowlitz County Building and Planning's website to keep the public informed about planning activities and to solicit input (see Figure 2-3.). The site's address (https://www.co.cowlitz.wa.us/2865/FloodPlan) was publicized in all social media releases, mailings and public meetings. The site provided the public with information on the plan development process, the Steering Committee, a project survey, and drafts of the plan. Cowlitz County Building and Planning will keep the website active after the plan's completion to keep the public informed about mitigation projects and future plan updates.

Figure 2-3. Cowlitz County Flood Plan Website

Survey

With guidance from the Steering Committee, the planning team developed a survey (see Figure 2-4.) to gauge household preparedness for the flood hazard and the level of knowledge about ways to reduce risk and loss from flooding. This survey was designed to help identify areas vulnerable to floods. The answers to its questions helped guide the Steering Committee in affirming the goals and objectives identified during the planning process and in selecting mitigation actions. Multiple methods were used to solicit survey responses:

- A web-based version of the survey was made available on the plan website.
- Attendees at public meetings were asked to complete a survey, using the web site or hard copies of the survey available at the meetings.
- A flyer was prepared advertising the survey.

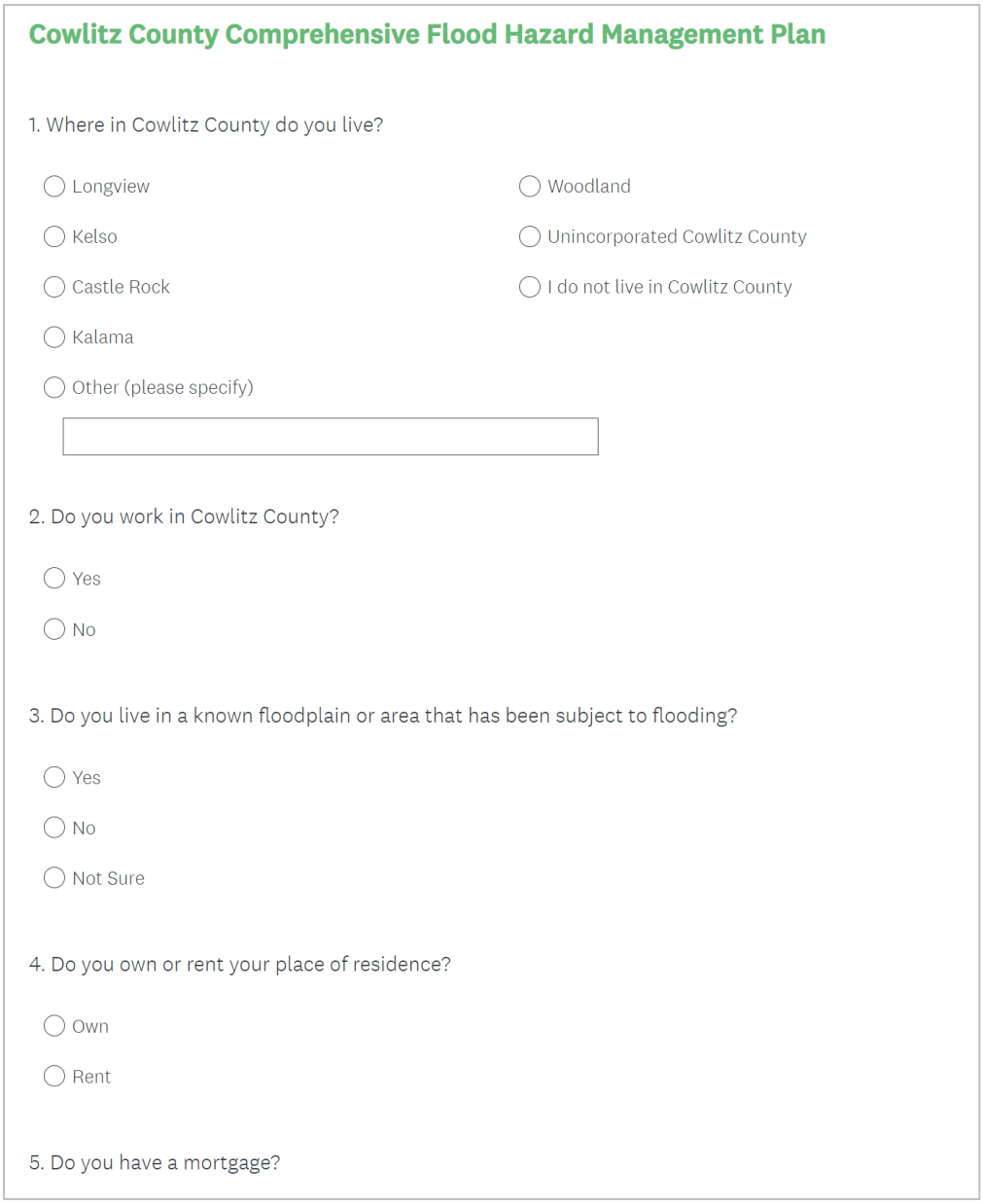
The complete survey and a summary of its findings can be found in Appendix C.

Meetings with Agencies and Tribe

The planning team met with local agencies and tribes during the planning process to discuss their specific needs and concerns (see Table 2-3). During the meetings, the planning team and local agencies and tribe discussed their specific concerns related to floodplain hazards and identified actions that were added into the action matrix.

Presentation to Community Groups

The planning team was invited to present to local groups during the planning process. The presentations included three local Rotary groups and a meeting focused on water releases from Lewis River dams owned and operated by PacifiCorp. See Table 2-4 for a list of meetings. During the community group meetings, the planning team passed out the fact sheet shown in Figure 2-5..



Cowlitz County Comprehensive Flood Hazard Management Plan

1. Where in Cowlitz County do you live?

- ◯ Longview
- ◯ Kelso
- ◯ Castle Rock
- ◯ Kalama
- ◯ Other (please specify)
- ◯ Woodland
- ◯ Unincorporated Cowlitz County
- ◯ I do not live in Cowlitz County

2. Do you work in Cowlitz County?

- ◯ Yes
- ◯ No

3. Do you live in a known floodplain or area that has been subject to flooding?

- ◯ Yes
- ◯ No
- ◯ Not Sure

4. Do you own or rent your place of residence?

- ◯ Own
- ◯ Rent

5. Do you have a mortgage?

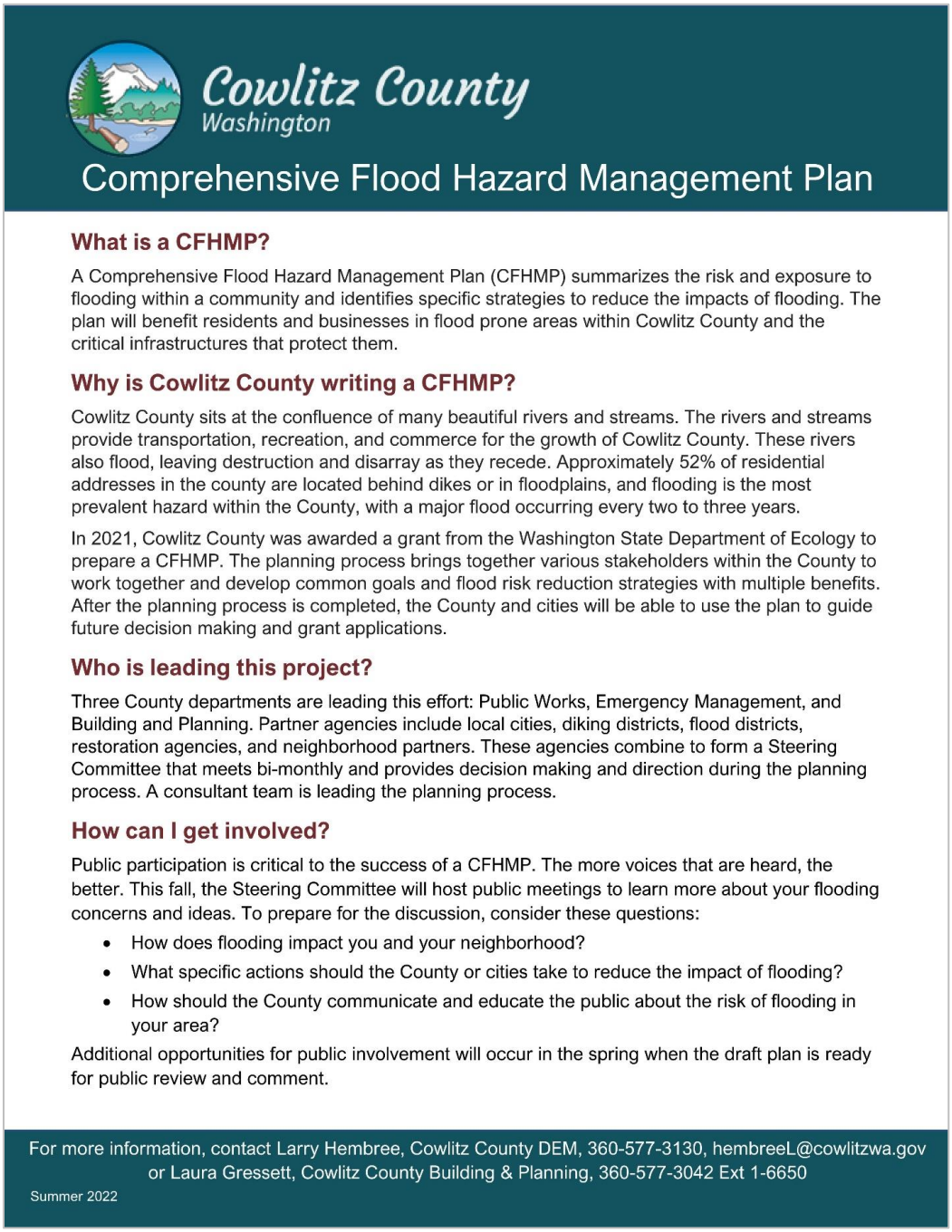
Figure 2-4. Example Survey Page

Table 2-3. Meetings with local agencies and tribe

When	Agency or Tribe
September 7, 2022	City of Longview and Consolidated Diking Improvement District #1
September 8, 2022	Cowlitz Indian Tribe
September 9, 2022	City of Woodland
September 15, 2022	City of Kelso Public Works
September 19, 2022	Cowlitz Indian Tribe
September 20, 2022	City of Kelso
September 22, 2022	City of Castle Rock Public Works

Table 2-4. Community group meetings

When	Who
August 23, 2022	Early Edition Rotary
October 6, 2022	Kelso Rotary
October 12, 2022	Lewis River/PacifiCorp
November 9, 2022	Longview Noon Rotary
June 14, 2023	Longview Noon Rotary



Cowlitz County
Washington

Comprehensive Flood Hazard Management Plan

What is a CFHMP?

A Comprehensive Flood Hazard Management Plan (CFHMP) summarizes the risk and exposure to flooding within a community and identifies specific strategies to reduce the impacts of flooding. The plan will benefit residents and businesses in flood prone areas within Cowlitz County and the critical infrastructures that protect them.

Why is Cowlitz County writing a CFHMP?

Cowlitz County sits at the confluence of many beautiful rivers and streams. The rivers and streams provide transportation, recreation, and commerce for the growth of Cowlitz County. These rivers also flood, leaving destruction and disarray as they recede. Approximately 52% of residential addresses in the county are located behind dikes or in floodplains, and flooding is the most prevalent hazard within the County, with a major flood occurring every two to three years.

In 2021, Cowlitz County was awarded a grant from the Washington State Department of Ecology to prepare a CFHMP. The planning process brings together various stakeholders within the County to work together and develop common goals and flood risk reduction strategies with multiple benefits. After the planning process is completed, the County and cities will be able to use the plan to guide future decision making and grant applications.

Who is leading this project?

Three County departments are leading this effort: Public Works, Emergency Management, and Building and Planning. Partner agencies include local cities, diking districts, flood districts, restoration agencies, and neighborhood partners. These agencies combine to form a Steering Committee that meets bi-monthly and provides decision making and direction during the planning process. A consultant team is leading the planning process.

How can I get involved?

Public participation is critical to the success of a CFHMP. The more voices that are heard, the better. This fall, the Steering Committee will host public meetings to learn more about your flooding concerns and ideas. To prepare for the discussion, consider these questions:

- How does flooding impact you and your neighborhood?
- What specific actions should the County or cities take to reduce the impact of flooding?
- How should the County communicate and educate the public about the risk of flooding in your area?

Additional opportunities for public involvement will occur in the spring when the draft plan is ready for public review and comment.

For more information, contact Larry Hembree, Cowlitz County DEM, 360-577-3130, hembreeL@cowlitzwa.gov or Laura Gressett, Cowlitz County Building & Planning, 360-577-3042 Ext 1-6650

Summer 2022

Figure 2-5. Flood Plan Factsheet

Open House Public Meetings

Meaningful public participation was essential for the planning process. The concept of mitigation was introduced to the public at public meetings. These gave the Steering Committee and planning team feedback that was used in developing components of the plan. Public meetings were scheduled as summarized in Table 2-5 to disseminate information and to solicit input from community members.

Table 2-5. Flood Hazard Management Plan Open House Public Meetings

When	Where
February 15, 2023, 4:00 PM to 7:00PM	Central (Kelso, Longview, Lexington, Rose Valley) County Administration Building 207 N. 4th Ave, Kelso, WA 98626
February 16, 2023, 10:00 AM to 12:00 PM	North (Castle Rock, Silver Lake, Toutle, Ryderwood) Department of Natural Resources 601 Bond Road, Castle Rock, WA 98611
February 16, 2023, 4:00 PM to 6:00 PM	South (Kalama, Woodland, Ariel, Cougar) Cowlitz Fire District 5, Station 2 415 Todd Road, Kalama, WA 98625

Open House Meeting Notification

Multiple means were used to provide broad public notice of the open house public meetings:

- Facebook post (Figure 2-6)
- Postcard (also shown in Figure 2-6)
- Notice of all public meetings was posted on the Flood Plan website (Figure 2-7.)
- Press release
- Flyer (Figure 2-8.)

Open House Meeting Format

The public meeting (open house) format allowed attendees to examine maps and handouts and have direct conversations with project staff. Reasons for planning and information generated for the risk assessment were shared with attendees via a PowerPoint presentation. A representative from FEMA attended all of the open houses to provide information about flood insurance. Planning team members were present to answer questions. All open house attendees were asked to complete a survey, and each was given an opportunity to provide written comments to the Steering Committee. Pictures from two of the open houses are shown in Figure 2-9. and Figure 2-10..

Figure 2-6. Facebook post

Attend an Open House on Flood Preparedness

1. Central (Kelso, Longview, Lexington, Rose Valley): Wednesday, Feb. 15, 4-7 pm County Administration Building, 207 N. 4th Ave Kelso https://goo.gl/maps/MmRn7uuh4WSz7zFt5
2. North (Castle Rock, Sliver Lake, Toutle, Ryderwood): Thursday, Feb. 16, 10 am- 12:00 pm Department of Natural Resources (DNR): Building 601 Bond Rd. Castle Rock https://goo.gl/maps/B6Yv7hGzs1PB15TX6
3. South (Kalama, Woodland, Ariel, Cougar): Thursday, February 16, 4 pm- 6 pm Cowlitz Fire District 5, Station 2 – 415 Todd Rd. Kalama https://goo.gl/maps/UgFJJvUYCcByx7tT9

During the open houses, attendees will be able to look up their property using state of the art modeling software to understand risks of flooding, review the proposed plan updates and provide feedback to the county. Experts will be available to answer questions and provide additional information about the plan update process. The Flood Hazard Management Plan is an important document that helps guide the county's efforts to reduce flood risks and protect the community. The county encourages all members of the community to attend one of the open houses and provide input on the plan updates.

For more information, please contact the Cowlitz County Building and Planning Department

Figure 2-7. County Website Announcement of Open House for the Flood Hazard Management Plan

Are You Ready for the Next Flood?

Encuentre información sobre los peligros de inundación en las reuniones públicas. El siguiente enlace proporciona la selección de idioma en la parte inferior derecha de la página. https://www.co.cowlitz.wa.us/2865/FloodPlan

Cities, agencies, districts, county officials, civic organizations, and the public from throughout Cowlitz County, have been working with consultants since mid-2022, to gather information regarding flooding concerns and potential resolutions, as part of a State of Washington Department of Ecology funded grant. The goal of this information gathering has been to develop a Comprehensive Flood Hazard Mitigation Plan for Cowlitz County.

The time has arrived in which we would like to share the current information with you for discussion. What do you like about the plan? What needs to be changed? Have we missed something critical? We would like to hear from you at one of three Open House Events taking place at the following locations and times:

Attend an Open House on Flood Preparation

1. **Central County:**
   Wednesday, February 15, from 4-6 pm
   County Administration Building, 207 N. 4th Ave. Kelso
2. **North County:**
   Thursday, February 16, 10 am – Noon
   Department of Natural Resources, 601 Bond Rd. Castle Rock
3. **South County:**
   Thursday, February 16, 4 - 6 pm
   Cowlitz Fire District #5, Station 52 – 415 Todd Rd., Kalama

During the open houses, attendees will learn how to look up their property using state of the art modeling software to understand risks of flooding, review the proposed plan updates and provide feedback to the county about flooding in their neighborhood. Experts will be available to answer questions and provide additional information about the plan update process.

For more information, please contact Adam Trimble, Senior Planner, Cowlitz County Building and Planning, at 360-577-3052 x6664 or visit the county flood plan website and please take a flood related survey at:
https://www.co.cowlitz.wa.us/2865/FloodPlan

COWLITZ COUNTY WASHINGTON

DEPARTMENT OF ECOLOGY State of Washington

Scan QR code with phone- please take our survey

Figure 2-8. Open House Flyer

Figure 2-9. North Public Meeting

Figure 2-10. Central Public Meeting

Planning Commission Meetings

The Cowlitz County Planning Commission's role in the plan update process was to provide a recommendation of adoption to the County Commissioners. The planning team kept the Planning Commissioners updated on the planning process through a series of presentations during the regularly scheduled meetings. The meetings are open to the public and the information presented also reached members of the public. Public meetings were scheduled as summarized in Table 2-6 to disseminate information and to solicit input from community members. A picture from the February Planning Commission presentation is shown in Figure 2-11..

Table 2-6. Summary of Planning Commission Meetings

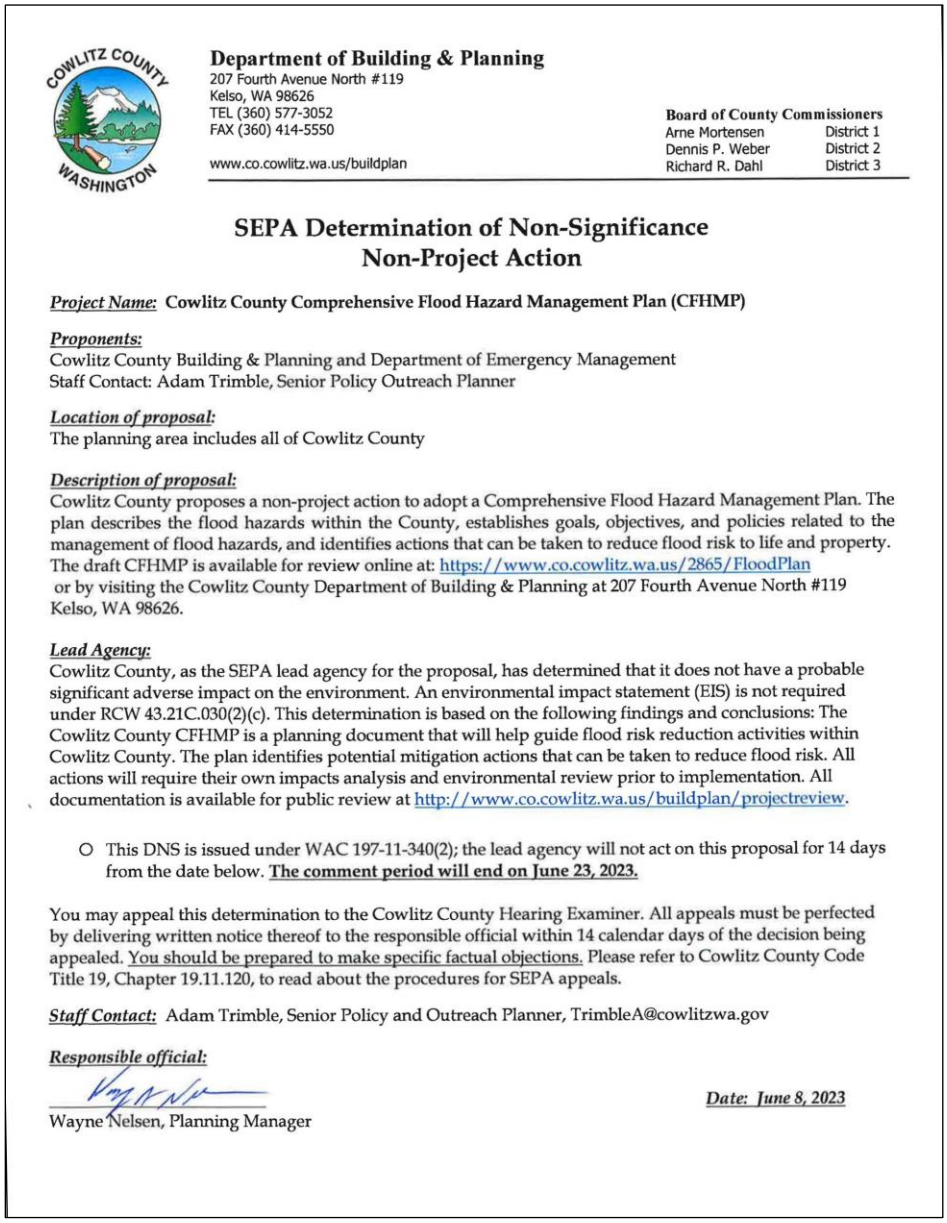
When	Topic
February 15, 2023	The consultant presented the open house presentation and discussed the planning process.
March 15, 2023	The county project manager provided an update on the planning process.
April 19, 2023	The county project manager provided an update on the planning process.
May 17, 2023	The consultant team presented the action plan to the Planning Commission.

Figure 2-11. February 15, 2023, Planning Commission Presentation

Presentation of the Draft Plan

The County held a public meeting during the Planning Commission meeting on May 17, 2023, to present the draft plan. This presentation was held in-person and included a PowerPoint presentation and opportunity for comments and questions. In addition, the presentation of the draft plan included direction to start a two-week public comment period with notification by press release, website, and social media to inform the public how to provide comment on the draft plan. During that period, a narrated PowerPoint presentation on the draft plan will be posted to the Flood Plan website.

The County advertised the draft plan was available for review and comment through a legal ad, press release, and Facebook post. The public comment period ran from June 9 – 23, 2023. The plan was evaluated through the State Environmental Policy Act process and the County issued a determination on non-significance (Figure 2-12).



COWLITZ COUNTY WASHINGTON

Department of Building & Planning
207 Fourth Avenue North #119
Kelso, WA 98626
TEL (360) 577-3052
FAX (360) 414-5550

www.co.cowlitz.wa.us/buildplan

Board of County Commissioners
Arne Mortensen District 1
Dennis P. Weber District 2
Richard R. Dahl District 3

SEPA Determination of Non-Significance
Non-Project Action

Project Name: **Cowlitz County Comprehensive Flood Hazard Management Plan (CFHMP)**

Proponents:
Cowlitz County Building & Planning and Department of Emergency Management
Staff Contact: Adam Trimble, Senior Policy Outreach Planner

Location of proposal:
The planning area includes all of Cowlitz County

Description of proposal:
Cowlitz County proposes a non-project action to adopt a Comprehensive Flood Hazard Management Plan. The plan describes the flood hazards within the County, establishes goals, objectives, and policies related to the management of flood hazards, and identifies actions that can be taken to reduce flood risk to life and property. The draft CFHMP is available for review online at: https://www.co.cowlitz.wa.us/2865/FloodPlan or by visiting the Cowlitz County Department of Building & Planning at 207 Fourth Avenue North #119 Kelso, WA 98626.

Lead Agency:
Cowlitz County, as the SEPA lead agency for the proposal, has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This determination is based on the following findings and conclusions: The Cowlitz County CFHMP is a planning document that will help guide flood risk reduction activities within Cowlitz County. The plan identifies potential mitigation actions that can be taken to reduce flood risk. All actions will require their own impacts analysis and environmental review prior to implementation. All documentation is available for public review at http://www.co.cowlitz.wa.us/buildplan/projectreview.

O This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below. **The comment period will end on June 23, 2023.**

You may appeal this determination to the Cowlitz County Hearing Examiner. All appeals must be perfected by delivering written notice thereof to the responsible official within 14 calendar days of the decision being appealed. You should be prepared to make specific factual objections. Please refer to Cowlitz County Code Title 19, Chapter 19.11.120, to read about the procedures for SEPA appeals.

Staff Contact: Adam Trimble, Senior Policy and Outreach Planner, TrimbleA@cowlitzwa.gov

Responsible official:

Wayne Nelsen, Planning Manager

Date: June 8, 2023

Figure 2-12. SEPA Notice and DNS

2.6.2 Public Involvement Results

Survey Results

The County received 23 responses to the public survey. Detailed results are provided in Appendix C. The number of respondents is considered to be insufficient for valid statistical analysis. However, the key results are as follows:

- Over half of respondents said they live in a floodplain or area subject to flooding; 32 percent said they do not; 14 percent said they are not sure.
- 73 percent of respondents said they do not have flood insurance; just over 20 percent said they do; 4 percent said they are not sure.
- The main reasons given by those without flood insurance for not having it are that they do not need it due to their property being located on high ground (39 percent) or that it is too expensive (22 percent).
- 77 percent of respondents said that the presence of a flood hazard at their current home was not disclosed to them by a real estate agent, seller, or landlord. More than half (64 percent) said such disclosure would have influenced their decision to buy or rent a home.
- The following flood hazards were identified as greatest issues of concern based on a scale of not concerned, somewhat concerned, concerned, very concerned and extremely concerned:
  - Urban flooding/drainage issues (62 percent are concerned, very concerned or extremely concerned)
  - Riverine flooding (57 percent are concerned, very concerned or extremely concerned)
  - Stream bank erosion (57 percent are concerned, very concerned or extremely concerned)
  - River/channel migration (45 percent are concerned, very concerned or extremely concerned)
  - Dam failure (41 percent are concerned, very concerned or extremely concerned)
  - Climate change (38 percent are concerned, very concerned or extremely concerned)
  - Mudflow hazards (36 percent are concerned, very concerned or extremely concerned)
- 61 percent of respondents said they are at least adequately prepared for a flood event; 9 percent indicated feeling not at all prepared.
- Respondents rated the following as the most effective means for providing general flood hazard and disaster information:
  - Social media, such as Twitter, Facebook, Instagram, etc. (83 percent)
  - Internet (48 percent)
  - TV news (43 percent)
  - Radio news (43 percent).
  - Public awareness campaign e.g., Flood Awareness Week (39 percent)
  - Fire department/ rescue (35 percent)
  - Public meetings (30 percent)
- Respondents' top preferred methods for receiving emergency notifications are as follows:
  - Text message (83 percent)
  - Cell phones (61 percent)
  - Social network, such as Twitter, Facebook, Instagram, etc. (30 percent)
- 43 percent of respondents somewhat agree or strongly agree that local, state and federal government should provide programs promoting resident action to reduce exposure to flood risks. 30 percent neither agree nor disagree.

- Respondents ranked government-sponsored flood damage reduction projects in the following order of preference:
  - Capital projects such as dams, levees, flood walls and drainage improvements
  - Retrofit infrastructure, such as improving cultures, bridges, and local drainage
  - Provide better information about flood risk to the public
  - Strengthen codes and regulations to include higher regulatory standards in flood hazard areas
  - Assist vulnerable properties owners with securing funding for mitigation
  - Acquire vulnerable properties and maintain as open space
- 76 percent of respondents support the preservation of natural land containing a flood hazard.

Agency and Tribal Meeting Attendance

Table 2-7 summarizes participation in the agency and tribal meetings that were held during the outreach effort.

Table 2-7. Agency and Tribal Meetings

Date	Location	Number of Attendees
September 7, 2022	Consolidated Diking Improvement District #1 Office	5
September 8, 2022	Cowlitz Indian Tribe	5
September 9, 2022	Woodland City Hall	6
September 15, 2022	Kelso Public Works	4
September 19, 2022	Virtual	4
September 20, 2022	Kelso City Hall	2
September 22, 2022	Castle Rock Public Works	3
October 3, 2022	Kalama City Hall	3
Total		**32**

Public Meeting Attendance

Table 2-8 summarizes participation in the public meetings that were held during the outreach effort.

Table 2-8. Summary of Public Meetings

Date	Location	Number of Attendees
August 23, 2022	Early Edition Rotary	18
October 6, 2022	Kelso Rotary	26
October 12, 2022	Woodland Police Department	6
November 9, 2022	Longview Noon Rotary	36
February 15, 2023	County Administration Building	24
February 16, 2023	Department of Natural Resources Building	8
February 16, 2023	Cowlitz Fire District 5, Station 2 - Kalama	9
Total		**118**

Public Review Comments

The County received two comments during the public comment period, from Washington Department of Fish and Wildlife and Washington Department of Ecology.

2.7 FLOOD HAZARD MANAGEMENT PLAN DEVELOPMENT CHRONOLOGY

Table 2-9 summarizes important milestones in the development of the plan.

Table 2-9. Plan Development Milestones

Date	Event	Description	Attendance
2021			
12/13	Steering Committee Meeting #1	• Project overview • Organize steering committee • Establish steering committee ground rules • Prior plan review	26
2022			
1/19	Steering Committee Meeting #2	• Discussed recent flooding event • Reviewed project purpose • Established timeline for RFQ and consultant hiring	16
3/1	Steering Committee Meeting #3	• Project Status—Flood Hazard Grant is out for RFQ • Spirit Lake Cowlitz Toutle Collaborative Overview • Discussed collaborative protentional for flooding and restoration • Infrastructure homework was reviewed	25
3/15	Request for Qualifications Advertised	• Cowlitz County advertised an RFQ for consultant support to prepare the Flood Plan.	—
4/5	Consultant Team Contracted	• Cowlitz County contracted with Tetra Tech to support the Flood Plan planning process.	—
6/1	Steering Committee Meeting #4	• Discuss consultant contract and schedule • Presentation of U.S. Army Corps of Engineers Sediment Monitoring project of Cowlitz River	18
7/19	Steering Committee Meeting #5	• Introduced consultant team • Introduced plan framework and reviewed planning process • Identified priority hazards • Discussed goal setting	17
9/26	Steering Committee Meeting #6	• Plan process update • Consistency Review • Confirmed goals • Mission/Vision Statement • Objectives exercise	21
11/29	Steering Committee Meeting #7	• Plan process update • Objectives exercise	N/A
2023			
1/24	Steering Committee Meeting #8	• Update of public outreach status • Confirmed 12 objectives • Reviewed risk assessment results • Suggestions for actions	29
2/15	Public Outreach and Field Visits	• Field visit meetings with Cities of Castle Rock, Longview, Kelso, Kalama, and Woodland and Consolidated Diking Improvement District #1 • Public Meeting in Kelso • Presentation at Planning Commission	-
2/16	Public Outreach	• Public Meeting in Castle Rock • Public Meeting in Kalama	-

Date	Event	Description	Attendance
2/28	Steering Committee Meeting #9	• Risk assessment updated (Levee-protected areas) • Reviewed Plan Maintenance Strategy • Policies	10
3/20	Steering Committee Meeting #10	• Continued policies discussion	13
4/12	Steering Committee Meeting #11	• SWOO Exercise • Introduced action plan	13
4/25	Steering Committee Meeting #12	• Action plan review • Draft plan discussion	13
5/17	Planning Commission Presentation	• Project team presented draft plan to Planning Commission and requested a recommendation to forward the plan to Department of Ecology for approval following the end of the public comment period.	—
6/9	Public Comment Period Begins and SEPA Determination of Non-Significance Issued	• Draft plan released and SEPA Determination of Non-Significance issued with two-week public comment period, from 6/9 to 6/23.	—
X/XX	Flood Plan forwarded to Ecology	• Final draft Flood Plan forwarded to Ecology for review and approval.	—
X/XX	Ecology approves plan	• Formal state approval	—
X/XX	Public Hearing and Plan Adoption	• The County Commissioners held a public hearing and adopted the Flood Plan.	XX

3. COWLITZ COUNTY PROFILE

Cowlitz County is located in southwest Washington along the lower portion of the Cowlitz River and the Columbia River (see Figure 3-1.). It is one of the original Washington counties. With an area of 1,166 square miles, it is the 28th largest of Washington's 39 counties. There are five incorporated municipalities in the county: Castle Rock, Kelso, Woodland (partially in Clark County), Kalama and Longview. Longview is the largest city in the county and Kelso serves as the county seat.

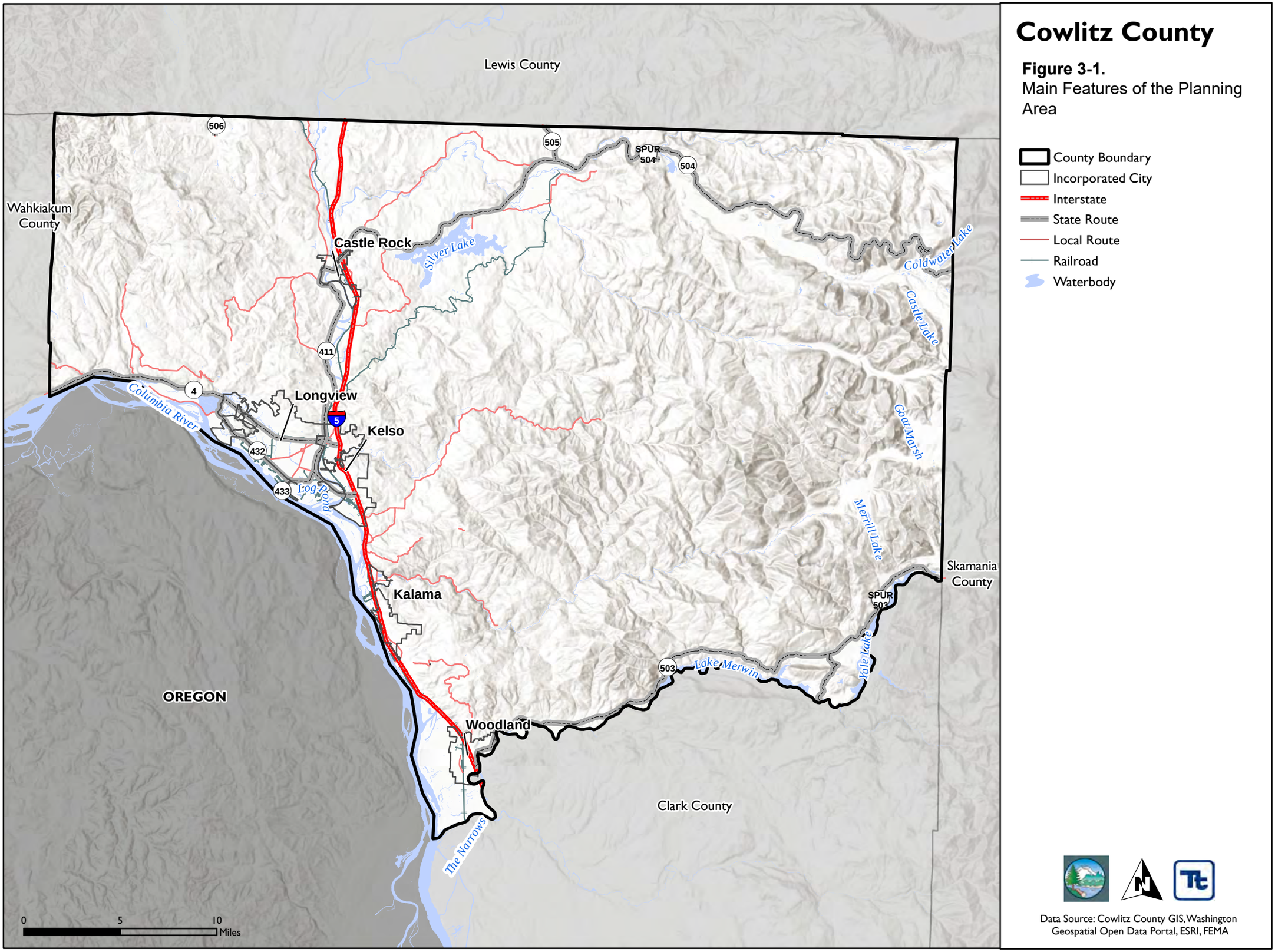
3.1 HISTORICAL OVERVIEW

Prior to European settlement of what is now Cowlitz County, the region was inhabited by several indigenous groups, the Cowlitz tribe being the largest. Attracted to the region's abundant salmon population, the Cowlitz are believed to be the first regional inhabitants to engage in trade with other tribes in Western and Eastern Washington. The Cowlitz population severely declined following the smallpox epidemic of 1829 – 1830. In 1855, the surviving Cowlitz were removed to the Yakima Indian Reservation in central Washington (State of Washington 1998).

The first American to settle in the future Cowlitz County was Peter Crawford, who took a donation claim on the left bank of the Cowlitz near the mouth of the Coweeman on December 25, 1847. In 1884, he platted a city on the site, which he named after his home in Scotland, Kelso. Other settlers took up claims across the Cowlitz and farmed the bottomland. They formed the communities of Freeport, Catlin, and Monticello (Wilma 2005).

In 1851, settlers north of the Columbia met at Cowlitz Landing and petitioned Congress to form a new territory separate from Oregon Territory. When no action was taken, delegates met again in the home of Harry Darby Huntington at Monticello in November 1852 and drafted another plea for a new territory to be called Columbia. This resulted in H.R. 348, creating Washington Territory. The Washington Territorial Legislature then formed Cowlitz County on April 21, 1854 (Wilma 2005).

River steamers serviced settlements up the Cowlitz as far as Monticello, where travelers took to canoes or a trail that followed the river. Since the Columbia was the main highway, the county became more closely tied economically with Portland and Astoria than with the rest of Washington Territory. In 1872, the Northern Pacific started building a branch of the transcontinental railroad from Kalama through Kelso north to Tacoma. Regular service began in 1874. Travelers took a ferry from Kalama to Portland until the transcontinental railroad was complete in the 1880s. Aside from agriculture, logging became the principal industry of the county, particularly after mechanization in the 1880s. Rivers provided easy movement of logs and ocean-going ships could load finished lumber at mills (Wilma 2005).



Cowlitz County

Figure 3-1.
Main Features of the Planning Area

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

In 1919, Robert Alexander Long's Long-Bell Lumber Co. purchased stands of timber in Cowlitz County from Weyerhaeuser and he made plans for a large mill to process logs for the domestic and foreign markets. The mouth of the Cowlitz River offered both rail connections and deep water for ships. Long spent $2.6 million in 1922 to buy up 14,000 acres consisting of 245 separate pieces of property for the mill and for a community where the 4,000 workers and their families—an estimated population of 12,000 to 15,000—could live. Long then embarked on the planned community of Longview (Wilma 2005).

In 1936, county voters approved the formation of a public utilities district. The PUD purchased the assets of the Washington Gas and Electric Company in 1940 just as cheap hydroelectric power began to flow from Columbia River dams. The Cowlitz PUD cut electric rates twice in the first year of operation. World War II meant a return to prosperity and the construction of an aluminum plant in Longview by Reynolds Metals Co. The aluminum was used for airplanes for the war and the plant employed 500 workers. The mills produced badly needed wood and paper products and Weyerhaeuser's fully bleached sulfite pulp helped produce smokeless gunpowder. The end of the war saw returning veterans. In 1956, Long-Bell Co. merged with International Paper. In 1960, the Long-Bell plant, once largest in the world, closed and was demolished (Wilma 2005).

Cowlitz County has been subject to many natural disasters, primarily flooding. The eruption of Mount St. Helens (in neighboring Skamania County) on May 18, 1980, sent a 200-foot-thick lahar (flow of melted ice and snow, mud, and debris) flow down the Toutle River Valley into the Cowlitz River. Roads and bridges disappeared along with any structures and vehicles in the way. The flows were so dramatic that the bottom of the Cowlitz silted up, raising the river 12 feet. Sediment also filled the Columbia, preventing ships from reaching or leaving Portland for more than a week. The landslide preceding the eruption buried Spirit Lake and the blast killed vegetation as far away as 23 miles. A total of 57 people died. The event had the unexpected consequence of producing a tourist attraction that brought business to the county (Wilma 2005).

Today, Cowlitz County's Board of County Commissioners is responsible for overall administration of Cowlitz County's government. The Board consists of three officials elected from designated commissioner districts. Its duties include adopting and enacting ordinances and resolutions, levying taxes, establishing County policies, and conducting general County administration. The Board is responsible for adoption of the annual budget, provision and maintenance of public facilities, construction and maintenance of County roads, development and implementation of planning and zoning policies, and appointments to advisory committees and boards.

3.2 PHYSICAL SETTING

3.2.1 Geology and Soils

The county can be divided into four geological areas—the Cascade Range foothills, Lower Cowlitz Basin, Lower Columbia Basin, and Coast Range foothills. The Cascade Range foothills are steep-sided ridges that generally run west-northwest from the west slopes of Mount St. Helens, the summit of which is in Skamania County. Elevation of these foothills ranges from about 1,200 feet above sea level near Toutle to about 4,600 feet on the ridgetops. The major streams that drain this area include the North Fork and South Fork of the Toutle River and the Green, Coweeman, Kalama, and Lewis Rivers.

The Lower Cowlitz Basin consists of alluvial valley bottoms, and it serves as the floodplain for many of the drainageways in the foothills of the Cascade and Coast Ranges. Elevation of the Lower Cowlitz Basin ranges from about 20 feet above sea level on the floodplain at the mouth of the Cowlitz River, near Kelso, to about 30 feet above sea level 22 miles upstream, near Olequa Crossing. From the confluence of the Toutle River

downstream to its juncture with the Columbia River, spoil from the eruption of Mount St. Helens in 1980 has been dredged from the Cowlitz River and deposited along its banks. The spoil acts as a dike that tends to keep the river from flowing onto the floodplain during periods of high flow. Flooding would still be a common occurrence, however, except for the three large artificial reservoirs on the upper part of the Cowlitz River. The rivers affected by the mudflow and other debris from Mount St. Helens continue to incise and transport large quantities of bedload. This bedload periodically is dredged to keep the Columbia River shipping channels open downstream and is deposited along the Cowlitz River.

3.2.2 Climate

The climate in Cowlitz County is typical of West Coast marine areas, with mild, wet winters and warm, dry summers. Annual precipitation varies from 45 inches near Kelso to over 150 inches on Mount St. Helens. Precipitation is concentrated in the period between October and March. Snow and freezing temperatures are common at higher elevations. Rain-on-snow events in intermediate elevations can result in significant flooding. Table 3-1 summarizes annual temperature and precipitation data for three weather stations around Cowlitz County.

Table 3-1. Annual Average Cowlitz County Climate Data

	Longview	Kelso	Castle Rock
Annual Average Daily High Temperature (ºF)	63.3	73	72
Annual Average Daily Low Temperature (ºF)	43.0	52	51
Annual Average Total Precipitation (inches)	48.12	57.9	57.1
Annual Average Total Snowfall (inches)	4.9	4.2	4.1

Source: NOAA, 2022; Western Regional Climate Center, 2022

3.3 NATURAL RESOURCES

Many species of mammals, birds, reptiles, amphibians and fish live in Cowlitz County in ecosystems that are dependent upon streams, wetlands and floodplains. Changes in hydrologic conditions can result in a change in the biodiversity of the ecosystem. Wildlife and fish are impacted when plant communities are eliminated or fundamentally altered to reduce suitable habitat. Wildlife populations are limited by shelter, space, food and water. Since water supply is a major limiting factor for many animals, riparian communities are of special importance. Riparian areas are the zones along the edge of a river or stream that are influenced by or are an influence upon the water body. Human disturbance to riparian areas can limit wildlife's access to water, remove breeding or nesting sites, and eliminate suitable areas for rearing young. Wildlife rely on riparian areas and are associated with the flood hazard in the following ways:

- Mammals depend upon a supply of water for their existence. Riparian communities have a greater diversity and structure of vegetation than other upland areas. Beavers and muskrats are now recolonizing streams, wetlands and fallow farm fields, which are converted wetlands. As human residences are built in rural areas, there is an increasing concern of beaver dams causing flooding of low-lying areas and abandoned farm ditches being filled, leading to localized flooding.
- A great number of birds are associated with riparian areas. They swim, dive, feed along the shoreline, or snatch food from above. Cowlitz County rivers, lakes and wetlands are important feeding and resting areas for migratory and resident waterfowl. Other threatened or endangered species (such as the bald eagle or the peregrine falcon) eat prey from these riparian areas.

- Fish habitat throughout the county varies widely based on natural conditions and human influence. Many ditches were dug throughout the county to make low, wet ground better for farming. As the water drained away and the wetlands were converted to farm fields, natural stream conditions were altered throughout the county. Agriculture along many rivers extends to the water's edge and smaller side channels have been tiled to drain better. Within developing areas, small streams were placed in pipes and wetland filled in to support urban development.

Protection of these biological resources within the floodplains of the planning area is very important to Cowlitz County. Equipped with planning tools such as Water Resource Inventory Area (WRIA) planning, comprehensive planning, critical areas ordinances, and open space planning, Cowlitz County has been able to establish a diverse inventory of preserve areas that maintain the natural and beneficial functions of the floodplain. This has resulted in flood hazard areas that are developed. Habitat complexity project areas that promote the natural and beneficial functions of floodplains include the following:

- ***Cowlitz County Critical Areas Ordinance***—The Growth Management Act requires Cowlitz County to designate critical areas and adopt development regulations to assure the protection of such areas in accordance with the best available science. In compliance with this mandate, the county finds that critical areas characterize certain portions of the county. These critical areas include wetlands, aquifer recharge areas, geologically hazardous areas, fish and wildlife habitat conservation areas, and frequently flooded areas. These areas contain valuable natural resources, provide natural scenic qualities important to the character of the community, perform important ecological functions and values, or present a hazard to life and property. Identification, management and protection of these lands and areas is, therefore, necessary to protect the public health, safety and general welfare of Cowlitz County's citizens.
- ***Merrill Lake Conservation Area***—This 114-acre site consists of a forest cover of mixed conifers and hardwoods along a lake at the 1,550-foot elevation. Merrill Lake is prime habitat for birds of prey, including osprey and bald eagles, and is also home to waterfowl such as bufflehead, common goldeneye, and hooded merganser. A regionally popular catch-and-release fly fishing spot, Merrill Lake has a boat launch for small craft (non-gasoline powered) and a nine-site campground. Spring through fall camping—on a first-come first-served basis—is mostly walk-in from the main parking area, with a few sites accessible by vehicle.
- ***Cowlitz Indian Tribe Natural Resources Department—***The Natural Resources Department is working to ensure that the plants, animals, and landscapes central to Cowlitz Culture persist and thrive for future generations. This involves restoring ecosystem health and function through direct action. The Department conserves and maintains lands for cultural and natural resource purposes, while providing fish and forest resources for every tribal member. It also advises tribal leadership on natural resource issues that impact plants, animals, and landscapes that are critical to Cowlitz culture.

3.4 DEVELOPMENT FEATURES

3.4.1 Land Use

The Land Use Element of the Cowlitz County Comprehensive Plan provides a policy framework for the future use of land throughout the unincorporated areas of the County. The patterns of development in Cowlitz County are extremely diverse. There are large uninhabited forest and open space areas. There are also extensive areas with scattered rural homes, marked with occasional small farms and rural community centers. The rural landscape is in sharp contrast to the intense urban activity of the County's cities. Each area's character is defined by how the land is used. Planning for the future of the County's land resources requires a system of classification to preserve and further this character. Most of the County's land base is under private ownership.

3.4.2 Critical Facilities and Infrastructure

Critical facilities and infrastructure are those that are essential to the health and welfare of the population. These become especially important after a hazard event. Critical facilities typically include police and fire stations, schools and emergency operations centers. Critical infrastructure can include the roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need, and the utilities that provide water, electricity and communication services to the community. Also included are facilities that hold or carry significant amounts of hazardous materials with a potential to impact public health and welfare in a hazard event. For this planning effort, critical facilities and infrastructure have been defined as follows:

> *A critical facility is one that is deemed vital to the Cowlitz County planning area's ability to provide essential services while protecting life and property. A critical facility may be a system or an asset, either physical or virtual, the loss of which would have a profound impact on the security, economy, public health or safety, environment, or any combination of thereof, across the planning area.*

For some hazards, potential damage to critical facilities was estimated using FEMA's Hazus computer model. For this reason, the list of critical facilities was categorized using categories that are defined in the Hazus model:

- **Safety and Security**—Law enforcement/security, search and rescue, fire services, government service, responder safety, and imminent hazard mitigation
- **Food, Water and Sheltering**—Evacuations, schools, food/potable water, shelter, durable goods, water infrastructure, and agriculture
- **Health and Medical**—Medical care/hospitals, patient movement, public health, fatality management, health care, and supply chain
- **Energy**—Power (grid), temporary power, and fuel
- **Communications**—Infrastructure, alerts, warnings, messages, 911 and dispatch, responder communications, and financial services
- **Transportation**—Highway/roadway, mass transit, railway, aviation, maritime and pipeline
- **Hazardous Materials**—Facilities, hazardous debris, pollutants, and contaminants

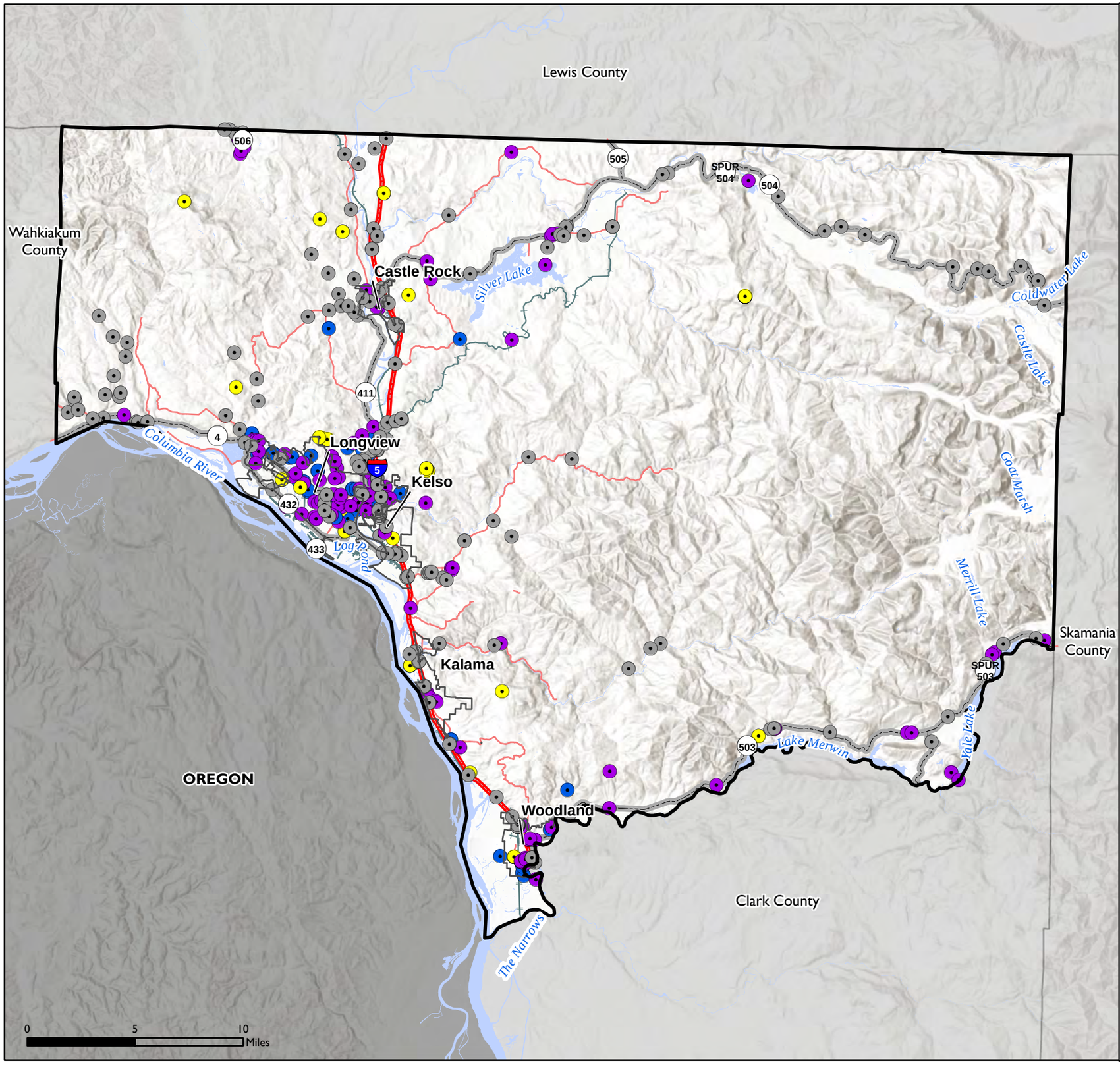
Using this definition, an inventory of critical facilities was created for the entire planning area. This inventory is summarized in Table 3-2 and shown in Figure 3-2..

Table 3-2. Total Critical Facilities Within the Cowlitz County Planning Area

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	1	0	2	8	5	**16**
Kalama	0	0	0	0	0	6	5	**11**
Kelso	1	0	2	0	4	17	25	**49**
Longview	4	0	2	0	30	37	9	**82**
Woodland (Cowlitz Co.)	4	0	0	0	4	12	9	**29**
Unincorporated	33	5	5	0	13	43	135	**234**
Total	**42**	**5**	**10**	**0**	**53**	**123**	**188**	**421**

Cowlitz County

Figure 3-2.
Identified Critical Facilities Within the Planning Area



- Communications
- Health and Medical
- Safety and Security
- Transportation
- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

3.5 DEMOGRAPHICS

Some populations are at greater risk from hazard events such as floods because of decreased resources or physical abilities. Elderly people, for example, may be more likely to require additional assistance. Research has shown that people living near or below the poverty line, the elderly (especially older single men), the disabled, women, children, ethnic minorities and renters all experience, to some degree, more severe effects from disasters than the general population. These vulnerable populations may vary from the general population in risk perception, living conditions, access to information before, during and after a hazard event, capabilities during an event, and access to resources for post-disaster recovery. Indicators of vulnerability—such as disability, age, poverty, and minority race and ethnicity—often overlap spatially and often in the geographically most vulnerable locations. Detailed spatial analysis to locate areas where there are higher concentrations of vulnerable community members would help to extend focused public outreach and education to these most vulnerable citizens.

3.5.1 Population Characteristics

Knowledge of the composition of the population and how it has changed in the past and how it may change in the future is needed for making informed decisions about the future. Information about population is a critical part of planning because it directly relates to land needs such as housing, industry, stores, public facilities and services, and transportation. The Washington State Office of Financial Management estimated Cowlitz County's population at 112,350 as of 2022, making it the 12th largest county by population in the state.

Population changes are useful socio-economic indicators. A growing population generally indicates a growing economy, while a decreasing population signifies economic decline. Figure 3-3. shows the Cowlitz County population change from 1996 to 2019 compared to that of the State of Washington. Over that period, the County has had a growth rate somewhat below that of the state. Table 3-3 shows the county population from 2007 to 2022. The Washington Office of Financial Management has developed forecasts of future population as shown in Table 3-4. The projections estimate a population of 130,933 in Cowlitz County by 2050, a 15.5 percent decrease from 2020.

Source: Washington ESD, 2021

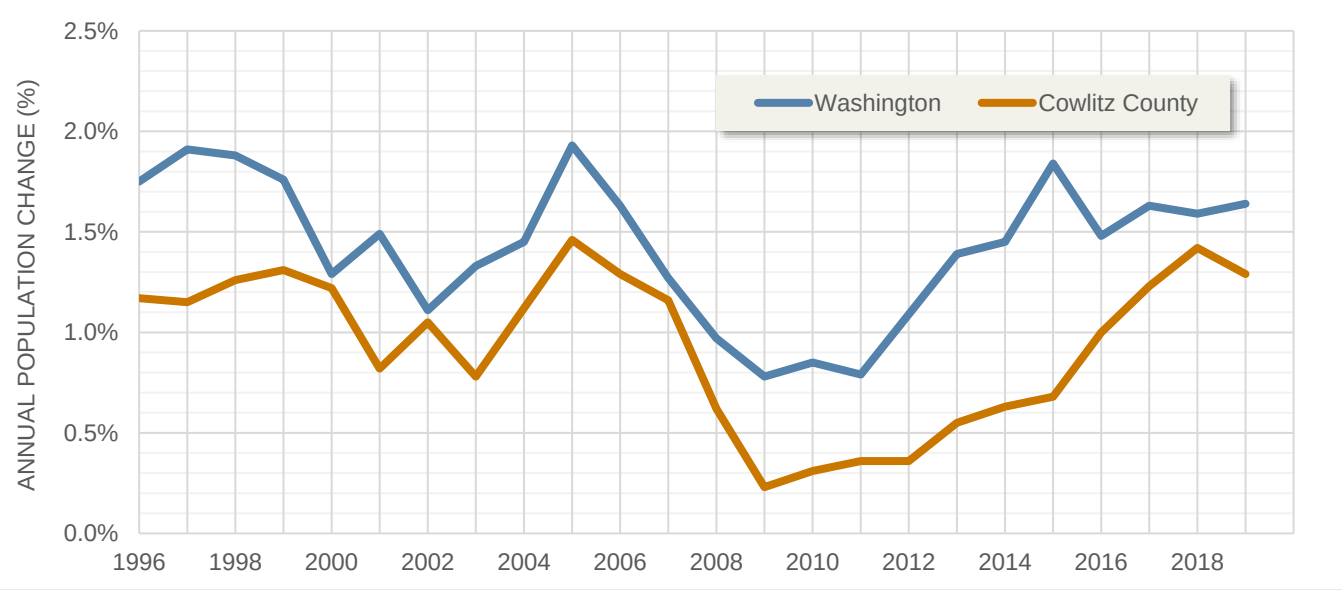


Figure 3-3. Washington and Cowlitz County Population Growth

Table 3-3. Recent County Population Growth

Year	Cowlitz County Population	Year	Cowlitz County Population	Year	Cowlitz County Population
2007	100,587	2012	101,669	2017	106,800
2008	101,555	2013	101,497	2018	108,673
2009	102,013	2014	101,811	2019	110,389
2010	102,358	2015	103,031	2020	110,924
2011	102,313	2016	104,760	2021	111,524

Source: U.S. Census Bureau, 2022

Table 3-4. Projected Future County Population

Year	Cowlitz County Population
2025	114,123
2030	118,309
2035	122,021
2040	125,320
2045	128,282
2050	130,993

Source: Washington OFM, 2023

3.5.2 Age Distribution

As a group, the elderly are more apt to lack the physical and economic resources necessary for response to hazard events and are more likely to suffer health-related consequences making recovery slower. They are more likely to be vision, hearing, and/or mobility impaired, and more likely to experience mental impairment or dementia. Additionally, the elderly are more likely to live in assisted-living facilities where emergency preparedness occurs at the discretion of facility operators. These facilities are typically identified as critical facilities by emergency managers because they require extra notice to implement evacuation. Elderly residents living in their own homes may have more difficulty evacuating their homes and could be stranded in dangerous situations. This population group is more likely to need special medical attention, which may not be readily available during natural disasters due to isolation caused by the event. Specific planning attention for the elderly is an important consideration given the current aging of the American population.

Children under 14 are particularly vulnerable to disaster events because of their young age and dependence on others for basic necessities. Very young children may additionally be vulnerable to injury or sickness; this vulnerability can be worsened during a natural disaster because they may not understand the measures that need to be taken to protect themselves from the flood hazard.

The overall age distribution for the planning area is illustrated in Figure 3-4.. Based on the most recent 5-year estimates (2020 – 2024) from the U.S. Census Bureau's American Community Survey, 19.0 percent of the planning area's population is 65 or older, compared to the state average of 15.4 percent. According to U.S. Census data, 39.8 percent of the over-65 population has disabilities of some kind and 7.7 percent have incomes below the poverty line. The Census estimates that 16.5 percent of children under 18 live below the poverty line. The county's population includes 18.8 percent who are 14 or younger, compared to the state percentage of 18.4 percent (U.S. Census Bureau 2023).

Source: (U.S. Census Bureau 2023)

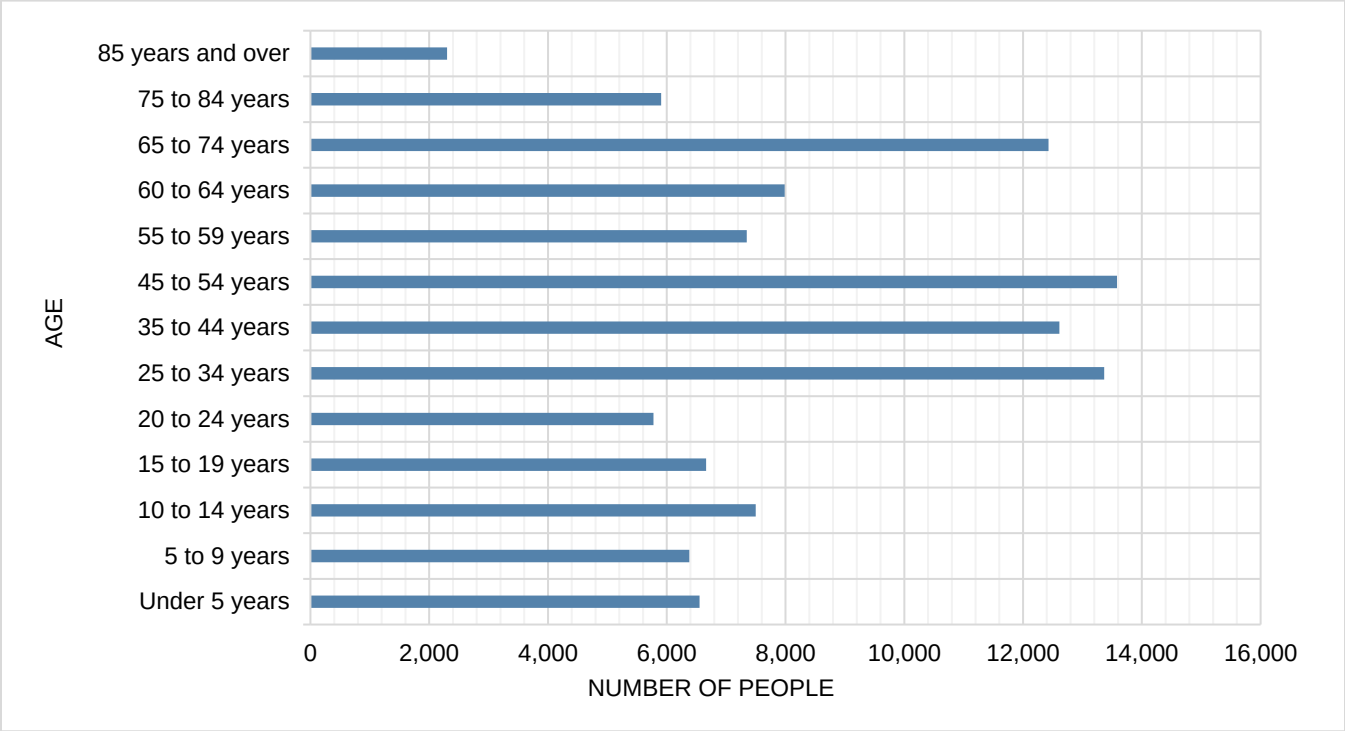


Figure 3-4. Planning Area Age Distribution

3.5.3 Race, Ethnicity and Language

Research shows that minorities are less likely to be involved in pre-disaster planning and experience higher mortality rates during a disaster event (Gibbs and Montagnino 2006). Post-disaster recovery can be ineffective and is often characterized by cultural insensitivity. Since higher proportions of ethnic minorities live below the poverty line than the majority white population, poverty can compound vulnerability.

According to the most recent 5-year estimates (2020 – 2024) from the U.S. Census Bureau's American Community Survey, the racial composition of the planning area is predominantly white, at 87.5 percent. The largest non-white populations are those identifying as two or more races at 6.7 percent and those identifying as "some other race" at 1.8 percent. Figure 3-5. shows the racial distribution in the planning area (U.S. Census Bureau 2023). Those identifying as Hispanic or Latino, of any race, make up 9.3 percent of the population.

The planning area has a 3.9 percent foreign-born population. Other than English, the most commonly spoken language in the planning area is Spanish, with 4.2 percent of the population speaking Spanish at home. The census estimates that 2.4 percent of the residents speak English "less than very well." (U.S. Census Bureau 2023).

3.5.4 Disabled Populations

The Census estimates that 54 million non-institutionalized Americans with disabilities live in the U.S.—about one-in-five persons. People with disabilities are more likely to have difficulty responding to a hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts.

Source: U.S. Census, 2020

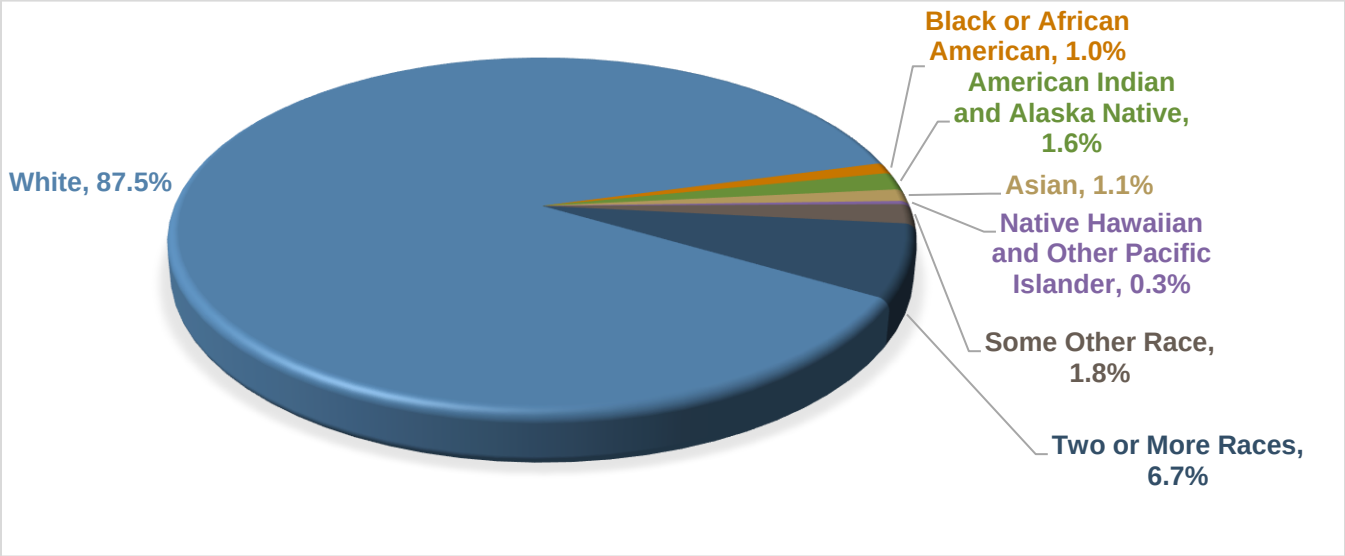


Figure 3-5. Planning Area Race Distribution

3.6 ECONOMY

3.6.1 Income

In the United States, individual households are expected to use private resources to prepare for, respond to and recover from disasters to some extent. This means that households living in poverty are disadvantaged when confronting hazards such as flooding. Additionally, the poor typically occupy more poorly built and inadequately maintained housing. Mobile or modular homes, for example, are more susceptible to damage in floods than other types of housing. Furthermore, residents below the poverty level are less likely to have insurance to compensate for losses incurred from natural disasters. This means that residents below the poverty level have a great deal to lose during an event and are the least prepared to deal with potential losses. The events following Hurricane Katrina in 2005 illustrated that personal household economics significantly impact people's decisions on evacuation. Individuals who cannot afford gas for their cars will likely decide not to evacuate.

In the most recent 5-year estimates (2020 – 2024) from the U.S. Census Bureau's American Community Survey, the median household income was $58,791. It is estimated that 45.8 percent of households receive an income between $50,000 and $149,999 per year and 10.7 percent of household incomes are above $150,000 annually. The Census Bureau estimates that 13.3 percent of the population in the County lives below the poverty level (U.S. Census Bureau 2023).

3.6.2 Industry, Businesses and Institutions

Cowlitz County's economy is strongly based in the education/health care/social assistance industry (22 percent of employment), followed by manufacturing (16 percent) and retail trade (12.6 percent). Wholesale trade (2.5 percent), and information (1.0 percent) are the industries making up the smallest sources of the local economy. Figure 3-6. shows the breakdown of employment by industry type in the county (U.S. Census Bureau 2023).

Source: (U.S. Census Bureau 2023)

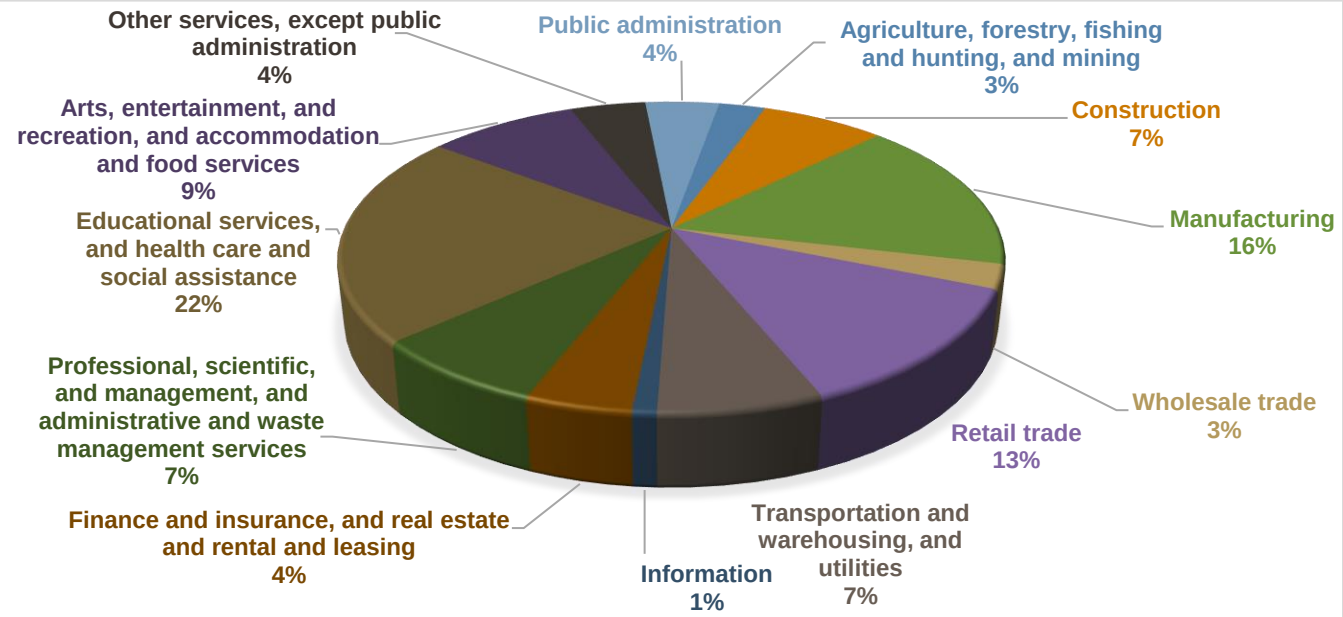


Figure 3-6. Employment by Industry Type in Cowlitz County

3.6.3 Employment Trends and Occupations

According to the 2020 – 2024 American Community Survey, 55.8 percent of the Cowlitz County population 16 years old or older is in the labor force, including 67.7 percent of women in that age range and 74.9 percent of men (U.S. Census Bureau 2023).

Figure 3-7. compares Washington's and Cowlitz County's unemployment trends from 1995 through 2021, based on data from the Washington State Employment Security Department (Washington Employment Security Department 2022). From a high of 13.5 percent in 2009, Cowlitz County's unemployment rate fell to a low of 5.9 percent in 2018, and has increased since then, reaching a new high of 9.3 percent in 2020.

Figure 3-8. shows Census Bureau estimates of employment distribution by occupation category (U.S. Census Bureau 2023). Management, business, science, and arts occupations make up 29.5 percent of the jobs in the County. Sales and office occupations make up 21.4 percent of the local working population. The U.S. Census estimates that 82.7 percent of workers in the County commute alone (by car, truck, or van) to work, and mean travel time to work is 25.7 minutes (U.S. Census Bureau 2023).

Sources: ESD, 2022

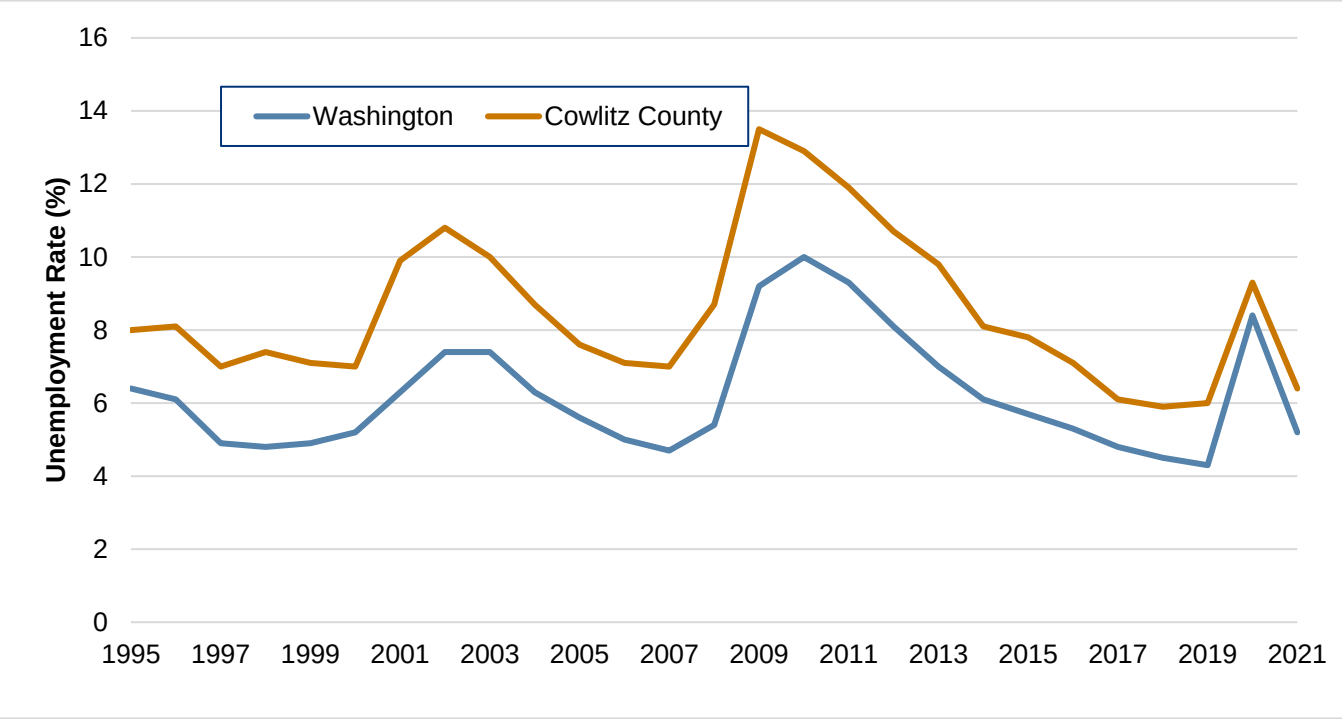


Figure 3-7. Washington and Cowlitz County Unemployment Rate

Source: U.S. Census, 2020

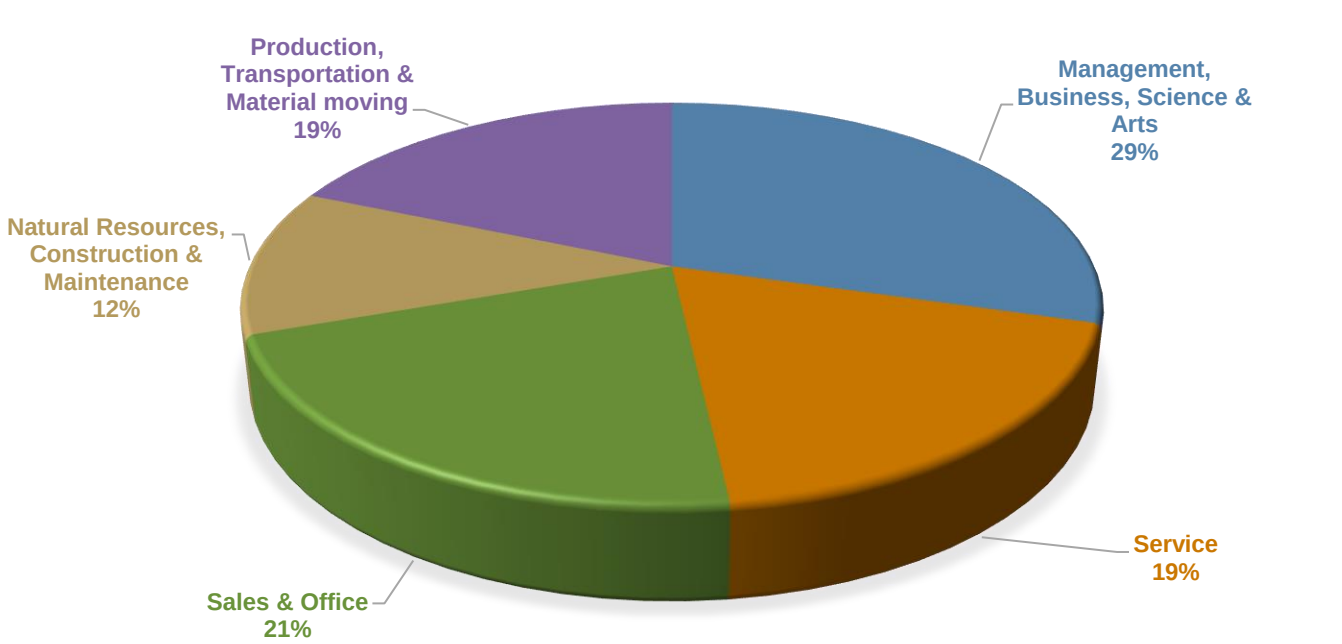


Figure 3-8. Occupations in Cowlitz County

4. RELEVANT PROGRAMS AND REGULATIONS

Flood hazard mitigation planning typically includes review and incorporation as appropriate of existing plans, studies, and technical information. This chapter provides a review of laws and ordinances that can affect flood hazard mitigation in the planning area. Some laws and programs have emergency protocols that go into effect during emergency situations to waive or expedite requirements or procedures. These modifications are limited in scope and duration, and all mitigation and recovery projects should be planned for and implemented in ways that meet all federal, state and local laws. All of the following federal, state and local programs have been identified as being related to the goals and objectives to this plan.

4.1 FEDERAL AND STATE

Federal and state regulations and programs that need to be considered in floodplain management are constantly evolving. For this plan, a review was performed to determine which regulations and programs are currently most relevant to local comprehensive floodplain management. The findings are summarized in Table 4-1 and Table 4-2. Short descriptions of each program are provided in Appendix D.

Table 4-1. Summary of Relevant Federal Agencies, Programs and Regulations

Agency, Program or Regulation	Local Relevance and Response
Americans with Disabilities Act	The ADA intersects with disaster preparedness programs regarding transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of residents. Local governments may implement a special-needs registry to identify the home addresses, contact information, and needs of residents who require more assistance for emergency management purposes.
Civil Rights Act of 1964	The Civil Rights Act of 1964 prohibits discrimination based on race, color, religion, sex or national origin and requires equal access to public places and employment. The Act prohibits local governments from favoring the needs of one population group over another. Local government and emergency response must ensure the continued safety and well-being of all residents equally, to the extent possible.
Clean Water Act	The Clean Water Act provides regulatory and nonregulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff to support propagation of wildlife and recreation in and on the water.

Agency, Program or Regulation	Local Relevance and Response
Community Development Block Grant Disaster Resilience Program	In response to disasters, Congress may appropriate additional funding for the U.S. Department of Housing and Urban Development Community Development Block Grant programs to be distributed as Disaster Recovery grants (CDBG-DR). These grants can be used to rebuild affected areas and provide seed money to start the recovery process. CDBG-DR assistance may fund a broad range of recovery activities, helping communities and neighborhoods that otherwise might not recover due to limited resources. CDBG-DR grants often supplement disaster programs of FEMA, the Small Business Administration, and the U.S. Army Corps of Engineers. Housing and Urban Development generally awards noncompetitive, nonrecurring CDBG-DR grants by a formula that considers disaster recovery needs unmet by other federal disaster assistance programs. To be eligible for CDBG-DR funds, projects must meet the following criteria: • Address a disaster-related impact (direct or indirect) in a federally declared county • Be a CDBG-eligible activity (according to regulations and waivers) • Meet a national objective. Incorporating preparedness and mitigation into these actions is encouraged, as the goal is to rebuild in ways that are safer and stronger.
Community Rating System	The CRS is a voluntary program within the NFIP that encourages flood hazard management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted in participating communities to reflect the reduced flood risk resulting from community actions to meet the CRS goals of reducing and avoiding flood damage to insurable property, strengthening and supporting the insurance aspects of the NFIP, and fostering comprehensive floodplain management. Currently, there are no eligible communities participating in this program within Cowlitz County.
Disaster Mitigation Act of 2000	The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for state, local and Indian tribal governments as a condition of mitigation grant assistance. The DMA amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by replacing previous mitigation planning provisions with new requirements that emphasize the need for planning entities to coordinate mitigation planning and implementation efforts. The law added incentives for increased coordination and integration of mitigation activities at the state level by establishing two levels of state plans. The DMA also established a new requirement for local mitigation plans and authorized up to 7 percent of Hazard Mitigation Grant Program funds to be available for development of state, local, and Indian tribal mitigation plans. Cowlitz County partnered with 22 local government planning partners to develop a multi-jurisdictional hazard mitigation plan in 2022.
Emergency Relief for Federally Owned Roads Program	The U.S. Forest Service's Emergency Relief for Federally Owned Roads Program was established to assist federal agencies with repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel and have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure. The program funds both emergency and permanent repairs.
Emergency Watershed Program	The USDA Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) Program, which responds to emergencies created by natural disasters. Eligibility for assistance is not dependent on a national emergency declaration. The program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, wind-storms, and other natural occurrences. EWP is an emergency recovery program. Financial and technical assistance are available for the following activities: • Remove debris from stream channels, road culverts, and bridges • Reshape and protect eroded banks • Correct damaged drainage facilities • Establish cover on critically eroding lands • Repair levees and structures • Repair conservation practices.

Agency, Program or Regulation	Local Relevance and Response
Endangered Species Act	The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. Criminal and civil penalties are provided for violations of the ESA and the Convention.
National Flood Insurance Program	The NFIP provides flood insurance against potential losses from flooding for participating property owners. Cowlitz County participates in the NFIP and has adopted regulations that meet the NFIP requirements. The County entered the NFIP in 1980, and the first Cowlitz County FIRM was issued December 2, 1980. The index date for the current FIRM is December 21, 2018. Cowlitz County is currently in good standing with the provisions of the NFIP as monitored by FEMA Region 10 and the Washington Department of Ecology. Table 4-6 (at the end of this chapter) summarizes the NFIP capability of Cowlitz County.
National Incident Management System	The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving floods and other hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In some cases, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency-responder disciplines. These cases necessitate coordination across this spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, terrorist activities, and other human-caused disasters) regardless of size or complexity. Cowlitz County has developed and adopted a Comprehensive Emergency Management Plan (CEMP) in response to this federal mandate that was approved by Washington State on April 3, 2019.
Presidential Executive Order 11990	Executive Order 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The requirements apply to the following activities: • Acquiring, managing, and disposing of federal lands and facilities • Providing federally undertaken, financed, or assisted construction and improvements • Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing.
Presidential Executive Orders 11988 and 13690	Executive Order 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. It requires federal agencies to provide leadership and take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values of floodplains. The requirements apply to the following activities: • Acquiring, managing, and disposing of federal lands and facilities • Providing federally undertaken, financed, or assisted construction and improvements • Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing. Executive Order 13690 expands Executive Order 11988 and acknowledges that the impacts of flooding are anticipated to increase over time due to the effects of climate change and other threats. It mandates a federal flood risk management standard to increase resilience against flooding and help preserve the natural values of floodplains. This standard expands management of flood issues from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain when federal dollars are involved in a project. The goal is to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended.

Agency, Program or Regulation	Local Relevance and Response
Public Law 8499, Flood Control and Coastal Emergencies (33 U.S.C. 701n) (69 Stat. 186)	This law gives the U.S. Army Corps of Engineers the legal authority to conduct emergency preparation, response, and recovery activities and to supplement local efforts in the repair of flood damage reduction projects that are damaged by floods. It authorizes the Chief of Engineers to undertake activities including disaster preparedness, advance measures, emergency operations (flood response and post-flood response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair of federally authorized shore protective works threatened or damaged by coastal storm, and provisions of emergency water in the event of drought or contaminated source.
Rural Development Program	The mission of the U.S. Department of Agriculture (USDA) Rural Development Program is to help improve the economy and quality of life in rural America. The program provides project financing and technical assistance to help rural communities provide the infrastructure needed by rural businesses, community facilities, and households. The program addresses rural America's need for basic services, such as clean running water, sewage and waste disposal, electricity, and modern telecommunications and broadband. Loans and competitive grants are offered for various community and economic development projects and programs, such as the development of essential community facilities including fire stations.

U.S. Army Corps of Engineers Programs	The U.S. Army Corps of Engineers has several civil works authorities and programs related to flood risk and flood hazard management:
	• Floodplain Management Services are 100-percent federally funded technical services such as development and interpretation of site-specific data related to the extent, duration and frequency of flooding. Special studies may be conducted to help a community understand and respond to flood risk. These may include flood hazard evaluation, flood warning and preparedness, or flood modeling.
	• For more extensive studies, the Corps of Engineers offers a cost-shared program called Planning Assistance to States and Tribes. Studies under this program generally range from $25,000 to $100,000 with the local jurisdiction providing 50 percent of the cost.
	• The Corps of Engineers has several cost-shared programs (typically 65 percent federal and 35 percent non-federal) aimed at developing, evaluating and implementing structural and non-structural capital projects to address flood risks at specific locations or within a specific watershed:
	  ○ The Continuing Authorities Program for smaller-scale projects.
	  ○ Larger scale studies for ecosystem restoration or to address other water resource issues.
	  ○ Watershed Management planning studies.
	• The Corps of Engineers provides emergency response assistance during and following natural disasters:
	  ○ Preparedness—Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.
	  ○ Response Activities—The Corps of Engineers can supplement State and local entities in flood fighting urban and other non-agricultural areas under certain conditions (Engineering Regulation 500-1-1 provides specific details).
	  ○ Rehabilitation—An eligible flood protection system can be rehabilitated if damaged by a flood event.

Table 4-2. Summary of Relevant State Agencies, Programs and Regulations

Agency, Program or Regulation	Local Relevance and Response
Comprehensive Emergency Management Planning	Washington's Comprehensive Emergency Management Planning law (RCW 38.52) establishes parameters to ensure that preparations of the state will be adequate to deal with disasters, to ensure the administration of state and federal programs providing disaster relief to individuals, to ensure adequate support for search and rescue operations, to protect the public peace, health and safety, and to preserve the lives and property of the people of the state. It achieves the following: • Provides for emergency management by the state and authorizes the creation of local organizations for emergency management in political subdivisions of the state. • Confers emergency powers upon the governor and upon the executive heads of political subdivisions of the state. • Provides for the rendering of emergency management mutual aid among political subdivisions of the state and with other states and for cooperation with the federal government. • Provides a means of compensating emergency management workers who suffer injury, death, or economic harm as a result of participation in emergency management activities. • Provides programs, to educate and train the public to be prepared for emergencies. Emergency management functions of the state and its political subdivisions are to be coordinated to the maximum extent with comparable functions of the federal government and agencies of other states and localities, and of private agencies of every type. WAC 118-30-060(1) requires each political subdivision to base its comprehensive emergency management plan on a hazard analysis, and makes the following definitions related to hazards.
Department of Ecology Grants	In 1984, the state Legislature established the Flood Control Assistance Account Program (FCAAP) to assist local jurisdictions in comprehensive planning and flood control maintenance (RCW 86.26; WAC 173-145). Projects include comprehensive flood hazard management planning, maintenance projects, feasibility studies, purchase of flood-prone properties, matches for federal projects, and emergency projects. FCAAP grants for non-emergency projects may not exceed $500,000 per county. The Department of Ecology's Floods and Floodplain Management Division administers the Floodplains by Design grant program, granting awards on a competitive basis to eligible entities for collaborative and innovative projects that support the integration of flood hazard reduction with ecological preservation and restoration.
Growth Management Act	The 1990 Washington State Growth Management Act (RCW Chapter 36.70A) mandates that local jurisdictions adopt land use ordinances to protect the following critical areas: • Wetlands • Critical aquifer recharge areas • Fish and wildlife habitat conservation areas • Frequently flooded areas • Geologically hazardous areas. The Growth Management Act regulates development in these areas, and therefore has the potential to affect hazard vulnerability and exposure at the local level.
Land and Water Conservation Fund	Congress established the Land and Water Conservation Fund in 1965 and authorized the Secretary of the Interior to provide financial assistance to the states for the acquisition and development of public outdoor recreation areas. The Washington State Recreation and Conservation Office administers the program in Washington. Eligible projects include land acquisition and development or renovation projects, such as natural areas and open space.
Salmon Recovery Fund	In 1999, the Washington State Legislature created the Salmon Recovery Funding Board. The board provides grants to protect or restore salmon habitat. Funded projects may include activities that protect existing, high-quality habitat for salmon or that restore degraded habitat to increase overall habitat health and biological productivity. Projects may include the actual habitat used by salmon and the land and water that support ecosystem functions and processes important to salmon.
Shoreline Management Act	The 1971 Shoreline Management Act (RCW 90.58) was enacted to manage and protect the shorelines of the state by regulating development in the shoreline area. A major goal of the act is to prevent the "inherent harm in an uncoordinated and piecemeal development of the state's shorelines."

Agency, Program or Regulation	Local Relevance and Response
State Environmental Policy Act	The State Environmental Policy Act (SEPA) provides a way to identify possible environmental impacts of governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies, or plans. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a proposal will affect the environment. This information can be used to change a proposal to reduce likely impacts, or to condition or deny a proposal when adverse environmental impacts are identified. Non-project actions are governmental actions involving decisions on policies, plans, or programs that contain standards controlling use or modification of the environment, or that will govern a series of connected actions. This includes, but is not limited to, the adoption or amendment of comprehensive plans (WAC 197-11-704(2)(b)). Adoption of the Comprehensive Flood Hazard Management Plan will have no probable significant adverse impact on the environment; therefore, an environmental impact statement will not be required under RCW 43.21C.030(2)(c).
State Hydraulic Code	Washington's Hydraulic Code states that any person or government agency intending to undertake a hydraulic project shall secure a Hydraulic Project Approval from the Washington Department of Fish and Wildlife verifying the adequacy of the proposed means for protecting fish (RCW 77.55.021 (1)).
Washington Silver Jackets	The Washington Silver Jackets team is a mix of federal and state agencies that work together to address flood risk priorities. The team's projects are intended to address state needs and improve flood risk management throughout the full flood life cycle (Silver Jackets 2016).
Washington State Building Code	The Washington State Building Code Council has authority to adopt amendments to codes for statewide application. Local amendments include: • Building Code • Residential Code • Fire Code • Mechanical Code • Energy Code • Wildland-Urban-Interface Code The State Building Code (SBC) is the minimum construction requirement for the state of Washington.
Washington State Enhanced Mitigation Plan	The 2018-2023 Washington State Enhanced Hazard Mitigation Plan provides guidance for hazard mitigation throughout Washington. The plan identifies hazard mitigation goals, objectives and actions for state government to reduce injury and damage from natural hazards. By meeting federal requirements for an enhanced state plan (44 CFR Parts 201.4 and 201.5), the plan allows the state to seek significantly higher funding from the Hazard Mitigation Grant Program following presidential declared disasters.
Washington State Floodplain Management Law	Washington's floodplain management law (Revised Code of Washington (RCW) 86.16, implemented through Washington Administrative Code (WAC) 173-158) states that prevention of flood damage is a matter of statewide public concern and places regulatory control with the Department of Ecology. RCW Chapter 86.12 (Flood Control by Counties) authorizes county governments to levy taxes, condemn properties and undertake flood control activities directed toward a public purpose.
Watershed Management Act	Washington's Watershed Management Act of 1998 encourages local communities to develop plans for protecting local water resources and habitat. Lawmakers wanted local governments and citizens to develop plans since they know their own regions best. WRIA is an acronym for "Water Resource Inventory Area." WRIAs are watershed planning areas established by the Department of Ecology. Washington State is divided into 62 WRIAs, each loosely drawn around a natural watershed or group of watersheds. A watershed is an area of land that drains into a common river, lake or the ocean.

4.2 LOCAL

4.2.1 Comprehensive Plan

Cowlitz County is required by RCW 36.70.320 to utilize a comprehensive plan to guide the orderly physical development of the County. Required elements of the comprehensive plan include a land use element and

circulation element. These may be augmented by other elements such as natural resources and community facilities. The Cowlitz County Comprehensive Plan was adopted by the Board of County Commissioners on July 19, 2017, updating the previous November 1, 1976, version. The plan is a product of a citizen-planning process including a citizens' task force and the Cowlitz County Planning Commission.

A comprehensive plan is an official document that is adopted by the Board of County Commissioners to guide policy decisions related to the physical, social, and economic growth of the County. The plan serve as a guide for growth and development over the next 20 years in Cowlitz County. It is designed to incorporate annual amendments that will keep it valid and progressive.

The plan provides direction through a framework of goals and policies that the County intends to use to improve citizens' quality of life, leverage the community's assets, and promote Cowlitz County as a safe, attractive, and prosperous place to live, work, and play now and into the coming decades. The comprehensive plan is not a regulatory document but is intended to provide guidance that informs development regulations and future planning efforts.

4.2.2 Comprehensive Emergency Management Plan

Last updated in April of 2019, the purpose of the County's Comprehensive Emergency Management Plan (CEMP) is to provide effective guidance to mitigate, prepare for, respond to and recover from natural, human-caused or technological emergencies or disasters in Cowlitz County. A major goal of the plan is to facilitate restoration of basic government operations following disasters as defined in the Cowlitz County Hazard Identification and Vulnerability Assessment.

The Comprehensive Emergency Management Plan details the authorities, functions, and responsibilities of local, state, and federal agencies in the event of emergency. It describes the processes of crisis and consequence management and how the integrated actions of local, state, and federal agencies establish a mutually cooperative environment for preparedness, prevention, response, and recovery activities.

4.2.3 Rural Economic Development Program

Cowlitz County is the recipient of certain sales and use taxes, commonly known as rural county public facility funds. These funds may be used only for the purposes authorized by RCW 82.14.370: namely, to finance public facilities serving economic development purposes in rural counties. The public facility must be listed as an item in the County's capital facilities plan or the capital facilities plan of a city or town located in Cowlitz County.

The statute defines public facilities as bridges, roads, domestic and industrial water facilities, sanitary sewer facilities, earth stabilization, storm sewer facilities, railroad, electricity, natural gas, buildings, structures, telecommunications infrastructure, transportation infrastructure, commercial infrastructure, and port facilities. Economic development is defined as purposes that facilitate the creation or retention of businesses and jobs in Cowlitz County.

Cowlitz County began identifying projects that meet the criteria of state law and the program intent of the Board of Commissioners in 1998. The Board of Commissioners has awarded over $18 million in Rural Public Facility funding to further economic development in Cowlitz County.

4.2.4 Critical Areas Ordinance

Cowlitz County is mandated by the Washington State Growth Management Act to designate critical areas and adopt development regulations to ensure their conservation. Designated critical areas of Cowlitz County are wetlands, fish and wildlife habitat, frequently flooded areas, geologically hazardous areas and critical aquifer recharge areas. Development activity within critical areas or their buffers is required to comply with the Cowlitz County Critical Areas Ordinance.

4.2.5 Cowlitz County Stormwater Program

On February 16, 2007, Cowlitz County was issued a National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Stormwater Permit. This permit requires the County to develop and implement a stormwater program. This permit was reissued on August 1, 2013. Cowlitz County Department of Public Works has posted its draft 2023 Stormwater Management Plan for public comment prior to submission to the Washington Department of Ecology. This plan describes permit requirements, activities completed in 2022, and planned activities for 2023.

4.2.6 Cowlitz Clean Waters Program

Cowlitz Clean Waters is a collaborative initiative of the City of Kelso, City of Longview, Cowlitz County, Consolidated Diking Improvement District #1 (CDID #1), Kelso School District, Longview School District, Washington State University (WSU) Cowlitz County Extension, and the Lower Columbia College. This partnership is committed to supporting a multifaceted public information and education campaign to help inform the Lower Columbia region about the impacts of stormwater runoff on local waterways and to affect behavior changes and water quality improvements.

4.2.7 Shoreline Master Program

In compliance with state requirements, Cowlitz County adopted a Shoreline Management Master Program in 1977. The current Shoreline Master Program was adopted on April 11, 2022. The goals, objectives and policies of the program apply only to development of shoreline areas as defined in the Shoreline Management Act. When considering development along, or any use of, shorelines of statewide significance, special attention is given to ensure that the state and regional interests are reflected, as well as local needs and desires.

4.2.8 Voluntary Stewardship Program

The Voluntary Stewardship Program is an optional, incentive-based approach to protecting critical areas while promoting agriculture. The program is allowed under the Growth Management Act as an alternative to traditional approaches to critical areas protection, such as “no touch” buffers. On January 17, 2012, the Board of County Commissioners elected to participate in the Voluntary Stewardship Program established by the Washington State Legislature. This program creates an alternative to protecting critical areas in areas used for agricultural activities through development regulations adopted under RCW 36.70A.070. The established goals for this program include the following:

- Promote plans to protect and enhance critical areas where agricultural activities are conducted, while maintaining and improving long-term viability of agriculture in Washington and reducing the conversion of farmland to other uses.

- Focus and maximize voluntary incentive programs to encourage good riparian and ecosystem stewardship as an alternative to historical approaches used to protect critical areas.
- Leverage existing resources by relying upon existing work and plans in counties and local watersheds, as well as existing state and federal programs to the maximum extent practicable to achieve program goals.
- Encourage and foster a spirit of cooperation and partnership among county, tribal, environmental, and agricultural interests to better assure program success.
- Improve compliance with other laws designed to protect water quality and fish habitat.
- Rely on voluntary stewardship practices as the primary method of protecting critical areas and do not require the cessation of agricultural activities.

4.3 CAPABILITY ASSESSMENT

The planning team performed an inventory and analysis of existing authorities and capabilities called a "capability assessment." A capability assessment creates an inventory of an agency's mission, programs and policies, and evaluates its capacity to carry them out.

Table 4-3 summarizes the legal and regulatory capability of Cowlitz County. This table describes the legal authorities available to the county and/or enabling legislation at the state level affecting planning and land management tools that can support floodplain management action items. Each of these capabilities represents an ongoing program that supports Cowlitz County's commitment to floodplain resilience. Any gap in capability identified in this table should be considered as an action by the County in the action plan component of this plan. The table identifies the following information for each program:

- **Local Authority**: Does the County have the authority to implement the identified capability through policy or formal adoption?
- **State of Federal Prohibitions**: Are there are any regulations that may impact the implementation of an identified capability that are enforced or administered by another agency (e.g., a state agency or special purpose district)?
- **Other Regulatory Authority**: Are there are any regulations that may impact the implementation of a capability that are enforced or administered by another agency (e.g., a state agency or special purpose district)? This can also be referred to as delegated authority.
- **State Mandated**—Do state laws or other requirements enable or require the listed item to be implemented at the local level?

Table 4-4 summarizes the administrative and technical capability of Cowlitz County. This table inventories the staff resources available to Cowlitz County to help with flood hazard mitigation planning and the implementation of specific mitigation actions.

Table 4-5 summarizes fiscal capabilities of Cowlitz County. It identifies what financial resources (other than grants) are available to the County to support the implementation of floodplain management actions.

Table 4-6 summarizes the County's participation status under the National Flood Insurance Program.

Table 4-3. Cowlitz County Legal and Regulatory Capability

	Local Authority	State or Federal Prohibitions	Other Jurisdictional Authority	State Mandated	Comments
Codes, Ordinances & Requirements					
Building Code	Y	N	N	Y	Title 16, section 16.05.050, adopts by reference the 2015 International Building Code as now or hereafter amended by the Washington State Building Code Council
Zoning Code	Y	N	N	Y	Title 18, Land Use and Development, Current as of 10/25/2022
Subdivisions	Y	N	N	N	Title 18, sections 18.30, 18.32, 18.34, 18.38 and 18.50, last verified through Ordnance 22-101, 10/25/2022
Post-Disaster Recovery	N	N	N	N	N/A
Real Estate Disclosure	Y	N	Y	Y	Revised Code of Washington 42.56 Public Records Act. Updated 2012.
Growth Management	Y	N	N	Y	Cowlitz County Comprehensive Plan, July 2017
Site Plan Review	Y	N	N	N	
Flood Damage Prevention Ordinance	Y	N	N	Y	Title 16, section 16.25, adopted 04/07/09
Critical Areas Ordinance	Y	N	N	Y	Title 19, Section 19.15, adopted 12/20/2016
Stormwater Management	Y	N	N	Y	Title 16, Section 16.22 regulates stormwater in the unincorporated, urbanized areas, adopted 07/18/2017 Title 16, section 16.20 regulates stormwater in the rural areas of the County, adopted 01/08/2013
Planning Documents					
Comprehensive Plan	Y	N	N	Y	Cowlitz County Comprehensive Plan, July 2017
Capital Improvement Plan	Y	N	N	N	Infrastructure and Physical Plant and Facilities Program. Updated every 2 years.
Economic Development Plan	Y	N	N	N	Rural Economic Development Program. https://www.co.cowlitz.wa.us/423/Rural-County-Public-Facility-Funds
Floodplain or Basin Plan	Y	N	N	N	Cowlitz County Comprehensive Flood Hazard Management Plan, 2008. This plan will be replaced by the 2023 Cowlitz County Comprehensive Flood Hazard Management Plan
Stormwater Management Plan	Y	N	N	Y	Cowlitz County Stormwater Management Program Plan, 03/2022
Habitat Conservation Plan	N	N	N	N	N/A
Shoreline Management Plan	Y	N	N	Y	Cowlitz County Shorelines Master Program, 04/11/2022. https://www.co.cowlitz.wa.us/1307/Shoreline-Master-Program
Emergency Response Plan	Y	N	N	N	Cowlitz County CEMP, April 2019
Continuity of Operations Plan	N	N	N	N	N/A
Post Disaster Recovery Plan	N	N	N	N	N/A
Other Relevant Plans	Y	N	N	N	

Table 4-4. Administrative and Technical Capability

Staff/Personnel Resources	Available?	Department/Agency/Position
Planners or engineers with knowledge of land development and land management practices	Yes	Cowlitz County Department of Public Works Cowlitz County Building and Planning
Engineers or professionals trained in building or infrastructure construction practices	Yes	Cowlitz County Department of Public Works
Planners or engineers with an understanding of flooding hazards	Yes	Cowlitz County Building and Planning
Staff with training in benefit/cost analysis	No	Not on staff, but can contract for support services
Floodplain manager	Yes	Director of Building and Planning or their designee
Surveyors	No	Not on staff, but can contract for support services
Personnel skilled or trained in GIS applications	Yes	The Information Technology Department provides computer-related technology support and services to the departments and offices of the county.
Planners familiar with flooding hazards in local area	Yes	Cowlitz County Building and Planning
Emergency manager	Yes	Cowlitz County Emergency Management
Grant writers	Yes	Cowlitz County Emergency Management

Table 4-5. Fiscal Capability

Financial Resources	Accessible or Eligible to Use?
Community Development Block Grants	Yes
Capital Improvements Project Funding (Flood Control District)	Yes
Authority to Levy Taxes for Specific Purposes	Yes
Incur Debt through General Obligation Bonds	Yes
Incur Debt through Special Tax Bonds	Yes
State Sponsored Grant Programs	Yes
Development Impact Fees for Homebuyers or Developers	Yes

Table 4-6. National Flood Insurance Program Compliance

What department is responsible for floodplain management in your community?	Building and Planning
Who is your community's floodplain administrator?	Director of the Department of Building and Planning
Do you have any certified floodplain managers on staff in your community?	No
What is the date of adoption of your flood damage prevention ordinance?	Cowlitz County Code: • Title 16, Chapter 16.25, last adopted on 04/07/09 • Critical Areas- Title 19, Chapter 19.15, last adopted 12/20/2016 • Shorelines-Title 19, Chapter 19.20, last adopted 04/08/2003
Current Standing	Good, no sanctions
When was the most recent Community Assistance Visit or Community Assistance Contact?	12/05/2022, performed by WA Department of Ecology
To the best of your knowledge, does your community have any outstanding NFIP	County has 17 properties identified as non-compliant due to minus insurance rating in FEMA's national violation tracker.

compliance violations that need to be addressed? If so, please state what they are.	The CAV identified issues with the County Flood Damage prevention ordinance and the County's procedures for development.
Do your flood hazard maps adequately address the flood risk within your community?	Flood hazard mapping has been identified as an issue that needs to be addressed by this planning process.
Does your floodplain management staff need any assistance or training to support its floodplain management program? If so, what type of assistance/training is needed?	Enhanced understanding of flood risk and training on ways to manage risk is always welcome by Cowlitz County floodplain management staff. This plan is the 1st step to enhancing the understanding of flood risk and its capabilities and capacities to manage that risk.
Does your community participate in the CRS? If so, is your community seeking to improve its CRS Classification? If not, is your community interested in joining the CRS program?	Neither Cowlitz County nor any of its cities currently participate in the CRS program. This planning effort has generated some interest from the County for participating in the CRS program sometime in the future.

5. REGIONAL CONSISTENCY

5.1 LOCAL APPLICABILITY OF COUNTY FLOOD PLANS

A provision of Washington state law regarding flood control by counties authorizes county governments to levy taxes, condemn properties and undertake flood control activities for public purposes. It also addresses the development of comprehensive flood control management plans and notes that such plans, when adopted, "shall be binding on each jurisdiction and special district that is located within an area included in the plan" (RCW Chapter 86.12.210). Cities in the planning area of a county flood plan have 120 days to formally adopt the Flood Plan after the county's adoption date. The statute includes provisions for arbitration of disputes between a city and county over disagreement on scope and applicability of policies in a flood hazard management plan.

This provision of state law seeks to establish regional consistency in flood hazard management. It recognizes the shortcomings of flood hazard management policy recommendations if they are not applied uniformly within a planning area. Flood risk cuts across municipal boundaries, and the actions of one jurisdiction can impact the flood risk of jurisdictions downstream. Flood hazard planning efforts must define what constitutes consistency in the implementation of flood hazard management actions or policies.

5.2 CONSISTENCY REVIEW

The Cowlitz County Flood Plan Steering Committee opted to perform a review of all municipalities within the planning area to assess the degree of consistency in their flood hazard management administration practices. The review assessed the floodplain administration capabilities of the County as well as the cities. The results were used in developing a definition of regional consistency for the Cowlitz County Flood Plan.

5.2.1 Methodology

The CRS provides a quantifiable rating system to create an incentive for more effective flood hazard management. The Baseline Assessment Tool (BATool™) is a proprietary tool developed by Tetra Tech, Inc. that helps communities gauge their ability to participate in the CRS. It provides feedback on the community's ability to succeed under the CRS program and whether a community's flood hazard management program is ready for a community assistance visit by CRS personnel. The BATool™ assesses 57 floodplain management programmatic applications in the following categories:

- Flood Risk (looking at the degree of flood risk exposure versus all assets within the Community)
- Programmatic—Regulations (looks at regulatory capability)
- Programmatic—Planning (Looks at planning capability)
- Programmatic—Administration. (Programmatic administration and enforcement)

Evaluation parameters are weighted based on the importance of the component to overall, programmatic flood hazard management. These weights were calibrated by looking at a sample of communities across the country.

The BATool™ classifies communities as green, yellow, or red:

- **Green**—Community is ready to move forward with a CRS community assistance visit
- **Yellow**—Community is close but might want to consider some resilience recommendations
- **Red**—Significant issues must be addressed before applying to the CRS

This tool was applied by the planning team for the Cowlitz County consistency review because it scores each program, allowing for a comparison of scores to identify which jurisdictions have the capability to administer policies considered for the Flood Plan and which do not. Based on that information, a policy being considered for inclusion in the Flood Plan can be amended for uniform application or dropped from consideration because it could not be implemented uniformly across the planning area.

5.2.2 Findings

The planning team performed BATool™ evaluations on the County and the five municipalities within the planning area. The results of these evaluations are shown in Table 5-1.

Table 5-1. Consistency Review Results

Municipality	Category Results				
	Flood Risk (%)	Programmatic-Regulation (%)	Programmatic Planning (%)	Programmatic Administration (%)	Overall Score (%)
Castle Rock	60	46.09	66.10	38.10	47.97
Kalama	66.67	46.09	76.27	39.19	50.62
Kelso	60	47.83	76.27	39.19	50.26
Longview	60	46.09	76.27	39.19	49.56
Woodland	46.67	46.09	76.27	39.19	47.09
Unincorporated County	51.67	49.57	76.27	50.18	54.85
Average	57.50	46.96	75.58	40.84	50.06

80% or Higher = Green; 50% to 79% = Yellow; 49% or Lower = Red

No municipality scored in the green level (80th percentile or higher) in any of the categories. The average overall score was 50.06 percent (yellow). The highest score was 54.85 percent and the lowest was 47.09 percent. While the results show that none of the programs appear ready to join the CRS program, they do show a degree of consistency between the County and the five city floodplain management programs. There was a less than 10 percent differential between the high and low score. The following were consistent issues among jurisdictions:

- Local flood hazard mapping does not accurately reflect the true flood risk for the area. This impacts a community's abilities to implement a program that is applied to a mapped and defined hazard area.
- With the exception of freeboard, the flood damage prevention ordinances in effect are minimum-requirement NFIP ordinances.
- Record keeping and formal administrative procedure are lacking across the board.

- Local permitting authority is generally limited to building permits, which makes it difficult to regulate development that does not include the placement of a structure.

All jurisdictions evaluated currently participate in the NFIP and are in full compliance and good standing under that program. None of the jurisdictions currently participate in the CRS program.

5.3 CONSISTENCY DEFINITION FOR THIS FLOOD PLAN

Based on the consistency review findings, flood hazard management program consistency for the Cowlitz County Comprehensive Flood Hazard Management Plan will be defined as maintaining compliance and good standing under the program requirements of the NFIP. Maintaining compliance is contingent upon each jurisdiction's strict enforcement of its own adopted codes and policies that govern development in the regulated floodplain. If a jurisdiction adopts a higher standard, strict application of that standard with no variance is expected under this definition of consistency. Compliance status is to be monitored by state or federal NFIP coordinating offices. The consistency definition does not establish what codes and polices each jurisdiction should adopt to support floodplain management, but it calls on all jurisdictions to enforce whatever codes and policies they have adopted.

5.4 POLICIES TO ENSURE CONSISTENCY

In the interest of supporting the objectives of RCW 86.16, Cowlitz County has identified policies that strive to achieve regional consistency in flood hazard management within Cowlitz County. These policies can be found in Section 12.1 of this plan.

PART 2—RISK ASSESSMENT

6. RISK ASSESSMENT METHODOLOGY

6.1 PURPOSE OF RISK ASSESSMENT

This part of the Flood Plan evaluates the risk of the flood hazard in the planning area. Risk assessment is the process of measuring the potential loss of life, personal injury, economic injury, and property damage resulting from natural hazards such as flooding. The risk assessment describes the flooding hazard, the planning area's vulnerabilities, and probable event scenarios. The following steps were used to define the risk:

- Identify and profile the flooding hazard (CRS Step 4); the following information is given:
  - Principal sources of flooding in the planning area
  - Major past flood events
  - Geographic areas most affected by floods
  - Estimated flood event frequency
  - Estimates of flood severity
  - Warning time likely to be available for response
  - Existing flood protection programs and projects
  - Secondary hazards associated with the flood hazard
  - Potential impacts of climate change on flooding
  - Expected future trends that could affect the flood hazard
  - Scenario of potential worst-case flood event
  - Key issues related to floodplain management in the planning area.
- Determine exposure to the flood hazard—Exposure was determined by overlaying flood maps with an inventory of structures, facilities, and systems to determine which of them would be exposed to flood events.
- Assess the vulnerability of exposed facilities—Vulnerability of exposed structures and infrastructure was determined by interpreting the probability of occurrence of each flood event and assessing structures, facilities, and systems that are exposed.

6.2 RISK ASSESSMENT APPROACH

6.2.1 Mapping

National, state, county, and city databases were reviewed to locate available spatially based data relevant to this planning effort. Maps were produced using geographic information system (GIS) software to show the spatial extent and location of flood hazards when such datasets were available. Data used for this plan represents the best science currently available.

6.2.2 Modeling

Overview

FEMA developed the standardized GIS-based software program Hazards U.S. (Hazus) to estimate losses caused by earthquakes, hurricanes and floods and identify areas that face the highest risk and potential for loss. Hazus is used to support risk assessments, mitigation planning, and emergency planning and response. It provides a wide range of inventory data, such as demographics, building stock, critical facilities, and transportation and utility infrastructure, and multiple models to estimate potential losses from natural disasters. The program maps and calculates hazard data and damage and economic loss estimates for buildings and infrastructure. Its advantages include the following:

- Provides a consistent methodology for assessing risk across geographic and political entities.
- Provides a way to save data so that it can readily be updated as population, inventory, and other factors change and as mitigation planning efforts evolve.
- Facilitates review of mitigation plans because it helps to ensure that FEMA methodologies are incorporated.
- Supports grant applications by calculating benefits using FEMA definitions and terminology.
- Produces hazard data and loss estimates that can be used in communication with local stakeholders.
- Is administered by the local government and can be used to manage and update a Flood Plan throughout its implementation.

For flood-related hazards, Hazus calculates losses to structures due to inundation by looking at depth of flooding and type of structure. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. The Hazus analysis also estimates the quantity of debris that would be caused by the flooding.

Levels of Detail for Evaluation

Hazus provides default data for inventory, vulnerability, and hazards; these default data can be supplemented with local data to provide a more refined analysis. The model can carry out three levels of analysis:

- **Level 1**—All of the information needed to produce an estimate of losses is included in the software's default data. These data are derived from national databases and describe in general terms the characteristic parameters of the planning area.
- **Level 2**—More accurate estimates of losses require more detailed information about the planning area. To produce Level 2 estimates of losses, detailed information is required about local geology, hydrology, hydraulics, and building inventory, as well as data about utilities and critical facilities. This information is needed in a GIS format.
- **Level 3**—This level of analysis generates the most accurate estimate of losses. It requires detailed engineering and geotechnical information to customize it for the planning area.

6.2.3 Assessment of Exposure and Vulnerability

Community exposure and vulnerability to the flood hazard were evaluated using Hazus. A Level 2 user-defined analysis was performed for general building stock in flood zones and for critical facilities. Current flood mapping

for the planning area was used to delineate flood hazard areas and estimate potential losses from the 10-percent-annual-chance, 2-percent-annual-chance, 1-percent-annual-chance, and 0.2-percent-annual-chance flood events. Additionally, the areas FEMA has designated as having reduced flood risk due to levees were analyzed. To estimate damage that would result from a flood, Hazus uses pre-defined relationships between flood depth at a structure and resulting damage, with damage given as a percent of total replacement value. Curves defining these relationships have been developed for damage to structures and for damage to typical contents within a structure. By inputting flood depth data and known property replacement cost values, dollar-value estimates of damage were generated.

6.2.4 Sources of Data Used

Building and Cost Data

Replacement cost values and detailed structure information derived from parcel and tax assessor data provided by Cowlitz County were loaded into Hazus. When available, an updated inventory was used in place of the Hazus defaults for critical facilities.

Replacement cost is the cost to replace the entire structure with one of equal quality and utility. Replacement cost is based on industry-standard cost-estimation models published in the 2022 *RS Means Square Foot Costs*. It is calculated using the RS Means square foot cost for a structure, which is based on the Hazus occupancy class (i.e., multi-family residential or commercial retail trade), multiplied by the square footage of the structure from the tax assessor data. The construction class and number of stories for single-family residential structures also factor into determining the square-foot costs.

Hazus Data Inputs

The effective Digital Flood Insurance Rate Map (DFIRM) for the planning area was used for the Hazus Level 2 analysis conducted for the risk assessment. The DFIRM was used to delineate flood hazard areas and estimate potential losses from the 10-percent-annual-chance, 2-percent-annual-chance, 1-percent-annual-chance, and 0.2-percent-annual-chance flood events, and the areas with reduced flood risk due to levees. Using the DFIRM floodplain boundaries and base flood elevation information, and a 3-meter resolution mosaic of various U.S. Geological Survey digital elevation model data, flood depth grids were generated and integrated into the Hazus model.

Data Source Summary

Table 6-1 summarizes the data sources used for the risk assessment for this plan.

6.2.5 FEMA's National Risk Index

The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards, including flooding. The National Risk Index uses available source data to develop a baseline relative risk measurement for each United States county and Census tract. The estimated risk is based on three factors: expected annual loss due to the 18 hazard types, social vulnerability, and community resilience. These measurements are calculated using average past conditions. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

Table 6-1. Hazus Model Data Documentation

Data	Source	Date	Format
Tax assessor improvements data (included information such as use code, year built, and building square footage)	Cowlitz County	2022	Digital (tabular)
Parcels	Cowlitz County	2022	Digital (GIS)
Building Footprints	Microsoft/Bind	2012 (Approximate)	Digital (GIS)
Building replacement (square foot) costs	RS Means	2022	Digital (pdf)
Digital Flood Insurance Rate Map—Cowlitz County effective 12/15/2015	FEMA	2015	Digital (GIS)
USGS Digital Elevation Model 3-meter resolution	U.S. Geological Survey	Unknown	Digital (GIS)
USGS Digital Elevation Model 10-meter resolution	U.S. Geological Survey	Unknown	Digital (GIS)
2020 Census Demographic Data	Hazus v6.0	2020	Digital (GIS)
Cowlitz County Comprehensive Plan Land Use	Cowlitz County	Provided 2022	Digital (GIS)
Airports	Cowlitz County	Provided 2022	Digital (GIS)
Care Facilities (includes adult family homes, assisted living facilities, childcare, hospice, rehabilitation centers, retirement homes)	Cowlitz County	Provided 2022	Digital (GIS)
Dams	Cowlitz County	2019	Digital (GIS)
Public Buildings (includes city halls, courthouses, fire stations, hospitals, police stations, post offices)	Cowlitz County	Provided 2022	Digital (GIS)
Schools	Cowlitz County	Provided 2022	Digital (GIS)
All Bridge and Tunnel Inventory	Washington State Department of Transportation	Downloaded 2023 (from Washington Geospatial Open Data Portal)	Digital (GIS)
Oil & Gas Wells	Washington State Department of Natural Resources	2023	Digital (GIS)
Wastewater Facilities	Washington State Department of Natural Resources	Downloaded 2023 (from Washington Geospatial Open Data Portal)	Digital (GIS)
AM Transmission Towers	Homeland Infrastructure Foundation-Level Data	Downloaded 2022	Digital (GIS)
Cellular Towers	Homeland Infrastructure Foundation-Level Data	Downloaded 2022	Digital (GIS)
FM Transmission Towers	Homeland Infrastructure Foundation-Level Data	Downloaded 2022	Digital (GIS)

The social vulnerability measurement in the index uses the Centers for Disease Control and Prevention's Social Vulnerability Index (SVI), which is based on 16 socioeconomic variables deemed to contribute to a community's reduced ability to prepare for, respond to, and recover from hazards:

- Below 150 percent of the poverty level
- Unemployed
- Housing cost burden
- No high school diploma
- No health insurance
- Aged 65 or older
- Aged 17 or younger
- Civilian with a disability
- Racial and ethnic minority status
- Multi-unit structures
- Mobile homes
- Crowding
- No vehicle
- Group quarters
- Single-parent households
- English language proficiency

The social vulnerability score in the National Risk Index represents the national percentile ranking of social vulnerability for a given county or Census tract in comparison to all other communities at the same level. The higher a county's or Census tract's social vulnerability score, the higher the risk. Because social vulnerability is unique to a geographic location—specifically, a county or Census tract—it is a geographic risk factor.

6.2.6 Limitations

Loss estimates, exposure assessments and vulnerability evaluations rely on the best available data and methodologies. However, results are subject to uncertainties associated with the following factors:

- Approximations and simplifications necessary to conduct a study
- Incomplete or outdated inventory, demographic or economic parameter data
- The unique nature, geographic extent and severity of the flood hazard
- Mitigation actions already employed
- The amount of advance notice residents have to prepare for a flood event

FEMA adheres to a protocol for map revision. Understanding that floodplains are dynamic and constantly changing, FEMA attempts to keep its maps current by adhering to this protocol. Cowlitz County floodway maps also are subject to revision as new information becomes available. It should be understood that at any point in time a current map may not reflect current conditions.

These factors can affect loss estimates by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. The results do not predict precise results and should be used only to understand relative risk.

7. COWLITZ COUNTY FLOOD HAZARD PROFILE

7.1 GENERAL CONCEPTS

A floodplain is the area adjacent to a river, creek or lake that becomes inundated during a flood. Floodplains may be broad, as when a river crosses an extensive flat landscape, or narrow, as when a river is confined in a canyon. When floodwaters recede after a flood event, they leave behind layers of rock and mud. These gradually build up to create a new floor of the floodplain. Floodplains generally contain accumulations of sand, gravel, loam, silt, and/or clay extending below the bed of the stream. These sediments provide a natural filtering system, with water percolating back into the ground and replenishing groundwater. The water in such aquifers is thus filtered compared to the water in the stream.

Connections between a river and its floodplain are most apparent during and after major flood events. These areas form a complex physical and biological system that not only supports a variety of natural resources but also provides natural flood and erosion control. When a river is separated from its floodplain with levees and other flood control facilities, natural, built-in benefits can be lost, altered, or significantly reduced.

7.1.1 Historical Uses of the River

Indigenous people in Cowlitz County have a deep connection with the rivers and floodplains in the region, utilizing them for various traditional purposes. The Cowlitz Indian tribe states, “Before the massive deathscape of the 1800s, Cowlitz villages dotted rivers that drained into larger rivers, what is now called the Columbia watershed (Cowlitz Indian Tribe n.d.).” The rivers in Cowlitz County offered an abundant source of fish and other aquatic resources used for sustenance. In addition, the floodplain was a source of edible plants and medicinal herbs for tribes, making the river banks the ideal location to establish villages. The rivers and floodplains were utilized for trade and communication between tribes. According to the Cowlitz Indian Tribe, “From the high mountains to the lowlands, rivers provided transport with efficient and brilliantly constructed crafts (Cowlitz Indian Tribe n.d.).” Transportation on the river was not only a source of trade but an exchange of culture and language. Intermarriages between near and distant villages ensured a constant interchange of language and customs; connecting tribes to one another and to the land. Rivers hold a significant spiritual and ceremonial value for many indigenous cultures.

7.1.2 Measuring Floods and Floodplains

Floods are commonly described as having a 10-percent, 2-percent, 1-percent, and 0.2-percent annual chance recurrence interval, meaning that floods of these magnitudes have (respectively) a 10-percent, 2-, 1-, or 0.2-percent chance of occurring in any given year. These measurements reflect statistical averages only; it is possible for two or more rare floods (with a 100-year or higher recurrence interval) to occur within a short time. Assigning

recurrence intervals to historical floods on different rivers can help indicate the intensity of an event over a large area. The same flood can have different recurrence intervals at different points on a river.

Flood studies use historical records to determine the probability of occurrence for the different discharge levels. These measurements reflect statistical averages only; it is possible for two or more floods with a 100-year or higher recurrence interval to occur in a short time period. The 1-percent-annual-chance flood has a 26 percent chance of occurring during the term of a 30-year mortgage. The 0.2-percent-annual-chance flood has a 6 percent chance of occurring during that time.

The extent of flooding associated with the 1-percent-annual-chance flood is often used as a regulatory boundary. Also referred to as the special flood hazard area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities. Many communities have maps that show the extent and likely depth of flooding for the 1-percent-annual-chance flood. Corresponding water-surface elevations describe the elevation of water that will result from a given discharge level, which is one of the most important factors used in estimating flood damage.

7.1.3 Effects of Human Activities

Because they border water bodies, floodplains have historically been popular sites to establish settlements. Human activities tend to concentrate in floodplains for a number of reasons: water is readily available; land is fertile and suitable for farming; transportation by water is easily accessible; and land is flatter and easier to develop. But human activity in floodplains frequently interferes with the natural function of floodplains. It can affect the distribution and timing of drainage, thereby increasing flood problems. Human development can create local flooding problems by altering or confining drainage channels. This increases flood potential in two ways: it reduces the stream's capacity to contain flows, and it increases flow rates or velocities downstream during all stages of a flood event. Human activities can interface effectively with a floodplain as long as steps are taken to mitigate the activities' adverse impacts on floodplain functions.

7.1.4 Floodplain Ecosystems

Floodplains can support ecosystems that are rich in biological quantity and diversity. Wetting of the floodplain soil releases a surge of nutrients: those left over from the last flood, and those that result from the rapid decomposition of organic matter that has accumulated since then. Microscopic organisms thrive and larger species enter a rapid breeding cycle. Opportunistic feeders—particularly birds—move in to take advantage. The production of nutrients peaks and falls away quickly, but the surge of new growth endures for some time. This makes floodplains particularly valuable for agriculture.

Riparian zone species have significant differences from those outside of floodplains. For instance, riparian trees tend to be very tolerant of root disturbance and tend to be very quick-growing compared to non-riparian trees.

7.2 WATERSHEDS

A watershed is an area draining into a river, lake, or other water body. The Washington Department of Ecology has divided Washington into Water Resource Inventory Areas (WRIAs) to delineate the state's major watersheds. The following sections describe the WRIAs that lie at least partially within Cowlitz County.

7.2.1 Watershed Resource Inventory Areas 22 and 23

The Chehalis Basin (WRIAs 22 and 23) is one of the larger river basins in the state of Washington. The Chehalis Basin is bounded on the west by the Pacific Ocean, on the east by the Deschutes River Basin, on the north by the Olympic Mountains, and on the south by the Willapa Hills and Cowlitz River Basin. Elevations vary from sea level at Grays Harbor to 5,054-foot Capitol Peak in the Olympic National Forest. The Chehalis Basin encompasses 2,520 square miles and drains 2,660 square miles. The Chehalis River system flows through three distinct ecoregions: Cascade (including the Olympic Mountains), Puget Lowland, and Coast Range before emptying into Grays Harbor near Aberdeen.

The Chehalis Basin encompasses large portions of Grays Harbor, Lewis, and Thurston counties, and lesser parts of Mason, Pacific, Cowlitz, Wahkiakum, and Jefferson counties. The mainstem and South Fork Chehalis drain areas west and south of the City of Chehalis. Two major tributaries in mid-basin, the Newaukum and Skookumchuck Rivers, have their headwaters in the foothills of the Cascade Range. Another mid-basin tributary, the Black River, originates in Black Lake.

The largest tributaries, the Satsop and Wynoochee Rivers, arise in southern extensions of the Olympic Mountains and join the mainstem shortly before its terminus at Grays Harbor. The Humptulips, Hoquiam and Wishkah Rivers flow from the southern Olympic Mountains to Grays Harbor; the Humptulips into North Bay, the Hoquiam into the inner estuary of Grays Harbor, and the Wishkah into the Chehalis River near the mouth. The Johns and Elk Rivers flow into the South Bay of Grays Harbor. The terminus of all rivers is where they enter Grays Harbor.

7.2.2 Watershed Resource Inventory Areas 25 and 26

WRIA 25 comprises the Grays River Basin and Elochoman River Basin as well as Germany, Mill and Abernathy Creeks. WRIA 26 comprises the basins of the Cowlitz River, Cispus, Toutle, Tilton, and Coweeman Rivers. Most of the area of WRIAs 25 and 26 lies in Wahkiakum, Cowlitz and Lewis Counties. Small portions also extend into Pacific, Skamania, Yakima and Pierce Counties. WRIAs 25 and 26 include several subbasins that drain to the Columbia River, but do not include the Columbia River itself. WRIAs 25 and 26 occupy approximately 296,000 and 1,592,000 acres, respectively. Figure 7-1 shows key features of WRIAs 25 and 26. Table 7-1 provides a summary of the major water features and their drainage areas.

The area ranges from temperate lowlands near sea level to high mountainous terrain at elevations over 8,000 feet. The hydrologic features of the basins vary with topography. At higher elevations in the Cascade Range, steeply dropping streams form waterfalls, pools, and rapids. In the lower portions of each basin, the terrain alternates from narrow canyon sections to broad meandering stretches with floodplains and terrace features. The WRIAs 25 and 26 subbasins are rain-dominated in the lower subbasins, such as the Grays and Elochoman. The upper subbasins, such as the Cowlitz and Cispus, are considered transient (a combination of rain- and snow-dominated).

7.2.3 Watershed Resource Inventory Areas 27 and 28

WRIA 27 comprises the Kalama and Lewis River Basins. WRIA 28 comprises the Salmon Creek, Burnt Bridge Creek, Lacamas Creek, and Washougal River Basins, as well as additional smaller creek basins. Most of the area of WRIAs 27 and 28 is in Clark, Cowlitz and Skamania Counties. A small portion of WRIA 27 also extends into Yakima County. WRIAs 27 and 28 include several subbasins that drain to the Columbia River, but do not include the Columbia River itself. Table 7-2 provides a summary of the major water features and their drainage areas. Figure 7-2 shows key features of WRIAs 27 and 28.

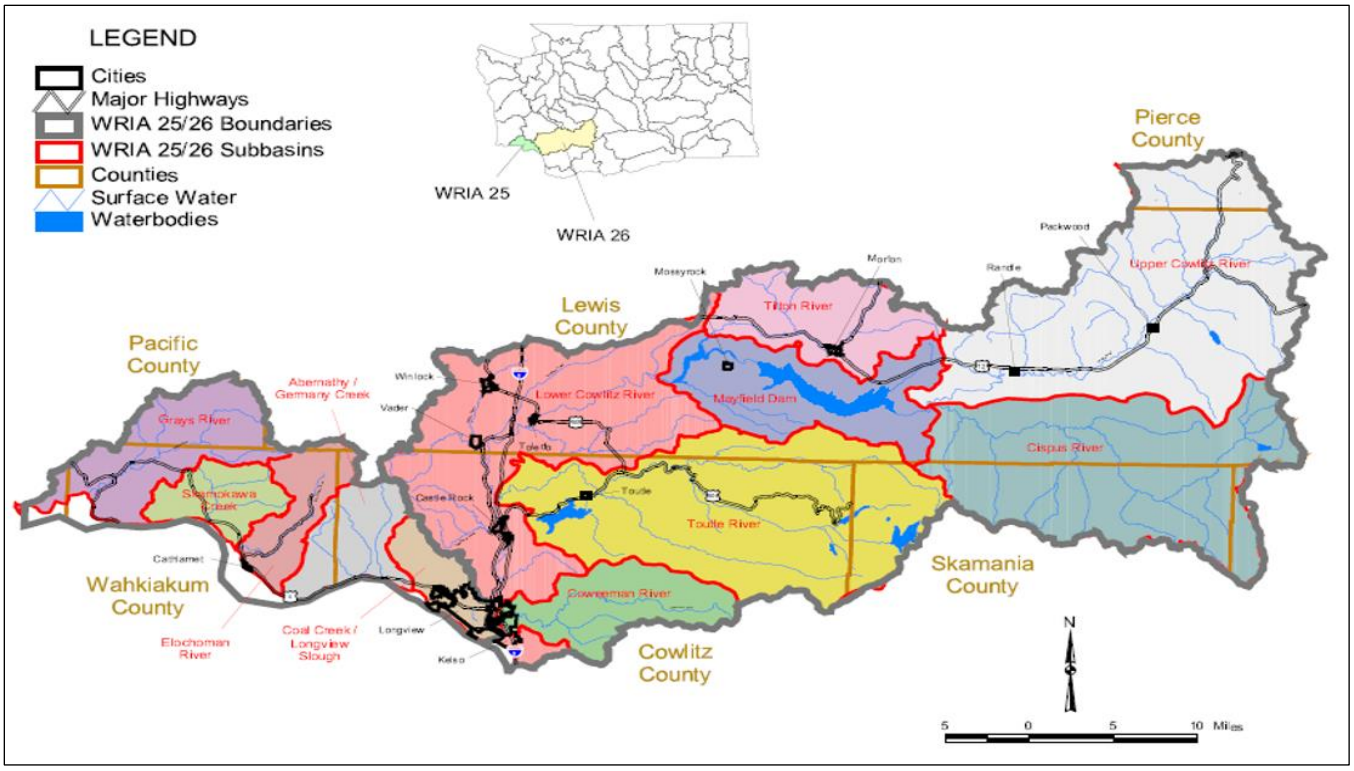


Figure 7-1. WRIA 25/26

Table 7-1. Major Surface Water Bodies in WRIA 25/26

Subbasin	Major Surface Water Features	Area (Square Miles)
Grays River	Grays River, West Fork Grays River	163
Elochoman River	Elochoman River	81.6
Skamokawa Creek	Skamokawa Creek	72.0
Abernathy-Germany Creeks	Abernathy and Germany Creeks	89.7
Coal Creek- Longview Slough	Coal Creek	56.3
Upper Cowlitz River Cowlitz River	Lake Scanewa	579
Lower Cowlitz River	Cowlitz River	456
Cispus River	Cispus River	451
Mayfield Dam Subbasin	Cowlitz River (Mayfield Lake and Riffe Lake)	207
Tilton River	Tilton River	154
Toutle River	Toutle River (N. and S. Forks), Green River, Spirit Lake, Silver Lake	511
Coweeman River	Coweeman River	66.4

Table 7-2. Major Surface Water Bodies in WRIA 27/28

Subbasin	Major Surface Water Features	Area (Square Miles)
Kalama	Kalama River	224
Lewis		
Lower Lewis	North Fork Lewis River	848
Middle Lewis	Lake Merwin, Yale Lake	255
Upper Lewis	Yale Lake, Swift Lake	361
East Fork Lewis	East Fork Lewis River	236
Salmon Creek	Salmon Creek, Lake River	118
Burnt Bridge Creek	Burnt Bridge Creek, Vancouver Lake, Lake River, Columbia Slope Streams	79
Lacamas Creek	Lacamas Creek, Lacamas Lake	65
Washougal River	Washougal River	148
Columbia River Tributaries	Gibbons Creek, Duncan Creek, others	85

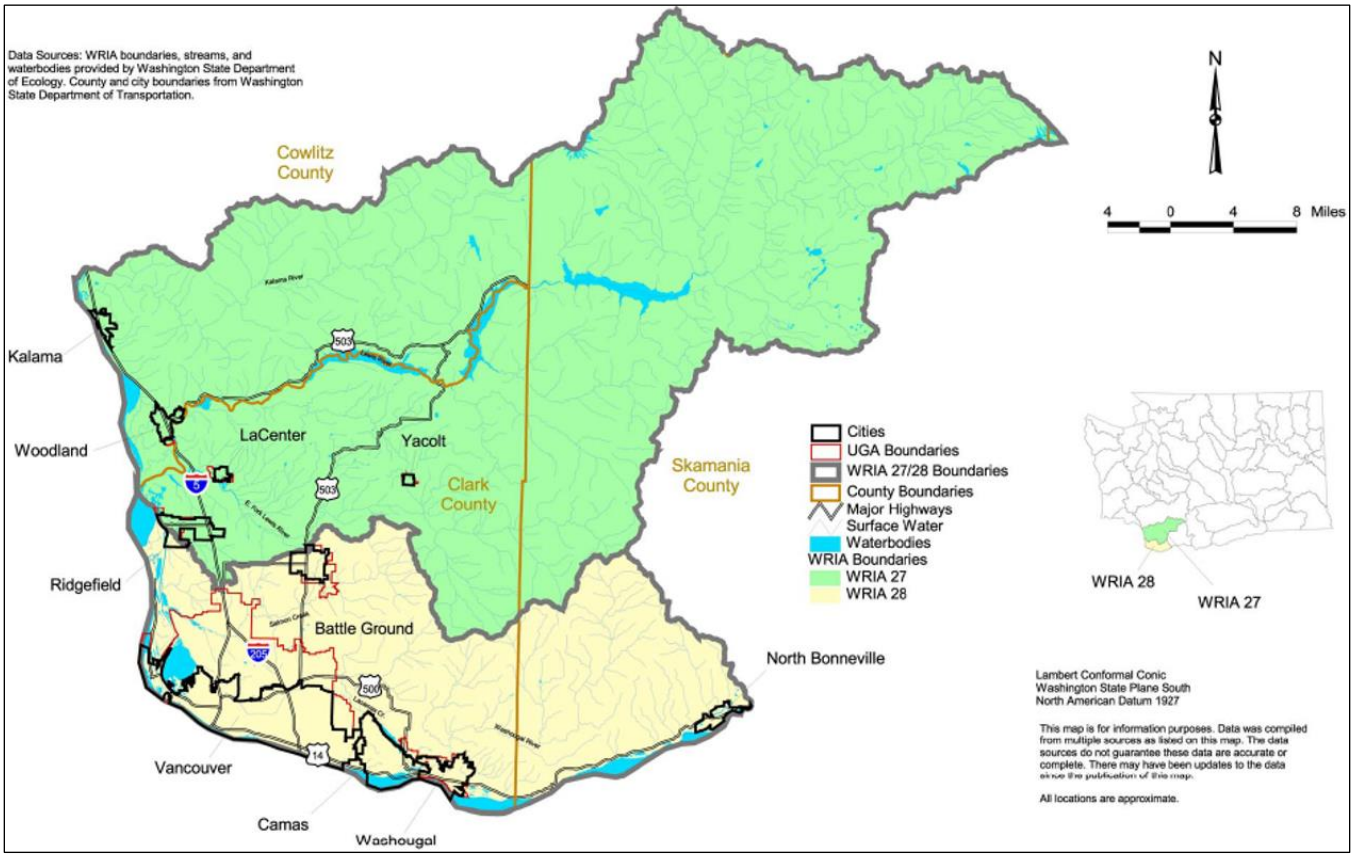


Figure 7-2. WRIA 27/28

The planning area occupies approximately 1,800 square miles and ranges from temperate lowlands near sea level to high mountainous terrain at elevations over 12,000 feet. Its headwaters are along the crest of the Cascade Range.

7.3 PRINCIPAL FLOOD SOURCES AND PROBLEMS IN COWLITZ COUNTY

Flooding in southwestern Washington, including Cowlitz County, is most frequently the result of coastal storms or heavy rains resulting in one to several days of precipitation. Major floods usually result from a combination of intense rainfall and snowmelt after the watershed has been saturated from prior rainfall.

Columbia River floods generally are an annual event that occurs in spring when the snow melts in the mountains. During spring floods, the Columbia River remains above flood stage for 30 to 90 days. Winter flood-stage periods are of much shorter duration, though there has been winter flooding in the County with magnitudes comparable to that of the larger spring floods. Flooding from rivers and smaller creeks in the Cowlitz, Kalama, and Lewis River basins generally occurs from November through January.

7.3.1 Water Bodies

The FEMA Flood Insurance Study for Cowlitz County aids in the administration of the NFIP for participating communities in the county. This FIS covers the entire area of Cowlitz County, including the cities of Castle Rock, Kalama, Kelso, Longview, and Woodland, and the unincorporated areas of Cowlitz County. The main bodies of water (and sources of flooding) in these areas are as follows:

- Abernathy Creek
- Arkansas Creek
- Baxter Creek
- Coal Creek
- Columbia River
- Coweeman River
- Coweeman River (Lower Reach Near Kelso)
- Cowlitz River
- Creek at Esoh Road
- Delameter Creek
- Falls Creek
- Fish Pond Creek
- Germany Creek
- Goble Creek
- Harmony Creek
- Kalama River
- Leckler Creek
- Lewis River
- Little Kalama River
- McCorkle Creek
- Mill Creek
- Monahan Creek
- N. Fork Goble Creek
- North Fork McCorkle Creek
- North Fork Owl Creek
- North Fork Toutle River
- Olequa Creek
- Ostrander Creek
- Outlet Creek
- Owl Creek
- Schoolhouse Creek
- Slide Creek
- South Fork Ostrander Creek
- South Fork Toutle River
- Toutle River

7.3.2 FEMA Special Flood Hazard Areas

Special flood hazard areas are defined in the December 16, 2015, DFIRMs for Cowlitz County, Letters of Map Revision issued by FEMA, and FIRMs resulting from FEMA's final Physical Map Revisions in 2018 and 2019. These areas include the following:

- **Areas of Shallow Flooding (Zone AH)—**Shallow flooding occurs in flat areas when there are depressions in the ground that collect ponds of water, areas of sloping land and areas of sheet flow where flood depths range from 1 to 3 feet.
- **Riverine Flooding (Zones A, AE, AR, A99)—**Flooding that occurs in a river (including tributaries), stream, or brook.

- **Regulated Floodways—**The regulated floodway consists of a stream channel plus the portion of the overbanks that must be kept free from encroachment in order to convey the 1-percent annual chance (base flood) event without increasing base flood levels/elevations.
- **Alluvial Fan Flooding (Zone AO)—**An alluvial fan is a sedimentary deposit at a point where ground surface slope changes suddenly, such as the base of a mountain front, escarpment, or valley side. Sediments at these locations are deposited in the shape of a fan. Alluvial fan flooding occurs on the surface of these deposits and is characterized by uncertain flow paths.

7.3.3 Urban Drainage

Stormwater runoff and drainage issues in the hill and valley areas of the County are dependent on the amount of development. More developed valley areas experience increased runoff volumes due to the large amount of impervious surface. The County and cities require new development to comply with Western Washington stormwater standards, which can reduce the impact of new development on urban flooding. The new stormwater systems generally are designed to catch and retain stormwater before it leaves the site and are often privately maintained.

The stormwater systems are designed to manage runoff based on historical rainfall quantities, and the runoff either infiltrates on site or is conveyed to nearby streams and rivers. However, a changing climate has caused more intense rainfall events. As temperatures warm, the atmosphere has an increased capacity to hold moisture, leading to heavier downpours. These intense rainfall events can overwhelm the capacity of existing stormwater systems and pump systems designed for previous rainfall patterns.

In Cowlitz County, many of the urbanized areas are protected from riverine flooding from levees, and the water that accumulates behind the levees must be manually removed from the area using pump systems. With higher intensity rainfall events and increased runoff, a greater volume of water needs to be pumped out from behind the levees that the pump systems may not have the capacity to manage. Therefore, flooding may occur on the inside of levee protected areas, since the additional stormwater runoff is unable to drain into streams and rivers. Also, the intense rainfall can result in a higher concentration of sediment and debris in the water that needs to be pumped out. This may increase the likelihood of clogs and blockages in the pump system, reducing their efficiency and causing pump failures.

7.3.4 Tidal Effects

Tidal effects on the Columbia River are primarily limited to the estuary, where the river meets the Pacific Ocean and freshwater mixes with saltwater. The estuary extends 146 miles from Ilwaco to the Bonneville Dam (Columbia River Estuary Study Taskforce 2020). In the estuary, tides play a critical role in shaping the hydrodynamics and ecology in the area. The tidal range can be substantial, depending on factors such as the phase of the moon and seasonal changes. The ebbs and flows of the tides can impact the flow patterns of the river near the estuary. During high tide, water from the ocean may move upstream, into the estuary, causing water levels to rise. During low tide, water from the estuary flows back into the ocean, resulting in a drop in water levels.

According to the National Oceanic and Atmospheric Administration, estuaries with strong tidal rivers, such as the Columbia, can alter or mask the incoming tide during powerful seasonal river flows in the spring (National Oceanic and Atmospheric Administration n.d.). In some cases, tidal fluctuations can have a backwater effect, impacting water levels further upstream from the estuary. In Cowlitz County, this could lead to increased water levels and flood risks along the Cowlitz and Kalama Rivers. However, the tidal effects on the Columbia River are

relatively subdued compared to coastal areas directly exposed to the open ocean. The river maintains a complex hydrological system, dam operations, and freshwater flow from tributaries that play significant roles in shaping its characteristics. Beyond the estuary, the Columbia river is primarily driven by freshwater inputs from tributaries and precipitation, rather than tidal forces.

7.3.5 Flash Flooding

Flash flooding is flooding characterized by a quick rise and fall of water level from intense rainstorms or debris dams bursting. Flash flooding typically occurs rapidly, with little to no warning and can last from a few minutes to several hours. Flash flooding is characterized by its rapid onset and high flow rates, often resulting in the sudden rise of water levels in streams, rivers, and low-lying areas. According to the National Severe Storms Laboratory, densely populated areas are at high risk for flash floods due to the number of impervious surfaces, which increase runoff by reducing the amount of rain absorbed by the ground. In addition, the topography of an area may increase the likelihood of flash flooding. Mountains, steep hills, rocks, and clayey soils are all more susceptible to flash flooding.

Recent burn areas are at high risk of flash flooding. Wildfires often destroy vegetation, leaving the ground bare and exposed. Without vegetation to absorb rainfall and stabilize soil, there is a greater risk of experiencing a flash flood. The lack of vegetation also leads to an increased risk of erosion, which may contribute to flooding by clogging drainage channels and exacerbating sedimentation. Wildfires also have the potential to impact soil properties. In some cases, the intense heat from a fire can cause a soil to become hydrophobic, meaning it will repel water instead of absorbing it (Sakas 2021). This leads to an increase in surface runoff and faster water flow. According to NOAA, flash floods after wildfires often lead to debris flows. The accumulation of debris from wildfires, including charred branches, tree trunks, and other burnt materials, may obstruct waterways, bridges, and culverts, further exacerbating flood risk (National Weather Service n.d.).

7.4 MAJOR HISTORICAL FLOOD EVENTS

The historical record of flooding in Cowlitz County is available only for the period since substantial population centers became established. In December 1933, the County experienced one of the worst and most extensive floods in memory when Cowlitz, Coweeman, Kalama, and Lewis Rivers peaked well in excess of their current estimated 1-percent-annual-chance discharge. Damage to the area was estimated at more than $3 million, occurring mainly within the populated urban centers of Kelso, Castle Rock, and Woodland when protective dikes were washed out and nearly 3,000 people were forced to evacuate their homes because of the high water. Several major bridges were destroyed and considerable damage to rural highways and farmland was incurred.

7.4.1 Federally Declared Flood Disasters

Federal disaster declarations are typically issued for hazard events that cause more damage than state and local governments can handle without assistance from the federal government, although no specific dollar loss threshold has been established for these declarations. A federal disaster declaration puts federal recovery programs into motion to help disaster victims, businesses and public entities. Some of the programs are matched by state programs. Cowlitz County has experienced 10 flooding events since 1964 for which federal disaster declarations were issued, as summarized in Table 7-3. Review of these events helps identify targets for risk reduction and ways to increase a community’s capability to avoid large-scale events in the future.

Table 7-3. History of Cowlitz County Flood Events with Federal Disaster Declarations

Event Dates	Declaration #	Type of event
12/29/1964	DR-185	Heavy Rains, Flooding
02/01/1972	DR-322	Severe Storms, Flooding
12/13/1975	DR-492	Severe Storms, Flooding
12/10/1977	DR-545	Severe Storms, Mudslides, Flooding
11/22-11/29/1986	DR-762	Severe Storms, Flooding
11/22-11/29/1986	DR-784	Severe Storms, Flooding
1/26-02/23/1996	DR-1100	High Winds, Severe Storms, Flooding
1/6-1/16/2009	DR-1817	Severe Winter Storm, Landslides, Mudslides, Flooding
12/1-12/14/2015	DR-4253	Severe Winter Storm, Straight-Line Winds, Flooding, Landslides, Mudslides
12/26/2021-1/15/2022	DR-4650	Severe Winter Storms, Snowstorms, Straight-Line Winds, Flooding

Source: (FEMA 2023)

7.4.2 Columbia River Floods

In June 1948, Columbia River swelled to a peak discharge of more than 1 million cubic feet per second (cfs) and caused an estimated $7.2 million in damage, $6 million of which was to farm property, in the region from Woodland to Willow Grove. Flooding was intensified by high tides that affected Columbia River elevations within Cowlitz County. The largest flood on the Columbia River in recorded history occurred on June 7, 1894. The following is an excerpt from the Cowlitz County Historical Quarterly, Volume 2, No.4, p. 9:

> *The floods of 1876 and 1884 had been bad but the flood of 1894 forced the vacating of all the business district and steamboats came up the streets of Kalama. The railroads were all under water and the ferry "Tacoma" was loaded with passenger cars to meet the trains at Kelso and transport the passengers direct to Portland. Business was carried on in private homes and in tents. Houses could be seen floating down the river and anxiety ran high as to whether the town's business district could withstand the strain. When the water finally subsided the grade level of the railroad was raised to its present level. In 1918 the dredges filled in the whole Kalama area to a high level with silt from the Columbia.*

Table 7-4 lists peak discharges at The Dalles, Oregon, stream gage and corresponding water-surface elevations at the City of Kalama (RM 75.0) and the City of Longview for six major floods on the Columbia River.

Table 7-4. Peak Discharges on the Columbia River

Date	Peak Discharges (cfs)	Water Surface Elevation (Feet NAVD 1988)	
		At Kalama	At Longview
June 7, 1894	1,240,000	30.81	27.01
June 1, 1948	1,010,000	27.21	23.91
June 24, 1876	958,000	26.71	23.71
June 4-6, 1956	823,000	23.91	20.91
June 19, 1933	722,000	22.71	19.71
December 24, 1964	364,000	24.61	21.81

NAVD = North American Vertical Datum
Source: (Federal Emergency Management Agency 2015)

7.4.3 Cowlitz River Floods

In December 1964, the Cowlitz River reached crest stage in 48 hours and remained above bankfull stage for 45 hours. The maximum rate of rise was 0.45 feet per hour, with an average rate of rise of 0.28 feet per hour. Average channel velocities during the 1-percent-annual-chance flood were estimated to range from 6 to 10 feet per second, with overbank velocities of up to 3 feet per second. Small portions of the City of Castle Rock, to the east and south of the downtown area, were subjected to inundation from the collection and ponding of local runoff which could not escape through natural drainage routes when the Cowlitz River was at flood stage. Table 7-5 shows the largest Cowlitz River floods at Castle Rock (Gage No. 14243000).

Table 7-5. Peak Discharges on the Cowlitz River

Date	Peak Discharges (cfs)[a]	Gage Height (Feet)[b]	Approximate Recurrence Interval (Years)
January 8, 2009	106,000	54.64	*c*
November 7,2006	77,300	49.78	*c*
February 8, 1996	112,000	32.11	*c*
December 23, 1933	139,000	31.60	*c*
December 4, 1975	86,700	24.53	150
December 2,1977	86,500	24.48	100
December 10, 1933	111,000	*c*	40

a. Discharge affected by regulation or diversion
b. U.S. Department of the Interior, U.S. Geological Survey, USGS Water Data for Washington, http://nwis.waterdata.usgs.gov/wa/nwis/
c. Data Not Available
Source: (Federal Emergency Management Agency 2015)

7.4.4 Coweeman River Floods

The largest known flood on the Coweeman River occurred in December 1933, before the USGS established the gage near the City of Kelso (Gage No. 14245000). The estimated discharge for that flood is 12,000 cfs. The largest recorded discharge on the Coweeman River since the gage was installed in July 1950 occurred in November 1962 and was 9,720 cfs. The estimated return intervals for the 1933 and 1962 floods are 200 and 40 years, respectively. Those floods caused little damage because of the levee system along Coweeman River.

7.4.5 Kalama River

The largest flood on the Kalama River occurred in December 1933. During that flood, it is estimated that velocities in the channel in the vicinity of the City of Kalama reached 15 feet per second, with overbank velocities up to 6 feet per second. Table 7-6 shows the peak discharges and corresponding elevations below Italian Creek (Gage No. 14223500) for the six largest recorded floods on the Kalama River.

7.4.6 Lewis River

The largest flood in recorded history on the Lewis River occurred in December 1933. During that flood, the river rose at an average rate of 0.2 feet per hour for 48 hours and remained above bankfull stage for 30 hours. During the flood of November 1962, the third largest flood of record, the river rose at an average rate of 1.5 feet per hour for 9 hours as a result of opening the spillway gates at Ariel Dam. A maximum rate of 6 feet per hour was experienced during that rise, and the river remained above bankfull stage for 18 hours. Table 7-7 shows peak discharges and elevations at the Ariel Dam (Gage No. 14220500) for eight major floods on the Lewis River.

Table 7-6. Peak Discharges on the Kalama River

Date	Elevation (Feet NAVD 1988)	Estimated Peak Discharges (cfs)	Approximate Recurrence Interval (Years)
December 23, 1933	52.54	45,000	*a*
January 20, 1972	40.94	17,900	15
December 12, 1977	40.44	16,900	10
November 20, 1962	40.44	16,600	10
November 23, 1942	40.14	16,250	9
December 9, 1953	40.14	16,000	8

a. Data Not Available
Source: (Federal Emergency Management Agency 2015)

Table 7-7. Peak Discharges on the Lewis River

Date	Elevation (Feet NAVD 1988)	Estimated Peak Discharges (cfs)[a]	Approximate Recurrence Interval (Years)
December 22, 1933	82.39	129,000	240
February 8, 1996	*b*	86,400	*b*
December 18,1917	73.89	81,500	25
November 20, 1962	73.09	75,500	19
December 2, 1977	*b*	71,900	*b*
December 13, 1946	71.39	67,300	13
December 4, 1975	69.99	64,500	11
November 25,1927	69.59	62,600	9

a. Discharge affected by regulation or diversion
b. Data Not Available
Source: (Federal Emergency Management Agency 2015)

7.4.7 Toutle River Floods

During the May 18, 1980, eruption of Mount St. Helens, a debris avalanche deposited some 3 billion cubic yards of material in the upper 17 miles of the North Fork Toutle River Valley. Mudflows incorporating melted snow, glacial ice, rock and other debris coursed down the Cowlitz and Toutle Rivers, damaging structures, causing flooding along the lower Cowlitz River and depositing 50 million cubic yards of sediment in the Cowlitz River channel and overbank areas. Cowlitz River bankfull capacity decreased from 70,000 cfs to less than 13,000 cfs. The mudflow discharge is not known because it destroyed the recording stream gage for Toutle River near Silver Lake (Gage No. 14242500). At its peak, it is estimated to have been about 28 feet higher than the flood of record. Table 7-8 shows the five largest Toutle River floods at the two Silver Lake gages.

Table 7-8. Peak Discharges on the Toutle River

Date	Peak Discharges (cfs)[a]
May 18, 1980 (mudflow)	Not recorded
February 8, 1996	61,800 [1]
December 2, 1977	43,200
March 2, 1910	37,600
December 23, 1933	34,300
December 11. 1946	29800

a. Toutle River near Silver Lake at Tower Road (Gage No. 14242580)
Source: (Federal Emergency Management Agency 2015)

7.4.8 1986 Floods

In 1986, Cowlitz County experienced two major flooding events. In February 1986 heavy rains combined with a warming trend and heavy snowmelt in the mountains causing $5 million in damage to public facilities and private property. Two hundred people were evacuated in the Lexington area; 100 to 120 homes were destroyed or damaged. In November 1986, a major storm with near continuous rainfall saturated the ground. At one point, 1.8 inches of rain fell in 24 hours.

7.4.9 1996 Floods

The February 1996 flood produced the most widespread flooding in the state's history. Mudslides and water over the road caused numerous roads to be closed, downtown Kalama flooded, Ostrander Park was evacuated and inundated with water, I-5 Northbound near Woodland closed due to a rockslide and the dike in Woodland was breached, causing major flooding and evacuations in the city. A presidential declaration of emergency was issued.

7.4.10 January 2022 Flooding

In January of 2022, after heavy rainfall and melted snow, rivers in Cowlitz County and surrounding areas rose above the flood stage. Interstate 5 in Lewis County was closed for 5 hours after three rivers overtopped their banks. Over 20 water rescues of people trapped at the confluence of the three rivers occurred, and multiple homes, roadways, and properties suffered severe water damage. Many individuals were trapped in deep floodwaters, after ignoring road closure signs. Several roads were closed due to standing water, debris, and mudslides.

7.5 FLOOD PROTECTION MEASURES

7.5.1 Levees, Dikes, and Dredging

A reduction of damage in major urban areas during the floods of 1964, 1972, 1975, 1977, 1986, 1996 and 2006 was due in part to flood-control structures constructed since the devastating 1933 and 1948 floods. These flood protection measures include an extensive levee system designed to provide protection against 0.2-percent-annual-chance flooding. Levees extend 4.6 miles along the Cowlitz River, 8.0 miles along the Columbia River, and 2.0 miles near Coal Creek Slough. Levee projects have also been completed at various locations along Coweeman, Kalama, and Lewis Rivers. A combination floodwall and dike along the west bank of the Lewis River protects most of the City of Woodland from the 1-percent-annual-chance flood.

Further protection is provided by numerous bank protection and levee projects maintained by the CDID #1 and #3, as well as the Cowlitz County Drainage Improvement District No.1. Some of these levees were constructed entirely by local interests. Others were either constructed or improved with federal funds in cooperation with local interests.

Following the May 1980 Mount St. Helens eruption, the lower Cowlitz River and Toutle River channel capacities were severely reduced by deposited sediment. With about 3 billion cubic yards of gradually eroding sediment in the Mount St. Helens blast area, the deposition in the study reaches was expected to progressively increase flood risk and damage for many years in the future. To prevent disastrous flooding, the U.S. Army Corps of Engineers conducted a massive program of improving the Cowlitz River levee systems and dredging the deposited sediment from Cowlitz and Toutle River channels. The Corp is proposing to implement updated sediment management measures to manage flood risk to established levels through 2035 for Castle Rock, Lexington, Kelso, and

Longview. These measures include raising the spillway on the Corps' sediment retention structure on the North Fork Toutle River, installing grade-building structures in the sediment plain upstream of the sediment retention structure, and ongoing dredging (U.S. Army Corps of Engineers 2018).

7.5.2 Drainage Infrastructure

In addition to the levees, the districts maintain a network of drainage ditches, sloughs, drains, and pump stations to remove local runoff. Some of these facilities remove surface drainage and levee seepage from approximately 9,500 acres, including the Cities of Kelso and Longview. Runoff from the eastern portion of the City of Longview is directed toward the Industrial Way pump station near the Longview-Rainer Bridge (also known as the Lewis and Clark bridge). The southwest portion of Longview drains toward the Reynolds pump station at the former Reynolds Aluminum Smelter south of the city. Longview's diking district, CDID #1, is located northwest of the City of Longview, at the north end of Cutoff Slough, along Coal Creek Slough. This station drains not only northern Longview, but also nearly 5,000 acres north of the city. The City of Longview has an additional four pump stations that help prevent local flooding: 48th Avenue, Oregon Way, Third Avenue and Pioneer pump stations.

7.5.3 Flood Storage Dams and Sediment Retention Structures

Columbia River

More than 50 storage projects on the Columbia River and its tributaries have a significant impact on flood peaks, including the 1- and 0.2-percent-annual-chance floods. It is estimated that the 1948 and 1956 floods could be regulated at The Dalles stream gage to 620,000 and 550,000 cfs, respectively, under present regulatory conditions.

Cowlitz River

Several projects lessen the impact of flooding on the Cowlitz River. Riffe Lake at RM 65.5 (storage began in 1968) and, to a lesser extent, Mayfield Reservoir at RM 52.0 (storage began in 1962), provide significant flood storage. Both projects, owned and operated by the City of Tacoma, regulate flood peaks at Castle Rock in coordination with the U.S. Army Corps of Engineers Portland District. The Mayfield Reservoir and Davisson Lake provide 360,000 acre-feet of flood regulation storage. This storage is sufficient to reduce the 1-percent-annual-chance discharge at the City of Castle Rock from 130,000 cfs to 80,000 cfs.

Toutle River

In order to stop the continuous downstream movement of sediment and to protect against future mudflows, a sediment retention structure was constructed on the North Fork of the Toutle River at RM 13.2. The structure is designed solely to trap sediment eroded from the upper North Fork Toutle Basin. It has little effect on day-to-day flows; but it significantly reduces the peaks of moderate floods up to about the 2-percent-annual-chance flood. As sediment fills the structure's storage, its effect on flood peaks will gradually diminish. Besides the sediment retention structure, there are no other significant flood protection measures that exist or are planned for the Toutle River.

Lewis River

No flood regulation is provided by the three power projects on Lewis River. They are operated exclusively for power generation. On August 18, 1983, FEMA and the Pacific Power and Light Company agreed to make 70,000 acre-feet available for flood control storage at Merwin Dam on the Lewis River, thus reducing the 1-percent-annual-chance discharge at the City of Woodland from l28,000 cfs to 102,000 cfs.

7.6 LOCATION

Flooding in the planning area has been extensively documented by gage records, high water marks, damage surveys and personal accounts. This documentation was the basis for the December 16, 2015, FIRMs generated by FEMA for the planning area (Federal Emergency Management Agency 2015). The flood hazard risk assessment for this plan evaluated five areas mapped by FEMA: the 10-percent, 2-percent, 1-percent, and 0.2-percent annual chance floods, and the "area with reduced risk due to levee." The levee-protected area is considered to be protected against flooding for the 1-percent-annual-chance event, but it is still susceptible to flooding in the event of a larger flood that causes levees to be overtopped. Countywide maps of the 1-percent and 0.2-percent annual chance flood areas, the levee-protected areas that would be inundated in the event of levee overtopping, and the floodway are shown on Figure 7-3, Figure 7-4, Figure 7-5, and Figure 7-6, respectively. Appendix E presents mapping of additional flood zones as well as detail maps for cities in Cowlitz County.

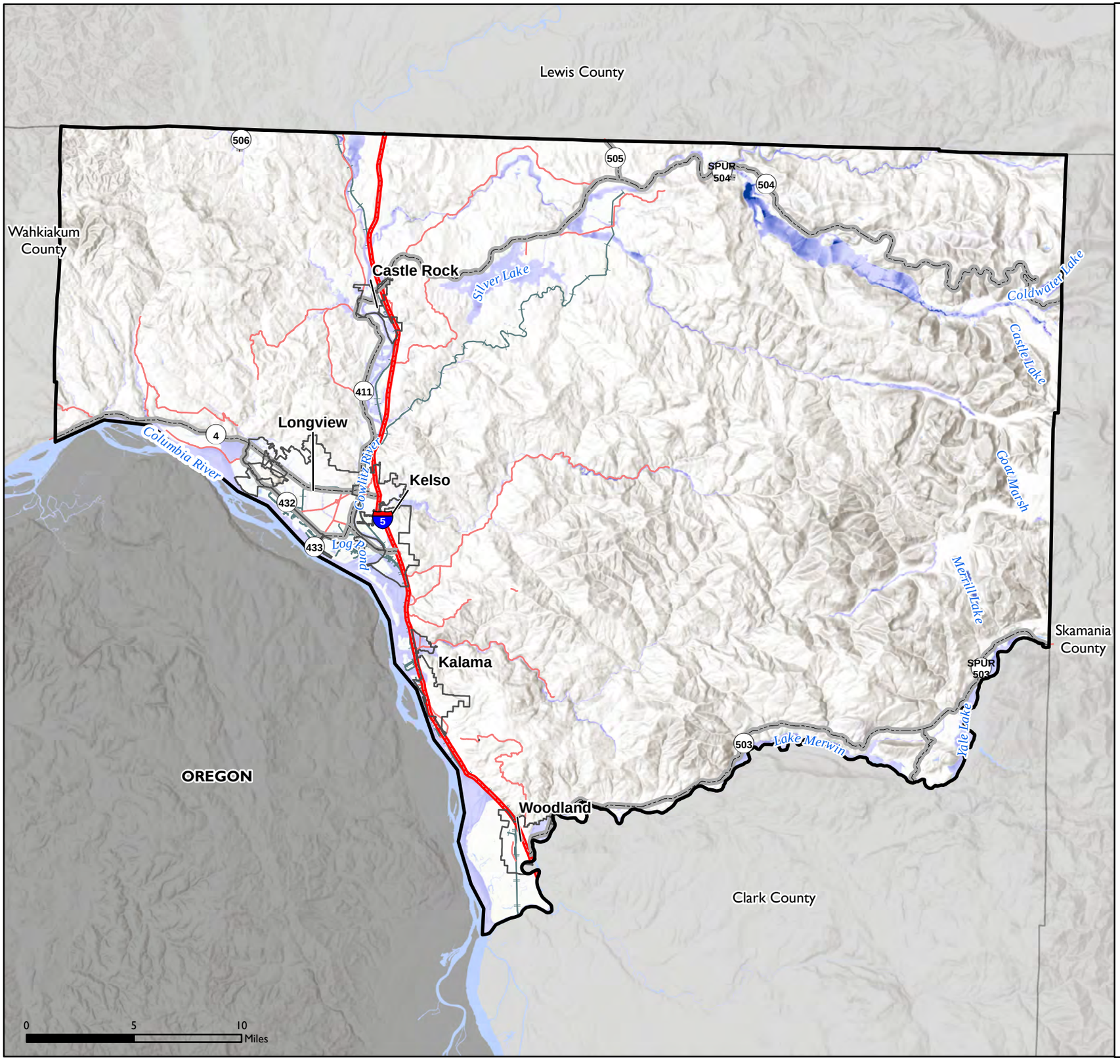
7.7 FREQUENCY

Recent history has shown that Cowlitz County can expect an average of one episode of minor river flooding each winter. Large, damaging floods typically occur every two to five years. Urban portions of the county annually experience nuisance flooding related to drainage issues.

7.8 SEVERITY

Although there was widespread flooding throughout Cowlitz County in 1964, 1972, 1975, and 1977, very little damage to major urban areas was incurred. Nevertheless, damage to county highways and bridges, and to telephone and electrical services could cause considerable loss of income and inconvenience to urban areas that would be cut off and isolated for any length of time. Domestic water-intake structures and sewage treatment plants located in the floodplain would be subject to damage if large amounts of heavy debris were transported by floodwaters. In the rural areas, the prime concern is damage to farmhouses and machinery, cattle and other livestock, and isolated residences within the floodplain. Damage to crops and the erosion of prime topsoil from agricultural land could result in extensive, long-term economic loss. Many low-lying areas which are protected by levees from riverine flooding may be subject to shallow ponding of interior runoff which cannot escape through normal drainage channels. This situation could be severe in residentially developed lowlands where there is no provision for storage and pumping out of excess runoff.

The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. Shallow flooding with high velocities can cause as much damage as deep flooding with slow velocity. This is especially true when a channel migrates over a broad floodplain, redirecting high velocity flows and transporting debris and sediment. Flood severity is often evaluated by examining peak discharges; Table 7-9 lists peak flows used by FEMA to map the floodplains of the planning area.



Cowlitz County

Figure 7-3.
1% Annual Chance Flood Hazard Areas in Cowlitz County

Flood Depth

High : > 25 ft

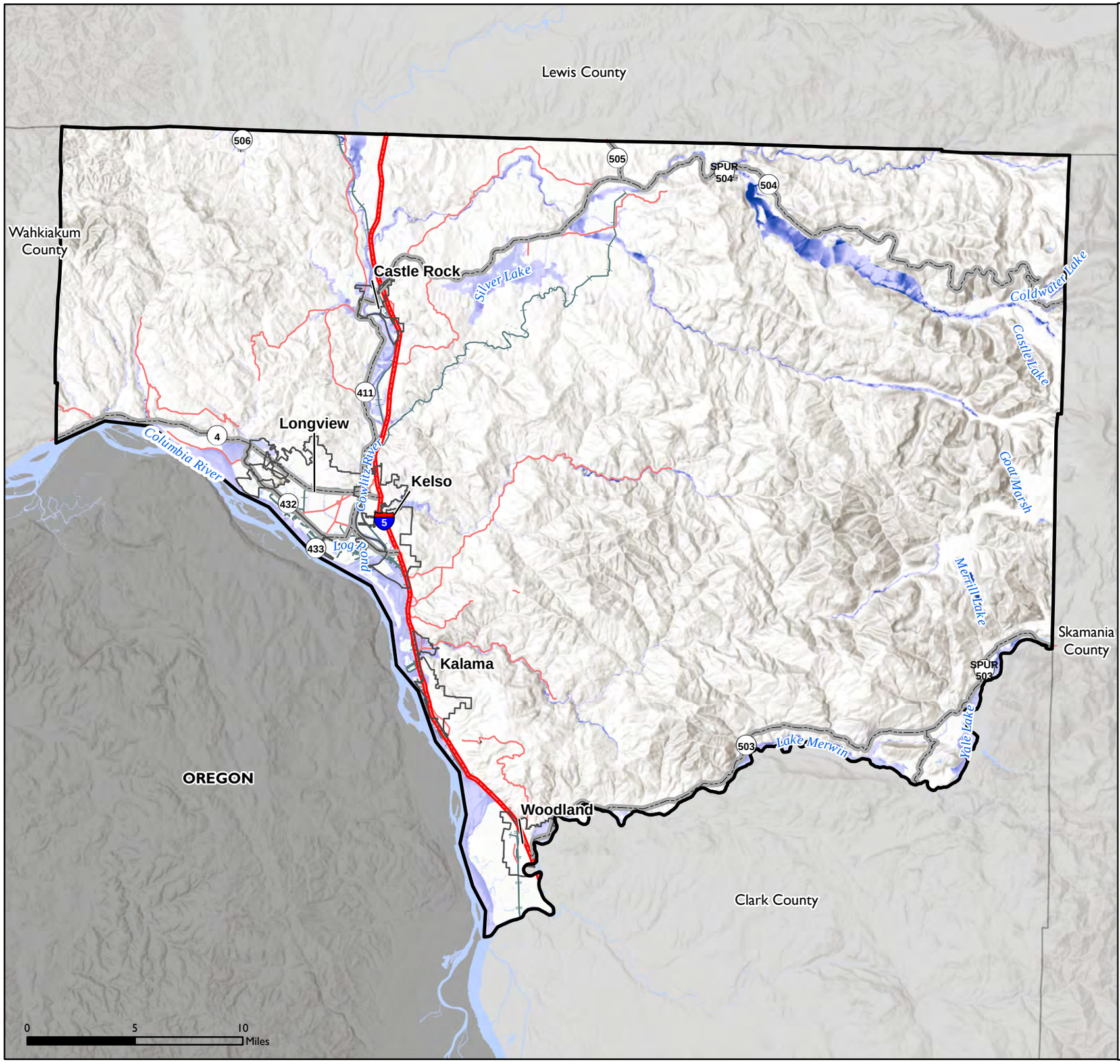
Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

Cowlitz County

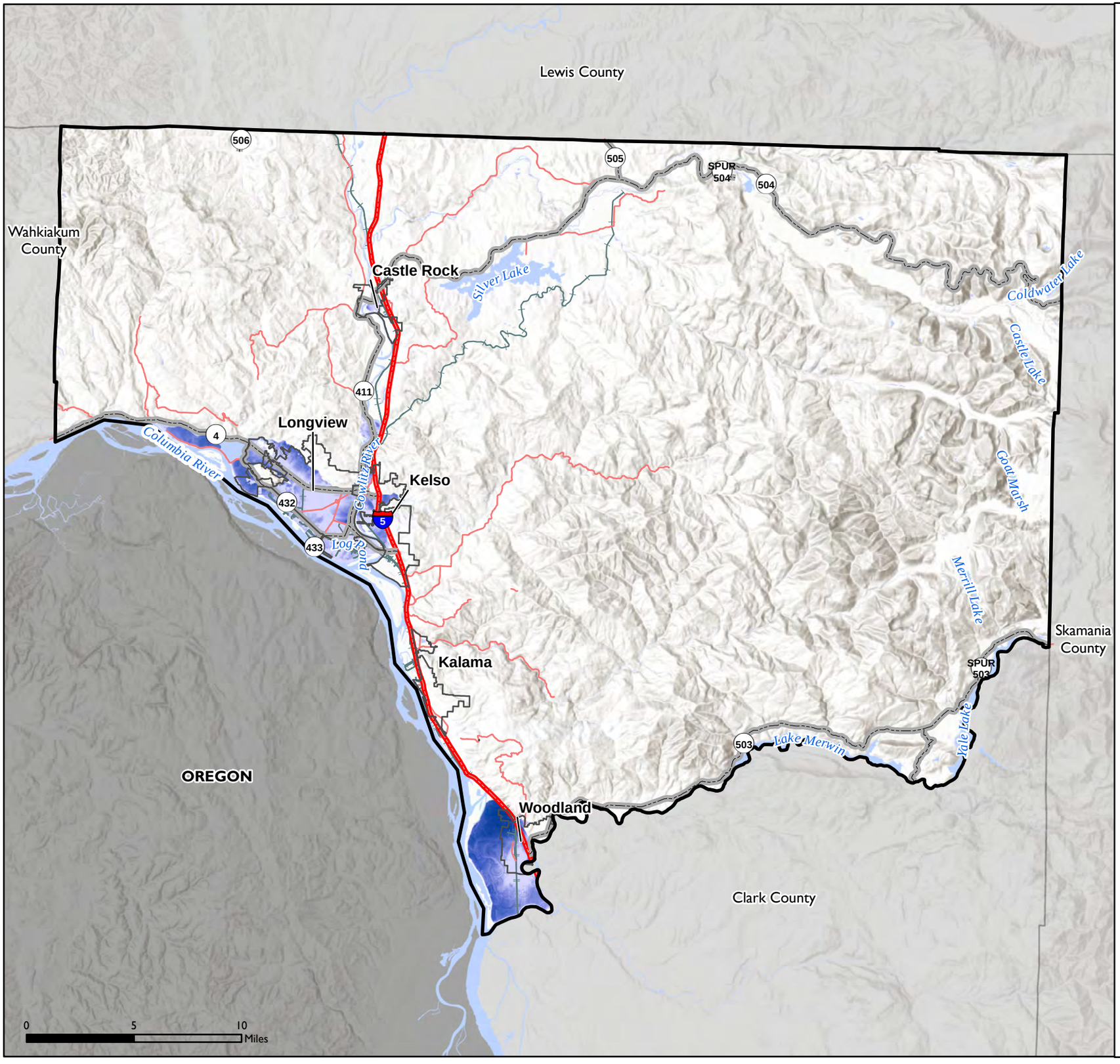
Figure 7-4.
0.2% Annual Chance Flood Hazard Areas in Cowlitz County



Flood Depth

- High : > 25 ft
- Low : 0 ft
- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



Cowlitz County

Figure 7-5.
Levee-Protected Areas in Cowlitz County Inundated in the Event of Levee Overtopping

Flood Depth

High : > 25 ft

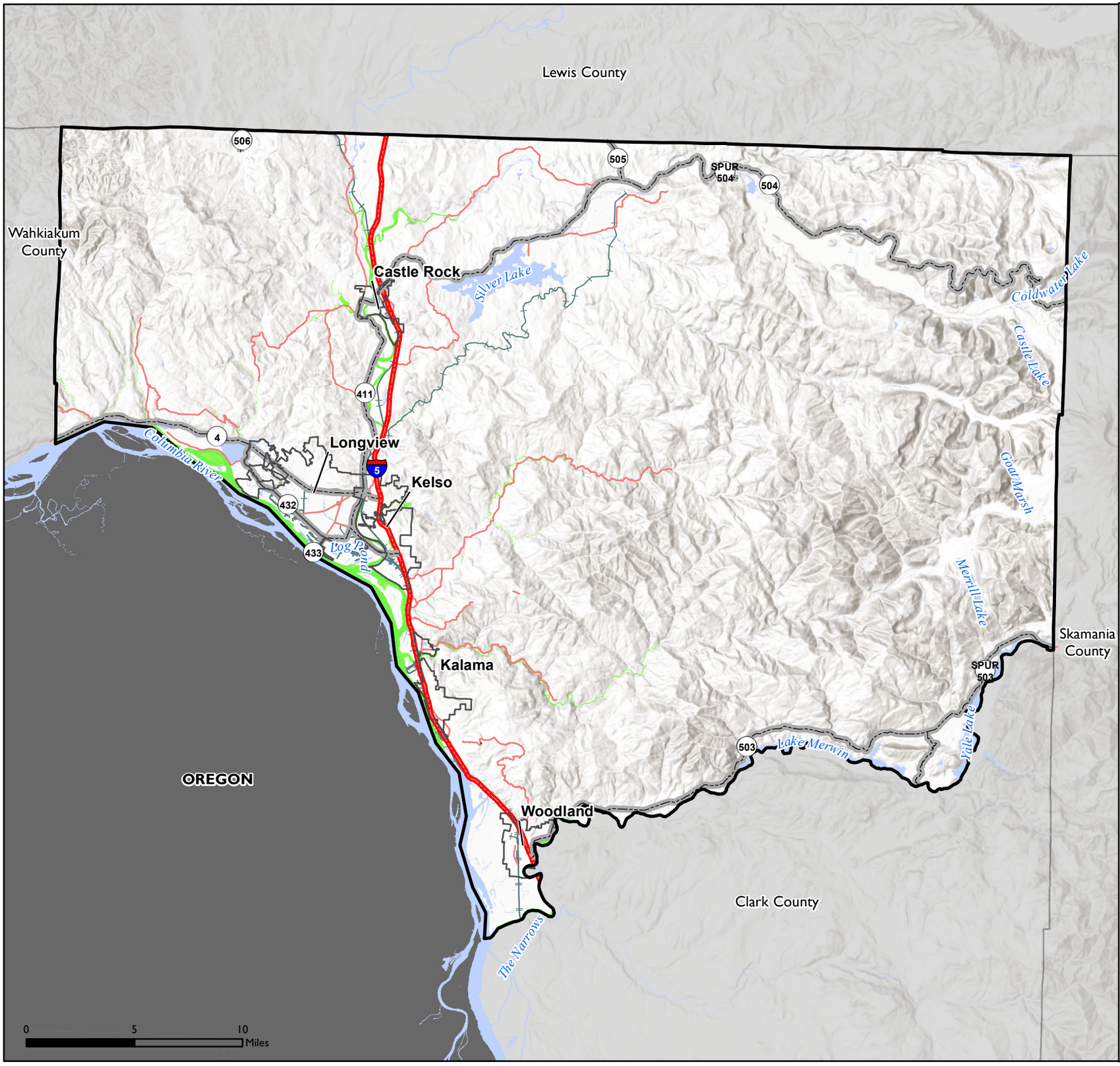
Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

Cowlitz County

Figure 7-6.
FEMA Floodway



- County Boundary
- Incorporated City
- Interstate
- State Route
- Railroad
- Floodway
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

Table 7-9. Summary of Peak Discharges in Unincorporated Cowlitz County

Source/Location	Drainage Area (square miles)	Discharge (cubic feet/second)			
		10-Year	50-Year	100-Year	500-Year
Abernathy Creek at confluence with Columbia River. Approximately 1/1 miles upstream of Abernathy Road Bridge	29.1	3,350	4,900	5,650	7,020
Approximately 1/1 miles upstream of Abernathy Road Bridge	12.8	1,1740	2,370	2,760	3,420
Arkansas Creek at confluence with Cowlitz	45.5	4,320	6,260	7,200	9,530
Upstream of Delameter Creek	20.3	1,860	2,760	3,110	4,220
Coal Creek at confluence with Coal Creek Slough	26.1	3,250	4,430	5,220	6,460
Approximately 2.25 miles upstream of Carlon Loop Road Bridge	8.2	1,160	1,530	1,730	2,120
Columbia River downstream of Cowlitz River	256,000	—	—	—	—
Coweeman River at confluence with Cowlitz River	127	8,000	10,500	11,600	14,400
At Kelso Gage	119	7,500	9,800	10,900	13,500
Upstream of Goble Creek	82.5	5,800	7,700	9,200	11,100
Cowlitz River downstream of Coweeeman River[a]	2,448	84,300	103,300	114,500	179,100
Downstream of Ostrander Creek[a]	2,313	78,300	94,400	104,300	165,600
Downstream of Arkansas Creek[a]	2,271	76,400	91,600	101,100	161,400
At Castle Rock[a]	2,217	74,000	88,000	97,000	156,000
Delameter Creek at confluence with Arkansas Creek	23.4	2,380	3,370	4,010	5,060
Germany Creek at confluence with Columbia River	23.5	2,920	3,920	4,450	5,620
Approximately 5.5 miles upstream of State Route 4 Bridge	17.9	2,480	3,280	3,800	4,640
Goble Creek at confluence with Coweeman River	26.5	2,590	3,610	4,090	5,040
Harmony Creek at confluence with Coal Creek	6.2	860	1,190	1,390	1,750
Kalama River at confluence with Coweeman River	205	16,500	22,450	25,000	31,500
Approximately 2.9 miles upstream of Weyerhaeuser Bridge	129.2	13,900	18,300	21,600	26,800
Lewis River at confluence with Columbia River[a]	1,046	75,000	114,100	132,700	181,000
At CC Street Bridge[a]	820	54,400	86,300	102,000	142,000
At USGS Gage No. 14220500[a]	731	49,000	79,000	94,000	132,000
Mill Creek at confluence with Columbia River	28.6	3,170	4,520	5,190	6,620
Approximately 130 feet upstream of Cowlitz/Wahkiakum County boundary	12.7	1,680	2,260	2,540	3,140
Monahan Creek at confluence with Delameter Creek	10.6	1,150	1,640	2,000	2,430
North Fork Goble Creek and confluence with Goble Creek	11.5	1,170	1,660	1,850	2,250
Ostrander Creek at confluence with Columbia River	26.4	1,790	3,030	3,580	4,660
South Fork Ostrander Creek at confluence with Ostrander Creek	9.3	570	1,080	1,300	1,790
Toutle River at confluence with Cowlitz River	512	26,900	43,500	51,100	65,900

a. Regulated by Mossyrock Dam

7.9 WARNING TIME

7.9.1 Flood Timing with Rainfall Events

Due to the sequential pattern of meteorological conditions needed to cause serious flooding, it is unusual for a flood to occur without warning. Warning times for floods can be between 24 and 48 hours. Flash flooding can be less predictable, but potential hazard areas can be warned in advance of potential flash flooding.

A hydrograph, which is a graph or chart illustrating stream flow in relation to time (see Figure 7-7.), is a useful tool for examining a stream's response to rainfall. Once rain starts falling over a watershed, runoff begins, and the stream begins to rise. Water depth in the stream (stage of flow) will continue to rise in response to runoff even after rainfall ends. Eventually, the runoff will reach a peak and the stage of flow will crest. The stream stage will remain the most stable at this point, exhibiting little change over time until it begins to fall and eventually subsides to a level below flooding stage.

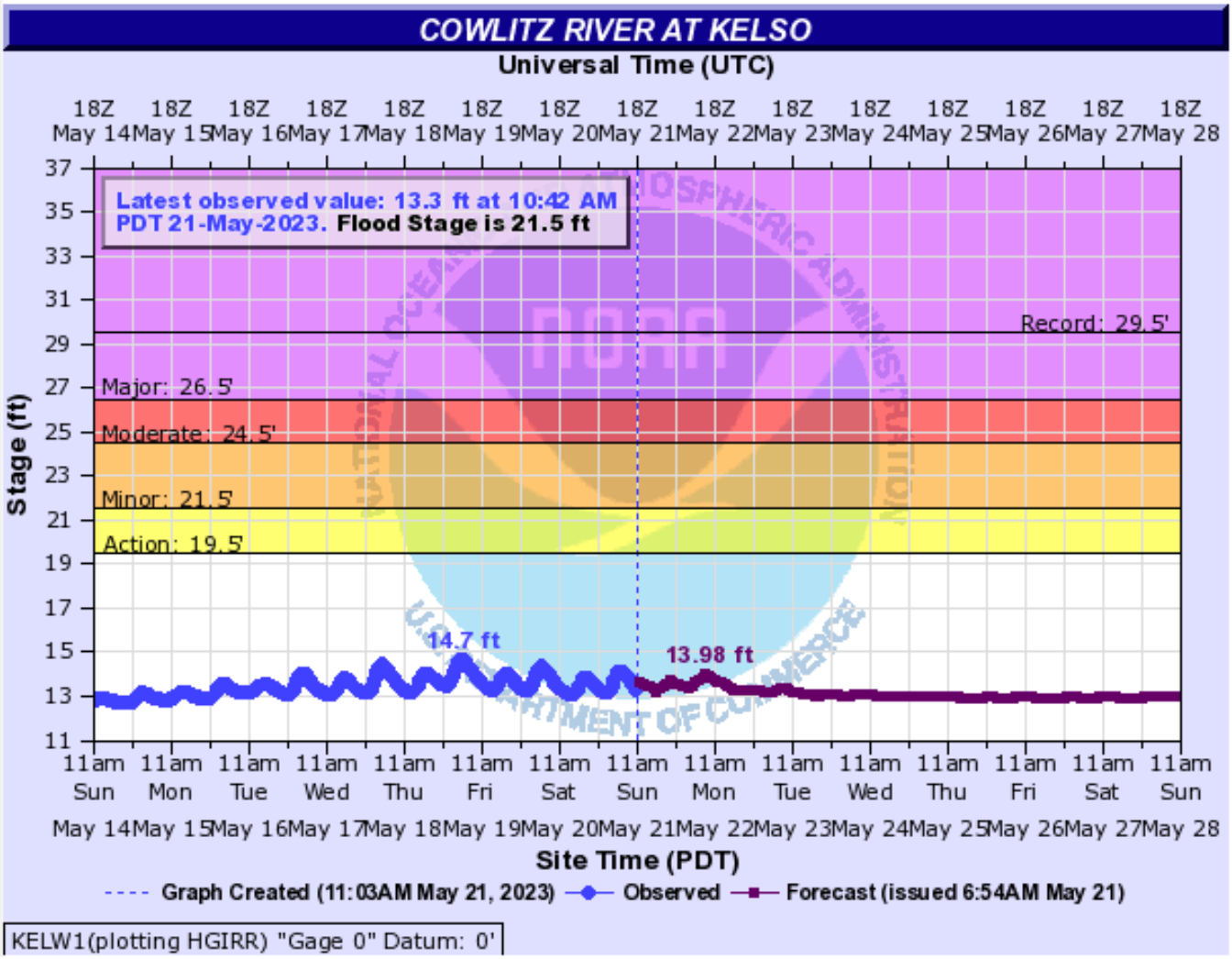


Figure 7-7. Cowlitz River Hydrograph at Kelso

The potential warning time a community has to respond to a flooding threat is a function of the time between the first measurable rainfall and the first occurrence of flooding. The time it takes to recognize a flooding threat reduces the potential warning time to the time that a community has to take actions to protect lives and property. Another element that characterizes a community's flood threat is the length of time floodwaters remain above flood stage.

7.9.2 Flood Threat Recognition Systems

The Cowlitz County flood threat recognition system consists, in part, of precipitation and U.S. Geological Survey stream gages at strategic locations in the county that constantly monitor and report rainfall and stream levels. To assess the flood threat along the major rivers in the county, the stream gage information is fed into a National Weather Service (NWS) river forecasting program. This program creates a forecast of the amount of flow expected in the stream for the next 10 days (measured in cubic feet per second), which can then be compared to the flood stages at those locations. For locations that do not have stream gages or river forecasts, the NWS also provides Doppler radar data and weather/flood forecast information that can determine other types of flood risk across the county, such as flash flooding, small stream flooding, etc. All of this information is analyzed to evaluate the flood threat and possible evacuation needs.

Flood Watches and Warnings

The NWS issues flood watches and warnings when forecasts indicate rivers may approach bank-full levels or when other types of localized flooding are possible. When a flood watch is issued, the public should prepare for the possibility of a flood. When a flood warning is issued, the public is advised to stay tuned to a local radio station for further information and be prepared to take quick action if needed. A flood warning means a flood is imminent, generally within 12 hours, or is occurring. Local media typically broadcast NWS watches and warnings; they can also be found online. If a flash flood warning is issued, which indicates that sudden or violent flooding is imminent or occurring, the Emergency Alert Service will alarm on NOAA weather radios and cut into local media broadcasts. Flash flood warnings will also trigger wireless emergency alerts on smart phones. Official thresholds for flood warnings have been established on the major rivers within Cowlitz County as follows:

- Cowlitz River at Kelso—Action stage at 19.5 feet
- Cowlitz River at Castle Rock—Action stage at 46.0 feet
- Columbia River at Longview—Action State at 12 feet
- Lewis River at Woodland—Action stage at 22 feet

There are several more stream gages across the county for areas that do not currently have river forecasts or predetermined flood stages. These gages are monitored for situational awareness during flood events.

7.10 SECONDARY HAZARDS

The most problematic secondary hazard for flooding is bank erosion, which in some cases can be more harmful than actual flooding. This is especially true in the upper courses of rivers with steep gradients, where floodwaters may pass quickly and without much damage, but scour the banks, edging properties closer to the floodplain or causing them to fall in. Erosion hazard areas are areas identified by the U.S. Department of Agriculture's Natural Resource Conservation Service as having a "severe" or "very severe" erosion hazard. Erosion hazard areas are

also those areas impacted by shore land or stream bank erosion and areas within a stream's channel migration zone (Cowlitz County 2023).

Flooding is also responsible for hazards such as landslides when high flows over-saturate soils on steep slopes, causing them to fail. Landslide hazard areas are areas potentially subject to landslides based on a combination of geologic, topographic, and hydrologic factors. They include areas susceptible because of any combination of bedrock, soil, slope (gradient), slope aspect, structure, hydrology, or other factors (Cowlitz County 2023).

Hazardous materials spills are also a secondary hazard of flooding if storage tanks rupture and spill into streams, rivers or storm sewers.

7.11 FUTURE TRENDS

Since 2000, the population of Cowlitz County has increased by 17.3 percent, an average annual growth rate 0.88 percent. The County's Comprehensive Plan has adopted goals, objectives, policies and actions with regards to frequently flooded areas. These plan components strive to steer future trends in development away from increasing flood risks in Cowlitz County. Cowlitz County's critical areas regulations regulate how development and redevelopment can safely occur on lands that contain critical areas. Additionally, Cowlitz County and its cities participate in the NFIP and have adopted flood damage prevention ordinances in response to its requirements. Cowlitz County has committed to maintaining its good standing under the NFIP through actions identified in this plan.

7.12 SCENARIO

The primary water courses in the planning area have the potential to flood at regular intervals (disaster declarations for flooding have been issued an average of once every 2.75 years), generally in response to a succession of intense winter rainstorms or other seasonal short-duration, high-intensity storms. Storm patterns of warm, moist air usually occur between early November and late March. A series of such weather events can cause severe flooding in the planning area. The worst-case scenario is a series of storms that flood numerous drainage basins in a short time or that lead to riverine or flash flooding. This could overwhelm response and floodplain management capabilities within the planning area. Major roads could be blocked, preventing critical access for many residents and critical functions. High in-channel flows could cause water courses to scour, possibly washing out roads and creating more isolation problems. In the case of multi-basin flooding, Cowlitz County would not be able to make repairs quickly enough to restore critical facilities and infrastructure. The floodplains mapped and identified by Cowlitz County will continue to take the brunt of these floods. Additionally, as the ground becomes saturated, groundwater flooding typical of the planning area would be significant.

7.13 ISSUES

Important issues associated with flood hazards in the planning area include but are not limited to the following issues identified by the Steering Committee:

- Programs to sustain efforts to gather historical damage data (such as high-water marks on structures and damage reports) to measure the cost-effectiveness of future mitigation projects are lacking within the planning area.
- Ongoing flood hazard mitigation will require funding from multiple sources.

- There needs to be a coordinated hazard mitigation effort between jurisdictions affected by flood hazards in the County.
- Floodplain residents need to continue to be educated about flood preparedness and the resources available during and after floods. This includes properties within levee-protected areas.
- The potential impact of climate change on flood conditions needs to be better understood.
- The County's adaptive capacity to address impacts of climate change should be evaluated.
- Floodplain compatible uses such as low-impact development, open-space preservation and low-density development should be considered where feasible, and both publicly and politically supported.
- The capability for prediction/forecast modeling needs to be enhanced.
- Flood warning capability should be tied to flood phases.
- There needs to be enhanced modeling to better understand the true flood risk.
- Floodplain restoration/reconnection opportunities should be identified as a means to reduce flood risk.
- Post-flood disaster response and recovery actions need to be solidified.
- Staff capacity is required to maintain the existing level of floodplain management.
- The approximate mapping on FEMA's current effective Flood Insurance Rate Maps has been found to have significant inaccuracies.
- The increasing cost of flood insurance is shifting the public's perception of flood risk.
- Certification/accreditation of levees could be a challenge when accounting for future floodplain conditions.
- The stormwater/urban drainage flooding risk has not been mapped, which makes it difficult to assess this hazard, other than looking at historical loss data.
- A lack of awareness about flood risk by property owners and other stakeholders can translate to a lack of political will to make changes.
- With a large percentage of pre-FIRM flood insurance policies in force, the County can expect to see significant increases in the costs of flood insurance to its residents. This will create challenges in the promotion of flood insurance and residents' ability to afford flood insurance.

8. FLOOD HAZARD EXPOSURE

The Level 2 (user-defined) Hazus protocol was used to assess exposure to flooding in the planning area. The model used census data at the block level and FEMA floodplain data, as reflected on the December 16, 2015, Flood Insurance Rate Map (FIRM) for Cowlitz County (Federal Emergency Management Agency 2015). These sources offer a level of accuracy acceptable for planning purposes. The following sections address exposure to the 10-percent, 2-percent, 1-percent, and 0.2-percent annual chance floods, and FEMA's mapped area with reduced risk due to levee. Appendix F provides a detailed breakdown of all risk assessment results by local community.

8.1 POPULATION

To estimate populations exposed to the flood hazard, the total planning area population was multiplied by the ratio of the number of structures in the floodplain to the total number in the planning area. Using this approach, exposed populations were estimated as follows:

- 10-percent annual chance floodplain—309 (less than 0.1 percent of the planning area population)
- 2-percent annual chance floodplain—1,265 (1.2 percent of the planning area population)
- 1-percent annual chance floodplain—5,062 (4.7 percent of the planning area population)
- 0.2-percent annual chance floodplain—6,935 (6.4 percent of the planning area population).
- Levee-protected areas—48,405 (44.5 percent of the planning area population)

According to the National Risk Index report for Cowlitz County, socially vulnerable groups in the county have a relatively high susceptibility to the adverse impacts of natural hazards compared to the rest of the United States. Cowlitz County scores in the 70.66 percentile nationally for social vulnerability as shown in Figure 8-1..

8.2 PROPERTY

8.2.1 Structures in the Floodplain

The Hazus model determined that there are 1,564 structures within the mapped 1-percent annual chance floodplain; 96 percent are residential occupancy. In the 0.2-percent annual chance floodplain, Hazus determined that there are 2,188 structures in the floodplain. More than 96 percent of these structures are residential. In the levee-protected areas, Hazus determined that there are over 16,700 structures at risk, over 89 percent of which are residential structures. The City of Woodland has the most structures in both the 1-percent and 2-percent annual chance floodplains. The City of Longview has the most structures in the levee-protected areas.

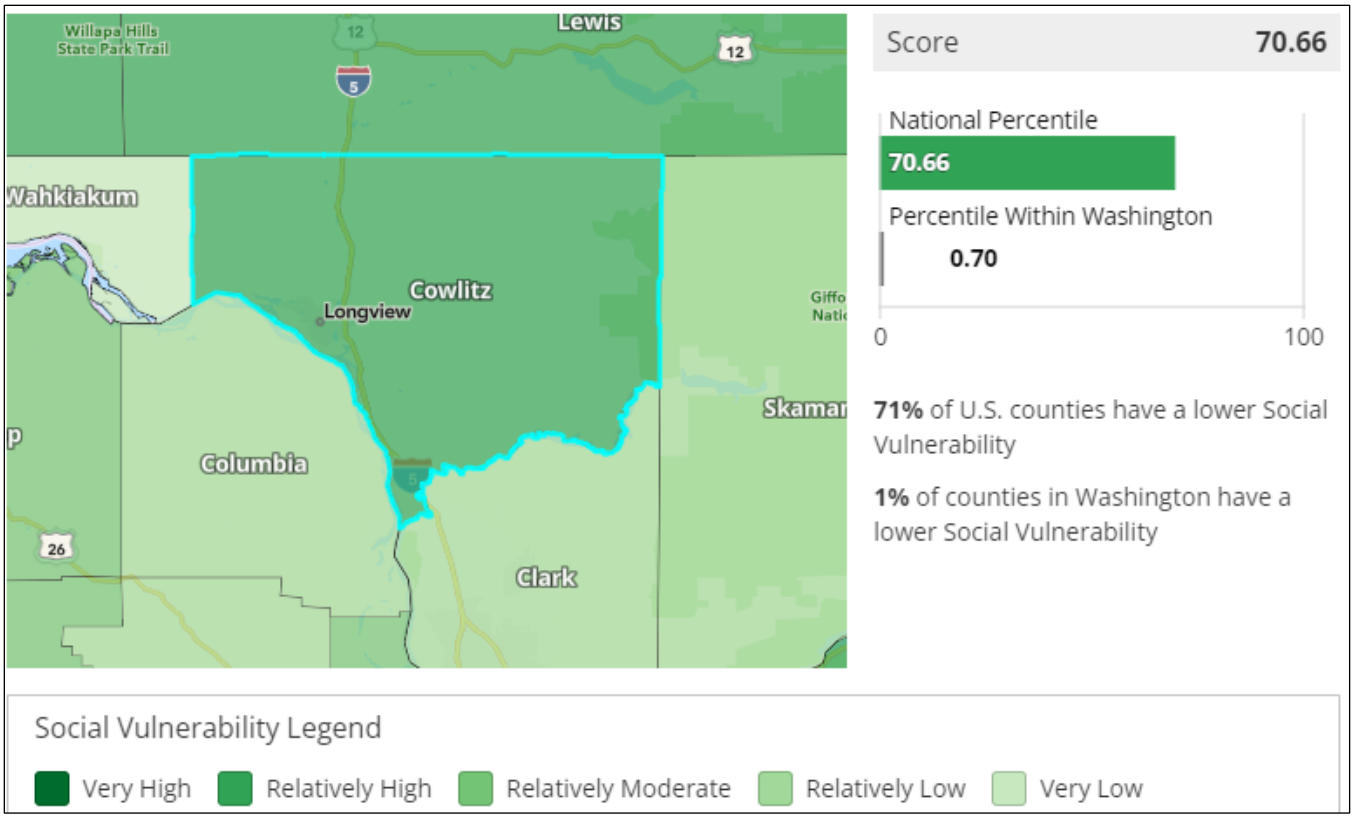


Figure 8-1. National Risk Index Ranking for Social Vulnerability

The total number of structures within the 1-percent annual chance floodplain represent 4 percent of the total structures in the county. The number of structures in the 0.2-percent annual chance floodplain represents 5.6 percent of the total structures in the county. The total number of structures in the levee-protected areas represent 42.9 percent of the total structures in the county. The total area and number of structures in the floodplain are summarized by community for the 1-percent annual chance floodplain, 0.2-percent annual chance floodplain, and levee-protected area in Table 8-1 through Table 8-3

Table 8-1. Area and Structures Within the 1% Annual Chance Floodplain by Municipality

	Area	Number of Structures							
	(acres)	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	433	47	1	0	0	1	0	0	**49**
Kalama	488	6	6	0	0	0	0	0	**12**
Kelso	960	13	6	0	0	0	0	0	**19**
Longview	664	28	7	0	0	0	1	0	**36**
Woodland	533	859	7	3	0	5	2	0	**876**
Unincorporated	40,224	550	18	0	0	3	0	1	**572**
Total	**43,302**	**1503**	**45**	**3**	**0**	**9**	**3**	**1**	**1564**

Table 8-2. Area and Structures Within the 0.2% Annual Chance Floodplain by Municipality

	Area	Number of Structures							
	(acres)	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	578	76	7	0	0	1	0	1	**85**
Kalama	548	7	7	0	0	0	0	0	**14**
Kelso	1,006	15	6	0	0	0	0	0	**21**
Longview	792	361	8	0	0	0	1	0	**370**
Woodland	588	919	8	3	0	5	2	2	**939**
Unincorporated	41,144	726	28	1	0	3	0	1	**759**
Total	**44,656**	**2104**	**64**	**4**	**0**	**9**	**3**	**4**	**2188**

Table 8-3. Area and Structures Within the Levee-Protected Areas by Municipality

	Area	Number of Structures							
	(acres)	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	208	494	64	0	0	14	7	3	**582**
Kalama	0	0	0	0	0	0	0	0	**0**
Kelso	1,522	1,828	257	7	0	14	6	14	**2,126**
Longview	7,039	9,582	815	25	0	67	18	20	**10,527**
Woodland	1,954	706	210	27	1	11	5	6	**966**
Unincorporated	10,646	2401	109	13	1	14	2	3	**2,543**
Total	**21,369**	**15,011**	**1455**	**72**	**2**	**120**	**38**	**46**	**16,744**

8.2.2 Land Use in the Floodplain

Some land uses are more vulnerable to flooding, such as single-family homes, while others are less vulnerable, such as agricultural land or parks. Table 8-4 shows the present land use of all parcels in the 1-percent annual chance floodplain (regulated floodplain) within the planning area based on County Assessor data, including vacant parcels and parcels in public/open space uses. This analysis focuses on the 1-percent annual chance floodplain as that is the area subject to regulation under flood damage prevention ordinances in the planning area.

Table 8-4. Present Land Use Within the Floodplain in Unincorporated Areas

	1% Annual Chance Floodplain	
Land Use	**Area (acres)**	**% of Floodplain Total Area**
Economic Resource Land Agriculture	681.0	1.6%
Economic Resource Land Forestry	4,818.3	11.1%
Economic Resource Land Industrial	1,941.7	4.5%
Economic Resource Land Mineral Resource Land	208.5	0.5%
Remote	12,873.1	29.7%
Rural	5,893.9	13.6%
Smallholding	5,786.6	13.4%
Suburban	438.2	1.0%
Urban	437.5	1.0%
Other	10,225.2	23.6%
Total	**43,304**	100.00%

Source: Cowlitz County Comprehensive Plan 2017 Update.

8.2.3 Exposed Value

The Hazus analysis estimated the exposed value of buildings and contents as follows:

- $81.9 million of building-and-contents exposure to the 10-percent annual chance flood, representing less than 1 percent of the planning area total replacement value (See Table 8-5)
- $173. 7 million of building-and-contents exposure to the 2-percent annual chance flood, representing less than 1 percent of the planning area total replacement value (See Table 8-6)
- $1.08 billion of building-and-contents exposure to the 1-percent annual chance flood, representing 3.2 percent of the planning area total replacement value (see Table 8-7). The Columbia River Basin area of the unincorporated county has the highest percentage of its building replacement value exposed to the 1-percent annual chance flood at 17.3 percent (see Appendix F).
- $1.49 billion of building and contents exposure to the 0.2-percent annual chance flood, representing 4.4 percent of the planning area total replacement value (see Table 8-8). The Columbia River Basin area of the unincorporated county has the highest percentage of its building replacement value exposed to the 0.2-percent annual chance flood at 17.3 percent (see Appendix F).
- $21.7 billion of building and contents exposure within the levee-protected areas, representing 64.1 percent of the planning area total replacement value (see Table 8-9). The Unincorporated County CDID 3 planning area has the highest percentage of its building replacement value exposed within the levee-protected areas at 100 percent (see Appendix F).

Table 8-5. Value of Structures in the 10% Annual Chance Floodplain by Municipality

	Value Exposed			% of Total
	Structure	Contents	Total	Replacement Cost
Castle Rock	$0	$0	$0	0.0%
Kalama	$20,183,280	$20,183,280	$40,366,560	4.4%
Kelso	$0	$0	$0	0.0%
Longview	$0	$0	$0	0.0%
Woodland	$8,219,341	$4,109,671	$12,329,012	0.4%
Unincorporated County	$17,027,829	$12,187,722	$29,215,551	0.09%
Total	**$45,430,450**	**$36,480,673**	**$81,911,123**	**0.2%**

Table 8-6. Value of Structures in the 2% Annual Chance Floodplain by Municipality

	Value Exposed			% of Total
	Structure	Contents	Total	Replacement Cost
Castle Rock	$0	$0	$0	0.0%
Kalama	$29,956,339	$29,685,200	$59,641,538	6.6%
Kelso	$0	$0	$0	0.0%
Longview	$0	$0	$0	0.0%
Woodland	$70,862,959	$4,242	$70,867,201	2.3%
Unincorporated County	$26,367,255	$16,857,435	$43,224,690	0.13%
Total	**$127,186,553**	**$46,546,877**	**$173,733,429**	**0.5%**

Table 8-7. Value of Structures in the 1% Annual Chance Floodplain by Municipality

	Value Exposed			% of Total
	Structure	Contents	Total	Replacement Cost
Castle Rock	$14,877,346	$10,140,925	$25,018,271	2.4%
Kalama	$32,703,259	$31,575,690	$64,278,948	7.1%
Kelso	$61,513,113	$56,535,265	$118,048,377	2.7%
Longview	$21,359,488	$15,264,240	$36,623,729	0.3%
Woodland	$278,834,295	$157,159,565	$435,993,859	14.4%
Unincorporated County	$229,754,991	$168,885,938	$398,640,928	2.9%
Total	**$639,042,492**	**$439,561,623**	**$1,078,604,112**	**3.2%**

Table 8-8. Value of Structures in the 0.2% Annual Chance Floodplain by Municipality

	Value Exposed			% of Total
	Structure	Contents	Total	Structure
Castle Rock	$54,320,555	$46,420,557	$100,741,113	9.7%
Kalama	$41,548,519	$40,202,510	$81,751,029	9.0%
Kelso	$66,805,476	$59,181,447	$125,986,922	2.9%
Longview	$118,780,227	$64,041,003	$182,821,229	1.7%
Woodland	$305,013,659	$175,355,500	$480,369,158	15.9%
Unincorporated County	$303,264,556	$217,742,707	$521,007,263	3.8%
Total	**$889,732,992.00**	**$602,943,724.00**	**$1,492,676,714.00**	**4.4%**

Table 8-9. Value of Structures in the Levee-Protected Areas

	Value Exposed			% of Total
	Structure	Contents	Total	Structure
Castle Rock	$372,972,449	$326,015,911	$698,988,360	67.3%
Kalama	$0	$0	$0	0.0%
Kelso	$1,711,589,593	$1,557,802,227	$3,269,391,820	74.1%
Longview	$5,480,332,630	$4,381,899,132	$9,862,231,762	90.2%
Woodland	$1,268,333,369	$1,260,470,887	$2,528,804,255	83.6%
Unincorporated County	$2,474,898,887	$2,902,041,284	$5,376,940,171	15.86%
Total	**$11,308,126,928.00**	**$10,428,229,441.00**	**$21,736,356,368.00**	**64.1%**

8.3 CRITICAL FACILITIES AND INFRASTRUCTURE (LIFELINES)

Table 8-10 summarize the planning area lifelines in the 10-percent, 2-percent, 1-percent, 0.2-percent annual chance floodplains and levee-protected areas. See Appendix F for a detailed breakdown by community. Additional details are provided in the following sections.

Table 8-10. Community Lifelines in Flood Hazard Areas

	Number of Exposed Facilities				
	10% Annual Chance Floodplain	2% Annual Chance Floodplain	1% Annual Chance Floodplain	0.2% Annual Chance Floodplain	Levee-Protected Areas
Communications	0	0	0	0	8
Energy	0	0	0	0	0
Food, Water, Shelter	1	1	2	2	4
Hazardous Material	0	0	2	2	24
Health and Medical	0	0	1	5	33
Safety and Security	0	1	4	6	69
Transportation	10	14	60	65	13
Total	**11**	**16**	**69**	**80**	**151**

8.3.1 Hazardous Materials Facilities

Hazardous materials facilities are those that use or store materials that can harm the environment if damaged by a flood. During a flood event, containers holding these materials can rupture and leak into the surrounding area, having a disastrous effect on the environment as well as residents. According to the Hazus analysis, there are 24 businesses in any of the mapped flood hazard areas that report having hazardous materials under the Environmental Protection Agency's Toxic Release Inventory program.

8.3.2 Infrastructure Lifelines

Populations can be at risk if infrastructure is damaged by flooding. Roads or railroads that are blocked or damaged can isolate residents and prevent access, including for emergency service providers needing to get to vulnerable populations or to make repairs. Bridges washed out or blocked by floods or debris also can cause isolation. Water and sewer systems can be flooded or backed up, causing health problems. Underground utilities can be damaged. Dikes can fail or be overtopped, inundating the land that they protect. The following sections describe exposure of specific types of critical infrastructure.

Roads

The following major roads in the planning area pass through the 1-percent annual chance/0.2-percent annual chance floodplains and thus are exposed to flooding:

- Interstate Highway 5
- State Route 411
- State Route 432
- State Route 503
- State Route 504
- State Route 505
- Westside Highway
- Ocean Beach Highway
- Willow Grove Road
- Delameter Road
- Old Pacific Highway
- Lewis & Clark Trail Highway
- Lewis River Road
- Dike Road, SW
- Kalama River Road, W
- Hendrickson Drive, N
- Tennant Way

Some of these roads are built above the flood level, and others function as levees to prevent flooding. Still, in severe flood events these roads can be blocked or damaged, preventing access to some areas.

Bridges

Flooding can significantly impact road bridges, which provide the only ingress and egress to some areas. While most bridges within the planning area are sufficiently protected from the impacts of flooding, some may have support structures within the river channel that can be exposed to erosion and scour damage in high flow events. There are 63 bridges that are in or cross over the 1-percent or 0.2-percent annual chance floodplain and 13 road or railway bridges within levee-protected areas in the planning area.

Water and Sewer Infrastructure

Floodwaters can back up drainage systems, causing localized flooding. Culverts and catch basins can be blocked by debris from flood events, also causing localized urban flooding. Floodwaters can get into drinking water supplies, causing contamination. Sewer systems can be backed up, causing wastewater to spill into homes, neighborhoods, rivers and streams. According the Hazus Analysis, there are six wastewater facilities within the flood hazard areas assessed by this plan.

8.4 ENVIRONMENT

Flooding is a natural event and floodplains provide many natural and beneficial functions. Nonetheless, flooding can impact the environment in negative ways, especially when compounded with impacts from human development. Migrating fish can wash into roads or over levees into flooded fields. Pollution from roads, such as oil, and hazardous materials can wash into rivers and streams. During floods, these pollutants can settle onto normally dry soils, polluting them for agricultural uses. Human development such as bridge abutments and levees, and logjams from timber harvesting can increase stream bank erosion, causing rivers and streams to migrate into non-natural courses.

9. FLOOD HAZARD VULNERABILITY

Many areas exposed to flooding may not experience serious flooding or flood damage. Vulnerability can be defined as the extent of harm that can be expected under certain conditions of exposure, susceptibility, and resilience. Defining vulnerability can help flood hazard managers understand the best ways to reduce it. The main objective in assessing vulnerability is to inform decision-makers or specific stakeholders about options for adapting to the impact of flooding hazards. This section describes vulnerabilities in terms of population, property, critical facilities infrastructure and environment.

9.1 POPULATION

9.1.1 Impacts on People

Table 9-1 summarizes Hazus-estimated impacts on the planning area population for each flood scenario.

Table 9-1. Estimated Flood Impact on Persons in Unincorporated Areas

	Displaced Persons	Persons Requiring Publicly Provided Short-Term Shelter[a]
10% Annual Chance Flood	117	8
2% Annual Chance Flood	773	36
1% Annual Chance Flood	2,803	146
0.2% Annual Chance Flood	3,606	200
Levee-Protected Areas	43,656	1,776

a. The number of persons requiring publicly provided shelter is less than the number of displaced persons because not all households will require public assistance to find short-term shelter.

9.1.2 Vulnerable Populations

An analysis using Hazus model demographic data (based on 2020 U.S. Census data) identified populations vulnerable to the flood hazard as summarized in Table 9-2.

Table 9-2. Estimated Percentage of Vulnerable Populations in the Floodplain

	Vulnerable Population as % of Total Population in the Floodplain	
	1% Annual Chance Floodplain	0.2% Annual Chance Floodplain
Economically Disadvantaged Populations[a]	19.8%	19.7%
Population over 64 Years Old	19.7%	19.6%
Population under 18 Years Old	23.2%	23.1%

a. Economically disadvantaged defined as households with incomes of $30,000 or less

In addition, persons with disabilities or others with access and functional needs are more likely to have difficulty responding to a flood or other hazard event than the general population. Local government is the first level of response to assist these individuals, and coordination of efforts to meet their access and functional needs is paramount to life safety efforts. It is important for emergency managers to distinguish between functional and medical needs in order to plan for incidents that require evacuation and sheltering. Knowing the percentage of population with a disability will allow emergency management personnel and first responders to have personnel available who can provide services needed by those with access and functional needs. According to the 2017 – 2021 Census estimates, 14.6 percent of the population, under age 65 years, in Cowlitz County has some form of disability.

9.1.3 Public Health and Safety

Floods present threats to public health and safety. Floodwater is generally contaminated by pollutants such as sewage, human and animal feces, pesticides and insecticides, fertilizers, oil, asbestos, and rusting building materials. The following health and safety risks are commonly associated with flood events:

- **Unsafe food—**Floodwaters contain disease-causing bacteria, dirt, oil, human and animal wastes, and farm and industrial chemicals. They carry away whatever lies on the ground and upstream. Their contact with food items, including food crops in agricultural lands, can make that food unsafe to eat and hazardous to human health. Power failures caused by floods damage stored food. Refrigerated and frozen foods are affected during the outage periods, and thus must be carefully monitored and examined prior to consumption. Foods kept inside cardboard, plastic bags, jars, bottles, and paper packaging are subject to disposal if contaminated by floodwaters. Even though the packages do not appear to be wet, they may be unhygienic with mold contamination and deteriorate rapidly.
- **Contaminated drinking and washing water and poor sanitation—**Flooding impairs clean water sources with pollutants and affects sanitary toilets. Direct and indirect contact with the contaminants—whether through direct food intake, vector insects such as flies, unclean hands, or dirty plates and utensils—can result in waterborne infectious disease. Wastewater treatment plants, if flooded and caused to malfunction, can be overloaded with polluted runoff waters and sewage beyond their disposal capacity, resulting in backflows of raw sewage to homes and low-lying grounds. Private wells can be contaminated or damaged severely by floodwaters, while private sewage disposal systems can become a cause of infection and illnesses if they are broken or overflow. Unclean drinking and washing water and sanitation, coupled with lack of adequate sewage treatment, can lead to disease outbreaks, including life-threatening cholera, typhoid, dysentery and some forms of hepatitis.
- **Mosquitoes and animals—**Prolonged rainfall and floods provide new breeding grounds for mosquitoes—wet areas and stagnant pools—and can lead to an increase in the number of mosquito-borne diseases such as malaria and dengue and West Nile fevers. Rats and other rodents and wild animals also can carry viruses and diseases. The public should avoid such animals and should dispose of dead animals in accordance with guidelines issued by local animal control authorities.
- **Molds and mildews—**Excessive exposure to molds and mildews can cause flood victims—especially those with allergies and asthma—to contract upper respiratory diseases and to trigger cold-like symptoms such as sore throat, watery eyes, wheezing and dizziness. Molds grow in as short a period as 24 to 48 hours in wet and damp areas of buildings and homes that have not been cleaned after flooding, such as water-infiltrated walls, floors, carpets, toilets and bathrooms. Very small mold spores can be easily inhaled by human bodies and, in large enough quantities, cause allergic reactions, asthma episodes, and other respiratory problems. Infants, children, older adults and pregnant women are considered most vulnerable to mold-induced health problems.

- **Carbon monoxide poisoning—**Carbon monoxide poisoning is as a potential hazard after major floods. Carbon monoxide can be found in combustion fumes, such as those generated by small gasoline engines, stoves, generators, lanterns and gas ranges, or by burning charcoal or wood. In the event of power outages following floods, flood victims tend to use alternative sources of fuels for heating, cooling, or cooking inside enclosed or partly enclosed houses, garages or buildings without an adequate level of air ventilation. Carbon monoxide builds up from these sources and poisons the people and animals inside.
- **Hazards when reentering and cleaning flooded homes and buildings—**Flooded buildings can pose health hazards after floodwaters recede. Electrical power systems can become hazardous. People should avoid turning on or off the main power while standing in floodwater. Gas leaks from pipelines or propane tanks can trigger explosion when entering and cleaning damaged buildings or working to restore utility service. Flood debris—such as broken bottles, wood, stones and walls—may cause wounds and injuries when cleaning damaged buildings. Containers of hazardous chemicals, including pesticides, insecticides, fertilizers, car batteries, propane tanks and other industrial chemicals, may be hidden or buried under flood debris. A health hazard can also occur when hazardous dust and mold in ducts, fans and ventilators of air-conditioning and heating equipment are circulated through a building and inhaled by those engaged in cleanup.
- **Mental stress and fatigue—**Exposure to extreme disaster events can cause psychological distress. Having experienced a devastating flood, seen loved ones lost or injured, and homes damaged or destroyed, flood victims can experience long-term psychological impact. The expense and effort required to repair flood-damaged homes places severe financial and psychological burdens on the people affected, in particular the unprepared and uninsured. Post-flood recovery—especially when prolonged—can cause anxiety, anger, depression, lethargy, hyperactivity, sleeplessness, and, in an extreme case, suicide. Behavior changes may also occur in children. There is also a long-term concern among the affected that their homes can be flooded again in the future.

Current loss estimation models such as Hazus are not equipped to measure public health impacts. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events.

9.1.4 Domestic Animals

In addition to human populations, domestic animals, specifically pets and livestock, may be vulnerable in flood events. Domestic animals must be included in evacuation and sheltering plans for their protection and the protection of their owners, who may risk their own lives to ensure the safety of their animals.

9.2 PROPERTY

9.2.1 Loss Estimates

Hazus calculates flood losses to structures based on flooding depth and structure type. Using historical flood insurance claim data, Hazus estimates the percentage of damage to structures and their contents by applying established damage functions to an inventory. For this analysis, local, user-defined data on facilities was used instead of the default inventory data provided with Hazus. The results of these analyses for the scenario flood events are summarized in Table 9-3 through Table 9-7.

Table 9-3. Loss Estimates for 10% Annual Chance Flood Event in Unincorporated Areas

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Replacement Cost
		Structure	Contents	Total	
Castle Rock	0	$0	$0	$0	0.0%
Kalama	4	$2,320,135	$5,376,826	$7,696,960	0.8%
Kelso	0	$0	$0	$0	0.0%
Longview	0	$0	$0	$0	0.0%
Woodland	19	$600,814	$280,741	$881,555	0.0%
Unincorporated	40	$2,104,009	$5,790,928	$7,894,937	0.02
Total	**63**	**$**5,024,958	**$**11,448,495	**$**16,473,452	**0.05%**

a. Impacted structures are those structures with finished floor elevations below the Hazus-estimated 10-percent annual chance water surface elevation. These structures are the most likely to receive damage in a 10-percent annual chance flood event

Notes: Values in this table are only for purposes of comparison among results.

Table 9-4. Loss Estimates for 2% Annual Chance Flood Event in Unincorporated Areas

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Replacement Cost
		Structure	Contents	Total	
Castle Rock	0	$0	$0	$0	0.0%
Kalama	5	$4,870,643	$9,600,796	$14,471,439	1.6%
Kelso	0	$0	$0	$0	0.0%
Longview	0	$0	$0	$0	0.0%
Woodland	126	$7,623,330	$8,732,963	$16,356,293	0.5%
Unincorporated	89	$3,827,292	$7,901,630	$11,728,922	0.02%
Total	**220**	**$**16,321,265	**$**26,235,389	**$**42,556,654	**0.1%**

a. Impacted structures are those structures with finished floor elevations below the Hazus-estimated 2-percent annual chance water surface elevation. These structures are the most likely to receive damage in a 2-percent annual chance flood event

Notes: Values in this table are only for purposes of comparison among results.

Table 9-5. Loss Estimates for 1% Annual Chance Flood Event in Unincorporated Areas

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Replacement Cost
		Structure	Contents	Total	
Castle Rock	18	$698,634	$383,191	$1,081,826	0.1%
Kalama	6	$6,912,764	$12,493,035	$19,405,799	2.1%
Kelso	11	$19,347,929	$25,294,815	$44,642,745	1.0%
Longview	8	$641,096	$882,514	$1,523,610	0.0%
Woodland	289	$16,235,338	$15,755,990	$31,991,327	1.1%
Unincorporated	262	$29,817,612	$30,099,839	$59,917,451	0.44%
Total	**594**	**$**73,653,373	**$**84,909,384	**$**158,562,758	**0.5%**

a. Impacted structures are those structures with finished floor elevations below the Hazus-estimated 1-percent annual chance water surface elevation. These structures are the most likely to receive damage in a 1-percent annual chance flood event

Notes: Values in this table are only for purposes of comparison among results.

Table 9-6. Loss Estimates for 0.2% Annual Chance Flood Event in Unincorporated Areas

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Replacement Cost
		Structure	Contents	Total	
Castle Rock	69	$7,610,003	$17,759,804	$25,369,807	2.4%
Kalama	7	$7,648,882	$14,526,589	$22,175,471	2.4%
Kelso	11	$19,265,870	$25,260,210	$44,526,080	1.0%
Longview	143	$2,565,016	$2,031,929	$4,596,945	0.0%
Woodland	879	$94,880,705	$66,831,129	$161,711,834	5.3%
Unincorporated	382	$44,107,596	$43,533,395	$87,640,992	0.65%
Total	**1491**	**$**176,078,072	**$**169,943,056	**$**346,021,129	**1.0%**

a. Impacted structures are those structures with finished floor elevations below the Hazus-estimated 0.2-percent annual chance water surface elevation. These structures are the most likely to receive damage in a 0.2-percent annual chance flood event

Notes: Values in this table are only for purposes of comparison among results.

Table 9-7. Loss Estimates for Levee-Protected Areas

	Structures Impacted[a]	Estimated Loss Associated with Flood			% of Total Replacement Cost
		Structure	Contents	Total	
Castle Rock	237	$21,776,468	$24,532,213	$46,308,681	4.5%
Kalama	0	$0	$0	$0	0.0%
Kelso	1,593	$272,751,520	$521,579,091	$794,330,612	18.0%
Longview	4,407	$513,416,728	$773,497,278	$1,286,914,006	11.8%
Woodland	399	$349,265,525	$586,534,002	$935,799,528	30.9%
Unincorporated	1,530	$290,855,935	$538,890,618	$829,746,552	1.75%
Total	**8,166**	**$**1,448,066,176	**$**2,445,033,202	**$**3,893,099,379	**11.5%**

a. Impacted structures are those structures with finished floor elevations below the Hazus-estimated 0.2-percent annual chance water surface elevation. These structures are the most likely to receive damage in a 0.2-percent annual chance flood event

Notes: Values in this table are only for purposes of comparison among results.

9.2.2 National Flood Insurance Program Statistics

Countywide Statistics

Table 9-8 lists flood insurance statistics that help identify vulnerability in Cowlitz County. These statistics are from the FEMA Open Data Source website (FEMA 2023) and are current as of September 30, 2022. Based on these statistics, the County and five municipalities within it participate in the NFIP, with 1,150 flood insurance policies providing $346.9 million in coverage. According to FEMA, 627 flood insurance claims were paid between January 1, 1978, and September 30, 2022, for a total of $13.7 million, an average of $21,888 per claim. The following information from flood insurance statistics is relevant to reducing flood risk:

- The use of flood insurance in the planning area is below the national average, with 34.1 percent of insurable planning area buildings in the SFHA having flood insurance. According to an NFIP study, 49 percent of single-family homes in SFHAs nationwide are covered by flood insurance.
- The average annual cost of a flood insurance policy in Cowlitz County is $792.60, which is slightly above the national average cost of $742 (as of May 2023). The average cost of a flood insurance policy in the unincorporated area is $737.71—7 percent lower than the County average and slightly lower than the national average.

Table 9-8. Flood Insurance Statistics for Cowlitz County

Jurisdiction	Date of Entry Initial FIRM Effective Date	# of Flood Insurance Policies as of 9/30/2022	Insurance In Force ($)	Total Annual Premium ($)	Claims, 11/1978 to 9/30/2022	Value of Claims paid, 11/1978 to 9/30/2022 ($)
Castle Rock	6/18/1980	16	$5,408,000	$18,339	24	$458,324
Kalama	6/01/1981	4	$957,000	$3,771	5	$262,813
Kelso	12/04/1979	103	$39,942,300	$128,692	49	$914,231
Longview	12/18/1979	195	$67,026,700	$131,532	50	$765,784
Woodland	2/01/1978	453	$122,506,300	$349,567	66	$899,500
Unincorporated	8/01/1980	379	$111,035,600	$279,591	433	$10,422,978
Total		**1150**	**$346,875,900.00**	**$911,492.00**	**627**	**$13,723,630.00**

- The average cost of a flood insurance policy in the SFHA is $767 per year.
- The average cost of a policy outside the SFHA is $704.
- 93 percent of the policies in force are for residences.
- Approximately 35 percent of the policies are for pre-FIRM construction.
- The amount of insurance in force represents 32.2 percent of the total value of the assets exposed within the SFHA.
- The high percentage of flood insurance policies in force outside the SFHA (roughly 54 percent of the policies) suggests that the currently effective mapping does not reflect the total flood risk.
- The average claim paid in the planning area ($21,888) represents about 3 percent of the 2022 average replacement cost value of structures in the floodplain. This correlates to a flood depth damage function of less than 1 foot for a 1-story structure with no basement using the U.S. Army Corps of Engineers generic flood-depth/damage curves.

Risk Rating 2.0

FEMA is updating the NFIP's pricing methodology through the implementation of Risk Rating 2.0: Equity in Action. This methodology leverages industry best practices and cutting-edge technology to enable FEMA to deliver rates that are actuarily sound, equitable, and easier to understand and that reflect a property's unique flood risk.

FEMA has discovered inequities in the existing pricing methodology. Presently, many policyholders with lower-value homes are paying more than they should and policyholders with higher-value homes are paying less than they should. Under Risk Rating 2.0 Equity in Action, FEMA can address rating disparities by incorporating more flood risk variables, including the property's replacement cost value. The new methodology delivers a 21st century pricing system that is fair and able to adjust to the effects of climate change.

Table 9-9 shows the projected number of insured properties in Cowlitz County that will see the indicated range of changes in monthly premiums for flood insurance. The policyholders with decreases saw these changes upon their renewal starting on Oct. 1, 2021. Policyholders with increases saw these changes upon their renewal starting on April 1, 2022.

Table 9-9. Projected Rate Changes for NFIP-Insured Properties in Cowlitz County

Change in Monthly Premium for Flood Insurance	Number of Policies Seeing Indicated Premium Change	Change in Monthly Premium for Flood Insurance	Number of Policies Seeing Indicated Premium Change
< -$100	38	$-20 to $-10	10
$-100 to $-90	6	$-10 to $0	20
$-90 to $-80	3	$0 to $10	979
$-80 to $-70	13	$10 to $20	203
$-70 to $-60	6	$20 to $30	41
$-60 to $-50	5	$30 to $40	14
$-50 to $-40	8	$40 to $50	6
$-40 to $-30	8	$50 to $60	14
$-30 to $-20	6	$60 to $70	1

Repetitive Loss

A repetitive loss property is defined by FEMA as an NFIP-insured property that has experienced any of the following since 1978, regardless of any changes in ownership:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property.

A severe repetitive loss property is further defined as follows:

- Four or more paid losses in excess of $5,000 each, with the cumulative amount of such claim payments exceeding $20,000
- At least two separate claim payments made, with the cumulative amount of the building portion of such claims exceeding the market value of the building
- At least two of the above referenced claims occurring within any rolling 10-year period and more than 10 days apart.

Repetitive loss properties make up only 1 to 2 percent of flood insurance policies in force nationally, yet they account for 40 percent of the nation's flood insurance claim payments. The government has instituted programs encouraging communities to identify and mitigate the causes of repetitive losses. A report on repetitive losses by the National Wildlife Federation found that 20 percent of these properties are outside any mapped 1-percent annual chance floodplain. The key identifiers for repetitive loss properties are the existence of flood insurance policies and claims paid by the policies.

FEMA has identified 121 repetitive loss properties withing Cowlitz County as of May 1, 2023. Table 9-10 shows the breakdown of repetitive loss propertied by community within the planning area.

Table 9-10. Repetitive Loss Statistics within the Planning Aare

Jurisdiction	# of Repetitive Loss Properties		
	Inside SFHA	Outside SFHA	Total
Castle Rock	2	2	4
Kalama	1	0	1
Kelso	3	14	14
Longview	0	2	2
Woodland	1	0	1
Unincorporated	48	51	99
Total	**55**	**69**	**121**

9.3 CRITICAL FACILITIES AND INFRASTRUCTURE

Hazus assesses the potential damage to critical facilities from flooding using depth/damage function curves. Based on historical averages, these curves indicate potential damage amounts as a percentage of the value of structures or contents. Actual damage to facilities may be less than these conservative estimates. For critical buildings, Hazus also estimates functional down-time, which is the time it might take to restore a facility to 100 percent of its functionality after flood damage occurs. Results for the 1-percent annual chance and 0.2-percent annual chance flood events and levee-protected areas are summarized in Table 9-11 through Table 9-13.

Table 9-11. Estimated Damage to Critical Facilities in Unincorporated Areas from 1% Annual Chance Flood

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety & Security	1	14.69	68.46
Food, Water & Sheltering	2	35.00	N/A
Health & Medical	0	N/A	N/A
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	12	4.29	55.95
Hazardous Materials	0	N/A	N/A
Total/Average	**15**	**17.99**	**62.21**

Table 9-12. Estimated Damage to Critical Facilities in Unincorporated Areas from 0.2% Annual Chance Flood

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety & Security	2	21.19	85.31
Food, Water & Sheltering	2	35.00	N/A
Health & Medical	1	31.80	42.59
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	12	6.35	67.63
Hazardous Materials	0	N/A	N/A
Total/Average	**17**	**23.59**	**65.18**

Table 9-13. Estimated Damage to Critical Facilities in Levee-Protected Areas

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety & Security	33	12.19	48.92
Food, Water & Sheltering	2	18.22	32.62
Health & Medical	22	32.22	53.48
Energy	0	N/A	N/A
Communications	2	8.57	N/A
Transportation	5	8.91	53.57
Hazardous Materials	0	N/A	N/A
Total/Average	**64**	**16.02**	**47.15**

The assessment shows that the percentage of the over 420 critical facilities and infrastructure in the planning area that is expected to experience any damage is small, as is the estimated amount of damage for affected facilities:

- Only 69 are within the 1-percent annual chance floodplain (see Table 8-10) and 15 are predicted to experience any damage from a 1-percent annual chance event (see Table 9-11). At those 15 facilities, the Hazus worst-case estimate of building damage averages 17.99 percent of the total building value.
- Only 80 are within the 0.2-percent annual chance floodplain (see Table 8-10) and 17 are predicted to experience any damage from a 0.2-percent annual chance event (see Table 9-12). At those 17 facilities, the Hazus worst-case estimate of building damage averages 23.59 percent of the total building value.
- Only 151 are within the levee protected areas (see Table 8-10) and 64 are predicted to experience any damage from a levee overtopping event (see Table 9-13). At those 64 facilities, the Hazus worst-case estimate of building damage averages 16.02 percent of the total building value.

9.4 ENVIRONMENT

The environment vulnerable to flood hazard is the same as the environment exposed to the hazard. The principle environmental impact from flood is the loss of aquatic habitat. One possible measure of environmental impacts from flooding is by looking at the amount of debris that that would be generated by each scenario flood event. Hazus includes a debris estimation component. These estimates can provide local governments feedback for not only what they need to deal with through recovery, but also what the potential exposure is to debris that could be carried by floodwaters. The Hazus debris estimates for each of the scenario flood events for the planning area are shown in Table 9-14.

Table 9-14. Estimated Flood -Caused Debris in Unincorporated Areas

	Debris[a] to Be Removed (tons)	Truckloads[b]
10% Annual Chance Flood Event	1,484	59
2% Annual Chance Flood Event	3,015	121
1% Annual Chance Flood Event	13,747	550
0.2% Annual Chance Flood Event	20,299	812
Levee-Protected Areas	88,554	3,542

a. The Hazus flood debris model focuses on building-related debris and does not address contents removal or additional debris loads such as vegetation and sediment.
b. Based on an estimate of 25 tons per truckload

10. CLIMATE CHANGE CONSIDERATIONS FOR FLOODPLAIN MANAGEMENT

This chapter presents an overview of current understandings of how climate change will affect the Cowlitz County region and implications for floodplain management. Information on climate change is being continually updated, and the information presented here is a snapshot of the best available information at the time this document was written.

10.1 WHAT IS CLIMATE CHANGE?

Climate, consisting of patterns of temperature, precipitation, humidity, wind and seasons, plays a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. "Climate change" refers to changes over a long period of time. Worldwide, average temperatures have increased 2.0 ºF since 1880, enough to lead to large changes in climate and weather (National Aeronautics and Space Administration 2023).

The warming trend and its related impacts are caused by increasing concentrations of carbon dioxide and other greenhouse gases in the earth's atmosphere. Greenhouse gases are gases that trap heat in the atmosphere, resulting in a warming effect. Carbon dioxide is the most commonly known greenhouse gas; however, methane, nitrous oxide and fluorinated gases also contribute to warming. Emissions of these gases come from a variety of sources, such as the combustion of fossil fuels, agricultural production and changes in land use.

According to the U.S. Environmental Protection Agency (EPA), carbon dioxide concentrations measured about 280 parts per million (ppm) before the industrial era began in the late 1700s and have risen 43 percent since then, reaching 412 ppm in 2021 (U.S. Environmental Protection Agency 2022) (see Figure 10-1.). Scientists place this rise in carbon dioxide in a longer historical context by measuring carbon dioxide in ice cores. According to these records, carbon dioxide concentrations in the atmosphere are the highest that they have been in 800,000 years. There is broad scientific consensus (95 percent probability) that climate-warming trends are very likely due to human activities (National Aeronautics and Space Administration 2022). Unless emissions of greenhouse gases are substantially reduced, this warming trend and its associated impacts are expected to continue.

10.2 HOW CLIMATE CHANGE AFFECTS FLOODPLAIN MANAGEMENT

An essential aspect of floodplain management is predicting the likelihood of flooding in a planning area. Typically, predictions are based on statistical projections from records of past events. This approach assumes that the likelihood of flood events remains essentially unchanged over time. Thus, if a river has flooded an average of once every five years for the past 100 years, then it can be expected to continue to flood an average of once every five years. But the assumption that future flooding behavior will be equivalent to past behavior is not valid if climate conditions are changing.

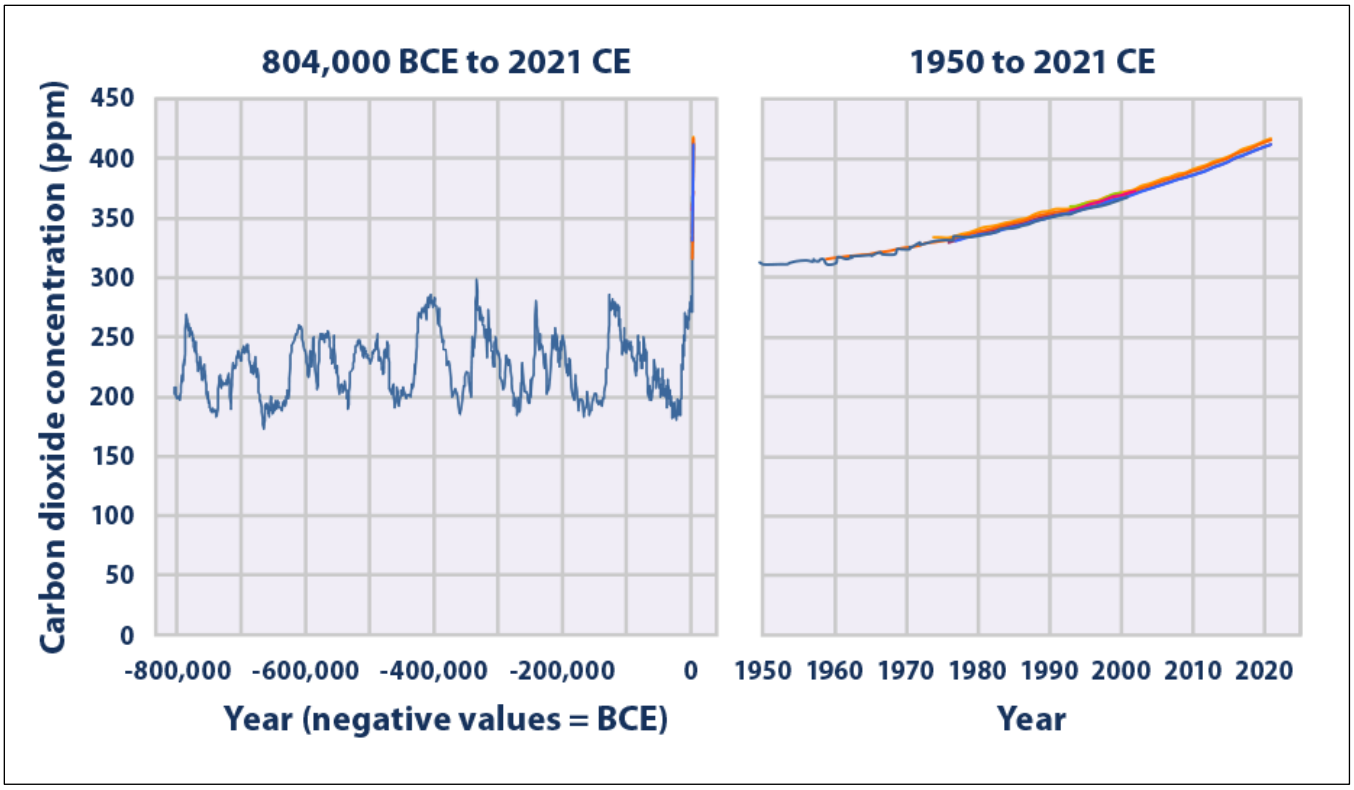


Figure 10-1. Global Carbon Dioxide Concentrations Over Time

Climate involves not only average temperature and precipitation but also the frequency and intensity of extreme weather events. According to studies by the University of Washington on the average amount of precipitation in the Cowlitz County region, there is potential for significant change in the intensity of individual storms, the amount of precipitation during the rainy season, or rainfall amounts in years of extreme wet weather or extreme dry weather. The frequency of flooding will not remain constant if broad precipitation patterns change over time. While predicting changes in flood events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment. For this reason, an understanding of climate change is pertinent to floodplain management activities. Information about how climate patterns are changing provides insight on the reliability of future flooding projections used in mitigation analysis.

Climate change will affect the people, property, economy and ecosystems of Cowlitz County in a variety of ways. Its impacts are most frequently associated with negative consequences and increased risk, such as increased flooding or increased heat-related public health concerns. The most important effect for the development of this plan is that climate change will have a measurable impact on the occurrence and severity of flooding. This chapter summarizes current understandings about climate change in order to provide a context for the recommendation and implementation of flood hazard mitigation measures in Cowlitz County.

10.3 CURRENT GLOBAL INDICATIONS OF CLIMATE CHANGE

The major scientific agencies of the United States—including the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA)—agree that climate change is

occurring. Multiple temperature records from all over the world have shown a warming trend, and the Intergovernmental Panel on Climate Change (IPCC) has stated that the warming of the climate system is unequivocal (Intergovernmental Panel on Climate Change 2014). Of the 10 warmest years in the 134-year record, all but one (1998) occurred since 2000, and 2015 was the warmest year on record (National Aeronautics and Space Administration 2016). Worldwide, average temperatures have increased 2.0ºF since 1880 (National Aeronautics and Space Administration 2023).

Rising global temperatures have been accompanied by other changes in weather and climate. Many places have experienced changes in rainfall resulting in more intense rain, as well as more frequent and severe heat waves (Intergovernmental Panel on Climate Change 2014). The planet's oceans and glaciers have also experienced changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. Global sea level has risen approximately 7.9 inches since 1900 (National Aeronautics and Space Administration 2023a). This has already put some coastal homes, beaches, roads, bridges, and wildlife at risk (U.S. Global Change Research Program 2009).

10.4 PROJECTED FUTURE IMPACTS

10.4.1 Global Projections

Scientists project that Earth's average surface temperature will continue to rise between 0.5ºF and 8.6ºF by 2100 (Intergovernmental Panel on Climate Change 2014). Some research has concluded that every increase of 2ºF in average global average temperature can have the following impacts (National Research Council 2011):

- 3 to 10 percent increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks
- 5 to 10 percent decreases in stream flow in some river basins.

The amount of sea level rise expected to occur as a result of climate change will increase the risk of coastal flooding for millions to hundreds of millions of people around the world, many of whom would have to permanently leave their homes. By 2100, sea level is expected to rise another 1 to 4 feet, with an uncertainty range of 0.66 to 6.6 feet. Rising seas will make coastal storms and the associated storm surges more frequent and destructive. Flooding may also become more intense even in areas where precipitation is expected to decline. What is currently termed a once-in-a-century coastal flooding event could occur more frequently (Melillo, Richmond and Yohe 2014).

10.4.2 Projections for the Cowlitz County

Temperature

In the Cowlitz County region by 2050, the frequency of heat waves and hot days (days on which the temperature exceeds 100 ºF) is not predicted to increase. However, the average summertime maximum temperate is predicted to increase an average of 3.4 ºF. By 2099, the number of hot days is predicted to increase by 4 days a year, while the average summertime temperature is predicted to increase by about 10 ºF (University of Washington 2023).

Precipitation

According to University of Washington Climate Mapping, the magnitude of the 2-year storm in Cowlitz County is predicted to increase by 8 percent between 2020 and 2049, with some areas of the western county seeing a 20 percent increase. An increase in heavy precipitation may intensify flooding events, cause damage to stormwater drainage systems, and lead to floods, landslides, and erosion. By 2099, heavy precipitation is predicted to increase by an average of 7 to 18 percent county-wide (University of Washington 2023).

Reduced Snowpack

On average, the April snowpack in Cowlitz County is predicted to reduce by 86 percent between 2020 and 2049, with the eastern section of the county predicted to have a 61 percent reduction. By 2099, the April snowpack is predicted to reduce by 100 percent (University of Washington 2023). As the climate warms, cold-season precipitation will begin to fall as rain, rather than snow, reducing the snowpack. Areas within Cowlitz County may experience greater damage from heavier, winter rainfall, which may lead to flooding, erosion, and washouts. In addition, the shift to a lower summer runoff may increase the reliance on stored water for irrigation in many parts of Cowlitz County (U.S. Department of the Interior 2021). Such significant changes in climate could lead to more frequent, intense, and longer severe weather events. The potential increase in the frequency of winter storms would also impact stream flows and increase flood rates.

Stream Flow

According to the University of Washington *Climate Mapping for a Resilient Washington*, rivers in Cowlitz County are predicted to have a high percent change in annual maximum stream flow in the coming years. By 2049, it is predicted that maximum stream flow in Cowlitz County will greatly increase. Table 10-1 summarizes the predicted percent change in annual maximum stream flow from 2020 to 2069 for select rivers in Cowlitz County.

Table 10-1. Percentage Increase in Maximum Stream Flow

	2020-2049	2030-2059	2040-2069
Kalama River	11%	15% (18% in eastern county)	18% (23% in eastern county)
Coweeman River	8%	10% (16% in eastern county)	14% (23% in eastern county)
Cowlitz River	18%	26% (27% in northern section)	34% (36% in northern section)
North Fork Toutle River	17%	23% (21% in eastern section)	31% (32% in eastern section)
South Fork Toutle River	3%	9%	14%
Lewis River	18%	25%	30% (31% in eastern section)
Columbia River	-1% (0% in eastern county)	0% (1% in eastern county)	2% (3% in eastern county)

Source: (University of Washington 2023)

Higher stream flow is expected to increase damage to infrastructure within the floodplain. In addition, the higher level of water may expand the floodplain and raise the base flood elevation, leading to damage of infrastructure and property that were not developed with the floodplain in mind. Increased base flood elevations may affect the level of protection ratings for the levees that protect significant areas within the County. More flooding also has the potential to increase the demand for emergency services.

Another impact of higher stream flow due to climate change is the impact that it may have on salmonid populations. The higher stream flow will greatly impact salmonid habitat and riparian vegetation and may reduce the quantity of a culturally important species for Northwest tribes.

Figure 10-2. demonstrates the predicted change in all streams and rivers within Cowlitz County. By 2020-2049, about 40 percent of streams are predicted to have no increased stream flow, and 60 percent are predicted to increase maximum flows by 10 to 30 percent. By 2070-2099, 46 percent of streams are predicted to increase maximum flows by 30 to 50 percent, and 47 percent are predicted to increase by 10 to 30 percent.

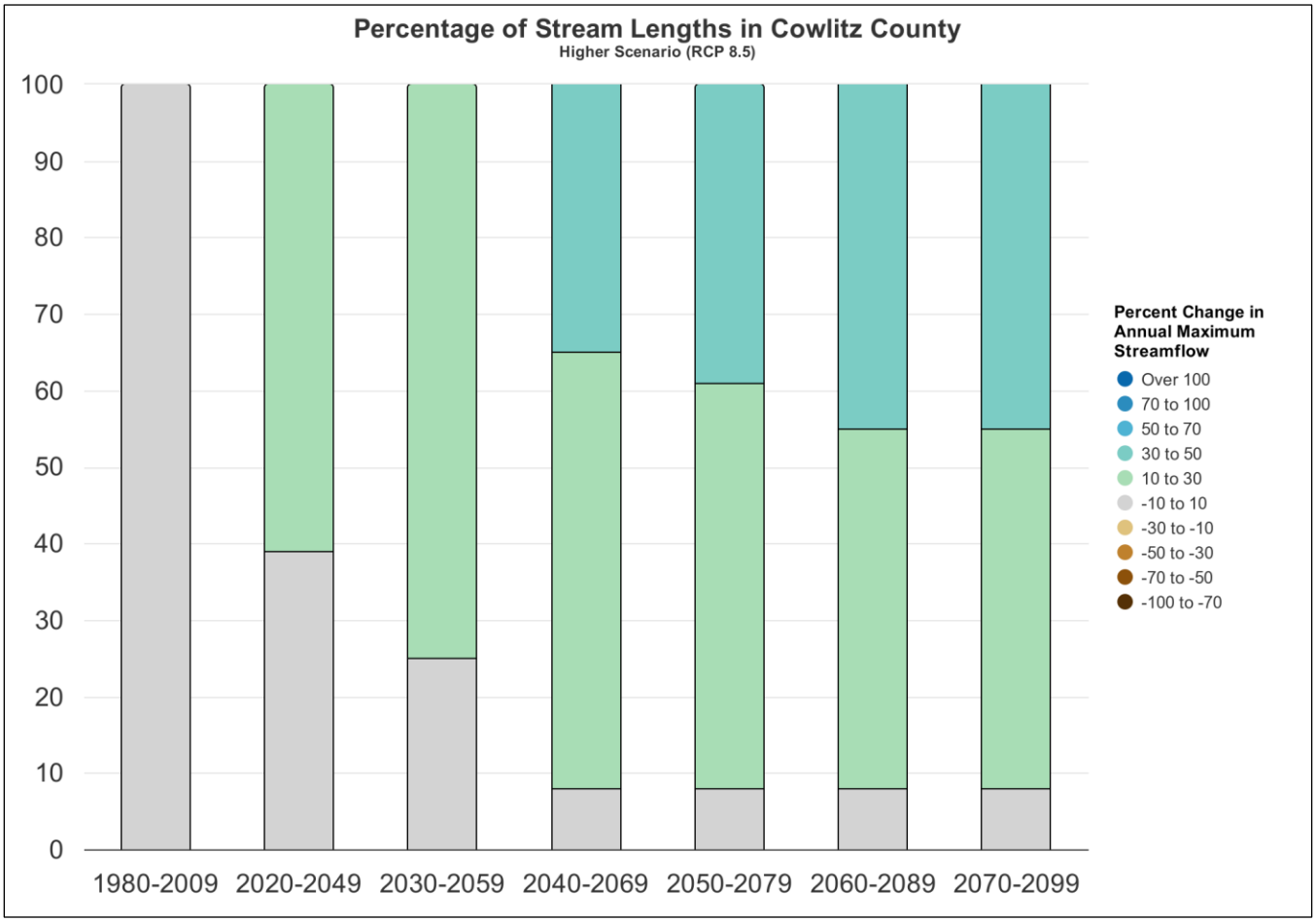


Figure 10-2. Predicted Change in All Streams and Rivers Within Cowlitz County

10.5 RESPONSES TO CLIMATE CHANGE

10.5.1 Mitigation and Adaptation

Communities and governments worldwide are working to address, evaluate and prepare for climate changes that are likely to impact communities in coming decades. Generally, climate change discussions encompass two separate but inter-related considerations: mitigation and adaptation. The term “mitigation” can be confusing because its meaning changes across disciplines:

- Mitigation in restoration ecology and related fields generally refers to policies, programs or actions that are intended to reduce or to offset the negative impacts of human activities on natural systems. Generally, mitigation can be understood as avoiding, minimizing, rectifying, reducing or eliminating, or compensating for known impacts.
- Mitigation in climate change discussions is defined as "a human intervention to reduce the impact on the climate system." It includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks (U.S. Environmental Protection Agency 2013).
- Mitigation in emergency management is typically defined as the effort to reduce loss of life and property by lessening the impact of disasters.

In this chapter, mitigation is used as defined by the climate change community. In the other chapters of this Flood Plan, mitigation is primarily used in an emergency management context.

Adaptation refers to adjustments in natural or human systems in response to the actual or anticipated effects of climate change and associated impacts. These adjustments may moderate harm or exploit beneficial opportunities (U.S. Environmental Protection Agency 2013).

Mitigation and adaptation are related, as the world's ability to reduce greenhouse gas emissions will affect the degree of adaptation that will be necessary. Some initiatives can both reduce greenhouse gas emissions and support adaptation to likely future conditions. One subset of this type of strategy is known as ecosystem-based adaptation. Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall strategy to help people adapt to the adverse effects of climate change. This includes the sustainable management, conservation and restoration of specific ecosystems that provide key services. In terms of floodplain management, many such actions are related to preserving or enhancing the natural beneficial functions of floodplain systems. Riparian forests can bind soils and hold large volumes of water during periods of significant precipitation, releasing it through the year. Floodplains can absorb large volumes of water during peak flows.

10.5.2 Future Modeling Efforts

Most current modeling efforts are unable to assess climate change at a resolution small enough to determine specific impacts for individual communities. Typically, generalized assessments of larger climatic regions have been used to determine impacts that are most likely to affect these communities. Climate researchers worldwide are working to improve modeling efforts at more refined scales. At the University of Washington, climate researchers have developed models for Washington State. As such models are developed in the future, the risk assessment presented in this Flood Plan may be enhanced to better measure these impacts.

10.5.3 Response To Climate Change in Washington

Washington House Bill 1181, signed by the Governor in May 2023, requires certain cities and counties to address greenhouse gasses and climate change resiliency in their comprehensive plans. These rules are applicable to communities planning under the Growth Management Act (GMA). In Cowlitz County, the only community planning under the GMA is the City of Woodland. In 2022-2023, the City participated in a Climate Resilience Pilot Project with the Department of Commerce and the University of Washington to help develop guidance to support statewide implementation, and to support increasing Woodland's resiliency to climate change effects.

10.6 POTENTIAL CLIMATE CHANGE IMPACT ON FLOOD HAZARDS

Developing projections of future climate change for a specific region is challenging, especially longer-term projections. The further out a prediction reaches, the more subject to changing dynamics it becomes. Modeling that is currently available is limited in its ability to produce quantitative estimates of the effect of climate change on flood hazard risks; however, an understanding of the basic features of climate change allows for the following qualitative assessments of impacts on flood-related hazards. This overview serves as a basis for evaluating how risk will change as a result of future climate change impacts.

10.6.1 Changes in Hydrology

Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects. For example, historical data are used for flood forecasting models and to forecast snowmelt runoff for water supply. This method of forecasting assumes that the climate of the future will be similar to that of the period of historical record. However, the hydrologic record cannot be used to predict changes in frequency and severity of extreme climate events such as floods. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted. Climate change is already impacting water resources, and resource managers have observed the following:

- Historical hydrologic patterns can no longer be solely relied upon to forecast the water future.
- Precipitation and runoff patterns are changing, increasing the uncertainty for water supply and quality, flood management and ecosystem functions.
- Extreme climatic events will become more frequent, necessitating improvement in flood protection and emergency response.

The amount of snow is critical for water supply and environmental needs, but so is the timing of snowmelt runoff into rivers and streams. Rising snowlines caused by climate change will allow more mountain area to contribute to peak storm runoff. High frequency flood events (e.g., 25-year floods, which have a 4 percent chance of occurring each year) will likely increase with a changing climate. The University of Washington Climate Group predicts that, by 2049, over half of the streams in Cowlitz County will have a 10 percent chance each year of experiencing what is currently considered to be a 25-year flood.

Along with reductions in the amount of the snowpack and accelerated snowmelt, scientists project greater storm intensity, resulting in more direct runoff and flooding (U.S. Global Change Research Program 2009). Changes in watershed vegetation and soil moisture conditions will likewise change runoff and recharge patterns. As stream flows and velocities change, erosion patterns will also change, altering channel shapes and depths, possibly increasing sedimentation behind dams reducing reservoir capacities, and affecting habitat and water quality. With potential increases in the frequency and intensity of wildfires due to climate change, there is potential for more floods following fire, which increase sediment loads and water quality impacts.

As hydrology changes, what is currently considered a 100-year flood may strike more often, leaving many communities already exposed to flood hazards at greater risk. Planners will need to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, bypass channels and levees, as well as the design of local sewers and storm drains.

10.6.2 Changes in Precipitation

As the climate continues to warm, the increased evaporation will result in more moisture in the atmosphere, which may intensify rainfall events. In addition, some areas may experience shifts in the timing and duration of rainy seasons due to warming climate. Warmer temperatures may cause earlier and faster snowmelt, altering the timing of water availability downstream. This may impact water supplies for agriculture, hydroelectric power generation, and freshwater ecosystems.

PART 3—MITIGATION STRATEGY

11. GOALS AND OBJECTIVES

This chapter identifies goals and objectives for reducing long-term vulnerabilities to flooding in the planning area. These vital planning components were developed by the Steering Committee through a facilitated process that addressed flooding issues, public support, political support, and existing capabilities within the planning area. They were developed to establish a vision for reducing risk to flood hazards in Cowlitz County. The goals and objectives are linear planning components, meaning that they all directly support one another. Goals were identified to set the vision for this plan. Objectives were selected that meet multiple goals. Achievement of the goals and objectives will be pursued through an action plan that identifies the programs, projects and technical studies that will be implemented as resources are identified and allocated.

11.1 GOALS

The effectiveness of a mitigation strategy is assessed by determining how well its goals are achieved. The Steering Committee established the following updated goals for the 2023 Comprehensive Flood Hazard Management Plan:

- Save lives and reduce public exposure to flood risk.
- Maintain sustainable operation of identified critical facilities.
- Reduce or prevent damage to public and private property.
- Improve the cost effectiveness of flood hazard management.
- Leverage natural and beneficial floodplain processes.

11.2 OBJECTIVES

The following objectives were selected that meet multiple goals:

1. Continually improve understanding of the location and potential impacts of flooding, vulnerabilities, community development patterns, and measures needed to protect public life, safety, and property.
2. Work cooperatively with federal, state, regional, and local agencies and stakeholders to plan for and understand the impacts of flooding.
3. Create and maintain partnerships among all levels of government and the whole community to coordinate mutually beneficial mitigation strategies.
4. Identify mitigation projects that provide the highest degree of flood protection and damage reduction, are cost effective, provide protection to property, including critical facilities, and mitigate impacts on the environment.

5. Consider floodplain management policies that promote resiliency and sustainable operations of identified critical facilities.
6. Utilize the best available data, science and local knowledge to consider current and future conditions in planning for flood and inundation hazards.
7. Integrate floodplain management goals and objectives into other plans and programs within the planning area that can support or enhance floodplain management within Cowlitz County.
8. Provide feasible, cost-effective flood hazard protection that strives to enhance or restore the natural and beneficial floodplain function.
9. Enhance all facets of emergency response capabilities, including mitigation of vulnerable critical facilities and infrastructure.
10. Sustain continuity of local emergency and government operations, including the operation of identified critical facilities, during and after a disaster.
11. Promote and enhance outreach and education efforts by state, regional and local agencies with flood hazard plans and programs to actively encourage engagement of stakeholder groups such as homeowners, private sector businesses, and nonprofit community organizations.
12. Encourage flood hazard mitigation measures that result in the least adverse effect on the natural environmental and that use natural processes.

12. POLICIES

Flood Plan policies adopted by the Board of County Commissioners provide a framework for making decisions about flood hazard management in Cowlitz County. These policies also provide guidance for decision-making at the program and project level and define the level of discretion Cowlitz County has available in flood management decisions. When a policy uses the term "shall" or "will," it is intended that such terms be interpreted as mandatory, and that the associated action or decision is nondiscretionary. The use of "should" or "may" in a policy means that the associated action or decision is provided as guidance and indicates that there is discretion in making decisions based on such policies.

The policies in this chapter are divided into six categories:

- General
- Flood hazard area land use
- Flood risk reduction
- River channel maintenance
- Flood warning and response
- Funding and financing.

The policies are intended to be consistent with any and all water resource policies in the *Cowlitz County Comprehensive Plan* (Cowlitz County 2017), which directs land use and growth in unincorporated Cowlitz County. These policies do not outline policy, code or program requirements for individual jurisdictions but do call on jurisdictions to enforce policies, codes and programs they choose to adopt.

Chapter 13 of this Flood Plan contains recommendations for flood hazard mitigation actions. These actions differ from policies in that they describe specific program and project actions that implement the Flood Plan. These actions are not mandatory. They are desirable actions that may be completed within staffing and budgetary limitations.

12.1 GENERAL POLICIES

The general policies listed below provides a vision for Cowlitz County and general guidance for its activities.

12.1.1 Flood Hazard Management

Watersheds do not follow jurisdictional boundaries. Actions taken by a city or county in one part of a drainage watershed, whether it be a land-use plan, development permit, or capital improvement project, can affect flood hazard problems experienced by other jurisdictions in the watershed, and can impact valuable ecological resources. Actions taken by a city or county can also have positive effects on neighboring jurisdictions.

Cooperative flood hazard management between counties is supported by Chapter 86.13 RCW. Multi-jurisdictional approaches to watershed management can produce a multitude of public and private benefits, including flood risk reduction and improved ecosystem functions and values.

Flood hazard management includes a range of services at both the regional and local level to reduce the risk of flood hazards. The following policies have been identified to guide Cowlitz County in the management of the flood hazard within the Cowlitz County planning area.

Policy G-1: Flood Hazard Risks

Cowlitz County should provide regional flood hazard management planning with emphasis in those areas mapped and regulated by local, state and federal agencies and/or those areas that pose an imminent flood threat, such as post-fire burn areas, flash flooding areas, dam failure inundation areas, or channels obstructed by debris accumulation. Flood hazards assessed in this plan pose a risk when either the natural process or past or current actions to control the natural process create or perpetuate any of the following:

- Threats to public safety
- Damage to public infrastructure
- Threats to identified critical facilities
- Impacts on the regional economy
- Impacts on ecological, natural resources, cultural resources, and productive agricultural soils
- Damage to private structures

Policy G-2: Flood Hazard Management Actions

Cowlitz County should provide flood hazard management services to reduce the risk of flood hazards, including but not limited to:

- Prepare technical studies to further identify flood hazard areas
- Provide technical information and assistance to other agencies, jurisdictions and individuals
- Develop, implement and enforce flood hazard area regulations and stormwater management standards within unincorporated Cowlitz County
- Construct, monitor, maintain, repair, retrofit, or remove County-managed flood protection facilities
- When feasible, preserve open space in flood hazard areas
- Monitor conditions in the river channels and take actions to reduce risks
- Coordinate flood preparedness activities and operate a flood warning program for flood hazard areas with flood threat recognition capability
- Perform emergency flood risk reduction actions
- Collaborate with other jurisdictions to implement flood risk reduction actions
- Take any other action deemed necessary to reduce flood related risks and the environmental impacts of flood hazard management on a regional scale

Policy G-3: Inter-Governmental Coordination and Cooperation

Cowlitz County's flood hazard management activities should be planned and implemented in close cooperation and coordination with cities, neighboring counties with watersheds that impact Cowlitz County, tribes, Water Resource Inventory Area (WRIA) forums, and other agencies sharing jurisdiction in each basin. This intergovernmental coordination shall also include federal agencies, including but not limited to the U.S. Forest Service, the U.S. Army Corps of Engineers, FEMA, the Bureau of Land Management, the National Park Service, the Bonneville Power Administration, the Bureau of Reclamation, the National Resource Conservation Service, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. This policy assumes that all federal agencies will coordinate in good faith as directed under Presidential Executive Order 11988.

Policy G-4: Intra-Governmental Coordination and Cooperation

This Plan should be implemented by multiple Cowlitz County departments that have a role in flood hazard management including, but not limited to, the Department of Public Works, Building and Planning, and the Office of Emergency Management. The roles and responsibilities of each department should be determined through a memorandum of understanding to ensure flood hazard management coordination within Cowlitz County government.

Policy G-5: Multi-Objective Management

Cowlitz County's rivers and major tributaries and their associated flood hazard areas should be managed for multiple uses and objectives. Flood hazard management actions and land uses should be encouraged that support long-term flood risk reduction outcomes. The Flood Plan should be integrated with other regulatory and land use plans to ensure consistency, including, but not limited to, the comprehensive plan, hazard mitigation plan, and shoreline management program.

Policy G-6: Protecting Natural Functions and Values

Cowlitz County should protect flood storage, conveyance, and ecological values of floodplains, wetlands, and riparian corridors and, when feasible, should enhance or restore these ecological functions and values. Natural flow regimes should be protected or restored, when feasible. Flood risk reduction strategies and projects should be considered on a river-reach scale in coordination with other agencies following the WRIA, salmon recovery, or other plans identifying areas that provide natural and beneficial floodplain functions.

Policy G-7: Flood Hazard Management on Private Property

With the exception of flood emergency response functions, flood hazard management obligations of the County shall be limited to public education and awareness outreach and grant funding where the County may act as an eligible applicant agent for identified feasible and cost-effective flood hazard mitigation projects. County funds shall not be used for the betterment of private property outside of these parameters.

12.1.2 Policies for Regional Consistency

This Flood Plan is a comprehensive flood control management plan as defined under RCW 86.12. Though state law suggests that such plans are binding on jurisdictions within the planning area, Cowlitz County acknowledges that municipalities within the county have different levels of existing development, flood hazard management resources, and staff for enforcing regulations. Complete adoption by all cities of all policies in this Flood Plan

may not be appropriate and is considered optional. Local flood hazard regulations and programmatic recommendations should strive for consistency with Cowlitz County's, but they may be adapted to suit each city's needs and resources.

Following adoption of the 2023 Comprehensive Flood Hazard Management Plan, Cowlitz County staff will be available as a resource to all cities in the planning area that seek assistance in establishing floodplain management policies consistent with those identified in this plan. Evaluation and coordination that will take place over time to maximize consistency between the adopted Flood Plan and incorporated areas may occur through WRIA forums, flood control districts, or other formal, multi-jurisdictional county-city groups. The policies below are intended to provide guidance on how consistency as defined for this plan will be supported during the performance period of this plan.

Policy G-8: Technical and Planning Assistance

Upon request, Cowlitz County should assist cities with which it shares jurisdiction of the major river basins in developing and adopting flood hazard management policies, regulations, and standards that are consistent with Policy G-3.

Policy G-9: NFIP Compliance and Good Standing

It should be the policy of Cowlitz County and all cities within the County that participate in the National Flood Insurance Program (NFIP) to maintain compliance and good standing by implementing programs that meet or exceed the minimum NFIP requirements. Such programs include but are not limited to the following:

- Enforcing an adopted flood damage prevention ordinance
- Limiting adverse downstream impacts from floodplain management policy
- Participating in floodplain mapping updates
- Providing public assistance and information on floodplain requirements and impacts.

The evaluation of compliance for this policy is managed by the Department of Ecology as the Washington State NFIP Coordinating Agency, and/or FEMA Region 10.

Policy G-10: Higher Regulatory Standards

Cowlitz County should encourage cities and towns to adopt policies and regulations that meet or exceed the FEMA and Washington state standards. The policies and regulations considered should be appropriate for the risk of each community, feasible, and within the resource capability of each community.

12.1.3 National Flood Insurance Program

The NFIP provides a financial mechanism to respond to flood disasters by making flood insurance available to private landowners. This program provides federally backed flood insurance that encourages communities to enact and enforce flood hazard management regulations in order to qualify residents for flood insurance. Communities can also receive flood insurance premium discounts by adopting regulations that exceed federal minimum standards under the CRS program (see Appendix A for additional information). Numerous local governments and agencies share jurisdiction over flooding and other issues in the County's watersheds. However,

many local governments lack the staff and resources to develop new flood hazard regulations and programs. In such cases, Cowlitz County should provide assistance when staffing and other resources are available.

Policy G-11: National Flood Insurance Program

When feasible, Cowlitz County and cities should strive to not only meet but also exceed the federal minimum standards stipulated by the NFIP, using the CRS as a guide to better protect public safety, reduce the risk of flood hazards to existing public and private property, and achieve flood insurance premium discounts.

Policy G-12: Substantial Damage Protocol

The County shall develop and exercise a substantial damage protocol to be deployed any time a hazard event impacts properties located within the FEMA-identified special flood hazard areas within the County. This protocol shall be developed following FEMA guidance documents and model programs promoted under programs such as the CRS and the Ideal State initiative

12.2 FLOOD HAZARD AREA LAND USE POLICIES

Development in flood hazard areas can create two types of challenges:

- Because of its location in a hazardous area, the development may be at risk from inundation.
- The development can increase risks to neighboring properties by creating a barrier to the conveyance of floodwaters, thus causing backwater flooding upstream, and by reducing the area available to store and slowly release floodwaters, thus increasing flow velocities and erosion downstream.

This subsection contains policies to guide land-use planning and development regulations in flood hazard areas. The goal of these policies, which incorporate flood-related restrictions already adopted in Cowlitz County's Floodplain Management Ordinance, is to reduce flood risks to future developments and prevent increased risks to surrounding properties.

12.2.1 Changes to Flood Hazard Areas Based on Future Conditions

Historically, Cowlitz County flood hazard management regulations have been applied within the special flood hazard area as mapped by FEMA. FEMA maps are based on current or historical land use in the watershed. As watersheds develop, however, the rate and volume of runoff reaching rivers and streams can increase. In addition, changes in climate patterns can affect hydrologic conditions in flood hazard areas. The boundaries of the 1-percent annual chance floodplain may change over time, creating inconsistencies between actual flood hazard conditions and those portrayed on FEMA maps. In addition, some rivers in Cowlitz County can migrate laterally, endangering properties along their banks. Areas that are at risk due to channel migration are sometimes outside mapped flood hazard areas, so residents may not be aware of the risk.

Policy FLU-1: Future Conditions

The County should strive to incorporate the best available data and science that utilize future condition projections for technical studies within the watersheds and basins that contribute to flood hazard areas within Cowlitz County. When feasible, land use policies and flood hazard regulations should apply to flood hazard areas that are defined based on future-condition hydrology.

Policy FLU-2: Channel Migration Zone Hazard Areas

Cowlitz County should continue to identify channel migration hazard areas through geomorphologic analyses, review of historical channel migration patterns and rates, and existing documentation. Land-use regulations should restrict unsafe development in identified channel migration hazard areas.

Policy FLU-3: Sediment Management Areas

Local governments within Cowlitz County should coordinate with the U.S. Army Corps of Engineers to monitor sediment. The Corps shall perform annual bathymetric surveys of the Cowlitz/Toutle Rivers and calculate the level of protection in the river, and implement the Long-Term Sediment Management Plan, in accordance with the Mount St. Helens Congressional Authorization.

12.2.2 Land Use Regulations

Cowlitz County local governments regulate development in flood hazard areas through flood hazard development ordinances. These codes include higher standards than are required by the NFIP and state law. The following policies support the development regulations that have already been adopted under the local government codes.

Policy LU-1: Subdividing Property

Where feasible within the parameters of adopted regulations, new subdivisions, short subdivisions, urban planned developments, and binding site plans in Cowlitz County shall strive to contain sufficient buildable land outside the FEMA-designated special flood hazard area or the 1-percent annual chance regulated floodplain. No residential structures shall be built or placed within a FEMA-designated floodway.

Policy LU-2: Base Flood Depth and Base Flood Velocity

Local governments should require a base flood depth and base flood velocity analysis for all new development in flood hazard areas where such information has not been provided on FEMA mapping.

Policy LU-3: Development in Flood Hazard Areas

New development and substantial improvements in flood hazard areas shall be constructed so that they can withstand the 1-percent annual chance flood without sustaining significant damage. They shall, at a minimum, be built so that the lowest finished floor is at or above the flood protection elevation, which is at least 1-foot above the 1-percent annual chance flood elevation. Areas below the lowest finished floor of residential structures shall be designed to allow for the unimpeded entry and exit of floodwaters.

Policy LU-4: Utilities

Utilities should be allowed within flood hazard areas only when no reasonable alternative location is available. When allowed, they shall be flood-protected to a flood protection elevation.

Policy LU-5: Anchoring Structures

Structures in flood hazard areas shall be anchored to prevent flotation, lateral movement or collapse.

Policy LU-6: Critical Facilities

Critical facilities and land uses that have the potential to create hazardous conditions if impacted by flooding, based on their use and/or presence of hazardous materials, shall not be allowed in a 1-percent annual chance floodplain or channel migration zone unless no reasonable alternative location is available. If no alternative site is available, the critical facility shall be flood protected, including the access, to 3 feet above the 1-percent annual chance flood elevation or placed at the 0.2-percent annual chance flood elevation, whichever is higher.

Policy LU-7: Zone X Levee-Protected Areas

Within areas identified on FEMA maps as Zone X (Areas with Reduced Flood Risk Due to Levee), the County and cities should educate the public about the residual risk of being located behind levees. The County and cities should encourage the lowest floor of new residential structures to be elevated above grade. New critical facilities should provide some level of protection to account for the residual risk of being located behind levees, such as elevating building utilities, to ensure the facilities remain operational for flood response and/or recovery.

12.3 FLOOD RISK REDUCTION POLICIES

The policies in this section guide a comprehensive program that can implement a range of flood hazard management projects, including both structural and non-structural projects. Structural projects often involve retrofitting existing facilities, including sediment management and bank stabilization facilities. Non-structural projects could include voluntary relocation, acquisition, and elevation of flood-prone homes and the removal of existing flood hazard management structures that are no longer needed.

Policy FRR-1: Criteria for Taking Action

Local governments should monitor and evaluate flood risk, sediment deposition, and channel migration processes to determine when action should be taken to reduce the potential risks associated with these processes using the following criteria:

- The consequences that will result if no action is taken
- The urgency of the need to take action
- The legal responsibility and authority of local governments

Policy FRR-2: Selecting Flood Risk Reduction Actions

Flood risk reduction actions should be selected based on consideration of the following criteria:

- Action effectively meets site- and reach-specific flood risk reduction objectives
- Action results in a benefit that exceeds the initial cost as well as the long-term maintenance costs
- Action does not create new unmitigated flood hazard or other problems
- Action recognizes riparian habitat and supports adopted Water Resource Inventory Area Plan objectives where applicable
- Action achieves public benefits
- Action builds upon funding and partnering opportunities

Policy FRR-3: Property Acquisition

Local governments may acquire property interests in land necessary to meet flood hazard management objectives. Except under very limited circumstances, acquisition of structures and property should be voluntary on the part of the property owner. Participation should be limited to the support of the pursuit of funding from non-county sources such as the suite of FEMA hazard mitigation grant programs or Washington Department of Ecology's "Floodplains by Design" initiative or FCAAP grant program. Condemnation should be considered only under the following circumstances:

- Federal, state or local regulations prohibit reconstruction of the building
- The property in question is causing significant flood damage to other properties
- A property owner refuses to sell a portion of an area in which the majority of property owners have agreed to sell to the County
- A property owner refuses to sell an area needed to complete a proposed flood risk reduction project

Policy FRR-4: Easements

Prior to participating in the construction of a new flood protection facility or maintaining, repairing or reconstructing an existing flood protection facility, local governments should obtain all easements necessary to construct, maintain, repair, or retrofit the flood protection facility consistent with applicable local government design and construction standards and federal and state engineering guidelines.

Policy FRR-5: Management of Flood Hazard Management Properties

Local governments shall manage public lands and easements within flood hazard areas in accordance with the policies within this Flood Plan. Public access to flood hazard management properties will be evaluated on a case-by-case basis to determine the impact the public may have on the facility, as well as overall public safety issues.

Policy FRR-6: Flood Facility Design and Maintenance Objectives

Local governments should construct new flood protection facilities and maintain, repair, or replace existing flood protection facilities in such a way as to:

- Require minimal maintenance over the long term
- Ensure that flood hazard problems are not transferred to other sites
- Maintain or enhance aquatic, riparian and other critical area habitat where feasible
- Minimize impacts on flood hazard areas within areas that provide fish and wildlife habitat, recreational opportunities and productive agricultural soils

Policy FRR-7: Monitoring and Adaptive Management

Flood hazard management projects shall be monitored to assess their function relative to established performance measures. Adaptive management shall be used to modify the project in order to improve the effectiveness of the project and to inform the design and implementation of future projects.

12.4 RIVER CHANNEL MAINTENANCE POLICIES

This section recommends policies to direct future channel maintenance activities undertaken by Cowlitz County. The policies seek a balance between resource concerns and the protection of public property and private structures. Routine maintenance of natural drainage systems is conducted using best management practices identified by various permitting agencies.

Policy CM-1: When to Remove, Reposition or Relocate Large Woody Debris

Naturally occurring accumulations of large woody debris should be removed, repositioned or relocated for flood hazard management purposes only if they create one or more of the flood-related risks described in Policy G-1 and all reasonable alternatives have been considered.

Policy CM-2: Relocation of Large Woody Debris

Removal, repositioning or relocation of naturally occurring large woody debris should be accomplished within the parameters of local, state or federal permits, using the technique that results in the least disturbance to the river channel. If removed, the wood should be put back into the river in a manner that does not create new flood hazard risks. If it is not practical or reasonable to return the large woody debris to the channel, it should be incorporated into an adjacent riparian corridor where feasible.

Policy CM-3: Comprehensive Sediment Management

Comprehensive sediment management in Cowlitz County shall be informed by technical sediment transport studies and consider the highly variable nature of sediment transport to achieve a balance between flood risk reduction and ecological health.

Policy CM-4: Gravel and Sediment Removal

Cowlitz County may remove gravel and sediment from rivers for flood hazard or channel migration protection purposes when:

- It can be demonstrated that gravel and sediment accumulation poses a flood or channel migration risk as defined in Policy G-1, or reduces the level of protection provided by levees
- Hydraulic and sediment transport studies conclude gravel or sediment removal has a benefit of flood or channel migration risk reduction
- The removal location is in a demonstrated area of gravel and sediment accumulation
- The removal project is part of a comprehensive, reach-scale flood risk reduction strategy or other applicable documents
- Biologic studies determine that gravel or sediment removal does not, with mitigation, result in a net loss of ecological function
- All proper approvals have been secured

Policy CM-5: Toutle and Cowlitz River Sediment Management

Sediment on the Toutle and Cowlitz Rivers shall be managed according to the Long-Term Sediment Management Plan. Local governments should participate in the Spirit Lake Collaborative or like groups to support long-term sediment management.

12.5 FLOOD WARNING AND RESPONSE POLICIES

Early warning of developing flood conditions is essential to effective flood risk reduction during flood events. Near-real-time weather and gage data should be interpreted and made available through a variety of means to allow agencies, organizations, and private individuals to take appropriate action before and during a flood event. This section recommends policies to direct future flood warning and emergency response activities undertaken by Cowlitz County.

Policy FW-1: Flood Warning

Local governments should assist the National Weather Service and provide flood information and notification services to county visitors and residents during flood events.

Policy FW- 2: Flood Emergency Response and Recovery

Cowlitz County and cities should coordinate regional flood emergency response and recovery services during and after flood emergencies through the Emergency Operations Center and Cowlitz County Department of Emergency Management. The County and cities should participate in advance planning to prepare for the emergency response and recovery, including developing messaging and other notifications.

Policy FW-3: Sandbags

Before and during expected flood events, local governments may provide a location for sandbags and sand. Citizens may request them from the individual fire district or public works departments. Property owners are responsible for placing sandbags and cleaning up sandbags after the flood event and meeting any regulations relating to sandbagging activity.

Policy FW-4: Agency Coordination

Cowlitz County and cities shall coordinate with diking districts, flood control districts, the National Weather Service, cities, police and fire departments, and other entities as needed (e.g., Army Corps of Engineers, U.S. Forest Service, Cowlitz PUD, Department of Ecology, Department of Fish and Wildlife) to improve flood warning and emergency response procedures.

Policy FW-5: Emergency Response Actions

Local governments should consider sustainable risk reduction objectives before taking emergency response actions. Emergency response actions should be implemented in a manner that does not preclude the achievement of long-term flood risk reduction actions or habitat restoration objectives, for example when a planned mitigation action can be implemented instead of an emergency action.

Policy FW-6: Levee-Protected Areas

Local governments should plan for flood response within levee-protected areas in the event of levee or pump failure, such as increasing preparedness of the community by communicating risk and developing emergency response plans and evacuation plans and procedures.

Policy FW-7: Windshield Surveys and Damage Estimates

After a flood event, local governments shall quickly begin surveying damage and support the collection of individual private property damage estimates due to drainage and flooding. Local governments shall take pictures of damage and document high water marks. This information gathered by local agencies should then be forwarded as soon as possible to the Cowlitz County Department of Emergency Management. The Department of Emergency Management will then record all reported damage using WebEOC or the current approved working method approved by Washington State Emergency Management Division, for documentation and historical recording purposes, which may later be utilized should damage thresholds meet or exceed required loss amounts.

Policy FW-8: High Water Mark Program

Local governments within the County should develop and implement a high water mark program with the public to ensure accurate and necessary flood data is collected after each event.

12.6 FUNDING AND FINANCING POLICIES

Local governments have limited funds and cannot meet all the drainage or flood hazard reduction needs of all the communities within the county. County and city funding is designated primarily to deal with public infrastructure and safety, not small local drainage issues. The policies in this section provide a framework for making decisions about how these funding sources are used for flood hazard management in Cowlitz County.

Policy FF-1: Designated Emergency Fund Balance

Local governments should strive to establish a designated emergency fund balance reserve to be used exclusively for flood emergency response. To the extent practicable, these funds should be used to leverage state and federal funds but should also be sufficient to allow local governments to respond to emergencies when state and federal funding is not readily available. The reserve allocation should be based on the projected costs for the local share of flood disaster recovery plus a margin of error.

Policy FF-2: Regional Funding

New or expanded regional funding sources should be identified to meet the need for enhanced or expanded flood hazard management projects and programs to address flood impacts.

Policy FF-3: Grant Funding

Local governments should identify, evaluate, and coordinate grant funding sources to determine their suitability and assess consistency with the goals and objectives of this Flood Plan, and apply for grants to leverage local sources of funding for flood risk reduction projects.

13. MITIGATION INITIATIVES

13.1 ALTERNATIVES ANALYSIS

The Flood Plan Steering Committee performed a core capability exercise to assess local strengths, weaknesses, obstacles and opportunities related to floodplain management. This served as a basis for a catalog of alternatives the County could consider as floodplain management actions. This catalog represents the range of floodplain management alternatives that were considered by the County in compliance with Step 7 of the CRS 10-step process. It presents a wide range of activities to ensure that all possible measures are explored, not just traditional approaches such as flood control, acquisition, and land use regulation. The Steering Committee's input on the County's core capabilities informed the alternatives review process. The planning team also used findings of public outreach efforts, and the risk assessment results to finalize the catalog. The resulting catalog includes alternatives that are categorized in two ways:

- By who would have responsibility for implementation:
  - Public sector (people who live and work in Cowlitz County)
  - Private sector (non-governmental organizations and business sectors)
  - Government sector (federal, state and local entities that possess regulatory authorities).
- By what the alternative would do:
  - Manipulate the flooding hazard
  - Reduce exposure to the flooding hazard
  - Reduce vulnerability to the flooding hazard
  - Build local capacity to respond to or be prepared for the flooding hazard.

The catalog provides a baseline of mitigation alternatives that are consistent with the goals and objectives of this plan. This list and the capabilities of the County to implement these alternatives were fully vetted by the Steering Committee. The catalog presents a range of alternatives to consider for actions to be recommended in this plan. Decisions not to carry over any actions into the action plan were based on the following criteria:

- The action is not feasible.
- The action is already being implemented.
- The County lacks the current capability to implement the action.
- There is an apparently more cost-effective alternative.
- The action does not have public or political support

Table 13-1 presents the catalog of flood hazard alternatives considered by the County.

Table 13-1. Alternatives to Mitigate the Flooding Hazard

Public Sector	Private Sector	Government Sector
Manipulate the hazard		
• Clear storm drains and culverts	• Clear storm drains and culverts	• Maintain drainage system • Dredging, levee construction, and providing regional retention areas • Structural flood control, levees, channelization, or revetments. • Stormwater management regulations and master planning • Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff
Reduce exposure to the hazard		
• Locate outside of hazard area • Elevate utilities above base flood elevation	• Locate critical facilities or functions outside hazard area	• Locate or relocate critical facilities outside of hazard area • Acquire or relocate identified repetitive loss properties • Promote open space uses in identified high hazard areas via techniques such as: planned unit developments, easements, setbacks, greenways, sensitive area tracks. • Adopt land development criteria such as planned unit developments, density transfers, clustering • Institute low impact development techniques on property • Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff • Preserve undeveloped and vulnerable shoreline • Restore existing flood control and riparian corridors
Reduce vulnerability to the hazard		
• Raise structures above base flood elevation • Elevate items within house above base flood elevation • Build new homes above base flood elevation • Flood-proof structures	• Build redundancy for critical functions or retrofit critical buildings • Provide flood-proofing when new critical infrastructure must be located in floodplains	• Harden infrastructure, bridge replacement program • Provide redundancy for critical functions and infrastructure • Adopt regulatory standards such as freeboard standards, cumulative substantial improvement or damage, lower substantial damage threshold; compensatory storage, non-conversion deed restrictions. • Stormwater management regulations and master planning. • Adopt “no-adverse impact” floodplain management policies to not increase flood risk on downstream communities • Facilitate managed retreat from, or upgrade of, the most at-risk areas • Require accounting of sea level rise in all applications for new development in shoreline areas

Public Sector	Private Sector	Government Sector
Build local capacity to respond to or prepare for the hazard		
• Buy flood insurance • Develop household plan, such as retrofit savings, communication with outside, 72-hour self-sufficiency during and after an event	• Keep cash reserves for reconstruction • Support and implement hazard disclosure for sale of property in risk zones. • Solicit cost-sharing through partnerships with others on projects with multiple benefits.	• Produce better hazard maps • Provide technical information and guidance • Enact tools to help manage development in hazard areas (stronger controls, tax incentives, and information) • Incorporate retrofitting or replacement of critical system elements in capital improvement plan • Develop strategy to take advantage of post-disaster opportunities • Warehouse critical infrastructure components • Develop and adopt a continuity of operations plan • Consider participation in the Community Rating System • Maintain and collect data to define risks and vulnerability • Train emergency responders • Create an elevation inventory of structures in the floodplain • Develop and implement a public information strategy • Charge a hazard mitigation fee • Integrate floodplain management policies into other planning mechanisms within the planning area. • Consider the probable impacts of climate change on the risk associated with the flood hazard • Consider the residual risk associated with structural flood control in future land use decisions • Enforce National Flood Insurance Program requirements • Adopt a Stormwater Management Master Plan • Develop an adaptive management plan to address the long-term impacts of sea level rise

13.2 SELECTED MITIGATION ACTIONS

The planning team and Steering Committee identified actions that will provide flood hazard mitigation benefits from Steering Committee meetings, public comments, stakeholder meetings, and by reviewing the flood hazard mitigation catalog. Table 13-2 lists the recommended actions, the lead agency for each, and the proposed timeline. The action plan matrix includes the following information:

- Whether the action applies to new or existing assets
- The types of flood hazards mitigated:
  - All flooding
  - Riverine flooding
  - Urban flooding
- The objectives met
- The lead agency responsible for implementing the action
- The agencies that will support implementing the action
- The estimated cost:
  - **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases)
  - **Medium**—The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years
  - **Low**—The project could be funded under the existing budget; the project is part of or can be part of an ongoing, existing program

- Potential sources of funding to implement the action
- Timeline for implementation:
  - **Short-term**—Action to be completed in 1 to 5 years
  - **Long-term**—Action to be completed in greater than 5 years
  - **Ongoing**—Action currently being funded and implemented under existing programs

The action plan matrix is organized by mitigation action type. Because many actions could be considered to be multiple mitigation types, the actions were organized by their primary mitigation type as follows:

- **Prevention**—Government, administrative or regulatory actions that influence the way land and buildings are developed to reduce hazard losses.; includes planning and zoning, flood hazard management laws, capital improvement programs, open space preservation, and stormwater management regulations
- **Property Protection**—Modification of public buildings, roads, or structures to protect them from a hazard or removal of structures from a hazard area.; includes acquisition, elevation, relocation, structural retrofit, storm shutters, and shatter-resistant glass
- **Public Education and Awareness**—Actions to inform citizens and elected officials about flood hazards and ways to mitigate them; includes outreach projects, real estate disclosure, hazard information centers, and school-age and adult education
- **Natural Resource Protection**—Actions that minimize hazard loss and preserve or restore the functions of natural systems; includes sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation
- **Emergency Services**—Actions that protect people and property during and immediately after a hazard event; includes warning systems, emergency response services, and the protection of essential facilities
- **Structural Projects**—Actions that involve the construction of structures to reduce the impact of a hazard; includes dams, setback levees, floodwalls, retaining walls, and safe rooms
- **Climate Resilience—**Actions that take into consideration future flood hazards and the changing climate
- **Community Capacity Building—**Actions that will increase the ability of local governments, emergency services, businesses, residents, and other entities to protect life and property from the impacts of flooding

Table 13-2. Recommended Actions

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Prevention						
Action PRE-1—Develop guidance for development within floodplains with unmapped floodway boundaries and pursue updates to flood maps in areas with unmapped floodways to identify floodway boundaries.						
Flood Type Mitigated: Riverine Flooding						
Both	1,6,7	Cowlitz County	American Rivers, FEMA, Ecology	Medium	HMGP 5% Initiative, FCAAP, Local funding, FEMA CTP	Short-term
Action PRE-2—Develop a private drainage system maintenance program to ensure that private systems remain operational and receive required maintenance.						
Flood Type Mitigated: Urban Drainage						
Both	1,4	County and Cities	HOAs, Private property owners	Medium	Local funding	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action PRE-3—Maintain stormwater drains, culverts, and other related infrastructure to ensure proper drainage.						
Flood Type Mitigated: Urban Drainage						
Existing	1,4,6,12	Cities	Diking Districts	Medium	Local	Ongoing
Action PRE-4—Identify and monitor drainage problem areas including Pleasant Hill, Washburn Road, Allen Street/ Corduroy Road, Ostrander, I-5 South, and other problem areas.						
Flood Type Mitigated: Urban Drainage						
Both	1,4	County and Cities	TBD	Low	Local funds	Ongoing
Action PRE-5—Support and encourage efforts to manage sediment within the Cowlitz River, Toutle River, and Spirit Lake to reduce the impacts on discharge capacity, levee protection levels, and flood attenuation capabilities, including actions related to storage and dredging. Support the efforts of the Spirit Lake Collaborative.						
Flood Type Mitigated: Riverine Flooding						
Existing	1,2,3,4,6	Corps of Engineers	Diking Districts, Cities, County, Spirit Lake Collaborative, USFS	Low	Corps of Engineers	Ongoing
Action PRE-6—Support implementation of the Long-Term Sediment Management Plan and ongoing sediment monitoring.						
Flood Type Mitigated: Riverine Flooding						
Existing	1,7	Corps of Engineers	Diking districts, cities, County, WDFW, Ecology, USFS	Low	Federal, State, Local	Ongoing
Action PRE-7—Perform regular maintenance on the slough and pump stations to ensure continued operation and adequate drainage.						
Flood Type Mitigated: Urban Drainage						
Both	1,9,10	Castle Rock	TBD	Medium	TBD	Ongoing
Action PRE-8—Support and encourage WSDOT inspection and improvements of China Creek culverts to ensure continued drainage of downtown Kalama.						
Flood Type Mitigated: Urban Drainage						
Both	1,2,3	WSDOT	Kalama	Medium	WSDOT	Short-term
Action PRE-9—Investigate and implement feasible, cost-effective solutions to flood issues along Lomor Drive.						
Flood Type Mitigated: All Flooding						
Existing	1,4,8	County	FEMA	High	Local funds, grant funds	Long-term
Action PRE-10—Continue to utilize best practices when reviewing subdivision projects for impacts on local stormwater systems.						
Flood Type Mitigated: Urban Drainage						
Both	1,2,6	County	TBD	Low		Ongoing
Action PRE-11—Investigate feasible and cost-effective ways to reduce flooding within the Cowlitz Gardens neighborhood.						
Flood Type Mitigated: Urban Drainage						
Existing	1,4	County	FEMA	Medium	Local funds, FCAAP, Floodplains by Design, BRIC, FMA, HMGP	Long-term
Action PRE-12—Maximize federal, state, and local funding opportunities through grant application submittals in support of capital improvement projects, technical studies, and other flood hazard management activities.						
Flood Type Mitigated: All Flooding						
Both	1,2,5	County, cities, and districts	State and federal agencies	Low	Local	Short-term
Action PRE-13—Continue to maintain good standing under the National Flood Insurance Program by implementing programs that meet or exceed the minimum NFIP requirements. Such programs include enforcing an adopted flood damage prevention ordinance, participating in floodplain mapping updates, and providing public assistance and information on flood hazard requirements and impacts						
Flood Type Mitigated: All Flooding						
Both	1,2,5,11	County and cities	Diking districts	Low	Local	Ongoing

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action PRE-14—Investigate the feasibility of implementing construction regulations for new structures within the levee-protected areas, such as prohibiting basements or requiring critical facilities to meet floodplain construction standards.						
Flood Type Mitigated:	*All Flooding:*					
New	4,5,6,11	County and cities	Diking districts	Low	Local	Short-term
Property Protection						
Action PRO-1—Design and construct buildings, roads, and bridges to be resilient and resistant to flooding in the long-term. Construct and retrofit infrastructure with more than the 1-percent annual chance flood in mind.						
Flood Type Mitigated:	All Flooding					
New	4,7	County and cities	Diking districts	High	TBD	Long-term
Action PRO-2—Prioritize the purchase of repetitive loss and flood-prone properties. Build partnerships with the Cowlitz conservation districts and tribes to purchase and preserve floodplain habitats.						
Flood Type Mitigated:	All Flooding					
Existing	1,4	County, cities	Cowlitz Tribe, FEMA, Ecology	High	FMA, HMGP, BRIC, FCAAP, Floodplains by Design, Cowlitz Tribe	Long-term
Action PRO-3—Modify the Kelso water system to remove the surface water withdrawal from the Cowlitz River in order to avoid sediment impacts and reduce the required maintenance.						
Flood Type Mitigated:	All Flooding					
Existing	1,5,10	Kelso	Ecology, Dept of Health, Corps of Engineers	High	TBD	Long-term
Action PRO-4—Continue to evaluate, maintain, and repair existing sewer and stormwater systems. Identify combined systems and replace, where feasible.						
Flood Type Mitigated:	Urban Drainage					
Both	3,4,5	County, Cities	TBD	Medium	Local funds	Ongoing
Action PRO-5—Evaluate, repair, and maintain the Kalama culvert system to ensure proper stormwater drainage. Investigate opportunities to improve drainage under I-5 and along the railroad tracks and to build a new outfall along unvacated sections of Kingwood Street.						
Flood Type Mitigated:	Urban Drainage					
Both	1,4,6,9	Kalama	WSDOT, Railroad	High	Local funds, grant funding, WSDOT, Railroad	Ongoing
Action PRO-6—Investigate options for improving the trash rack on China Creek in Kalama to reduce maintenance requirements.						
Flood Type Mitigated:	Urban Drainage					
Both	1,4,8	Kalama	WSDOT	Low	Local funds, WSDOT	Short-term
Action PRO-7—Install a new 48-inch discharge pipe from the Kingwood ditch in Kalama to the Columbia River.						
Flood Type Mitigated:	Urban Drainage					
Both	1,4,8	Kalama	WSDOT, Railroad	High	TBD	Long-term
Action PRO-8—Evaluate options to improve the Burris Creek culvert that goes underneath Green Mountain Road to reduce the flooding of adjacent properties that occurs after heavy rains. Investigate methods to reduce future sedimentation and maintenance requirements.						
Flood Type Mitigated:	Urban Drainage					
Existing	1,4,8	County	Woodland	Medium	TBD	Short-term
Action PRO-9—Clear culvert that runs under the Kelso Skate Park and investigate methods to reduce future sedimentation and maintenance requirements.						
Flood Type Mitigated:	Urban Drainage					
Both	1,4,8	Kelso	WSDOT	High	Local funds, WSDOT	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Public Education and Awareness						
Action PUB-1—Discuss and identify property ownership and responsibility related to waterways, sloughs, dikes, pumps, etc.						
Flood Type Mitigated: All Flooding						
Existing	2,11	County, Cities	Diking Districts	Medium	Local funds	Short-term
Action PUB-2—Implement an outreach program to provide education to community members about how to prepare for and reduce their risk to flooding in Cowlitz County. Ensure that community members are aware of areas that are regularly flooded and methods to reduce flood damage to private property. Develop and deploy an outreach program for levee-protected areas to ensure residents understand the residual risk of living behind a levee. Develop a flood information website that includes a Flood Plan StoryMap. Improve current website to make the flood information easier to access. Deploy a targeted outreach program to residents that reside within the floodplain to inform them about ways to prevent damage to property, protect life, and safely evacuate in case of emergency. Develop and implement a live website for viewing river, dam, and reservoir gages.						
Flood Type Mitigated: All Flooding						
Both	1,11	County, cities	Districts, Ecology, FEMA	Medium	Local, State, Federal	Short-term
Action PUB-3—Develop an on-the-ground outreach program that includes signage, such as evacuation routes and past or projected flood levels.						
Flood Type Mitigated: All Flooding						
Both	1,3,9,11	County	Cities, Dam operators	Medium	TBD	Short-term
Action PUB-4—Implement a real-world geography curriculum in the school systems to educate school kids and their parents of the flood risks in Cowlitz County. Through this curriculum, inform on ways to protect property and life and respond to emergency situations.						
Flood Type Mitigated: All Flooding						
Both	1,11	County	Cities and school districts	Medium	Local funds	Ongoing
Action PUB-5—Utilize Tacoma Power's and PacifiCorp's inundation flooding maps to provide education to community members and coordination with Emergency Management and emergency responders.						
Flood Type Mitigated: Riverine						
Both	1,3,11	County	Cities, Tacoma Power, PacifiCorp	Medium	TBD	Short-term
Natural Resource Protection						
Action NRP-1—Encourage beaver reintroduction in appropriate locations throughout all basins to promote reduced risk of flood through beaver dams and provide habitat for fish, small mammals, and insects with a goal of boosting biodiversity. Appropriate locations are unpopulated areas where beavers are unlikely to affect the built environment or migrate to populated areas.						
Flood Type Mitigated: All Flooding						
Both	4,8,12	Tribes	CCD, WDFW	Low	Local funds	Ongoing
Action NRP-2—Implement flood damage reduction projects that aim to restore or enhance the native riparian vegetation, sequester sediment, and reconnect the floodplain to its historical area.						
Flood Type Mitigated: All Flooding						
Both	4,8,12	County	CCD, diking districts	High	Floodplains by Design	Long-term
Action NRP-3—Implement flood control measures that preserve, protect, or enhance fish passage and reduce flood risk.						
Flood Type Mitigated: All Flooding						
Both	12	County, cities	Tribes, CCD, WDFW, WSDOT	High	TBD	Long-term
Action NRP-4—Stabilize Whittle Creek through the planting of willows to support preservation of fish habitat, reduce erosion, and create and preserve flood capacity.						
Flood Type Mitigated: Riverine Flooding						
Both	4,8,12	County	Castle Rock, CCD	Medium	TBD	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action NRP-5—Maintain and trim existing vegetation along creeks and drainages to prevent overcrowding and blockages.						
Flood Type Mitigated: Urban Drainage						
Existing	8,12	Cities	County, diking districts	Medium	Local funds	Short-term
Action NRP-6—Eradicate noxious weeds that are contributing to shoreline erosion and causing other issues, including Coal Creek Slough, Olequa Creek, Ditch 6, and other watercourses.						
Flood Type Mitigated: Riverine Flooding						
Existing	4,8	County, cities, diking districts	CCD, Cowlitz County Noxious Weed Control Board	Medium	Local funds	Ongoing
Action NRP-7—Restore and reconnect the floodplain on the main stem Cowlitz River where feasible, to provide both floodplain protection and habitat restoration.						
Flood Type Mitigated: Riverine Flooding						
Both	4,8,12	Tribes	CCD, County	High	TBD	Long-term
Action NRP-8—Evaluate fish barriers to determine which to replace or remove in collaboration with County Public Works and the Cowlitz Tribe.						
Flood Type Mitigated: All Flooding						
Existing	4	County	Tribe, WSDOT, WDFW	Medium	Local, state, and federal funds	Ongoing
Action NRP -9—Promote/retain natural vegetation along I-5 MP 22-25 to decrease severity of landslides during rain events.						
Flood Type Mitigated: Mudslides						
Existing	4,8,12	WSDOT	TBD	Medium	TBD	Short-term
Emergency Services						
Action EMG-1—Evaluate and identify critical facilities that require backup power, including pumping stations. Purchase permanent or portable generators for critical facilities that lack backup power. Ensure compatibility between systems.						
Flood Type Mitigated: All Flooding						
Both	10	County, cities, diking districts	Districts	High	Grant funding, Local funds	Short-term
Action EMG-2—Evaluate emergency operations centers for flood resiliency and ability to operate during a flood. If necessary, implement mitigation necessary to ensure continued operation. If an emergency operations center is found to be vulnerable, determine the feasibility of relocating it outside of the floodplain and levee-protected areas.						
Flood Type Mitigated: All Flooding						
Existing	5,10	Woodland	County, Fire Districts	High	Bond or levy	Long-term
Action EMG-3—Prepare a flood evacuation plan that includes, but is not limited to, senior care facilities, public facilities, vulnerable populations, and disabled or mobility impaired residents, including Ryderwood (County) and Brookhollow Estates (Kelso). Identify areas that may be isolated during flood events and require additional support or evacuations. Identify and publish evacuation routes and gage heights at which roads are flooded/closed.						
Flood Type Mitigated: All Flooding						
Existing	1,5,9	County	Cities	Medium	Local funds, Grant funding	Short-term
Action EMG-4—Develop a county-wide Substantial Damage Response Plan.						
Flood Type Mitigated: All Flooding						
Existing	2,7	County	Cities	Medium	Local funds, Grant funding	Short-term
Action EMG-5—Implement a flood alert and warning system that has real-time flood threat recognition capability and ability to notify community members of imminent flood threats. Develop and implement a live website for viewing river, dam, and reservoir gages.						
Flood Type Mitigated: Riverine Flooding						
Both	1,3,10,11	County	Cities	High	TBD	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action EMG-6—Work collaboratively with stakeholders to establish communication protocols for municipalities, special districts, and first responders during an emergency flood event. Determine protocols for communicating with state and federal agencies and dam operators.						
Flood Type Mitigated: All Flooding						
Both	1,2,3,11	County	Cities, Fire Districts	Medium	Local funds	Short-term
Action EMG-7—Develop a county-wide disaster debris management plan.						
Flood Type Mitigated: All Flooding						
Both	3,7	County	Cities	Medium	TBD	Long-term
Action EMG-8—Develop flood response plans, including for levee breach scenarios. Maintain an updated contact list that is accessible to all agencies county-wide. Update and maintain interlocal agreements. Include building department and planning staff as an asset that can be shared. Update the mutual aid agreement between diking districts, public works departments, and other agencies that maintain levees. Implement advance planning and enter into prepositioned contracts to ensure that supplies and equipment needed during flood events are available, such as generators, cranes, etc.						
Flood Type Mitigated: All Flooding						
Both	3,7	County	Cities, diking districts	Medium	TBD	Long-term
Action EMG-9—Conduct annual exercises of the County Emergency Operations Plan in compliance with NIMS standards, such that flood response actions of the County are reviewed, evaluated, and adapted based on observations from the exercises. Support training and exercises between various flood responders to promote understanding of flood risk and flood response roles and responsibilities within the community. Use Hazus results to inform the flood scenario. Include outside agencies and contractors with roles in flood response. Provide more functional exercises.						
Flood Type Mitigated: All Flooding						
Both	3,5,9,11	County	Cities, diking districts	Medium	Local Funds	Short-term
Action EMG-10—Continue evaluating options for public notifications; coordinate with district and cities if feasible. Provide training for public notification systems and develop canned messages and protocols to ensure consistency and coordination.						
Flood Type Mitigated: All Flooding						
Both	2,11	County	Cities, districts	Low	TBD	Short-term
Action EMG-11—Identify and improve secondary access routes, prioritizing those that are used most frequently, such as the forest road used to bypass Ostrander Road during flood events.						
Flood Type Mitigated: All Flooding						
Existing	1,4,5,10	County	TBD	High	TBD	Long-term
Action EMG-12—Encourage the participation of cities and other flood response agencies when updating the CEMP and/or emergency support functions with a goal of increasing consistency between plans and an increased understanding of roles and responsibilities.						
Flood Type Mitigated: All Flooding						
Both	2,3,7	County	Cities, districts	Low	TBD	Ongoing
Action EMG-13—Conduct an annual pre-flood-season meeting with all agencies.						
Flood Type Mitigated: All Flooding						
Both	1,2,3	County	Cities, Fire Districts, Diking Districts	Low	TBD	Ongoing
Action EMG-14—Develop and implement an expanded levee closure training program that builds upon the requirements of the Army Corps of Engineers. Identify opportunities to practice levee closures.						
Flood Type Mitigated: Riverine Flooding						
Both	2,10	Diking districts	County, cities, WSDOT	Medium	Local funds	Short-term
Action EMG-15—Replace the Coweeman River gage. Install additional river gages near frequently flooded roads to increase ability to monitor water levels and be prepared for road closures.						
Flood Type Mitigated: Riverine Flooding						
Both	4	County	Ecology, USGS	Medium	Local funds, State funds, Federal funds	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Structural Projects						
Action STR-1—Investigate areas that experience repetitive flooding and identify feasible and cost-effective mitigation actions. These areas include, but are not limited to, Corduroy Rd/Sunrise-Harris St. Road vicinity, Bowmont St. Slough Area, Mill St between 8th and 11th, Clark St. area in West Kelso near the Phoenix House Complex, Fairway Vista, Big Canyon/ Street Park, and Westover, Lomar and Alpha Drive, Allen Street, and Brookhollow.						
Flood Type Mitigated: All Flooding						
Existing	1	County and cities	TBD	High	TBD	Long-term
Action STR-2—Implement systems along SR 4 to ensure adequate water drainage to prevent rockslides and damage to roads during flash flood events.						
Flood Type Mitigated: Flash Flooding, Mudslides						
Existing	4	WSDOT	County	High	State funding	Long-term
Action STR-3—Evaluate and implement feasible, cost effective methods to reduce flooding and rockslide impacts on Kalama River Road.						
Flood Type Mitigated: Riverine Flooding, Mudslides						
Existing	1,4	County	TBD	High	TBD	Long-term
Action STR-4—Evaluate stormwater systems to ensure adequate drainage capacity. If deemed feasible, replace culverts on Ditches 3, 5, and 6 and Drain 12, and replace other system components found to be undersized or inadequate. Evaluate the Chestnut Street stormwater system and improve if necessary to ensure that water is able to flow free of blockages and other restrictions. Identify opportunities to coordinate county and city stormwater systems that interact.						
Flood Type Mitigated: Urban Drainage						
Existing	1,4	Diking districts, County, cities	TBD	Medium	TBD	Long-term
Action STR-5—Replace Rose Valley Road bridge with a bridge that will allow continued use during floods and will not clog with debris.						
Flood Type Mitigated: All Flooding						
Existing	4,8	County	TBD	High	TBD	Long-term
Action STR-6—Investigate and determine where additional pump stations are needed or where existing pump stations need increased capacity, redundancy, or replacement and begin the process of implementing their construction. Continue hydraulic modeling processes and conduct further evaluations of Lexington, West Kelso, Clark Street, and Fishers Lane for additional pump stations and Oregon Way for additional capacity. Evaluate and repair or replace pumps at 2917 32nd Ave, 3845 Mint Place, the Golf Course, and other areas that need further defense to ensure flood protection. Provide permanent protection for pump stations on Cowlitz Drive at risk of flooding.						
Flood Type Mitigated: Urban Drainage						
Select	4,10	Diking districts	Cities	High	TBD	Long-term
Action STR-7—Evaluate Huntington Avenue, Lions Pride Park, and other repetitively flooded areas to determine the feasibility of flap gates, bank armoring, or rock groins to prevent erosion that may harm the road or utilities.						
Flood Type Mitigated: Riverine Flooding						
Existing	1,4	Castle Rock	TBD	Medium	TBD	Long-term
Action STR-8—Evaluate ditches to determine where rerouting or adding flap gates could be an appropriate mitigation to reduce risk of flooding.						
Flood Type Mitigated: Urban Drainage						
Both	1,4	Diking districts	County, cities	High	TBD	Long-term
Action STR-9—Install a positive closure valve for the Green Acres subdivision						
Flood Type Mitigated: Urban Drainage						
Existing	4	City of Castle Rock	TBD	Medium	TBD	Short-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action STR-10—Maintain, evaluate, and improve levee systems county-wide. Maintain or increase levee freeboard to ensure the protection of land, property, and roadways from flooding and to maintain the levee-protected areas designation on flood maps. Evaluate and repair the damage caused to levees from burrowing by animals and humans. Establish procedures to mitigate the potential damage, such as trapping and removal of nutria and rock armoring.						
Flood Type Mitigated: Riverine Flooding						
Both	4,5,9	Diking districts	County and cities, Corps of Engineers	Medium	TBD	Ongoing
Action STR-11—Raise the Cowlitz River Levee from the Hall of Justice to River Road Condos to remove low spots, maintain freeboard, and increase the level of protection.						
Flood Type Mitigated: Riverine Flooding						
Both	4	CDID#1	City of Longview	Low	TBD	Long-term
Action STR-12—Improve the effectiveness of the levee at Fishers Lane and West Side Highway by raising the intersection to improve the level of protection by eliminating the need for a temporary closure system. Evaluate the feasibility and cost effectiveness of permanently closing the other levee gaps or improving the temporary flood gates that are installed when flooding is imminent.						
Flood Type Mitigated: Riverine Flooding						
Both	4,9	CDID#1, Woodland	Longview, WSDOT, Corps of Engineers	High	TBD	Long-term
Action STR-13—Investigate the Woodland levee to determine if improvements are necessary to ensure continued designation as a levee-protected area on FEMA flood insurance rate maps. Implement improvements.						
Flood Type Mitigated: Riverine Flooding						
Both	4,9	CDID#2	Corps of Engineers, City of Woodland	High	District funds, Corps of Engineers	Short-term
Action STR-14—Evaluate levees to identify location where levee setback may be feasible with a goal of creating additional flood storage and floodplain habitat.						
Flood Type Mitigated: Riverine Flooding						
Both	4,8	Cowlitz Tribe	County, cities, Corps of Engineers, CCD	Low	Grant funding	Long-term
Climate Resilience						
Action CLI-1—Define floodplain mapping criteria that take into account future flood hazard conditions and/or expected worst case conditions to be applied to all future flood studies within the planning area.						
Flood Type Mitigated: All Flooding						
Existing	1	County, cities	FEMA	Medium	TBD	Long-term
Action CLI-2—Evaluate the effect of climate change on future flood potential, including the effect of sea level rise to tidal impacts and increased flood height effects on levee-protected areas. Account for changing climate conditions in relevant codes and future infrastructure projects.						
Flood Type Mitigated: All Flooding						
Both	1,8	County	Cities	High	TBd	Long-term
Community Capacity Building						
Action CAP-1—Continue to collect new information and data on the floodplains in Cowlitz county, using LIDAR and/or other techniques to ensure accurate elevations are being utilized. Periodically review FEMA floodplain maps to determine the need to update County maps.						
Flood Type Mitigated: All Flooding						
Both	1	County and cities	FEMA, DNR	Medium	TBD	Ongoing
Action CAP-2—Evaluate and map tidal effects of the Columbia River to identify affected areas and better understand the tidal effects on flooding.						
Flood Type Mitigated: Tidal Flooding						
Both	1	County	FEMA	High	TBD	Long-term

Benefits New or Existing Assets	Objectives Met	Lead Agency	Support Agency	Estimated Cost	Sources of Funding	Timeline
Action CAP-3—Evaluate the flood control capabilities of Tacoma Power's dam.						
Flood Type Mitigated: Riverine Flooding						
Both	1	Tacoma Power	County	Medium	TBD	Short-term
Action CAP-4— Encourage communication between various agencies with project examples that could be practiced in Cowlitz County, including the support of the Spirt Lake Collaborative's upper watershed projects that reduce flooding through environmental projects.						
Flood Type Mitigated: Riverine Flooding						
Both	2,3	County	Spirit Lake Collaborative, Corps of Engineers	Medium	TBD	Short-term
Action CAP-5—Create a Woodland Bottoms Stormwater plan that includes inventory of existing infrastructure.						
Flood Type Mitigated: Urban Drainage						
Both	1,7	CDID #2	County, City of Woodland, Port of Woodland	Medium	Local funds	Short-term
Action CAP-6—Continue to keep Cowlitz Tribe informed of Flood Plan progress and engagement points.						
Flood Type Mitigated: All Flooding						
Both	2,3,11	County	Cowlitz Tribe	Low	Local funds	Short-term
Action CAP-7—Evaluate levee-protected areas to identify most vulnerable areas and populations. For example, areas that may be first to flood or will be impacted the greatest in the event of a levee breach, or areas that have a high population of socially vulnerable residents, such as low income or disabled or elderly residents who may need evacuation support.						
Flood Type Mitigated: All Flooding						
Both	1,2,3,9,11	Diking Districts	County and cities	High	TBD	Short-term
Action CAP-8—Include and collaborate with CDID #2 in next City of Woodland Comprehensive Plan Update. Include CDID#2 data in Utilities and Public Services chapter, including revenues and expenses/liabilities reporting similar to municipal utilities. Include assessment of CDID #2 infrastructure and levee status in long-term planning.						
Flood Type Mitigated: All Flooding						
Both	1,2,3	City of Woodland	County	Medium	TBD	Long-term
Action CAP-9—Adopt and enhance the Longview Stormwater Master Plan.						
Flood Type Mitigated: Urban Drainage						
Both	1,4,7	Longview	TBD	Medium	Local funds	Short-term
Action CAP-10—Utilizing the best available data, science, and technology, maintain and enhance as data becomes available the Level 2, user-defined HAZUS-MH model that was constructed to support this planning effort.						
Flood Type Mitigated: All Flooding						
Both	1	County	FEMA	Medium	Local funds, grant funds	Short-term
Action CAP-11—Integrate the Flood Plan into other appropriate plans and programs that can support or enhance the County's and cities' efforts to reduce flood risk as these plans and programs are updated. Examples of such plans/programs include, but are not limited to, Cowlitz County Hazard Mitigation Plan, Cowlitz County Comprehensive Plan, city comprehensive plans, water and sewer system plans, stormwater plans, and Cowlitz County Shoreline Master Program.						
Flood Type Mitigated: All Flooding						
Both	7	County	Cities	Low	FEMA, Commerce, Ecology	Short-term

13.3 PRIORITIZATION OF ACTIONS

13.3.1 Benefit/Cost Analysis

The action plan is prioritized according to a benefit/cost analysis of the proposed projects and their associated costs. The benefits of proposed projects were weighed against estimated costs as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program and the BRIC grant program. A less formal approach was used because some projects may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time. Therefore, a review of the apparent benefits versus the apparent cost of each project was performed. Parameters were established for assigning subjective ratings (high, medium, and low) to the costs and benefits of these projects.

Cost ratings were defined as follows:

- **High**—Existing funding will not cover the cost of the project; implementation would require new revenue through an alternative source (for example, bonds, grants, and fee increases).
- **Medium**—Project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
- **Low**—Project could be funded under the existing budget. The project is part of or can be part of an ongoing existing program.

Benefit ratings were defined as follows:

- **High—**Project will provide an immediate reduction of risk exposure for life and property.
- **Medium—**Project will have a long-term impact on the reduction of risk exposure for life and property, or project will provide an immediate reduction in the risk exposure for property.
- **Low—**Long-term benefits of the project are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-beneficial and are prioritized accordingly.

For many of the strategies identified in this action plan, Cowlitz County may seek financial assistance under the FEMA Hazard Mitigation Grant Program or Hazard Mitigation Assistance programs, both of which require detailed benefit/cost analyses. These analyses will be performed on projects at the time of application using the FEMA benefit-cost model. For projects not seeking financial assistance from grant programs that require detailed analysis, Cowlitz County reserves the right to define “benefits” according to parameters that meet the goals and objectives of this plan.

13.3.2 Implementation Priority

The priority for implementing each action was assigned based on the following definitions:

- **High Priority**—An action that meets multiple objectives, has benefits that exceed costs, and has a secured source of funding. Action can be completed in the short term (1 to 5 years).
- **Medium Priority**—An action that meets multiple objectives, has benefits that exceed costs, and is eligible for funding though no funding has yet been secured for it. Action can be completed in the short

term (1 to 5 years) once funding is secured. Medium-priority actions become high-priority actions once funding is secured.

- **Low Priority**—An action that will mitigate the risk of a hazard, has benefits that do not exceed the costs or are difficult to quantify, has no secured source of funding, is not eligible for any known grant funding, and can be completed in the long term (1 to 10 years). Low-priority actions are generally "wish-list" actions. They may be eligible for grant funding from programs that have not yet been identified.

13.3.3 Grant Pursuit Priority

The priority for pursuing grant funding for each action was assigned based on the following definitions:

- **High Priority**—An action that meets identified grant eligibility requirements, has high benefits, and is listed as high or medium implementation priority; local funding options are unavailable or available local funds could be used instead for actions that are not eligible for grant funding.
- **Medium Priority**—An action that meets identified grant eligibility requirements, has medium or low benefits, and is listed as medium or low implementation priority; local funding options are unavailable.
- **Low Priority**—An action that has not been identified as meeting any grant eligibility requirements.

13.3.4 Prioritization Summary for Mitigation Actions

Table 13-3 lists the priority of each action, based on the qualitative benefit-cost review, the number of plan objectives achieved, and the availability of funding.

13.4 ANALYSIS OF INSTREAM ACTIONS

WAC 173-145-040 requires flood plans to evaluate instream flood control works to determine that they are consistent with applicable policies and rules, and to identify and consider potential impacts on the following instream uses and resources:

- Fish resources
- Wildlife resources
- Scenic, aesthetic, and historic resources
- Navigation
- Water quality
- Hydrology
- Existing recreation
- Other impacts

Several actions in this plan are instream or have the potential to be instream after a preferred alternative is selected. These actions are described in more detail in the instream action worksheets below:

- Cowlitz River Sediment Monitoring and Removal (Table 13-4)
- Levee Maintenance and Improvements (Table 13-5)
- Kelso Skate Park Culvert (Table 13-6)
- Install River Gages Near Frequently Flooded Roads (Table 13-7)
- China Creek Maintenance (Table 13-8)
- Burris Creek Culvert Improvements (Table 13-9)
- Beaver Reintroduction (Table 13-10)

Table 13-3. Prioritization of Mitigation Actions

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
Prevention Actions								
PRE-1	3	Medium	Medium	Yes	Yes	Yes	Medium	High
PRE-2	2	Medium	Medium	Yes	No	Yes	Medium	Low
PRE-3	4	High	Medium	Yes	No	No	Medium	Low
PRE-4	2	Low	Low	Yes	No	Yes	Medium	Low
PRE-5	5	High	Low	Yes	No	Yes	High	Low
PRE-6	2	High	Low	Yes	No	Yes	High	Low
PRE-7	3	Medium	Medium	Yes	No	Yes	Medium	Low
PRE-8	3	Medium	Medium	Yes	No	Yes	Medium	Low
PRE-9	3	High	High	Yes	Yes	No	Medium	Medium
PRE-10	3	Low	Low	Yes	No	Yes	High	Low
PRE-11	2	Medium	Medium	Yes	Yes	Yes	Medium	Medium
PRE-12	3	Medium	Low	Yes	Yes	Yes	High	High
PRE-13	4	High	Low	Yes	No	Yes	High	Low
PRE-14	4	Medium	Medium	Yes	Yes	Yes	Medium	Medium
Property Protection Actions								
PRO-1	2	High	High	Yes	Yes	No	Medium	Medium
PRO-2	2	High	High	Yes	Yes	No	Medium	High
PRO-3	3	High	High	Yes	Yes	No	Medium	Medium
PRO-4	3	High	Medium	Yes	Yes	Yes	High	High
PRO-5	4	High	High	Yes	Yes	No	Medium	Medium
PRO-6	3	Medium	Low	Yes	Yes	Yes	Medium	Medium
PRO-7	3	Medium	High	Yes	Yes	No	Low	Medium
PRO-8	3	Medium	Medium	Yes	No	Yes	Medium	Low
PRO-9	3	High	Medium	Yes	No	Yes	High	Low
Public Education Actions								
PUB-1	2	Low	Medium	No	No	Yes	Low	Low
PUB-2	2	High	Medium	Yes	Yes	Yes	High	High
PUB-3	4	Medium	Medium	Yes	Yes	Yes	Medium	Medium
PUB-4	2	Medium	Medium	Yes	Yes	Yes	Medium	Medium
PUB-5	3	Medium	Medium	Yes	Yes	Yes	Medium	Medium
Natural Resource Protection Actions								
NRP-1	3	Low	Low	Yes	No	Yes	Low	Low
NRP-2	3	Medium	High	No	Yes	No	Low	Medium
NRP-3	1	Medium	High	No	Yes	No	Low	Medium
NRP-4	3	Medium	Medium	Yes	Yes	Yes	Medium	Medium
NRP-5	2	Medium	Medium	Yes	No	Yes	Medium	Low
NRP-6	2	Medium	Medium	Yes	No	Yes	Medium	Low
NRP-7	3	Low	High	No	Yes	No	Low	Medium
NRP-8	1	Medium	Medium	Yes	Yes	Yes	Medium	Medium
NRP-9	3	Medium	Medium	Yes	No	Yes	Medium	Low
Emergency Services Actions								
EMG-1	1	High	High	Yes	Yes	No	High	High

Action #	# of Objectives Met	Benefits	Costs	Do Benefits Equal or Exceed Cost?	Is Project Grant-Eligible?	Can Project Be Funded Under Existing Programs/ Budgets?	Implementation Priority	Grant Pursuit Priority
EMG-2	2	Medium	High	No	No	No	Low	Low
EMG-3	3	Medium	Medium	Yes	Yes	Yes	Medium	Medium
EMG-4	2	Medium	Medium	Yes	Yes	Yes	Medium	Medium
EMG-5	4	High	High	Yes	Yes	No	Medium	Medium
EMG-6	4	High	Medium	Yes	No	Yes	Medium	Low
EMG-7	2	Medium	Medium	Yes	Yes	Yes	Medium	Medium
EMG-8	2	Medium	Medium	Yes	No	Yes	Medium	Low
EMG-9	4	High	Medium	Yes	No	Yes	High	Low
EMG-10	2	Medium	Low	Yes	No	Yes	High	Low
EMG-11	4	High	High	Yes	Yes	No	Medium	Medium
EMG-12	3	Medium	Low	Yes	No	Yes	Medium	Low
EMG-13	2	Medium	Medium	Yes	Yes	Yes	Medium	Medium
EMG-14	2	High	Medium	Yes	No	Yes	High	Low
Structural Projects								
STR-1	1	High	High	Yes	Yes	No	Medium	Medium
STR-2	1	High	High	Yes	No	No	Medium	Low
STR-3	2	High	High	Yes	Yes	No	Medium	Medium
STR-4	2	High	Medium	Yes	Yes	Yes	High	High
STR-5	2	Medium	High	No	Yes	No	Low	Low
STR-6	2	High	High	Yes	Yes	No	High	High
STR-7	2	High	Medium	Yes	Yes	Yes	High	High
STR-8	2	Medium	High	No	No	No	Low	Low
STR-9	1	High	Medium	Yes	No	Yes	Medium	Low
STR-10	3	High	Medium	Yes	No	Yes	High	Low
STR-11	1	High	High	Yes	No	No	Medium	Low
STR-12	2	Medium	High	Yes	Yes	No	Medium	Medium
STR-13	2	High	High	Yes	Yes	No	Medium	Medium
STR-14	2	Low	High	No	Yes	No	Low	Medium
Climate Resilience Actions								
CLI-1	1	Medium	Medium	Yes	Yes	Yes	Low	Low
CLI-2	2	Medium	High	No	Yes	No	Medium	Medium
Capacity Building Actions								
CAP-1	1	Medium	Medium	Yes	Yes	Yes	Medium	Medium
CAP-2	1	Medium	High	No	Yes	No	Low	Medium
CAP-3	1	Low	Medium	No	Yes	Yes	Low	Medium
CAP-4	2	High	Medium	Yes	No	Yes	High	Low
CAP-5	2	High	Medium	Yes	Yes	Yes	High	High
CAP-6	3	Low	Low	Yes	No	Yes	Medium	High
CAP-7	5	High	High	Yes	Yes	No	Medium	Medium
CAP-8	3	Medium	Medium	Yes	No	Yes	Medium	Low
CAP-9	3	Medium	Medium	Yes	No	Yes	Medium	Low
CAP-10	1	Medium	Medium	Yes	Yes	Yes	Medium	Medium
CAP-11	1	Medium	Low	Yes	Yes	Yes	High	High

Table 13-4. Cowlitz River Sediment Monitoring and Removal Worksheet

Instream Action Worksheet	
Mitigation Action Title	Cowlitz River Sediment Monitoring and Removal
Mitigation Action #	PRE-5. Support and encourage efforts to manage sediment within the Cowlitz River, Toutle River, and Spirit Lake to reduce the impacts to discharge capacity, levee protection levels, and flood attenuation capabilities, including actions related to storage and dredging. Support the efforts of the Spirit Lake Collaborative. PRE-6. Support implementation of the Long-Term Sediment Management Plan and ongoing sediment monitoring.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Riverine Flooding
Description of instream work and specific problem being mitigated	After the eruption of Mount St. Helens on May 18, 1980, a hot flow carried a high sediment load and tons of debris toward the Toutle River. Approximately 3.3 billion cubic yards of material entered the Toutle River and 50 million cubic yards of sand size and larger material was deposited into the Columbia River. By the day after the eruption, the 40-foot navigation channel in the Columbia River had filled in to 14 feet (Mount St. Helens Long-Term Sediment Management Plan, 2018). At Sprit Lake, the debris blocked the lake's natural outflow, creating a threat of catastrophic failure and flooding. In 1985, the Corps of Engineers completed a tunnel that was bored through the ridge to the north to serve as a drainage outlet. From the eruption on May 18, 1980, to September 30, 2018, the Toutle River transported about 405 million tons of sediment into the lower Cowlitz River (Uhrich, et al. 2021). The deposit of sediment in the Cowlitz River has substantially increased the flood risk to downstream communities including Castle Rock, Lexington, Kelso, and Longview. Even with a sediment retention facility that was constructed in 1987 by the Corps of Engineers, the Toutle River still transports about 2.8 million tons of sediment into the Cowlitz River each year. The Corps of Engineers is responsible for managing the sediment retention facility and monitoring its effectiveness through a congressionally mandated flood-control plan. The proposed action includes supporting regular monitoring of the sediment in the Cowlitz River, including the collection of samples. In addition, the action proposed supports efforts to dredge the river to increase the discharge capacity, protect levees, and support flood attenuation capabilities. This action also supports the implementation of the Long-Term Sediment Monitoring Plan. It supports the efforts of the Spirit Lake Collaborative, which was formed to assess the options for a long-term plan to remove the threat of catastrophic failure of Spirit Lake.
Evaluation of Potential Alternatives	
Alternatives to instream work considered.	No action. This was considered as an alternative to the proposed action. However, this is not a feasible alternative. The Long-Term Sediment Management Plan outlines that if no action were taken, there would be an increased risk of flooding to downstream communities due to an accumulation of sediment in the river, as well as severe economic impacts if the sediment were allowed to accumulate in the Columbia River shipping channel. In addition, taking no action could lead to a loss of habitat, negatively impact water quality, and impact recreational opportunities. Other alternatives were not evaluated as part of this Flood Plan. Toutle and Cowlitz River sediment and Spirit Lake management is a multi-agency effort with congressional authorizations that has undergone 40 years of monitoring, assessment, and evaluation. In 2018, the Corps of Engineers released a Final Supplemental Environmental Impact Statement for the Long-Term Sediment Management Plan that evaluated alternatives, including a no action alternative, dredging only alternative, sediment retention structure raising alternative, and a phased alternative. The full document is available at https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/7629.

Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	Monitoring sediment will have limited impact on fish, wildlife, scenic, aesthetic, historic, navigation, water quality, or hydrogeology resources. The dredging of the Cowlitz River may have significant impact on the aquatic environment. It may disturb the wildlife habitat and release sediment and other materials into the water column, reducing water clarity. However, through utilizing best practices, the negative impacts of dredging can be minimized. Without performing these actions, there would be greater negative impacts caused by the accumulation of sediment, and the potential for catastrophic failures would increase.
Project Information	
Applicable Objectives (refer to list of objectives)	1,2,3,4,6
Estimated Benefits (losses avoided):	X Life Safety X Damage/Risk Reduction ☐ Loss of Function ☐ Other Describe:
Timeline for Completion	Ongoing
Consistency with Policies and Rules	The action complies with plan policies to reduce flood risk and manage sediment on the Cowlitz and Toutle Rivers. The action complies with all local, state, and federal rules relating to in water work.
Plan for Implementation	
Lead Agency	U.S. Army Corps of Engineers
Support Agency	Diking Districts, Cities, County, Spirit Lake Collaborative, U.S. Forest Service
Potential Funding Sources	Corps of Engineers
Implementation Prioritization	High
Mitigation Action Prioritization	
Number of Objectives Met	5
Benefits	High
Costs	Low
Do Benefits Equal or Exceed Cost?	Yes
Is Project Grant-Eligible?	No
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	High
Grant Pursuit Priority	Low

Table 13-5. Levee Maintenance and Improvements

Instream Action Worksheet	
Mitigation Action Title	Levees Maintenance and Improvements
Mitigation Action #	STR-10. Maintain, evaluate, and improve levees systems county-wide. Maintain or increase levee freeboard to ensure the protection of land, property, and roadways from flooding and to maintain the levee protected areas designation on flood maps. Evaluate and repair the damage caused to levees from burrowing by animals and humans. Establish procedures to mitigate the potential damage, such as trapping and removal of Nutria and rock armoring. STR-11. Raise the Cowlitz River Levee from the Hall of Justice to River Road Condos to remove low spots, maintain freeboard, and increase the level of protection. STR-12. Improve the effectiveness of the levee at Fishers Lane and West Side Highway by raising the intersection to improve the level of protection by eliminating the need for a temporary closure system. Evaluate the feasibility and cost effectiveness of permanently closing the other levee gaps or improving the temporary flood gates that are installed when flooding is imminent. STR-13. Investigate necessary improvements to the Woodland levee to ensure continued designation as a levee protected area.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Riverine Flooding
Description of instream work and specific problem being mitigated	The existing levee system in Cowlitz County requires careful maintenance to ensure adequate flood protection. The proposed projects focus on maintaining the current protection of the levees and evaluating the feasibility of increasing protection through improvements to specific levees.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. No action was considered as a potential alternative; however, this is not a feasible solution. In order to ensure the protection of downstream communities and habitat of animals and aquatic species, the levee system must be maintained and improved. Flood Storage. The construction of flood storage basins was considered as an alternative to improving the levee system. Flood storage basins are constructed on the landward side of levees to capture and store floodwaters during high flow events and in some cases, they can greatly reduce the pressure on the levee system and prevent downstream flooding. However, this was not considered a viable option due to the cost and amount of land required to build the basins at a capacity that would reduce downstream flooding. Levee setbacks and reconstruction. Another considered alternative was moving the levees father back from the river by reconstructing the levees. This action could create more capacity and reduce flooding downstream, and the condition of the levee would be new. However, this may not be a feasible option due to land requirements. Currently, most areas behind the levees are developed. There are very few areas, if any, that could support a levee setback. The only way to do so would be through purchasing private property, which would be very costly. The County and diking districts would consider this to be a viable alternative if a feasible location were identified, per Action STR-14.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	The levees in Cowlitz County protect millions of dollars of infrastructure and thousands of people. Levees prevent rivers from flooding into their natural floodplains, which can have negative impacts on the health of the river's ecosystem. In addition, levees can alter the way that sediment is deposited in rivers and streams. However, the proposed project generally focuses on maintaining the levee system currently in place and providing improvements to certain levees, which will have minimal impact on the environment and aquatic species. Most of the levees in the County are outside of the stream channel, and maintenance generally does not include instream work, as work would be performed during a low flow. During flooding, some levees may require emergency work which could occur while the levee is considered to be instream due to high water levels.

Project Information	
Applicable Objectives (refer to list of objectives)	4,5,8,9
Estimated Benefits (losses avoided):	X Life Safety X Damage/Risk Reduction X Loss of Function ☐ Other Describe:
Timeline for Completion	Ongoing, short-term, or long-term, depending on specific action
Consistency with Policies and Rules	This action supports plan policies to maintain existing infrastructure and reduce flood risk. All proposed work will comply with the rules required to receive the local, state, and/or federal permits required to implement the action.
Plan for Implementation	
Lead Agency	Diking Districts
Support Agency	County, Corps of Engineers, Cities
Potential Funding Sources	Diking districts, local funds, Corps of Engineers, grant funds
Implementation Prioritization	High, medium, or low depending on specific action
Mitigation Action Prioritization	
Number of Objectives Met	4
Benefits	High, medium, or low depending on specific action
Costs	High, medium, or low depending on specific action
Do Benefits Equal or Exceed Cost?	High, medium, or low depending on specific action
Is Project Grant-Eligible?	Yes or no depending on specific action
Can Project Be Funded Under Existing Programs/Budgets?	Yes or no depending on specific action
Implementation Priority	High, medium, or low depending on specific action
Grant Pursuit Priority	Medium or low depending on specific action

Table 13-6. Kelso Skate Park Culvert

Instream Action Worksheet	
Mitigation Action Title	Kelso Skate Park Culvert
Mitigation Action #	PRO-9. Clear culvert that runs under the Kelso Skate Park and investigate methods to reduce future sedimentation and maintenance requirements
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Urban drainage
Description of instream work and specific problem being mitigated	The 42-inch culvert that runs under the Kelso Skate Park requires maintenance in order to maintain the flow capacity and prevent debris buildup. Currently, the culvert entrance is covered by debris. The culvert is at the bottom of a high embankment that could impound water if the culvert were to clog or not have sufficient capacity to discharge the creek flow. The embankment is not constructed to serve as a dam, and there is concern the embankment could fail, causing a flash flood that would run into Kelso's commercial area and possibly affecting I-5. In addition, the City will need to implement measures to perform regular maintenance and ensure debris removal can continue to occur when needed. The culvert is accessed by a steep road, which makes it difficult to perform the required maintenance.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. No action was a considered alternative. However, the entrance to the culvert needs to be cleared to determine the condition of the culvert and to maintain capacity and prevent damage. There are no known methods to do this that do not involve working in the stream.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	The clearing of the culvert entrance can disrupt aquatic habitats and introduce sediments into the stream. To minimize potential impacts, the project will follow best practice guidance for in-water work, such as working when the flows are the lowest.
Project Information	
Applicable Objectives (refer to list of objectives)	1,4,8
Estimated Benefits (losses avoided):	X Life Safety X Damage/Risk Reduction X Loss of Function ☐ Other Describe:
Timeline for Completion	Short Term (1-5 years)
Consistency with Policies and Rules	A preferred alternative has not been selected for this action. Maintaining consistency with polices and rules in Cowlitz County will be considered when determining the best action. The proposed action is consistent with plan policies to reduce flood risk and maintain existing infrastructure.
Plan for Implementation	
Lead Agency	City of Kelso
Support Agency	WSDOT
Potential Funding Sources	
Implementation Prioritization	

Mitigation Action Prioritization	
Number of Objectives Met	3
Benefits	High
Costs	Medium
Do Benefits Equal or Exceed Cost?	Yes
Is Project Grant-Eligible?	No
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	High
Grant Pursuit Priority	Low

Table 13-7. Install River Gages Near Frequently Flooded Roads

Instream Action Worksheet	
Mitigation Action Title	Install river gages near frequently flooded roads.
Mitigation Action #	EMG-15. Replace the Coweeman River gage. Install additional river gages near frequently flooded roads to increase ability to monitor water levels and be prepared for road closures.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Riverine Flooding
Description of instream work and specific problem being mitigated	The river gage for the Coweeman River was removed in 2019. Since then, County officials have been unable to predict or track the likelihood of the river flooding. This has caused the County to err on the side of caution, taking precautions and closing bridges due to unknown possibility of flooding. In order to replace the Coweeman River gage, a new site will need to be selected, which may require installation of instream components. This will include assessing the site to ensure the gage will provide accurate readings. In addition, the new gage will need to be installed in an accessible location. In addition to the Coweeman River, other water courses throughout the County also flood roads. The areas that are frequently flooded should be assessed to determine if a river gage is feasible and if so, a river gage should be installed.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. No action was considered as an alternative; however, taking no action is not a feasible solution. The Coweeman River gauge needs to be replaced so the County can better manage flooding and road closures. Radar Gage. Install a radar gage, which is typically mounted on a bridge and uses radar to measure the water height. A radar gage may not be appropriate for all locations. Frequent Monitoring. Instead of installing a gage, the County could conduct more frequent visual monitoring of the frequently flooded roads.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	A new river gauge may temporarily impact aquatic species during the installation process. However, through utilizing best practices for in-water work, the long-term impacts will be minimal. Although small, some river gaging stations are unsightly, and private property owners may not want the station on their property.
Project Information	
Applicable Objectives (refer to list of objectives)	4
Estimated Benefits (losses avoided):	☐ Life Safety X Damage/Risk Reduction ☐ Loss of Function ☐ Other Describe:
Timeline for Completion	Short Term (1-5 years)
Consistency with Policies and Rules	A preferred alternative has not been selected for this action. Maintaining consistency with polices and rules in Cowlitz County will be considered when determining the best action. The proposed action is consistent with plan policies to reduce flood risk and improve flood warning systems.

Plan for Implementation	
Lead Agency	Cowlitz County
Support Agency	Ecology, USGS
Potential Funding Sources	Local funds, state and federal funds, grant funds
Implementation Prioritization	High
Mitigation Action Prioritization	
Number of Objectives Met	1
Benefits	High
Costs	Medium
Do Benefits Equal or Exceed Cost?	Yes
Is Project Grant-Eligible?	Yes
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	High
Grant Pursuit Priority	High

Table 13-8. China Creek Maintenance

Instream Action Worksheet	
Mitigation Action Title	China Creek Maintenance
Mitigation Action #	PRO-6. Investigate options for improving the trash rack on China Creek in Kalama to reduce maintenance requirements.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Urban drainage
Description of instream work and specific problem being mitigated	The preferred alternative for this problem has not yet been selected. China Creek enters culverts that travel under I-5 and the railroad, making two 90 degree bends. Preserving the capacity of the culverts is essential to ensuring the creek is able to flow out of downtown Kalama. Currently, the trash rack at the entrance to the I-5 culvert on China Creek in Kalama requires a lot of maintenance and is difficult to get access to due to its location adjacent to the freeway off ramp. The first step in determining a preferred alternative to improve the trash rack is to perform a detailed site assessment including an evaluation of the hydraulic conditions, structural conditions of the trash rack, and any environmental considerations that may impact the modification process.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. Taking no action was an alternative that was considered. However, this is not a viable option. The maintenance that is required on the trash rack in China Creek is burdensome and expends unnecessary resources and time—especially during emergent flood situations. Through modifying the trash rack, the required maintenance will be alleviated. Upstream debris management. The City could focus on managing debris upstream of the existing trash rack to reduce the amount of debris that accumulates at the culvert entrance. This could involve installing additional upstream debris traps or trash racks in locations that are easier to maintain to capture debris before it reaches the culvert entrance, and may result in less trash accumulating on the existing rack that is harder to maintain. Outreach and education. The City could implement an outreach program to remind residents to not throw or allow debris to enter the creek channel. Increase culvert size under I-5 and the railroad to pass debris. Increasing the size of the culvert would be a significant effort and expense, and likely not feasible and not cost effective. Larger trash rack/self-cleaning trash rack. This alternative would be costly and still require regular maintenance.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	The trash rack at the culvert entrance is a vital piece of infrastructure to ensure the China Creek can drain out of downtown Kalama. There are no effective alternatives that would not occur instream, as some level of protection will always be required to keep large objects from entering the culvert. China Creek is home to a variety of wildlife, including birds, mammals, and amphibians. The instream work could temporarily impact the habitat for these animals. However, through utilizing best practices for in-water work, and completing all necessary permitting, the impacts on fish and wildlife will be minimized. No other impacts would occur.

Project Information	
Applicable Objectives (refer to list of objectives)	1,4,8
Estimated Benefits (losses avoided):	X Life Safety X Damage/Risk Reduction ☐ Loss of Function ☐ Other Describe:
Timeline for Completion	Short Term (1-5 years)
Consistency with Policies and Rules	A preferred alternative has not been selected for this action. Maintaining consistency with polices and rules in Cowlitz County will be considered when determining the best action. The proposed action is consistent with plan policies to reduce flood risk and maintain existing infrastructure.
Plan for Implementation	
Lead Agency	City of Kalama
Support Agency	WSDOT
Potential Funding Sources	Local funds, WSDOT
Implementation Prioritization	Medium
Mitigation Action Prioritization	
Number of Objectives Met	3
Benefits	Medium
Costs	Low
Do Benefits Equal or Exceed Cost?	Yes
Is Project Grant-Eligible?	Yes
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	Medium
Grant Pursuit Priority	Medium

Table 13-9. Burris Creek Culvert Improvements

Instream Action Worksheet	
Mitigation Action Title	Burris Creek Culvert Improvements
Mitigation Action #	PRO-8. Evaluate options to improve the Burris Creek culvert that goes underneath Green Mountain Road to reduce the flooding of adjacent properties that occurs after heavy rains. Investigate methods to reduce future sedimentation and maintenance requirements.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	Urban drainage
Description of instream work and specific problem being mitigated	The preferred alternative has not yet been selected for this project. The Burris Creek culvert serves as a chokepoint where stormwater enters the city from county ditches and culverts. The culvert goes underneath Green Mountain Road and causes regular flooding of the surrounding properties during heavy rain events. The culvert needs to be evaluated to determine if a larger culvert is required, if the current culvert can be improved or modified, or if other solutions are viable.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. No action was a considered alternative. However, the Burris Creek culvert needs increased capacity to allow free water flow and prevent flooding. Overflow channel that is only active during heavy rain events that is outside of the main stream channel. Sediment Management. Avoid impacts on the existing culvert by managing sediment upstream of the culvert. This would likely require some instream work and may not address all of the issues at the culvert. Property buyout. Remove buildings from adjacent properties that experience flooding. Install larger culvert. A large culvert or bridge could be installed that spans the entire creek bed and riparian area. This action may be cost prohibitive and would require some amount of instream work that may impact riparian habitat.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	The clearing of the culvert at Burris Creek can cause short-term disruptions to aquatic habitats. To minimize potential impacts, if instream work is required, the project will follow best practice guidance for in-water work.
Project Information	
Applicable Objectives (refer to list of objectives)	1, 4, 8
Estimated Benefits (losses avoided):	☐ Life Safety X Damage/Risk Reduction ☐ Loss of Function ☐ Other Describe:
Timeline for Completion	Short Term (1-5 years)
Consistency with Policies and Rules	A preferred alternative has not been selected for this action. Maintaining consistency with polices and rules in Cowlitz County will be considered when determining the best action. The proposed action is consistent with plan policies to reduce flood risk and maintain existing infrastructure.

Plan for Implementation	
Lead Agency	Cowlitz County
Support Agency	City of Woodland
Potential Funding Sources	Local funds
Implementation Prioritization (High, Medium, Low)	Medium
Mitigation Action Prioritization	
Number of Objectives Met	3
Benefits	Medium
Costs	Medium
Do Benefits Equal or Exceed Cost?	Yes (Investigation only, not construction)
Is Project Grant-Eligible?	No
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	Medium
Grant Pursuit Priority	Low

Table 13-10. Beaver Reintroduction

Instream Action Worksheet	
Mitigation Action Title	Beaver Reintroduction
Mitigation Action #	NRP-1. Encourage beaver reintroduction in appropriate locations throughout all basins to promote reduced risk of flood through beaver dams and provide habitat for fish, small mammals, and insects with a goal of boosting biodiversity. Appropriate locations are unpopulated areas where beavers are unlikely to affect the built environment or migrate to populated areas.
Assessing the Risk and Vulnerability	
Flood Hazard(s) Addressed	All flooding
Description of instream work and specific problem being mitigated	Beaver reintroduction in appropriate locations can be an effective natural solution to reduce flooding in certain areas. Beaver dams can slow the flow of water and create wetland habitats that can absorb excess water during heavy rainfall or flooding events. In addition, beaver dams can provide essential habitat for fish, small mammals, and insects.
Evaluation of Potential Alternatives	
Alternatives to instream work considered	No action. No action was considered as an alternative to the proposed project. However, this is not an effective solution to mitigate flood issues within the County. Riparian buffer zone restoration. Riparian buffer zone restoration was considered as an alternative. Through the planting of vegetation along the banks of the river, the speed and volume of water could be reduced during flood events similar to the effects of a beaver dam. However, a similar action to this has already been proposed and it does not provide the same benefits that beaver reintroduction does, especially in areas that would be appropriate for beavers. Beaver dam analogs. Artificial beaver dams provide some of the same benefits as real beaver dams, without the negative effects of beavers. However, these structures are also instream.
Identification and Consideration of Potential Impacts	
Impacts related to fish, wildlife, scenic, aesthetic, historic, navigation, water quality, hydrology, existing recreation, and other impacts	The reintroduction of beavers can have both positive and negative impacts. If reintroduced to appropriate locations, beaver dams can have a positive effect. Beaver dams can help to create wetland habitats that support biodiversity and improve water quality. However, depending on the location of the dams and the adjacent land uses, beaver dams have the potential to alter water flow patterns and cause flooding that can damage private property and public infrastructure. In addition, if beavers move into populated areas, they create many issues including tree damage, flooding, and activities that conflict with human interests and infrastructure, such as building dams in urban creeks or stormwater systems. To minimize negative impacts of beaver reintroduction, project leaders will need to work closely with experts and state wildlife officials to ensure successful reintroduction efforts into appropriate areas.
Project Information	
Applicable Objectives (refer to list of objectives)	4, 8, 12
Estimated Benefits (losses avoided):	☐ Life Safety X Damage/Risk Reduction X Loss of Function ☐ Other Describe:
Timeline for Completion	Short Term (1-5 years)
Consistency with Policies and Rules	This action is consistent with plan policies to support multi-objective flood management and protect natural function and values. The action will be implemented in compliance with all local, state, and federal rules.

Plan for Implementation	
Lead Agency	Tribes
Support Agency	CCD, WDFW
Potential Funding Sources	Agency funds
Implementation Prioritization	Low
Mitigation Action Prioritization	
Number of Objectives Met	3
Benefits	Low
Costs	Low
Do Benefits Equal or Exceed Cost?	Yes
Is Project Grant-Eligible?	No
Can Project Be Funded Under Existing Programs/Budgets?	Yes
Implementation Priority	Low
Grant Pursuit Priority	Low

PART 4—PLAN MAINTENANCE

14. PLAN ADOPTION

The Cowlitz County Board of County Commissioners formally adopted the *Cowlitz County Comprehensive Flood Hazard Management Plan* by (CRS Step 9). A copy of the adoption resolution is provided in Appendix G.

15. PLAN MAINTENANCE STRATEGY

This chapter presents a plan maintenance process (CRS Step 10) that includes the following:

- Implementing the recommended action plan
- Monitoring, evaluating and updating the Flood Plan over a 5-year cycle
- Maintaining public participation in the plan maintenance process
- Incorporating the requirements of the Flood Plan into other local government planning mechanisms, such as comprehensive, capital improvement or hazard mitigation plans, when appropriate.

The plan maintenance strategy is the formal process that will ensure that the Flood Plan remains active and relevant and that Cowlitz County maintains its eligibility for applicable funding.

15.1 IMPLEMENTING THE PLAN

The effectiveness of the Flood Plan depends on its implementation and incorporation of its action items into existing local plans, policies and programs. Together, the action items in the Flood Plan provide a framework for activities that Cowlitz County can implement over the next five years. The planning team and the Steering Committee have established goals and objectives and have prioritized mitigation actions that will be implemented through existing plans, policies, and programs.

Cowlitz County Emergency Management, in cooperation with other communities, will have lead responsibility for overseeing the Flood Plan implementation and maintenance strategy. Plan implementation and evaluation will be a shared responsibility among all agencies identified as lead agencies in the mitigation action plan. Some action items do not need to be implemented through regulation. Instead, these items can be implemented through the creation of new educational programs, continued interagency coordination, or improved public participation.

15.2 MONITORING, EVALUATING AND UPDATING THE PLAN

15.2.1 Steering Committee

The Steering Committee is a total volunteer body that oversaw the development of the plan and made recommendations on key elements of it, including this maintenance strategy (see Section 2.2). It was the Steering Committee's position that an oversight committee with representation similar to that of the Steering Committee should have an active role in the plan maintenance strategy. Therefore, it is recommended that a steering committee remain a viable body involved in key elements of the plan maintenance strategy. The new steering committee should include representation from stakeholders in the planning area (the unincorporated areas of Cowlitz County).

The principal role of a steering committee in this plan maintenance strategy will be to review the annual progress report and provide input to Cowlitz County Emergency Management on possible enhancements to be considered at the next update. Future plan updates will be overseen by a steering committee similar to the one that participated in this plan development process, so keeping an interim steering committee intact will provide a head start for future updates. It will be the new steering committee's role to review the progress report in an effort to identify issues needing to be addressed by future plan updates.

15.2.2 Annual Progress Report

The minimum task of the ongoing annual steering committee meeting will be the evaluation of the progress of its individual action plan during a 12-month performance period. This review will include the following:

- Summary of any flood hazard events that occurred during the performance period and the impact these events had on the planning area
- Review of mitigation success stories
- Review of continuing public involvement
- Brief discussion about why targeted strategies were not completed
- Re-evaluation of the action plan to determine if the timeline for identified projects needs to be amended (such as changing a long-term project to a short-term one because of new funding)
- Recommendations for new actions
- Changes in or potential for new funding options (grant opportunities)
- Impact of any other planning programs or actions that involve flood hazard mitigation.

The planning team has created a template for preparing a progress report (see Appendix H). The plan maintenance steering committee will provide feedback to the planning team on items included in the template. The planning team will then prepare a formal annual report on the progress of the plan. This report should be used as follows:

- Posted on the County's web page dedicated to the Flood Plan
- Provided to the local media through social media, press release, or other methods
- Presented to the Cowlitz County Commissioners and city councils to inform them of the progress of mitigation actions implemented during the reporting period
- Provided as part of the CRS annual re-certification package. The CRS requires an annual recertification to be submitted by October 1 of every calendar year for which the community has not received a formal audit. To meet this recertification timeline, the planning team will strive to complete progress reports between June and September each year.

Annual progress reporting is credited under CRS Step 10.

15.2.3 Plan Update

The information on flood hazard, risk, vulnerability, and mitigation contained in this Flood Plan is based on the best science and technology available at the time this plan was prepared. The plan's format allows sections to be reviewed and updated when new data become available, resulting in a plan that will remain current and relevant. Cowlitz County intends to update the Flood Plan on a 5-year cycle, beginning when the plan is integrated into the

Hazard Mitigation Plan during the next update (CRS Step 10). This will allow for a uniform update cycle for both plans and eliminate redundant planning. This cycle may be accelerated to less than 5 years based on the following triggers:

- A federal disaster declaration that impacts the planning area
- A flood event that causes loss of life
- A comprehensive update of Cowlitz County comprehensive plan, which is considered to be an integral part of this plan.

It will not be the intent of future updates to develop a complete new Flood Plan for the planning area. The update will, at a minimum, include the following elements:

- The update process will be convened through a steering committee.
- The flood hazard risk assessment will be reviewed and, if necessary, updated using best available information and technologies.
- The action plan will be reviewed and revised to account for any actions completed, dropped, or changed and to account for changes in the risk assessment or new policies identified under other planning mechanisms (such as the comprehensive plan).
- The draft update will be sent to appropriate agencies and organizations for comment.
- The public will be given an opportunity to comment on the update prior to adoption.
- The flood insurance coverage assessment (see Section 8.1) will be updated with the best available and most readily accessible insurance data available at the time of the plan update.
- The Cowlitz County Board of County Commissioners will adopt the updated plan.

15.3 MAINTAINING PUBLIC INVOLVEMENT

The public will continue to be informed of the plan's progress through the Cowlitz County website and by copies of annual progress reports provided to the media. The website will not only house the final plan, it will become the one-stop shop for information regarding the Flood Plan and plan implementation. Upon initiation of future update processes, a new public involvement strategy will be initiated based on guidance from a new steering committee. This strategy will be based on the needs and capabilities of Cowlitz County at the time of the update. At a minimum, this strategy will include the use of local media outlets within the planning area.

15.4 INCORPORATING THE PLAN INTO OTHER MECHANISMS

Cowlitz County, through adoption of a general plan and zoning ordinance, has planned for the impacts of flooding. The Flood Plan development process provided the opportunity to review and expand on policies in these planning mechanisms. The Cowlitz County Comprehensive Plan and the Comprehensive Food Hazard Management Plan are complementary documents that work together to achieve the goal of reducing risk exposure. An update to the county's comprehensive plan may trigger an update to the Flood Plan. Cowlitz County has identified a priority action to link the Flood Plan and Cowlitz County Comprehensive Plan. Other planning processes and programs to be coordinated with the recommendations of the Flood Plan include the following:

- Emergency response plans

- Cowlitz County Multi-Jurisdictional Hazard Mitigation Plan
- Capital improvement programs
- Municipal codes
- Community design guidelines
- Water-efficient landscape design guidelines
- Stormwater management programs
- Water system vulnerability assessments

As information becomes available from other planning mechanisms that can enhance this plan, that information will be incorporated via the update process.

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Appendix A. CRS Guidelines for Flood Planning

A. CRS GUIDELINES FOR FLOOD PLANNING

A. Floodplain Management Planning

1. Organize to prepare the plan (Maximum credit: 10 points). The credit for this step is the total of the following points, which are based on how the community organizes to prepare its floodplain management plan:

- (a) if the planning process is under the supervision or direction of a professional planner;
- (b) if the planning process is conducted through a committee composed of staff from those community departments that will be implementing the majority of the plan's recommendations;
- (c) if the planning process and/or the committee are formally created or recognized by action of the community's governing board.

The plan document must discuss how it was prepared, who was involved in the planning process, and how the public was involved during the planning process. (REQUIRED) When a multi-jurisdictional plan is prepared, at least one representative from each community seeking CRS credit must be involved on the planning committee that is credited under item (b).

2. Involve the public (Maximum credit: 85 points). The planning process must include an opportunity for the public to comment on the plan during the drafting stage and before plan approval (REQUIRED). The term "public" includes residents, businesses, property owners, and tenants in the floodplain and other known hazard areas as well as other stakeholders in the community, such as business leaders, civic groups, academia, non-profit organizations, and major employers. The credit for this step is the total of the following points based on how the community involves the public during the planning process.

- (a) if the planning process is conducted through a planning committee that includes members of the public. If this is the same planning committee credited under step 1, items (b) and (c), at least one half of the members must be representatives of the public, including residents, businesses, or property owners from the flood-prone areas. The committee must hold a sufficient number of meetings that involve the members in planning steps 4 through 9 (e.g., at least one meeting on each step).
- (b) if one or more public information meetings are held in the affected area(s) at the beginning of the planning process to obtain public input on the natural hazards, problems, and possible solutions. At least one meeting must be held separate from the planning committee meetings in item (a).
- (c) for holding at least one public meeting to obtain input on the draft plan. The meeting must be at the end of the planning process, at least two weeks before submittal of the recommended plan to the community's governing body.
- (d) if surveys are distributed asking the public for information on their natural hazards, problems, and possible solutions. The surveys must be distributed to at least 90% of the floodplain residents.

- (e) if written comments and recommendations are solicited from neighborhood advisory groups, homeowners' associations, parent-teacher organizations, the Chamber of Commerce, or similar organizations that represent the public in the affected area(s).
- (f) if other public information activities are implemented to explain the planning process and encourage input to the planner or planning committee.

3. Coordinate (Maximum credit: 25 points). Other agencies and organizations must be contacted to see if they are doing anything that may affect the community's program and to see if they could support the community's efforts.

Examples of "other agencies and organizations" include neighboring communities; local, regional, state, and federal agencies; and businesses, academia, and other private and non-profit organizations affected by the hazards or involved in hazard mitigation or floodplain management. The credit for this step is the total of the following points. To receive credit for this step, the coordination must include items (a) and (b).

- (a) if the planning includes a review of existing studies, reports, and technical information and of the community's needs, goals, and plans for the area. (REQUIRED)
- (b) if neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests are given an opportunity to be involved in the planning process. (REQUIRED)
- (c) if neighboring communities, the state NFIP Coordinator, the state water resources agency, the county and state emergency management agency, the FEMA Regional Office, and (where appropriate) the state's coastal zone management agency are contacted at the beginning of the planning process to see if they are doing anything that may affect the community's program and to see how they can support the community's efforts.
- (d) if other governmental and nongovernmental organizations, such as the National Weather Service, Red Cross, homebuilders association, and environmental groups are contacted at the beginning of the planning process to see if they are doing anything that may affect the community's program and to see how they can support the community's efforts.
- (e) if the coordination effort includes holding meetings with representatives of the other agencies and organizations to review common problems, development policies, mitigation strategies, inconsistencies, and conflicts in policies, plans, programs, and regulations.
- (f) for sending the draft action plan to the other agencies and organizations contacted under items (b), (c), (d), and (e) and asking them to comment by a certain date.

4. Assess the hazard (Maximum credit: 20 points). The credit for this step is the total of the following points based on what the community includes in its assessment of the hazard. To receive CRS credit for this step, the assessment must include item (a). If the community wants the plan to also qualify as a FEMA multi-hazard mitigation plan, item (b) must also be completed.

- (a) for including an assessment of the flood hazard in the plan. If the community is a Category B or C repetitive loss community, this step must cover all of its repetitive loss areas (REQUIRED). The assessment must include at least one of the following items:

  - (1) a map of the known flood hazards. "Known flood hazards" means the floodplain shown on the Flood Insurance Rate Map (FIRM), repetitive loss areas, areas not mapped on the FIRM that have

flooded in the past, and surface flooding identified in existing studies. No new studies need to be conducted for this assessment.
- (2) a description of the known flood hazards, including source of water, depth of flooding, velocities, and warning time.
- (3) a discussion of past floods.

- (b) if the plan includes a map, description of the magnitude or severity, history, and probability of future events for other natural hazards, such as erosion, tsunamis, earthquakes, and hurricanes. The plan should include all natural hazards that affect the community. At a minimum, it should include those hazards identified by the state's hazard mitigation plan. (REQUIRED FOR PLANS TO BE CREDITED UNDER THE DISASTER MITIGATION ACT OF 2000)

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5. Assess the problem (Maximum credit: 35 points) The credit for this step is the total of the following points, based on what is included in the assessment of the vulnerability of the community to the hazards identified in the previous hazard assessment step. To receive credit for this step, the assessment must include item (a) and must evaluate the hazard data in light of their impact on the community. Simply listing data, such as the names of the critical facilities or the number of flood insurance claims, will not suffice for credit.

- (a) if the plan includes an overall summary of the jurisdiction's vulnerability to each hazard identified in the hazard assessment (step 4) and the impact on the community. (required)
- (b) if the plan includes a description of the impact that the hazards identified in the hazard assessment (step 4) have on: (1) life, safety, and health and the need and procedures for warning and evacuating residents and visitors. (5 points) (2) critical facilities and infrastructure. (5 points) (3) the community's economy and tax base. (5 points)
- (c) for including the number and types of buildings subject to the hazards identified in the hazard assessment.
- (d) if the assessment includes a review of all properties that have received flood insurance claims (in addition to the repetitive loss properties) or an estimate of the potential dollar losses to vulnerable structures.
- (e) if the plan describes areas that provide natural and beneficial functions, such as wetlands, riparian areas, sensitive areas, and habitat for rare or endangered species.
- (f) if the plan includes a description of development, redevelopment, and population trends and a discussion of what the future brings for development and redevelopment in the community, the watershed, and natural resource areas.

When a multi-jurisdictional plan is prepared, the critical facilities, building counts, and similar data must be presented for each community.

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6. Set goals (Maximum credit: 2 points). The two credit points for this step are provided if the plan includes a statement of the goals of the community's floodplain management or hazard mitigation program. (REQUIRED)

7. Review possible activities (Maximum credit: 30 points) The plan must describe those activities that were considered and note why they were or were not recommended (e.g., they were not cost-effective or they did not support the community's goals). (REQUIRED)

If an activity is currently being implemented, the plan must note whether it should be modified. The discussion of each activity needs to be detailed enough to be useful to the lay reader. The credit for this step is the total of the following points based on which floodplain management or hazard mitigation activities are reviewed in the plan.

- (a) if the plan reviews preventive activities, such as zoning, stormwater management regulations, building codes, and preservation of open space and the effectiveness of current regulatory and preventive standards and programs;
- (b) if the plan reviews property protection activities, such as acquisition, retrofitting, and flood insurance;
- (c) if the plan reviews activities to protect the natural and beneficial functions of the floodplain, such as wetlands protection;
- (d) if the plan reviews emergency services activities, such as warning and sandbagging;
- (e) if the plan reviews structural projects, such as reservoirs and channel modifications; and
- (f) if the plan reviews public information activities, such as outreach projects and environmental education programs.

8. Draft an action plan (Maximum credit: 70 points). The action plan specifies those activities appropriate to the community's resources, hazards, and vulnerable properties.

For each recommendation, the action plan must identify who does what, when it will be done, and how it will be financed. The actions must be prioritized and include a review of the benefits of the proposed projects and their associated costs. (REQUIRED) A multi-hazard mitigation plan must identify actions that address both existing and new infrastructure and buildings. The credit for this step is based on what is included in the action plan. Credit is provided for a recommendation on floodplain regulations, provided it recommends a regulatory standard that exceeds the minimum requirements of the NFIP.

- (a) if the action plan includes flood-related recommendations for activities from two of the six categories credited in step 7, Review possible activities.
- (b) if the action plan includes flood-related recommendations for activities from three of the six categories credited in step 7, Review possible activities.
- (c) if the action plan includes flood-related recommendations for activities from four of the six categories credited in step 7, Review possible activities.
- (d) if the action plan includes flood-related recommendations for activities from five of the six categories credited in step 7, Review possible activities.
- (e) additional points are provided if the action plan establishes post-disaster mitigation policies and procedures.
- (f) additional points are provided if the action plan's recommended natural resource protection activities include recommendations from a Regional Habitat Conservation Plan as credited under Section 511.c.
- (g) additional points are provided if the plan includes action items (other than public information activities) to mitigate the effects of the other natural hazards identified in the hazard assessment (step 4, item (b)).

If the plan calls for acquiring properties, there must be a discussion of how the project(s) will be managed and how the land will be reused. When a multi-jurisdictional plan is prepared, it must have action items from at least two of the six categories that directly benefit each community seeking CRS credit.

9. Adopt the plan (Maximum credit: 2 points) The 2 credit points for this step are provided if the plan and later amendments are officially adopted by the community's governing body. (REQUIRED)

When a multi-jurisdictional plan is prepared, it must be adopted by the governing board of each community seeking CRS or multi-hazard mitigation plan credit.

10. Implement, evaluate, and revise (Maximum credit: 15 points) The credit for this step is the total of the following points based on how the community monitors and evaluates its plan.

- (a) if the community has procedures for monitoring implementation, reviewing progress, and recommending revisions to the plan in an annual evaluation report. The report must be submitted to the governing body, released to the media and made available to the public. (REQUIRED)
- (b) if the evaluation report is prepared by the same planning committee that prepared the plan that is credited in step 2(a) or by a successor committee with a similar membership that was created to replace the planning committee and charged with monitoring and evaluating implementation of the plan.

To maintain this credit, the community must submit a copy of its annual evaluation report with its recertification each year and update the plan at least every five years.

B. Repetitive Loss Area Analysis

Up to 50 points are provided for conducting area analyses of all of the community's repetitive loss areas. An area analysis is prepared according to the following criteria:

- 1. All repetitive loss areas must be mapped as described in Section 503.b. If the community does not conduct an analysis of all the areas, it will be reflected through the impact adjustment in Section 512.
- 2. Data must be collected on each building in the area(s) using the "limited data view" of the National Flood Mitigation Data Collection Tool. The database file created by the National Flood Mitigation Data Collection Tool must be made available to FEMA and the state, upon request.
- 3. A five-step process must be followed. The steps do not have to be done in the order listed.

    - Step 1. Advise all the property owners in the repetitive loss areas that the analysis will be conducted. This must be sent directly to each property owner and cannot be done via a newspaper or newsletter notice or article.
    - Step 2. Collect data on each building and determine the cause(s) of the repetitive damage.
    - Step 3. Review alternative approaches and determine whether any property protection measures or drainage improvements are feasible. The review must look at all of the property protection measures listed in Figure 510-2 that are appropriate for the types of buildings affected.
    - Step 4. Contact agencies or organizations that may have plans that could affect the cause or impacts of the flooding.
    - Step 5. Document the findings, including a map showing all parcels in the area, recommendations, and how the recommendations will be funded.

- 4. Each area analysis document must be approved by the head of the appropriate community department. It does not have to be circulated to or adopted by the community's governing board, but it does have to be made available to any inquirer, including residents of the repetitive loss area(s).
- 5. The community must prepare an annual report on progress toward implementing the recommendations.

C. Habitat Conservation Plan

If the community has adopted a regional Habitat Conservation Plan or other plan that explains and recommends actions to protect rare, threatened, or endangered aquatic or riparian species. The plan must have been adopted by the community's governing board and there must be documentation that the plan is being implemented. The plan must identify:

- the species in need of protection,
- the impact of new development on their habitat,
- alternative actions that could be taken to protect that habitat,
- what actions are recommended to protect that habitat and why they were selected from the alternatives, and
- how the recommendations will be funded.

If the plan has also been accepted as a Habitat Conservation Plan by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.

Cowlitz County Comprehensive Flood Hazard Management Plan

Appendix B. Steering Committee Materials

MEETING RECORDS

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders' Kick off Meeting
Date: Monday, December 13, 2021
Location: City of Longview, 2nd Floor Meeting Room

MEETING SUMMARY

9:38 am: Larry Hembree welcomed attendees

1) **Attendance:** Amy Blain (CDID 1), Bill Fashing (CWCOG), Darren Frye (CDID 1), Travis Goddard (Woodland), Laura Gressett (Cowlitz B&P), Patrick Harbison (Cowlitz PW/Dike), Ken Hash (Longview) Larry Hembree (Cowlitz DEM), Jeremy Hilton (Beacon Hill W/S), Robert Huhta (Longview Police), Jayson Lelli (Tacoma Power) Jason Lugo (Cowlitz B&P), Peyton Murphy (Cowlitz B&P), Scott Neves (Cowlitz Fire 2), Kevin Kennedy (Highlands Comm), Monique Rabideau (WSDOT), Kelly Rassmussen (Kalama PW), Shelly Reeves (Cowlitz 911), Ann Rivers (Longview), Ernie Schnabler (Cowlitz DEM), Janel Skreen (LCC), Steve West (LCFRB), Nolan Wheeler (LCC), Jim Williams (Cowlitz GIS), George Winn (Cowlitz B&P), Nathan Worthington (Tacoma Power)

2) **Project Scope:** Reviewed CFHMO goal to create an actionable countywide strategy to prevent loss of life and property due to riverine and coastal flooding. Approximately 52% of Cowlitz County is in a flood zone area. County has great risk vulnerability and low rates of resiliency, these include: An aging population, poverty, lower rates of technological connectivity. The goal is to create a flood Plan to benefit these vulnerable groups in flood prone areas.

3) **Presentation**

a. **Timeline Review**

- Jan 2022 Board of County Commissioners to accept Grant
- Jan 2022 Post RFQ
- Feb 2022 Hire a Consultant
- May 2022 Hold Public Meetings
- June 2022 Hold Public Meetings
- Nov 2022 Work with Consultant to Develop Draft #1
- Jan 2023 Work with Consultant to Develop Draft #2
- June 2023 Completion

b. **Minimum Requirements of Flood Plan Review**

- Determine Need
- Alternate flood control work
- ID Consideration of impacts of instream flood control work
- 100 year frequent flood plan
- Conclusion & proposal solutions
- Certification from State Dept.

4) Call for Plan Priorities

See Proceeding Pages

5) Steering Committee Formation and Next Steps

- County Commissioners need to vote to accept state grant to begin project
- Suggestion to meet approximately once per month in a hybrid – Virtual and In-person format
- Suggestion for in-person meetings in Ryderwood, Toutle, and incorporated cities
- Collaboration with Cowlitz Tribe, Fish & Wildlife, and area cities
- City of Longview offered their meeting room for future meetings

Next Meeting: January 19, 2022 at the City of Longview

December 13, 2021

Comprehensive Flood Hazard Management Plan Kick Off Meeting

Flood issues/ideas

All County

Senior care facility evacuations and public facilities
Sediment sequestration; floodplain reconnection; riparian enhancement
Fish passage
Secondary access routes n/s
Infrastructure resilience- building more than just to the 100 year flood plain
Preparedness education of populace
Forest practices
Alternate Emergency Operations Center (EOC)
Evaluate effect of sea-rise on tidal impacts
Eradication of broadleaf deciduous trees
Evacuation routes
Lidar elevation mapping of the flood plains; establish accurate elevations for all to work with
Evaluate the Emergency Operation's Centers for flood resiliency; are they able to operate during a flood
Evaluated and map tidal effects of Columbia River so each city is aware of its effects on their city.
Evacuation routes
Mapping of the flood plains; establish accurate elevations for all to work with
Evaluate the EOC; Centers for flood resiliency; are they able to operate in a flood
Education for communities
Elevation of dikes
SR 4 rock slides related to water run-off, community roads cut off
Sediment storage
Coordinate evacuation routes; establish evacuation refuges (i.e. where on I-5 corridor will be safe to find refuge)
Clarify floodway boundary. Either locate it on ground or provide guidance for how development applications should treat flood plain maps with un-defined floodway lines.
Real world geography curriculum
Coordination & education of Tacoma Power's inundation flooding
Flood Control capabilities of Tacoma Power's dams.
Homeowner education on floodplains/floodway
Regular flooding areas/zones county-wide (i.e. N. Kelso, Kalama, Woodland, Castle Rock, rural areas, etc)
Produce a map of the CDID facilities and infrastructure and drainage easement.
Evaluate effects of global warming on flood potential.
Better alert system to notify community to evacuate and have shelter for them
Communication protocols in emergency flood event
Homeless/transient camp activity & impacts to levee (burrowing)
Dike damage; Nutria trapping and removal

North County (Castle Rock, Toutle, Ryderwood, Mt St Helens)

Toutle Sediment Retention Structure
Ryderwood evacuation and flooding "Seniors"
Mt St Helens sediment reduction
Early warning for Toutle River Valley related to Spirit Lake Dam/Tunnel- Toutle, CR, Longview, Kelso
Ryderwood Lake sedimentation

Central County (Longview, Kelso

Hall of Justice / 911 / EOC danger of flooding and below river level
Westover Road always floods
Lexington pumps fail and floods the community
Lexington area
Rose Valley Road bridge near Bradford Place clogged water over roadway and cutoff
Rose Valley Flooding Owl Creek, Goble Creek, Upper Coweeman River
Central County – I have noticed that when the roads flood it can be as simple as clearing the drains
Lomar and Alpha Drive
Westover and Lomar Creek flooding
Pleasant Hill (West Stock Road area) and Washburn Road
Ostrander between N Pacific Ave and East Stock Road
Longview CDID #1 Backup generator compatibility
Longview CDID #1; update mutual aid agreement
Cowlitz Drive pump station
Allen Street/Corduroy Road area
Cowlitz Gardens
Evacuation routes; stormwater run-off; Evacuation centers
Dorothy Lake Outflow
Cowlitz River dredging south Kelso to mouth of Cowlitz County
Levee closure at north end of Cowlitz Levee at Weyerhaeuser Patriot Rail
Levee raise at Fishers Lane and West Side Highway
Coweeman River gauge
Longview Stormwater Master Plan
    Knowledge of what to do flooding whenever it rains hard in all basements from Washington Way to Louisiana Street in the 2800 blocks to 30th Ave
I-5 South at Mile post 44; always floods/multiple accidents
Low spots in Cowlitz River Levee from Hall of Justice to Chuck Bond Apartments
Cowlitz River sediment removal; dredging, excavation,
West Side Highway related to Cowlitz River impacts from 4 Corners to Allen Street

South County (Woodland, Kalama)

Kalama River Road; always excessive flooding, rocks, and slides trap people
Kalama lack of ability for drainage of storm-water under I-5 since conception in mid 1960's
Maintenance update of Kalama culvert system
Perform a review of CDID #2 infrastructure – Dike integrity (all CDID?)
East Woodland flood elevations
Early warning Lewis River – Woodland
Live website for PacifiCorp Dams and reservoirs
I-5 between MP 22 – 25 landslides

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders' 2nd Meeting
Date: Wednesday, January 19, 2022
Location: Virtual – Online Meeting

MEETING SUMMARY

9:30 am: Larry Hembree welcomed attendees

1) **Attendance:** George Winn (Cowlitz B&P), Larry Hembree (Cowlitz DEM), Steve West (LCFRB), Ernie Schnabler (Cowlitz DEM), Mark Smith (County Planning Commission), Susan Eugenis (Cowlitz PW), Janel Skreen (LCC), Nathan Worthington (Tacoma Power), Laura Gressett (B&P), Ken Hash (City of LV), Jayson Lelli (Tacoma Power), Monique Rabideau (WSDOT), Amy Blain (CDID 1), David Vorse (CR PW), Jerry Jensen (Cowlitz 911), Jeremy Hilton (Highlands Neighborhood Association)

2) **Recent Flooding Event:** Ernie Schnabler discussed the recent rain and flooding events. Although there was flooding and slides, he felt Cowlitz County was very fortunate that local flooding was less than our neighbors to the north: Lewis Co, Thurston Co, and Whatcom. Ken Hash, mentioned that City of Longview reported $200,000 in property damage claims. Damage to PUD equipment and in the Castle Rock area, damages are approximately $500,000+. Susan Eugenis, noted that were several mudslides, culverts and road damages. Estimate is of $700,000. Threshold for FEMA assistance is $430,000. Ernie Schnabler also mentioned that, at this time, there is not a lot of individual property damages being claimed. Predicts that Cowlitz will received presidentially declared disaster area designation. This will start funding through FEMA.

3) **Project Purpose.** George Winn noted that the Flood Plan Contract is still in review with State Ecology Office. Board of County Commissioners will then review.

4) **Commissioner Acceptance & Draft RFQ**

- Timeline discussed
    - Expects BOCC grant acceptance on February 1, 2022
    - Will need to let consultants know RFQ is going to be published.
    - County to Publish RFQ by mid February.
    - Hopes to hire a consultant by early March.

5) **December 2021, Meeting Notes Review**

- Meeting once per month to continue / Virtual for now.

6) **Next Steps**

- George will create a questionnaire with prompts for answering flooding related questions regarding infrastructure and other highlights.

Next Meeting: Late February (TBD), 2022

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders' 3rd Meeting
Date: Tuesday, March 1, 2022
Location: Virtual – Online Meeting

MEETING SUMMARY

10:05 am: Ernie Schnabler welcomed attendees

1) **Attendance:** Amy Blain (CDID 1), Aaron Yanez, Ann Rivers (City Longview), Bill Fashing (CWCOG), Bill Lemonds (Fire 6 Chief), Christine Donehower (Cowlitz Tribe), David Lukaczer (City Woodland), Ernie Schnabler (Cowlitz DEM), George Winn (Cowlitz B&P), Janel Skreen (LCC), Jason Lugo (Cowlitz B&P), Jenny Conde (Cowlitz B&P), Kelly Rasmussen (City Kalama), Ken Hash (City Longview), Larry Hembee (Cowlitz DEM), Laura Gressett (Cowlitz B&P), Loy Yeo (WSDOT), Mark Smith (Cowlitz Planning Commission), Mike Murray (City Kelso), Monique Rabideau (WSDOT), Nathan Worthington (Tacoma Power), Nolan Wheeler(LCC), Steve West (LCFRB), Tim Karnofski (Port of LV), Travis Goddard (City Woodland)

2) **Project Status:** Ernie Schnabler discussed the current rains and local area hazards like the Tower Road washout. For Federal money to be available; Federal grant funding, the Hazard Mitigation and Flood Hazard Management plan are all integral.

   George Winn announced that Flood Hazard Grant is out for RFQ. Engineer responses are due in 2 weeks. Hoping that an Engineer will be on board by end of April 2022.

3) **Spirit Lake Cowlitz Toutle Collaborative Overview:** Bill Fashing provided an overview of the Collaborative's work, including partnerships with the Forest Service, USAC, and others, to track Mt St Helens related flooding and sediment problems. Life safety issues in upper watersheds can affect downstream communities. This collaborative work is separate from the Flood Plan and compliments the work we are doing here. It's a good tool for communication.

4) **Collaborative potential for flooding and restoration.** George asked if any flood restoration specialists were available to review projects that would reduce flood potentials, although benefiting their agencies, this work can also be written into the grant. George will be contacting individually.

5) **Discussion of infrastructure homework.** Infrastructure work plans for various projects for the following agencies were reviewed:

City of Castle Rock	Cowlitz County Public Works
Washington State Department of Transportation	City of Woodland
Lower Columbia Fish Recovery Board	Lower Columbia College
City of Kelso	CDID #1
City of Longview	City of Kalama
Port of Longview	Tacoma Power

6) **Next Steps.** Plans for next meeting in **mid April. Time: TBD.** More GIS information to be included. Virtual meetings allow for greater attendance. City of Longview meeting room was offered, could be a joint virtual and in person format.

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 4th Meeting
Date: Wednesday, June 1st, 2022
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

1. Attendance: Laura Gressett – Cowlitz, George Winn – Cowlitz, Larry Hembree – Cowlitz, Jim Kelly, Peyton Murphy – Cowlitz, George Forens – WDFW, Adam Smee _ City of Kalama, David Lukaczer – City of Woodland, Janel Skreen – LCC, Loy Yeo – Wash Dot, Jenny Conde – Cowlitz, Christine Donehower Amy Boyd – Port of Longview, Mike Murry – City of Kelso, Rob Flaner – Tetra Tech, Nathan Worthington-Tacoma Power), Tracy Coleman, Brad Clark

2. Discuss Consultant Contract and Schedule: Rob updated the team regarding the scope of work. Ecology wants a final draft by May 2023. Rob anticipates that in March of 2023 there will be draft documents to review.

3. Presentation by Karl Ahlen on USACR Sediment Monitoring project on Cowlitz River: Karl discussed sediment loads, long-term flood risk management, monitoring and dredging, interim action, and future debris avalanche sediment load.

4. Schedule Visits with Local Public Works Offices: It was determined to schedule visits with local public works offices and ports in September on Wednesday and/or Thursdays.

5. Next Steps: The next meeting Tetra Tech will facilitate. A tentative date was set for July 19th. Larry discussed the importance of reading out to cities, organizations, and local citizens for input.

6. Adjourn at 10:50

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #5
Tuesday, July 19, 2022
9:30 am – 10:30 am

Hybrid Meeting with both in-person and virtual option via GoToMeeting
Light Refreshments for in-person attendees

In Person
City of Longview Training Room
City Hall – 2nd Floor
1525 Broadway ST
Longview, WA 98632

Virtual
https://global.gotomeeting.com/join/750934789
You can also dial in using your phone:
United States: +1 (669) 224-3412
Access Code: 750-934-789

MEETING AGENDA

1.	Introductions	9:30
2.	Plan Framework	9:40
3.	Mission/Vision Statement & Goal Setting	9:50
4.	Next Steps • Consistency review • Objectives • Risk assessment • Next Steering Committee meeting date	10:20
5.	Adjourn	10:30

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 5th Meeting
Date: Tuesday, July 19, 2022
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

9:35 am: George Winn welcomed attendees

1. Attendance: George Winn (Cowlitz B&P), Larry Hembree (Cowlitz DEM), Bill Fashing (CWCOG), Christina Wollman (Perteet), Lorraine Fuller (Cowlitz GIS), Christina Donehower (Cowlitz Tribe), Ann Rivers (City of Longview), Patrick Harbison (Cowlitz PW), Peyton Murphy (Cowlitz B&P), Jason Lugo (Cowlitz B&P), Laura Gressett (Cowlitz B&P), Jenny Conde (Cowlitz B&P), Aaron Yanez (WSDOT), Chris Andrews (Cowlitz PW) , Brad Clark (WSDOT), Matt Gerlach (WA ECY), Catherine Rawsthorne (Cowlitz HHS), David Lukaczer (City of Woodland), Christina Wollman, Rob Flaner

2. Plan Framework: Christina introduced the flood plan framework and reviewed the planning processes. She presented a draft table of contents for the plan.

3. Goal Setting: Christina introduced goal setting. She provided a list of priority hazards and themes gathered from the first five steering committee meetings. The priority hazards include riverine flooding, mudslides/rockslides, dam inundation areas, and tidal effects. The priority themes include topics related to emergency management, natural systems, community, regulatory, and river and facility management.

   After reviewing the priorities, Christina provided several example goals from other CFHMPs for discussion. Committee members discussed a desire for simple and to the point goals, and key words such as multiple benefit, life safety, and economy. The committee was drawn to the simple and straightforward goals in the Stillaguamish River CFHMP and supplemented the list with goals from Chelan County CFHMP and Chehalis River Basin CFHMP. At the end of the discussion, there were seven goals in the list, but some goals were similar to each other. Due to lack of time, the committee decided to review and finalize the goals at the next Steering Committee meeting.

   The draft goals are:

   1. Reduce and minimize flood damage and financial impacts to the community.
   2. Strive to protect or restore the natural and beneficial functions of floodplains.
   3. Save lives and reduce public exposure to risk.
   4. Maintain sustainable operation of identified critical facilities.
   5. Reduce or prevent damage to public and private property.
   6. Reduce the costs associated with flood hazard management.
   7. To the maximum extent possible, allow and encourage natural floodplain processes.

4. Next Steps: Rob Flaner and his team are working on constancy review and will present results at next meeting. During the next meeting we will finalize goals and begin discussing objectives and mission/vision statement. Tetra Tech is working on the risk assessment. The planning team needs to confirm the area to be remapped. Next Steering Committee meeting date to be in September 2022. The date is to be determined.

5. Adjourn: Meeting adjourned at 10:33.

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #6
Monday September 26, 2022
9:00 am – 11:00 am

Hybrid Meeting with both in-person and virtual option via GoToMeeting
Light Refreshments for in-person attendees

In Person
Department of Emergency Management
Hall of Justice, Basement, Room # 156
312 SW 1st Avenue
Kelso, WA 98626

Virtual
https://global.gotomeeting.com/join/750934789
You can also dial in using your phone:
United States: +1 (669) 224-3412
Access Code: 750-934-789

MEETING AGENDA

1.	Introductions	9:00
2.	Planning Process Update	9:10
3.	Consistency Review	9:30
4.	Break	10:00
5.	Confirm Goals	10:05
6.	Mission/Vision Statement	10:20
7.	Introduce Objectives Exercise	10:40
8.	Next Steps • Risk assessment • Next Steering Committee meeting date: Mid November	10:50
9.	Adjourn	11:00

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 6th Meeting
Date: Tuesday, September 22, 2022
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

9:35 am: George Winn welcomed attendees

1. Attendance: Larry Hembree, Laura Gressett, Chris Andrews, Jenny Conde, Peyton Murphy, Lorraine Fuller, Brad Clark, Christina Donehower, Bill Fashing, Matthew Gerlach, George Winn, Jim Williams, Devin Mackin, Skylar Masters, Monique Rabiedu, Steve West, Mark Smith, Kelly Rasmussen, Ken Hash, Travis Goddard, Amy Boyd, George Forens, Vicky Barnes, Christina Wollman, Rob Flaner

2. Plan Review Process Update: Christiana updated the steering committee on where the planning process is currently at. Westover Creek and Lomar Creek have been selected an area within the County to complete a new flood study. This area is a well known flooding area but doesn't have a comprehensive analysis and has not been studied in detail with FEMA.

3. Goal Setting: The goals from the previous steering committee were discussed and revised. The final goals are:

    1. Save lives and reduce public exposure to flood risk.
    2. Maintain sustainable operation of identified critical facilities.
    3. Reduce or prevent damage to public and private property.
    4. Improve the cost effectiveness of flood hazard management.
    5. Leverage natural and beneficial floodplain processes.

4. Consistency Review: Rob Flaner presented results of the consistency review. It was found that there is not a lot of consistency within the County. There are no freeboard requirements for mechanical.

5. Mission/Vision Statement: Christina explained to the steering committee the purpose of a CFHMP having a strong mission/vision statement. She then presented a variety of mission statements from various communities in the United States that were adapted to Cowlitz County. After discussion from the steering committee, the mission/vision statement that was chosen is:

    Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

6. Introduce Objectives Exercise: Christina introduced the objectives exercise and explained that great objectives will meet multiple goals.

7. Next Steps: During the next meeting Christina and Rob will present results from the risk assessment.

5. Adjourn: Meeting adjourned at 11:00.

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #7
Tuesday, November 29, 2022
9:00 am – 10:30 am

Hybrid meeting with both in-person and virtual option via Zoom
Light refreshments for in-person attendees

In Person
Department of Emergency Management
Hall of Justice, Basement, Room #156
312 S.W. 1st Avenue
Kelso, WA 98626

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-205-0468
Passcode: 898 8887 6916

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	9:00
2.	Planning Process Update	9:10
3.	Objectives Exercise	9:20
4.	Next Steps • Risk assessment • Next Steering Committee meeting date: Mid-January	10:20
5.	Adjourn	10:30

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose:	Stakeholders 7th Meeting
Date:	Tuesday, November 29, 2022
Location:	Hybrid – Longview City Hall and Online

MEETING SUMMARY

1. Attendance: Larry Hembree, Laura Gressett, Chris Andrews, Amy Boyd, Steve West, David Lukaczer, Tim Karnoski, Travis Goddard, Amy Blaine, Monique Rabideau, Adam Trimble, Lorraine Fullller, Loyd Hill, Jenny Conde, Dave Vorse, Kelly Rassmussen, Skylar Masters, Vicky Barnes, Dean Reynolds, Devin Mackin, Bill Fashing, Greta, Amanda Lomaseny, Michael Kardas, Ken Hash, Mark Smith, Robert Huhta, Christina Wollman, Rob Flaner

2. Planning Process Update: Rob gave update about flood modeling status and risk assessment. They are in process and underway. Should have everything ready by next meeting.

3. Objectives Exercise: Christina led the steering committee in an objective exercise, after members completed a survey prior to the meeting. 12 objectives were selected for further discussion:

    1. Continually improve understanding of the location and potential impacts of flooding, the vulnerabilities, community development patterns, and the measures needed to protect public life, safety, and property.
    2. Work cooperatively with federal, state, regional, and local agencies and stakeholders with responsibilities for flood protection; in the planning for and understanding of the impacts from flooding.
    3. Create and maintain partnerships among all levels of government and the whole community to coordinate mutually beneficial mitigation strategies.
    4. Identify mitigation projects that provide the highest degree of flood protection and damage reduction, are cost effective, provide protection to property, including critical facilities, and mitigate impacts on the environment.
    5. Consider floodplain management policies that promote resiliency and sustainable operations of identified critical facilities.
    6. Utilize the best available data, science and local knowledge to consider current and future conditions in planning for flood and inundation hazards.

7. Integrate floodplain management goals and objectives into other plans and programs within the planning area that can support or enhance floodplain management within Cowlitz County.
8. Provide feasible, cost-effective flood hazard protection that strives to enhance or restore the natural and beneficial floodplain function.
9. Enhance all facets of partnership emergency response capabilities, including mitigation of vulnerable critical facilities and infrastructure.
10. Sustain continuity of local emergency and government operations, including the operation of identified critical facilities, during and after a disaster.
11. Promote and enhance outreach and education efforts by state, regional and local agencies with flood hazard plans and programs to actively encourage engagement of stakeholder groups such as homeowners, private sector businesses, and nonprofit community organizations.
12. Encourage hazard mitigation measures that result in the least adverse effect on the natural environmental and that use natural processes.

4. Next Steps
   - Risk assessment
   - Next Steering Committee meeting date: Mid-January

5. Adjourn 10:30

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #8
Tuesday, January 24, 2023
9:00 am – 10:30 am

Hybrid meeting with both in-person and virtual option via Zoom
Light refreshments for in-person attendees

In Person
Department of Emergency Management
Hall of Justice, Basement, Room #156
312 S.W. 1st Avenue
Kelso, WA 98626

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-215-8782
Meeting ID: 898 8887 6916
Passcode: 05181980

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	9:00
2.	Planning Process Update	9:10
3.	Confirm Objectives	9:20
4.	Risk Assessment Results	9:30
5.	Next Steps • Public Outreach (February 15-16) • Action Planning • Identify Programs and Policies • Next Steering Committee meeting date: February 28	10:20
6.	Adjourn	10:30

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 8th Meeting
Date: Tuesday, January 24th, 2022
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1. Attendance: Susan Eugenis, Aaron Yanez, Amanda Lomasney, Bill LeMonds, Bob J, Brad Clark, Chris Andrews, David Lukaczer, David Vorse, Devin Mackin, Greta Holmstrom, James Gordon, Jim Williams, Kelly Rasmussen, Lorraine Fuller, Mark Smith, Matthew Gerlach, Nathan Worthington, Paul Morin, Rita Asgeirsson, Sharon Kuroda, Steve Fraidenburg, Susan Eugenis, Tracy Coleman, Vicky Barnes, Adam Trimble, Larry Hembree, Laura Gressett, Patrick Harbison, Kate Murphy, Dalton Fry, Amie Blaine, Christina Wollman, Rob FLaner

2. Planning Process Update 9:10

Rob updated the group with public outreach, status. Feels we are about 50% complete.

3. Confirm Objectives 9:20

Steering Committee agreed on objectives and the proposed revised objective. The objectives are:

1. Continually improve understanding of the location and potential impacts of flooding, the vulnerabilities, community development patterns, and the measures needed to protect public life, safety, and property.
2. Work cooperatively with federal, state, regional, and local agencies and stakeholders to plan for and understand the impacts of flooding.
3. Create and maintain partnerships among all levels of government and the whole community to coordinate mutually beneficial mitigation strategies.
4. Identify mitigation projects that provide the highest degree of flood protection and damage reduction, are cost effective, provide protection to property, including critical facilities, and mitigate impacts on the environment.

5. Consider floodplain management policies that promote resiliency and sustainable operations of identified critical facilities.
6. Utilize the best available data, science and local knowledge to consider current and future conditions in planning for flood and inundation hazards.
7. Integrate floodplain management goals and objectives into other plans and programs within the planning area that can support or enhance floodplain management within Cowlitz County.
8. Provide feasible, cost-effective flood hazard protection that strives to enhance or restore the natural and beneficial floodplain function.
9. Enhance all facets of partnership emergency response capabilities, including mitigation of vulnerable critical facilities and infrastructure.
10. Sustain continuity of local emergency and government operations, including the operation of identified critical facilities, during and after a disaster.
11. Promote and enhance outreach and education efforts by state, regional and local agencies with flood hazard plans and programs to actively encourage engagement of stakeholder groups such as homeowners, private sector businesses, and nonprofit community organizations.
12. Encourage hazard mitigation measures that result in the least adverse effect on the natural environmental and that use natural processes.

4. Risk Assessment Results

Rob presented the risk assessment results. Risk is measured quantitatively using data to make assumption.

Need to determine if excluded areas were included in risk assessment. If not, then add in specifically to results as excluded areas.

Suggestions for actions

- Levee study to look for levee weak points, where is first place to flood, where are highest risk areas behind levee?
- Sprit Lake collaboration, put into action plan to continue, encourage, participate in, etc. to support Objective 2.

5. Next Steps
    - Public Outreach (February 15-16)
        - Laura presented meetings and asked for participating from stakeholders to engage with the public about flooding.
        - County will provide information to the other agencies that they can use to advertise the meeting.
    - Action Planning

- Identify Programs and Policies
  - Christina discussed upcoming meeting topics.
- Next Steering Committee meeting date: February 28
  - Christina discussed timeline and explained by next meeting was in February.

6. Adjourn 10:30

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #9
Tuesday, February 28, 2023
9:00 am – 10:45 am

Hybrid meeting with both in-person and virtual option via Zoom
Light refreshments for in-person attendees

In Person
Department of Emergency Management
Hall of Justice, Basement, Room #156
312 S.W. 1st Avenue
Kelso, WA 98626

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-215-8782
Meeting ID: 898 8887 6916
Passcode: 05181980

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	9:00
2.	Planning Process Update • Public Meetings • Site Visits	9:05
3.	Risk Assessment Update	9:15
4.	Plan Maintenance Strategy	9:25
5.	Policies	9:35
5.	Next Steps • Public Outreach • Action Planning • SWOO Workshop	10:35
6.	Adjourn	10:45

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 9th Meeting
Date: Tuesday, February 28th, 2023
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

1. Attendance: Adam Trimble, Chris Andrews, Devin Mackin, David Lukaczer, Jen Ortiz, James Gordon, Bill Lemonds, Bill Fashing, Dalton Fry, Tracy Coleman, Larry Hembree, Laura Gressett, Lorraine Fuller, Patrick Harbison, Jim Williams, Aaron Yanez, Amie Blain, Matthew Gerlach, Mark Smith, Christina Wollman, Rob Flaner

2. Planning Process Update
   - Public Meetings
   - Site Visits

3. Risk Assessment Update: Rob presented risk assessment of levee protected areas, explained limitations to vulnerability due to lack of information regarding floor heights. The data is also working on 10- and 50-year loss information. A steering committee member asked how risk is defined for sediment and volcanic hazards; Rob explained that we can only assess risk on data that we have.

4. Plan Maintenance Strategy and Policies: Christina explained the plan maintenance strategy and policies.

5. Next Steps
   - Public Outreach
   - Action Planning
   - SWOO Workshop

6. Adjourn 10:45

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #10
Monday, March 20, 2023
1:00 pm – 3:00 pm

Virtual meeting via Zoom

In Person
Virtual Attendance Only

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-215-8782
Meeting ID: 898 8887 6916
Passcode: 05181980

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	1:00
2.	Planning Process Update	1:10
3.	Policies	1:20
4.	Next Steps • SWOO Workshop • Action Planning • Public Outreach	2:50
5.	Adjourn	3:00

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 10th Meeting
Date: Monday, March 20th, 2023
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

1. Attendance: Adam Trimble, Larry Hembree, Laura Gressett, Lorraine Fuller, Patrick Harbison, Ken Hash, Amie Blaine, Devin Mackin, Kelly Rasmussen, David Lukaczer, David Vorse, Morgan, Monique Rabideau, Tim Karnoski, Steve West, Matthew Gerlach, Mark Smith, Bill Fashing, Marisa Hutcheson, Dill Hillger, Christina Wollman, Rob Flaner

2. Planning Process Update: Christina updated the steering committee on the planning process. The planning team has determined a schedule for completing the planning process which includes two more steering committee meetings. The risk assessment data is currently being inputted into the draft plan. The next two meetings are critical to determine actions for the plan.

3. Policies: Christina showed the revised policies from the internal County planning team. Steering committee members were sent the revised polices prior to the meeting. There was discussion about if policies should use “should” or “shall” in reference to County responsibilities.

   Christina discussed CRS and NFIP requirements and compliance.

4. Next Steps
   - SWOO Workshop
   - Action Planning
   - Public Outreach

5. Adjourn 3:00

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #11
Wednesday, April 12, 2023
9:30 am – 12:00 pm

Virtual meeting via Zoom

In Person
County Administration Building
3rd Floor
207 N 4th Avenue
Kelso, WA 98626

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-215-8782
Meeting ID: 898 8887 6916
Passcode: 05181980

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	9:30
2.	Strengths, Weaknesses, Opportunities and Obstacles	9:40
3.	Introduction to the Action Plan	11:30
4.	Next Steps • Action Planning • Draft Plan Review	11:45
5.	Adjourn	12:00

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 11th Meeting
Date: Wednesday, April 12, 2023
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

1. Attendance: Laura Gressett, Adam Trimble, Amy Boyd, Amie Blaine, Patrick Harbison, Larry Hembree, Lorraine Fuller, Ken Hash, David Vorse, Kelly Rasmussen, Travis Goddard, Tracy Coleman, Chris Andrews, David Lukazcer, Monique Rabideau, Tim Karnokski, Steve West, Matthew Gerlach, Mark Smith, Marisa Hutcheson, Christina Wollman, Rob Flaner

2. Strengths, Weaknesses, Opportunities and Obstacles: There were nine responses to the SWOO survey that was sent out prior to the meeting. Christina went through the results of the survey and the committee engaged in in-depth discussion for various questions from the survey. The committee helped identify SWOO for each of the questions discussed. Christina documented the conversation on the PDFs of the SWOO questions.

3. Introduction to the Action Plan: Christina explained the process of creating an action plan based on the abundance of information gathered during the steering committee meetings, site visits, research, and outreach.

4. Next Steps

   - Draft Plan Review
   - Action Planning

5. Adjourn 12:00

Cowlitz County
Countywide Flood Hazard Management Plan

Steering Committee Meeting #12
Tuesday, April 25, 2023
10:00 am – 12:00 pm

Virtual meeting via Zoom

In Person
County Administration Building
3rd Floor
207 N 4th Avenue
Kelso, WA 98626

Virtual
https://us06web.zoom.us/j/89888876916?pwd=Z3J6TUt6RFUwdHJMWWYzc0JGd1pTZz09
Call In: 1-253-215-8782
Meeting ID: 898 8887 6916
Passcode: 05181980

Mission Statement: Reduce flooding vulnerability to protect the health, safety, economy, and quality of life in Cowlitz County.

MEETING AGENDA

1.	Introductions	10:00
2.	Action Plan Review	10:15
3.	Draft Plan	11:15
4.	Next Steps • Public Comment Period • Planning Commission • Ecology Review • Adoption	11:45
5.	Adjourn	12:00

Cowlitz County
Countywide Flood Hazard Management Plan

Purpose: Stakeholders 12th Meeting
Date: Tuesday, April 25, 2023
Location: Hybrid – Longview City Hall and Online

MEETING SUMMARY

MEETING AGENDA

1. Attendance: David Lukazer, Nathan Worthington, Bill LeMonds, Mark Smith, James Gordon, Tim Karnoski, Tracy Coleman, Jim Williams, Adam Trimble, Laura Gressett, Bill Fashing, Kelly Rasmussen, David Vorse, Patrick Harbison, Larry Hembree, Lorraine Fuller, Ken Hash, Travis Goddard, Amie Blain, Matthew Gerlach, Christina Wollman, Rob Flaner

2. Action Plan Review: Christina showed steering committee members the filled-out Action Plan Matrix. After discussion about the Action Plan Matrix, Christina explained the in-water mitigation action worksheet.

3. Draft Plan: Rob explained that he is hoping to have a 75-85% draft done by the middle of May. The final draft will not be completed until after public comment has occurred and the plan has been accepted and adopted.

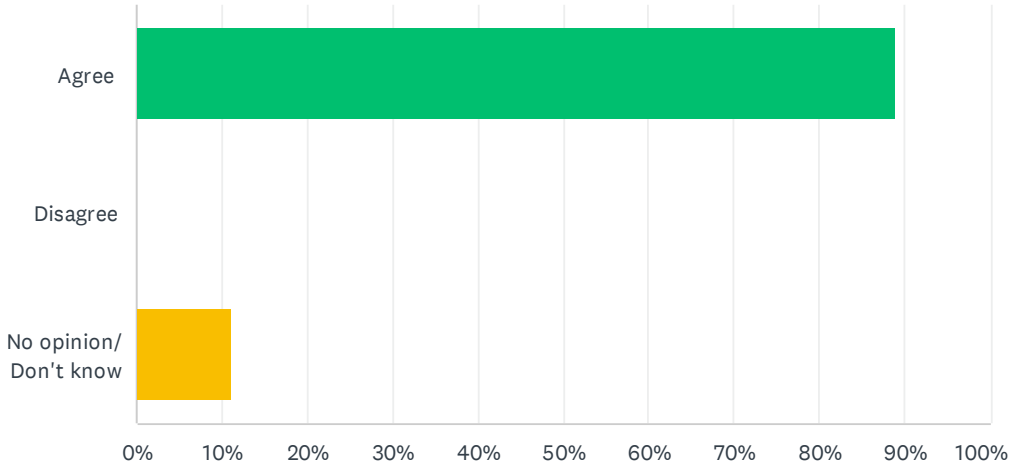
4. Next Steps
   - Public Comment Period
   - Planning Commission
   - Ecology Review
   - Adoption

5. Adjourn 12:00

SWOO EXERCISE RESULTS

Q1 Flood emergency management is provided by a unified authority or program within the County.

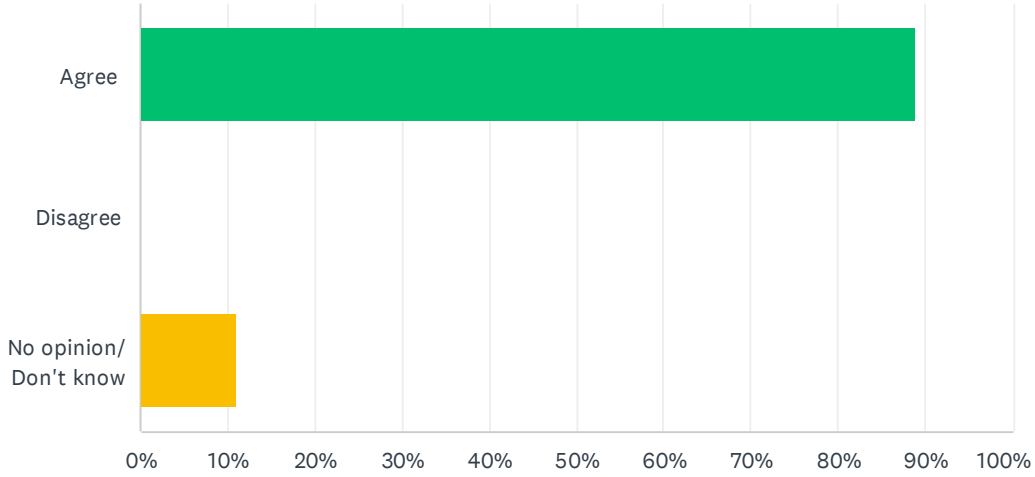
Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	88.89%	8
Disagree	0.00%	0
No opinion/ Don't know	11.11%	1
TOTAL		9

Q1 Flood emergency management is provided by a unified authority or program within the County.

Answered: 9 Skipped: 0



Strengths

- Type 3 IMT takes command of incident, Emergency management provides support, follows the ICS system, cities and county coordinate
- Leverage expertise
- Cities can rely on emergency mgmt
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Weaknesses

- Educating current staff, high staff turnover
- Notification system
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Opportunities

- Updating ESFs at end of year
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Obstacles

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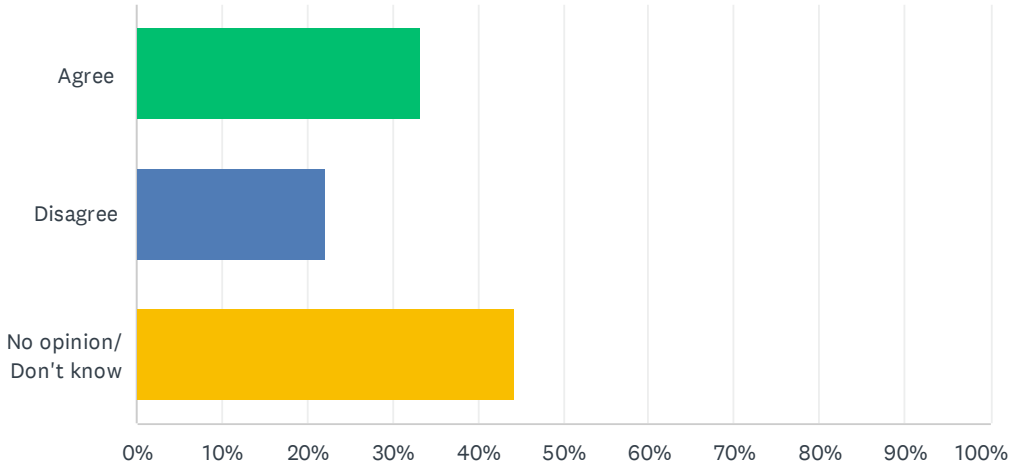
#	COMMENTS?	DATE
	There are no responses.	

Q2 Flood emergency response functions for the cities and county are clearly defined and are effective.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	22.22%	2
No opinion/ Don't know	44.44%	4
TOTAL		9

Q2 Flood emergency response functions for the cities and county are clearly defined and are effective.

Strengths

- ILAs in place for equipment
- High level of expertise that can be relied on
- 6 of 7 diking districts are managed and staffed by county
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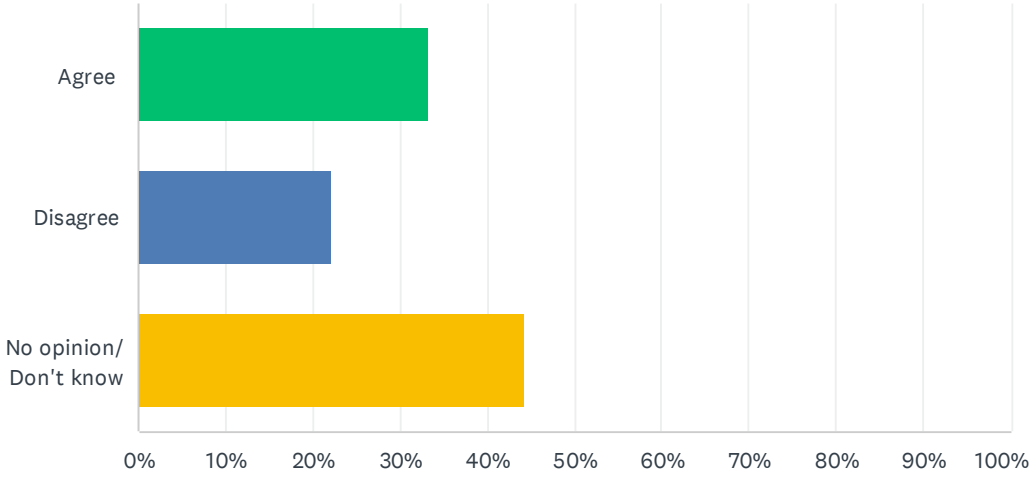
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

- Coordinate ESF updates with cities
- More county-wide exercises and training
- Use Hazus results to inform scenarios
- Assess broader types of flooding/future flooding
- Keep contact lists updated

Obstacles

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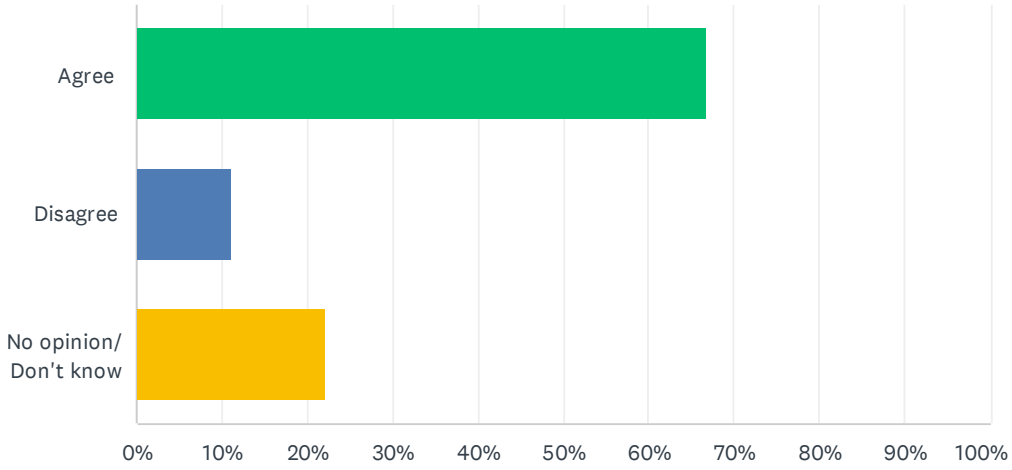
#	COMMENTS?	DATE
1	Each jurisdiction has its own plan to flood response but not sure the county has all the information for a total countywide plan.	4/10/2023 2:42 PM

Q3 Roles and responsibilities for emergency management within Cowlitz County are clearly defined.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	11.11%	1
No opinion/ Don't know	22.22%	2
TOTAL		9

Q3 Roles and responsibilities for emergency management within Cowlitz County are clearly defined.

Strengths

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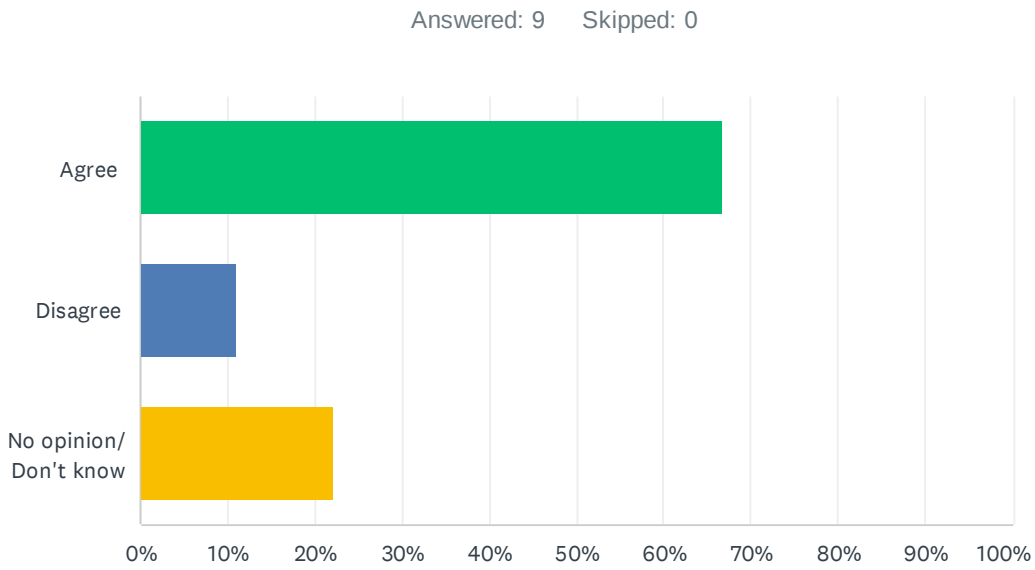

Weaknesses

- EM often has to reach out to find information
- People may not understand role of EM and how they can support response
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Opportunities

- WebEOC
- Develop one system for collecting information
- Larry new to role and opportunity to implement new processes
- Pre-flood season (fall) meeting with all agencies
- Add building official/inspectors to ILAs
- Increase consistency between city/county/district plans, united response

Obstacles

- Limited time for planning for all hazards
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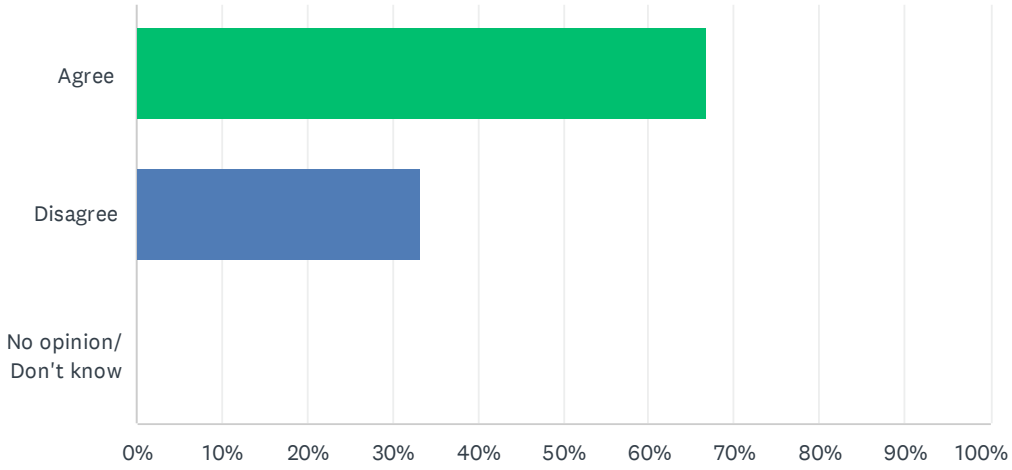
#	COMMENTS?	DATE
	There are no responses.	

Q4 City and County personnel with emergency management functions are adequately trained and exercised.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	33.33%	3
No opinion/ Don't know	0.00%	0
TOTAL		9

Q4 City and County personnel with emergency management functions are adequately trained and exercised.

Strengths

- County investment in emergency management / leadership
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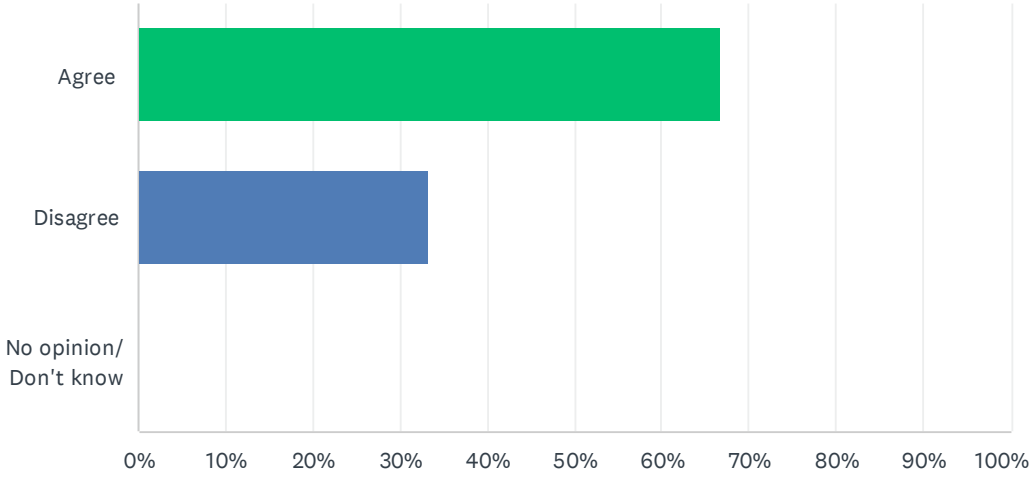
Answered: 9 Skipped: 0



Weaknesses

- Substantial damage estimating
- Hard to test levee closure structures
- Contact lists are not regularly updated
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Opportunities

- Develop SD response plan
- Improve/expand levee closure training, assess ability to close highway, develop consistent protocols, training program
- Include contractors in training
- More functional exercises
- Increase training/exercise audience, increase collaboration between outside agencies
- Build forms now and training

Obstacles

- Staff turnover
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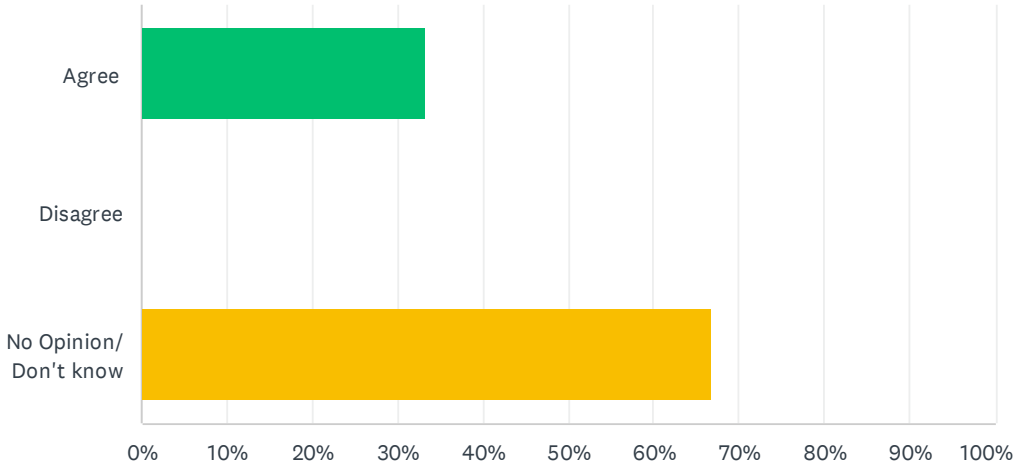
#	COMMENTS	DATE
1	I feel more exercises would be helpful	4/10/2023 2:42 PM
2	Can never be prepared enough. Would like to see more hands-on training versus table top training.	3/31/2023 10:49 AM

Q5 Current land uses within identified flood hazard areas are appropriate for the risk posed by each hazard.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	0.00%	0
No Opinion/ Don't know	66.67%	6
TOTAL		9

Q5 Current land uses within identified flood hazard areas are appropriate for the risk posed by each hazard.

Strengths

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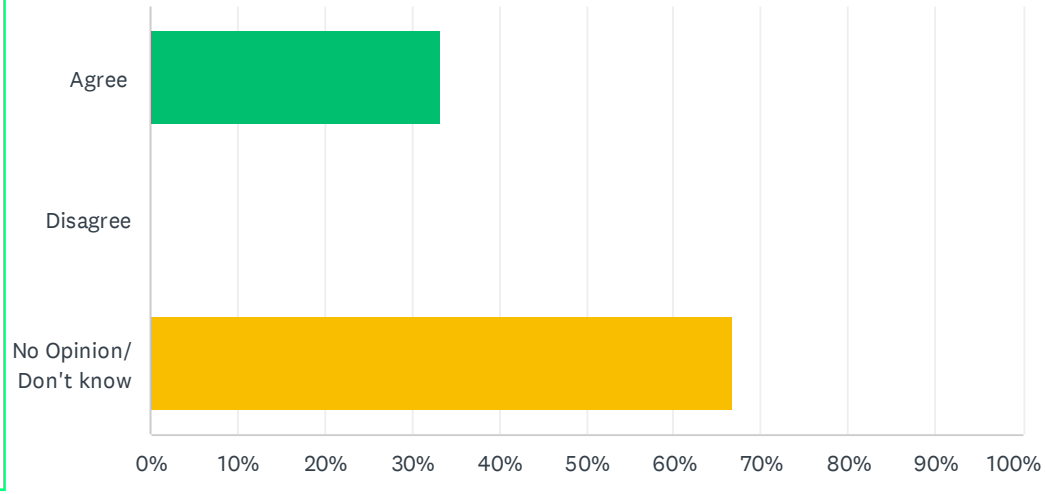
Answered: 9 Skipped: 0



Weaknesses

- Conflicting regulations, SMP vs NFIP
- Flood risk extends beyond identified areas
- Levee protected areas do not have flood regulations
- Past decisions cause issues today
- Long range land use planning
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Opportunities

- Integrate CFHMP into comprehensive planning and long range land use planning
- County-wide coordination and consistency
- Study A zones
- Develop strategies to mitigate high risk areas/RL/past decisions
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Obstacles

- Politics
- Inaccurate maps
- Lack of staff
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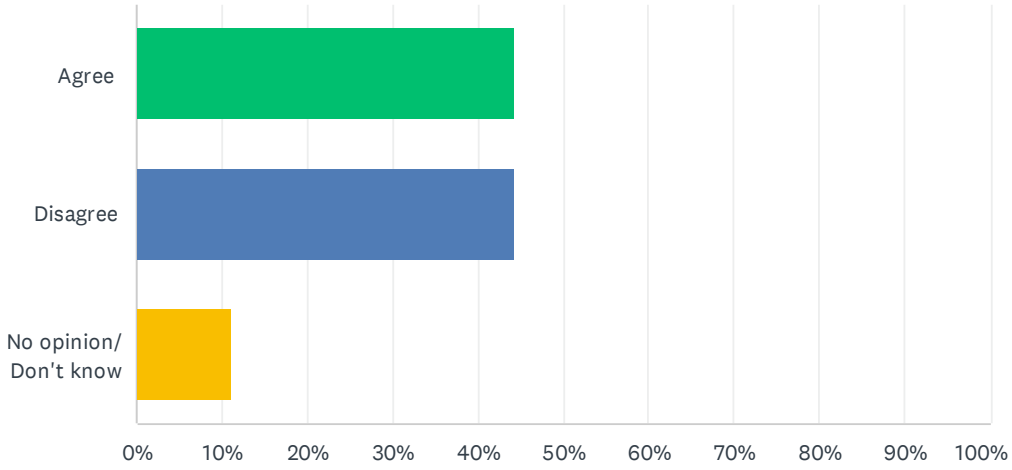
#	COMMENTS?	DATE
	There are no responses.	

Q6 There is a good understanding of the flood risk posed by all flood hazards in Cowlitz County.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	44.44%	4
Disagree	44.44%	4
No opinion/ Don't know	11.11%	1
TOTAL		9

Q6 There is a good understanding of the flood risk posed by all flood hazards in Cowlitz County.

Strengths

- Tsunami signs in risk areas
- Levee fact sheet sent to everyone in protected area (CDID1)
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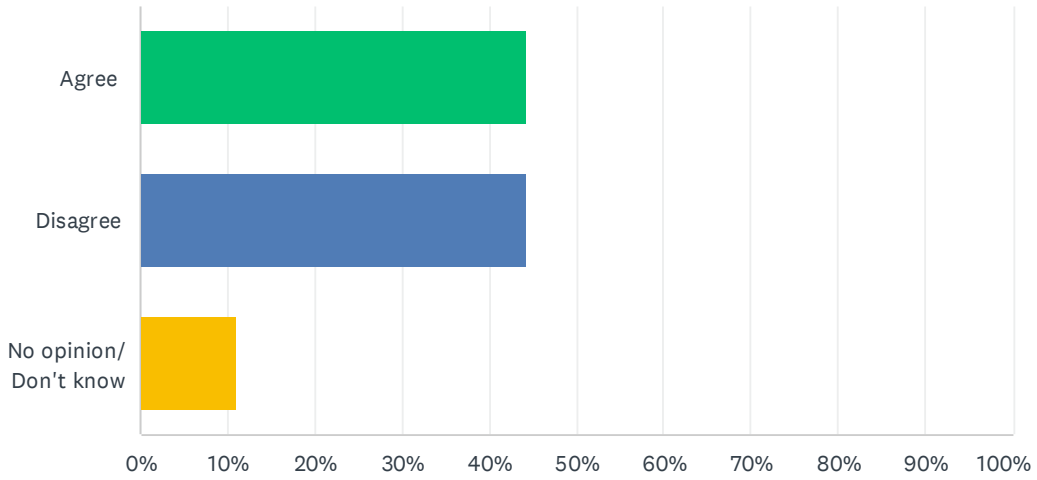
Answered: 9 Skipped: 0



Weaknesses

- Complicated causes of flooding (sediment, treaties)
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Opportunities

- Better define flood areas on the ground, signs, past flood levels
- Educational campaigns, united messages, before flood season
- Residual levee risk, how the levees work
- School outreach
- Update website

Obstacles

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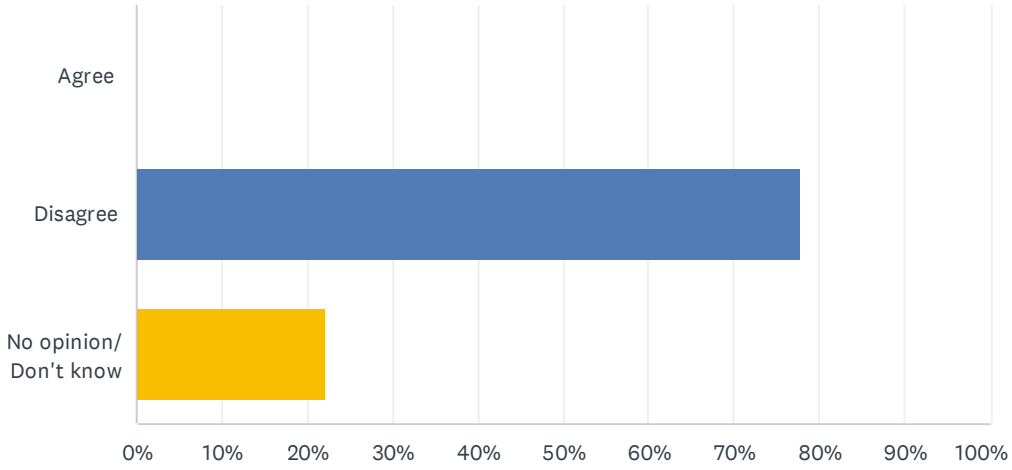
#	COMMENTS?	DATE
1	In my opinion the public does not have a clear understanding of the level of flood risks that are present in Cowlitz County.	4/6/2023 3:42 PM

Q7 Members of the public know where to find information about flood hazards and risk.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	0.00%	0
Disagree	77.78%	7
No opinion/ Don't know	22.22%	2
TOTAL		9

Q7 Members of the public know where to find information about flood hazards and risk.

Strengths

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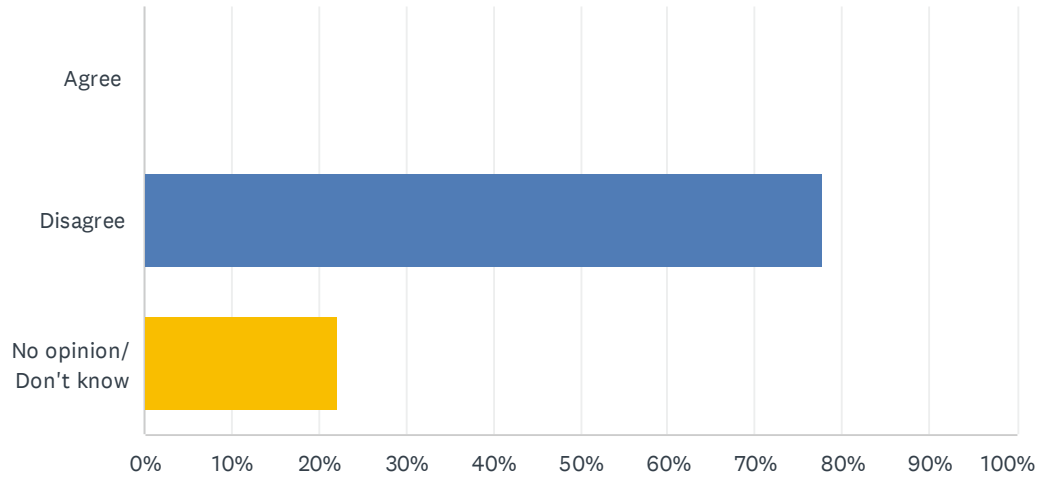
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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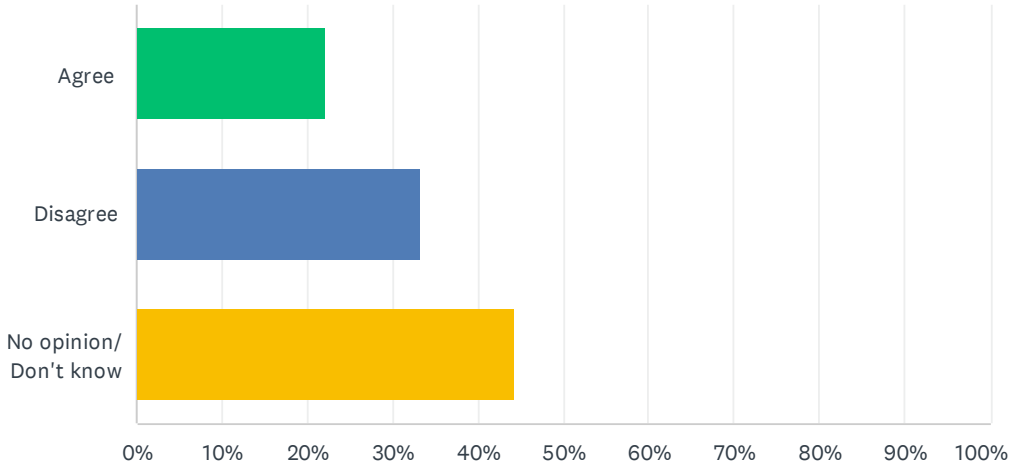
#	COMMENTS?	DATE
1	Cities/county need to do better on providing information outlets	4/10/2023 2:42 PM

Q8 Areas that provide natural resource protection are identified and protected within the County by a uniform policy.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	22.22%	2
Disagree	33.33%	3
No opinion/ Don't know	44.44%	4
TOTAL		9

Q8 Areas that provide natural resource protection are identified and protected within the County by a uniform policy.

Strengths

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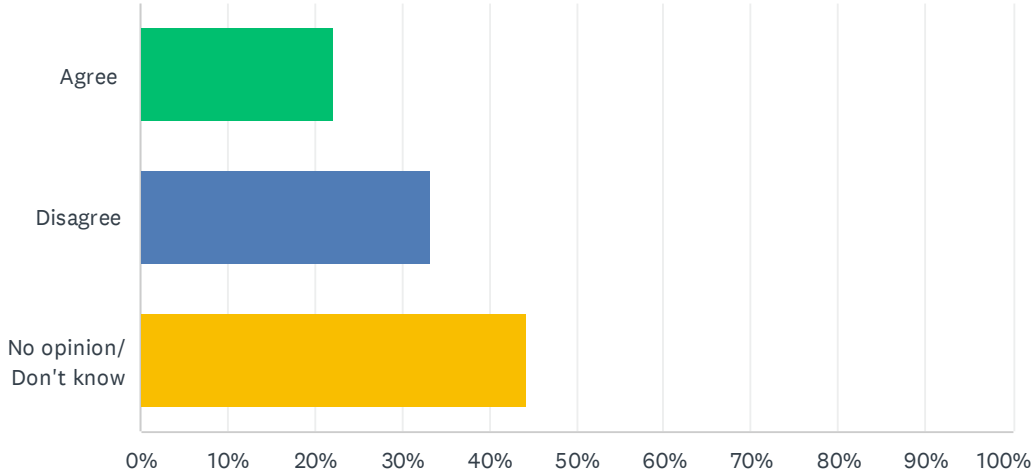
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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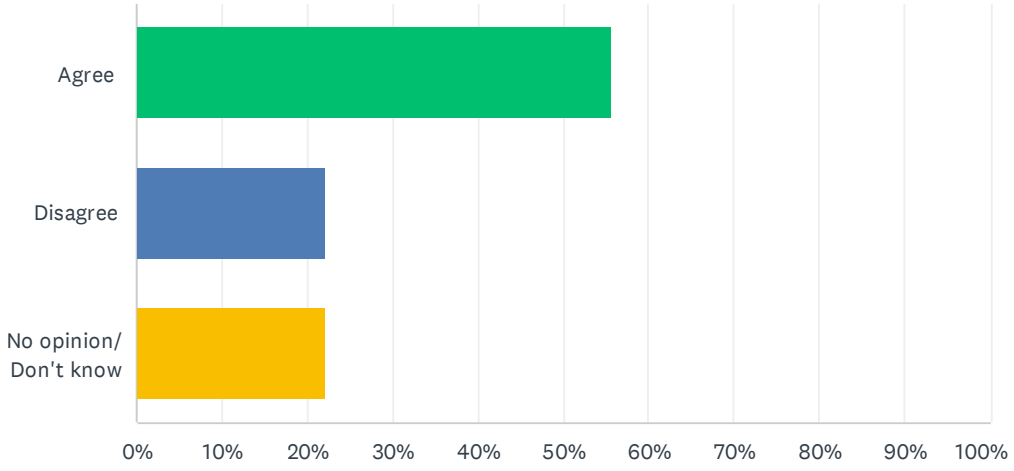
#	COMMENTS?	DATE
	There are no responses.	

Q9 Existing flood control systems are effective and well maintained.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	55.56%	5
Disagree	22.22%	2
No opinion/ Don't know	22.22%	2
TOTAL		9

Q9 Existing flood control systems are effective and well maintained.

Strengths

- Levee heights are good, well maintained
- Infrastructure is in place
- Adequate revenues for maintenance, tax assessments
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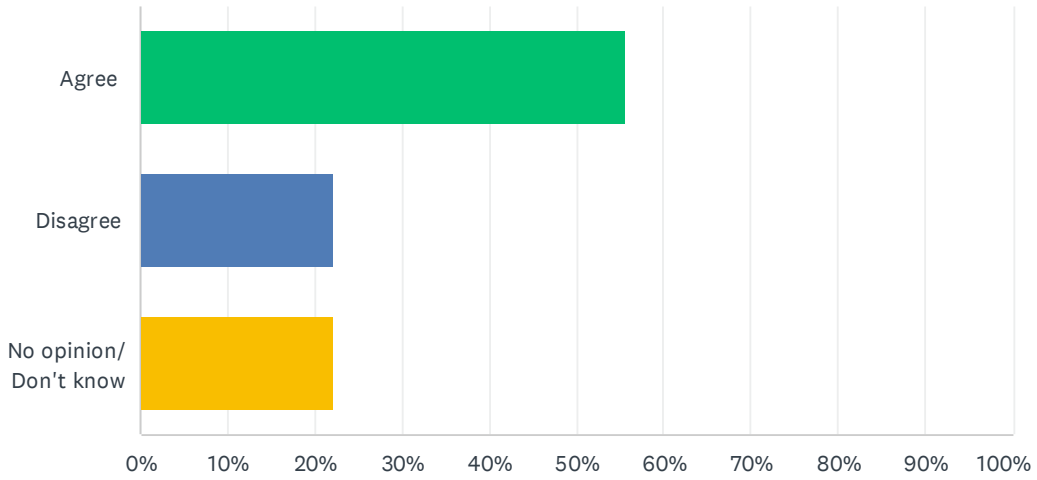
Answered: 9 Skipped: 0



Weaknesses

- Drainage issues
- Old infrastructure, lack of confidence
- Need to close gaps
- Lack of collaboration with state and federal stakeholders
- Reliance on pump systems, electricity
- Private maintenance of drainage systems, lack of maintenance

Opportunities

- Increase collaboration between stakeholders
- Improve private drainage system management
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Obstacles

- Dredging, environmental regulations
- Politics, funding limits
- HOA funding and maintenance capabilities
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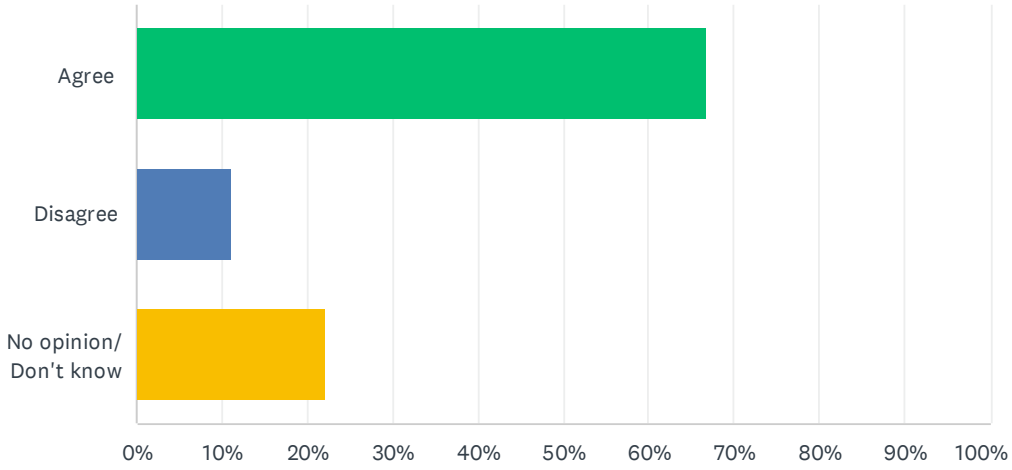
#	COMMENTS?	DATE
1	Every jurisdiction will have a different answer.	4/10/2023 2:42 PM
2	Some areas have info structure concerns that have not been address that may cause additional problems during a flood event.	4/6/2023 3:42 PM

Q10 City and County staff are knowledgeable about flood hazards and their impacts and are willing to share that knowledge with the public.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	11.11%	1
No opinion/ Don't know	22.22%	2
TOTAL		9

Q10 City and County staff are knowledgeable about flood hazards and their impacts and are willing to share that knowledge with the public.

Strengths

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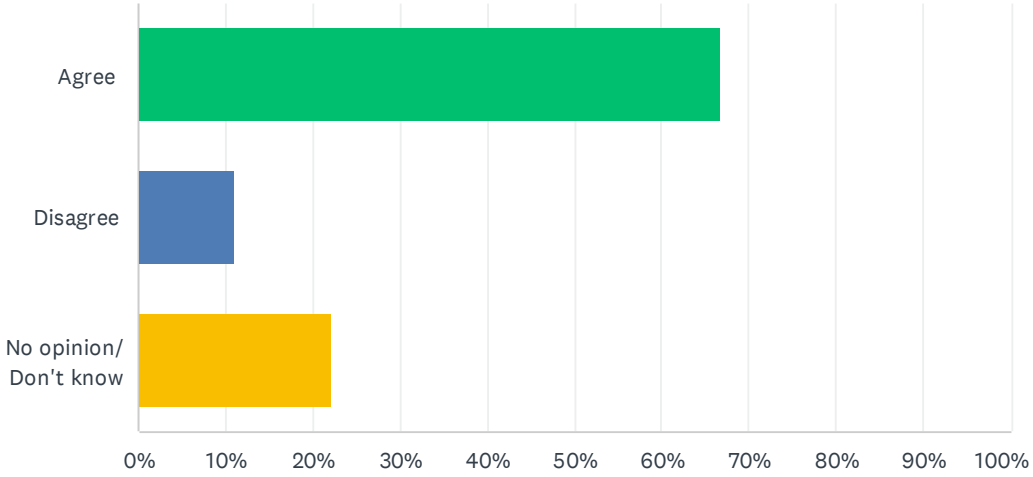
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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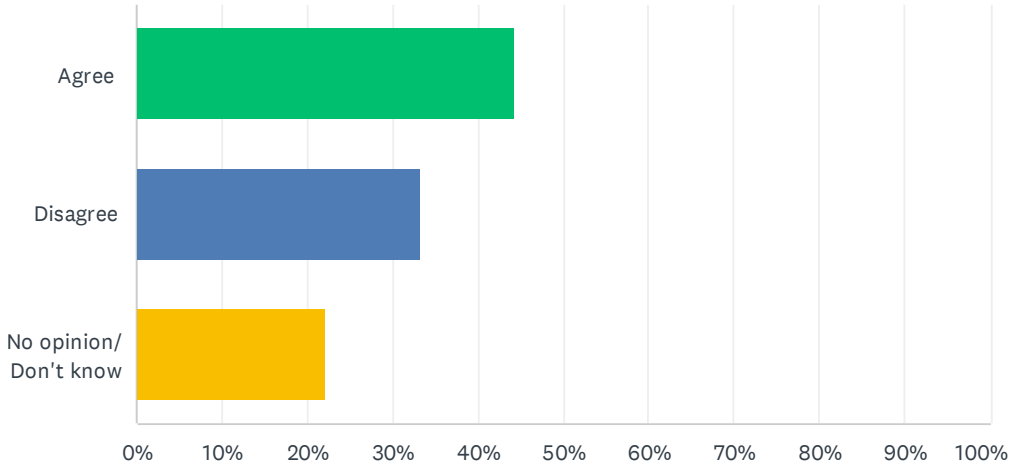
#	COMMENTS?	DATE
1	I am not sure if municipal staff have the historic data? And I am not aware of any public outreach notification at this time.	4/6/2023 3:42 PM

Q11 The core capability to assess and mitigate flood risk within the planning area is high.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	44.44%	4
Disagree	33.33%	3
No opinion/ Don't know	22.22%	2
TOTAL		9

Q11 The core capability to assess and mitigate flood risk within the planning area is high.

Strengths

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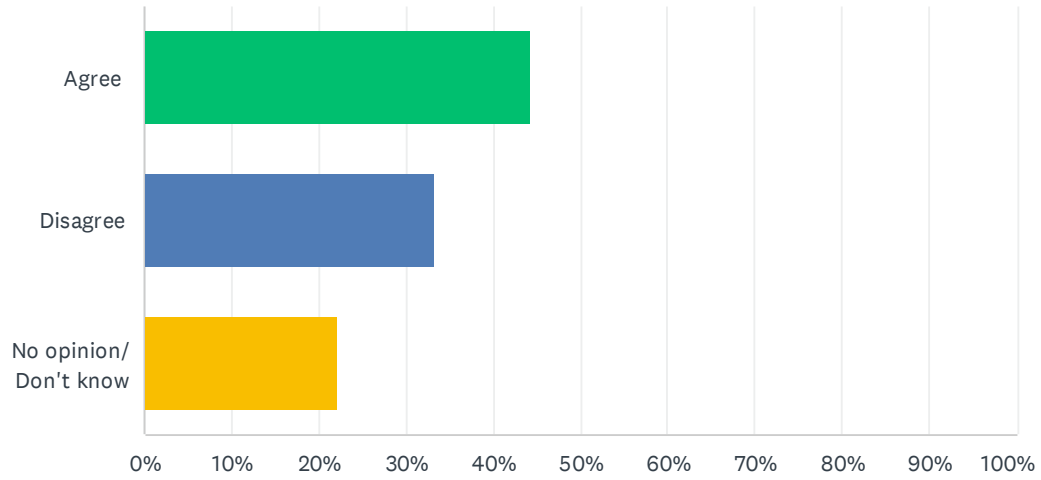
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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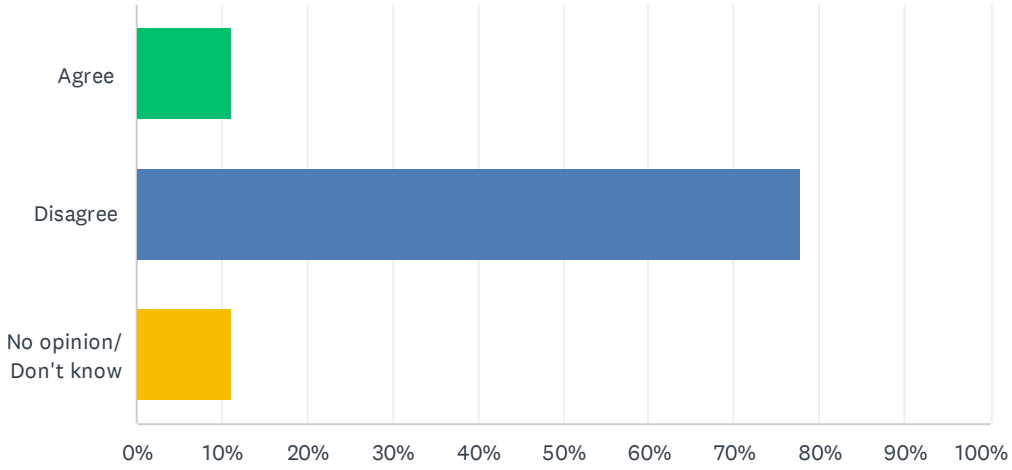
#	COMMENTS?	DATE
1	Not sure if we are assessing flood risk for new development along possible flood areas outside of diked areas	4/10/2023 12:38 PM

Q12 Cowlitz County citizens have a good understanding of flood hazard exposure and risk.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	11.11%	1
Disagree	77.78%	7
No opinion/ Don't know	11.11%	1
TOTAL		9

Q12 Cowlitz County citizens have a good understanding of flood hazard exposure and risk.

Strengths

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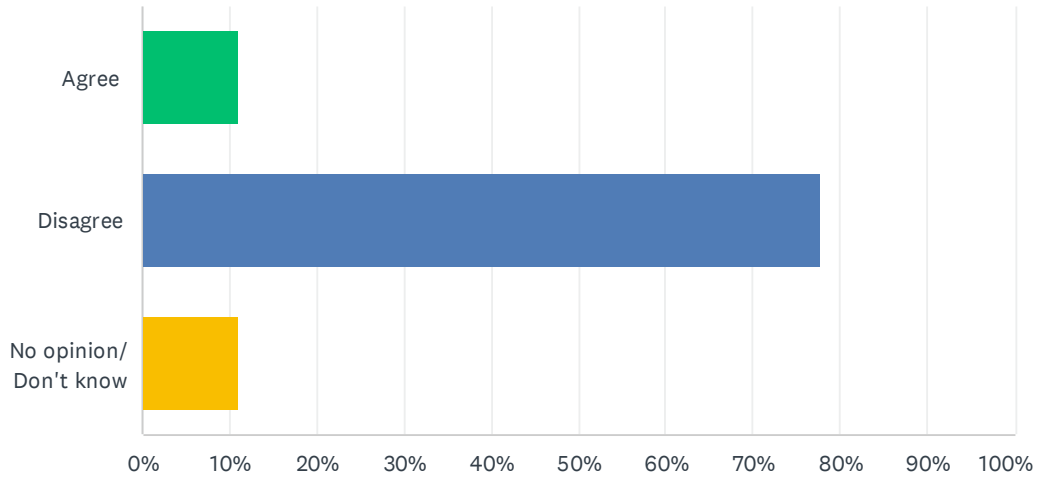
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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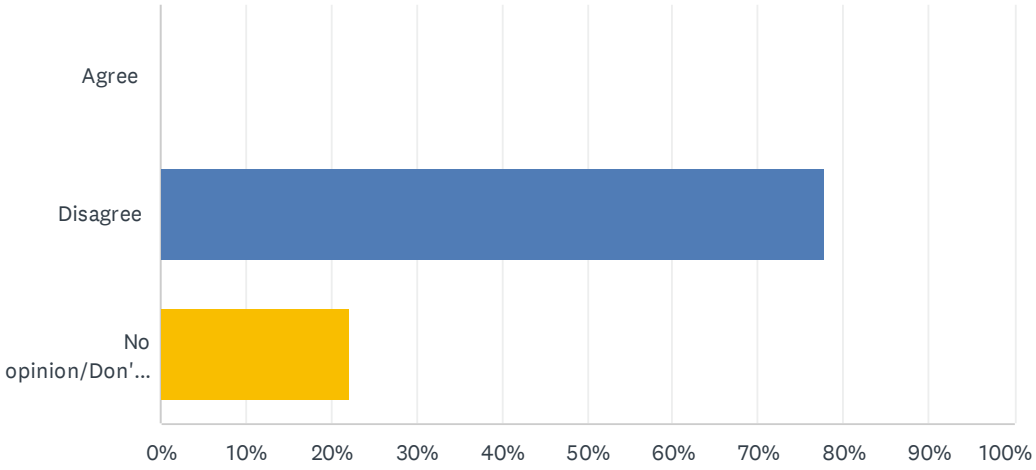
#	COMMENTS?	DATE
1	I agree and disagree. Those that want to know will and those that don't wont.	4/10/2023 2:42 PM

Q13 There is sufficient funding to support flood hazard risk reduction within the Cowlitz County.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	0.00%	0
Disagree	77.78%	7
No opinion/Don't know	22.22%	2
TOTAL		9

Q13 There is sufficient funding to support flood hazard risk reduction within the Cowlitz County.

Strengths

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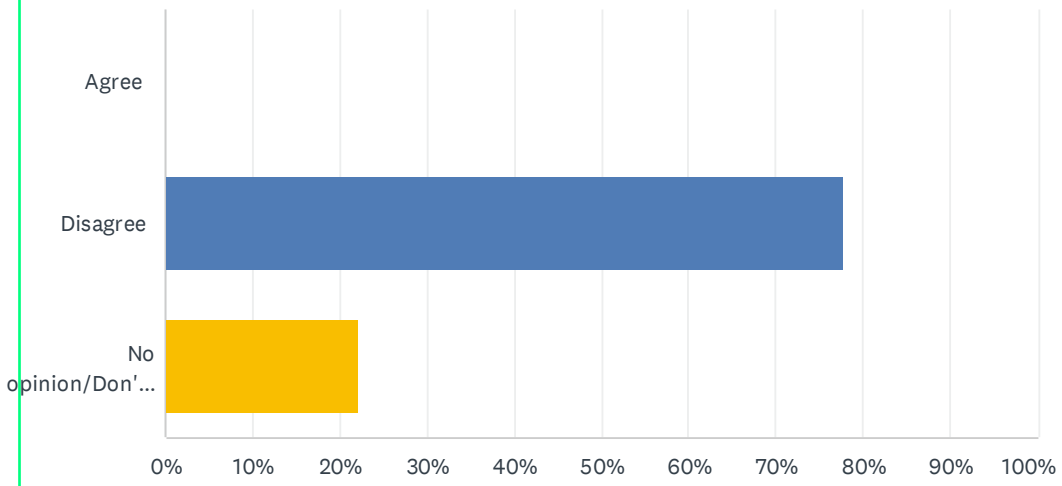
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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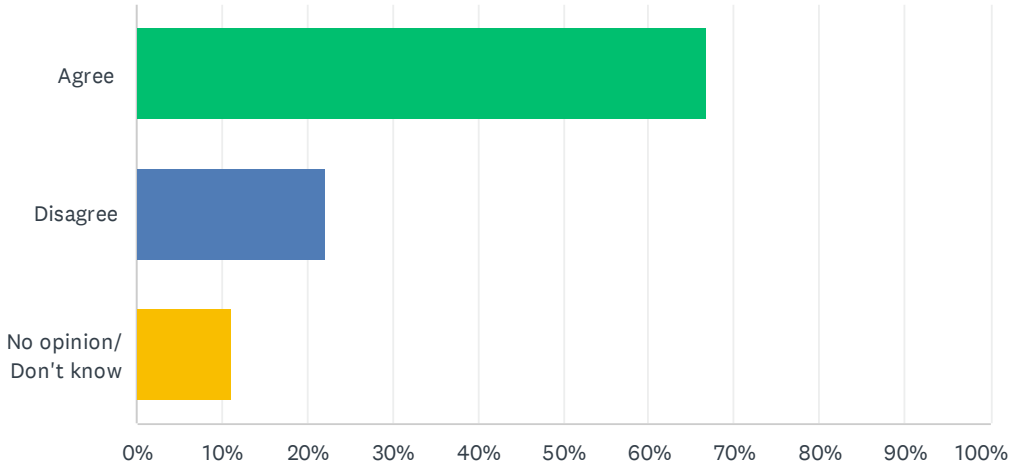
Q14 Strong collaboration and coordination exists between the cities, County, neighboring jurisdictions, and state and federal agency partners.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	22.22%	2
No opinion/ Don't know	11.11%	1
TOTAL		9

Q14 Strong collaboration and coordination exists between the cities, County, neighboring jurisdictions, and state and federal agency partners.

Strengths

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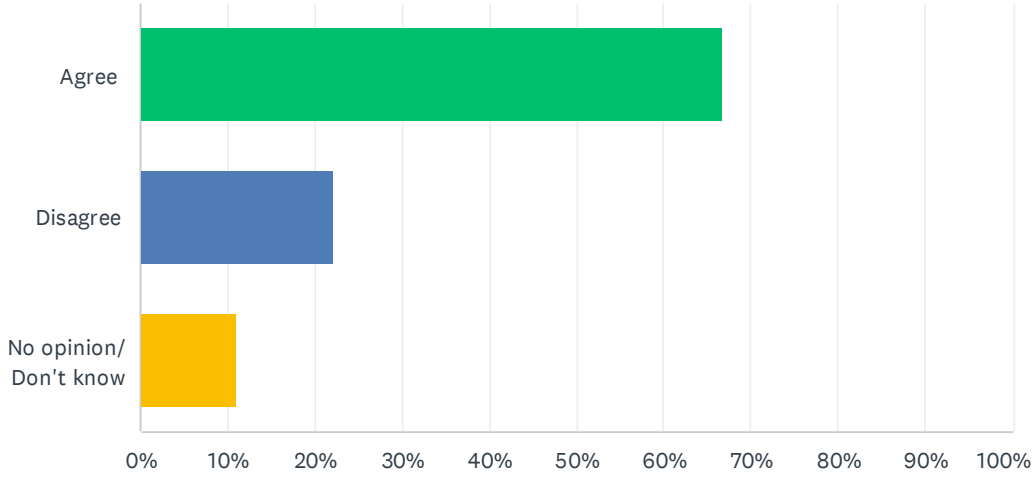
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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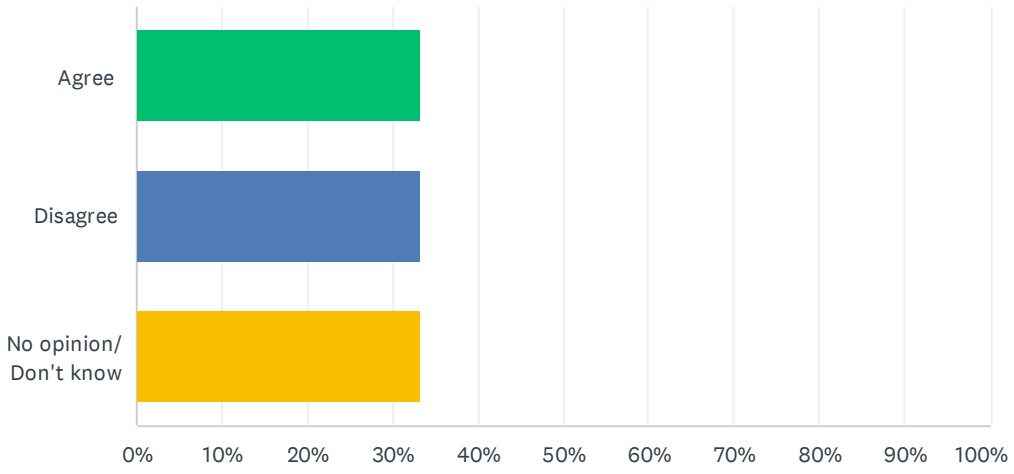
#	COMMENTS?	DATE
	There are no responses.	

Q15 Appropriate and timely flood warning systems are in place.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	33.33%	3
No opinion/ Don't know	33.33%	3
TOTAL		9

Q15 Appropriate and timely flood warning systems are in place.

Strengths

- Facebook has large following
- Cell phones
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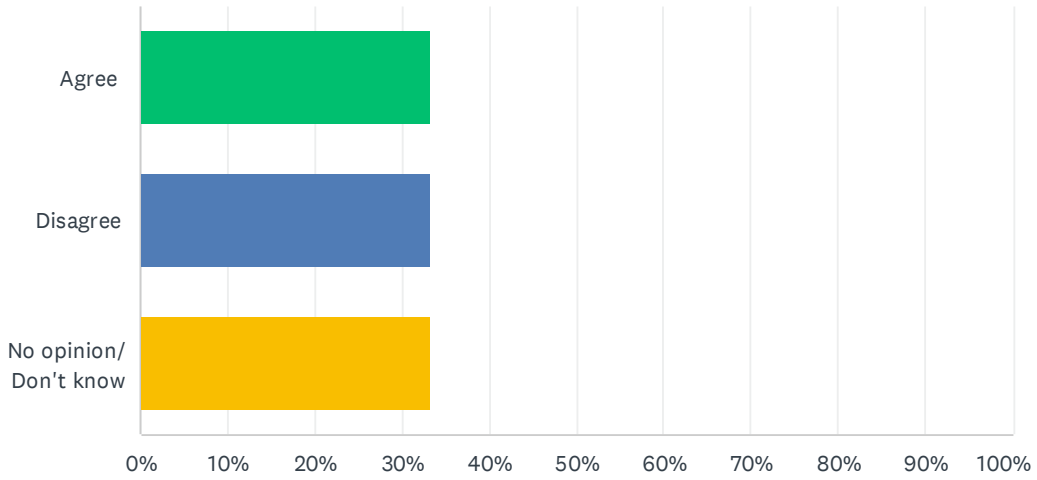
Answered: 9 Skipped: 0



Weaknesses

- Protocols not well distributed, available technology not well known
- Not one centralized location/system for distribution of messages
- May be multiple distributions of messages
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Opportunities

- R911 training
- Develop canned messages for consistency and coordination
- Develop county-wide protocols and coordinate with federal agencies/dam operators
- County currently evaluating software for notifications, possible coordination with districts and cities
- Educate public about where/how to get information

Obstacles

- People may not be on internet
- Funding to pay for software/equipment
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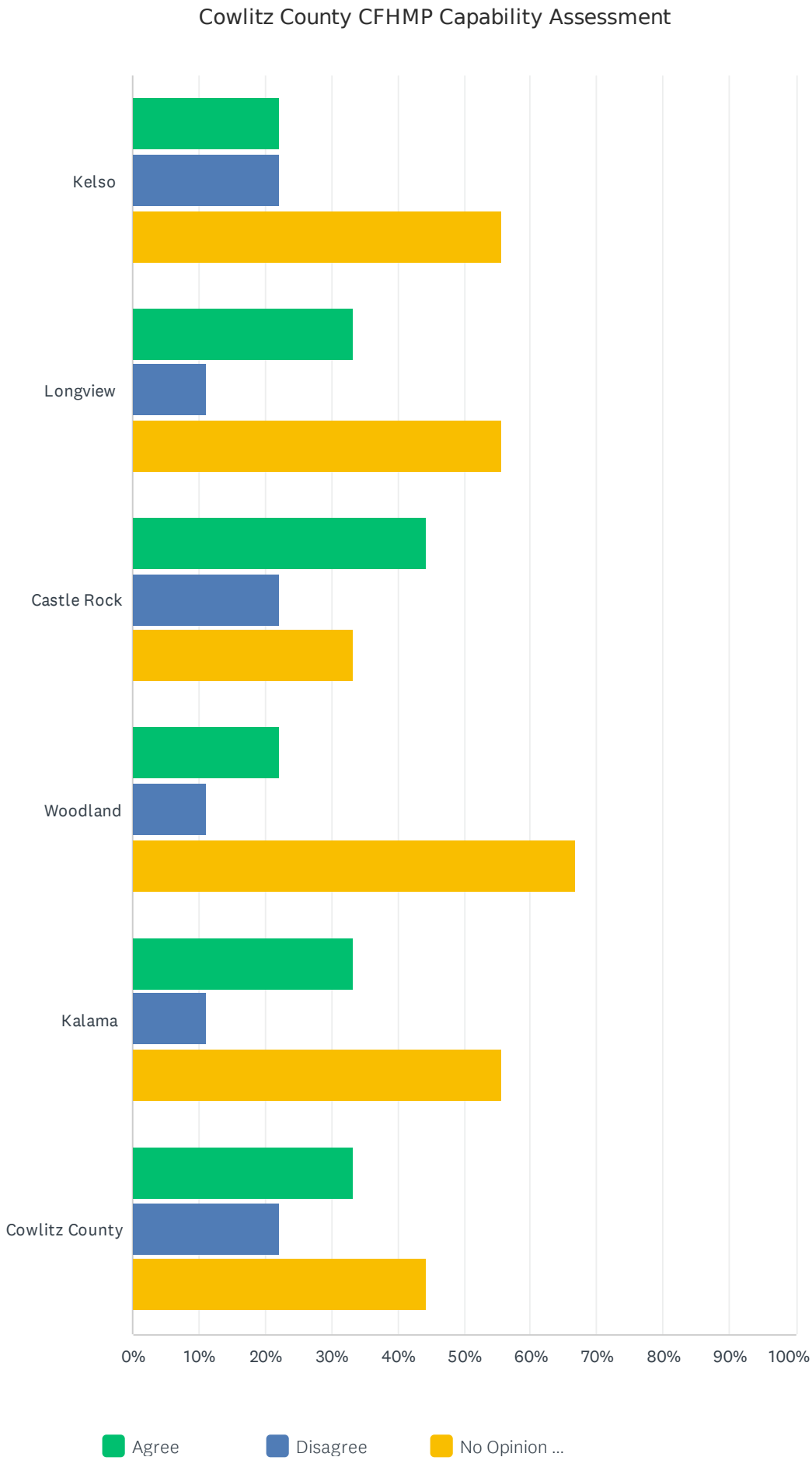
		DATE
There are no responses.		

Q16 The cities and county currently have an adequate variety of both regulatory and non-regulatory strategies to reduce risk.

Answered: 9 Skipped: 0


Cowlitz County CFHMP Capability Assessment
Kelso
Longview
Castle Rock
Woodland
Kalama
Cowlitz County
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Agree
Disagree
No Opinion ...

	AGREE	DISAGREE	NO OPINION / DON'T KNOW	TOTAL
Kelso	22.22% 2	22.22% 2	55.56% 5	9
Longview	33.33% 3	11.11% 1	55.56% 5	9
Castle Rock	44.44% 4	22.22% 2	33.33% 3	9
Woodland	22.22% 2	11.11% 1	66.67% 6	9
Kalama	33.33% 3	11.11% 1	55.56% 5	9
Cowlitz County	33.33% 3	22.22% 2	44.44% 4	9

Q16 The cities and county currently have an adequate variety of both regulatory and non-regulatory strategies to reduce risk.

Answered: 9 Skipped: 0

Strengths

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Weaknesses

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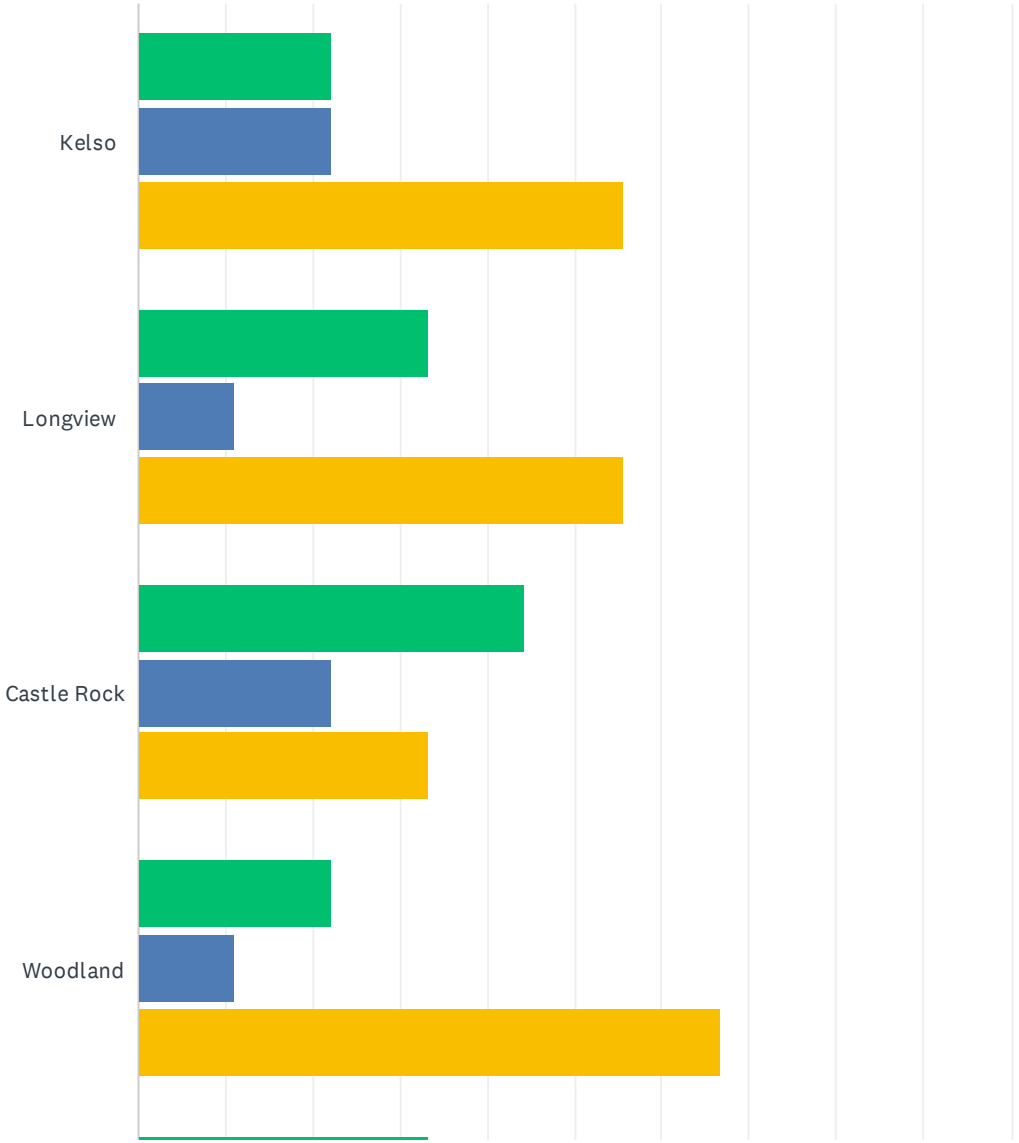

Opportunities

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Obstacles

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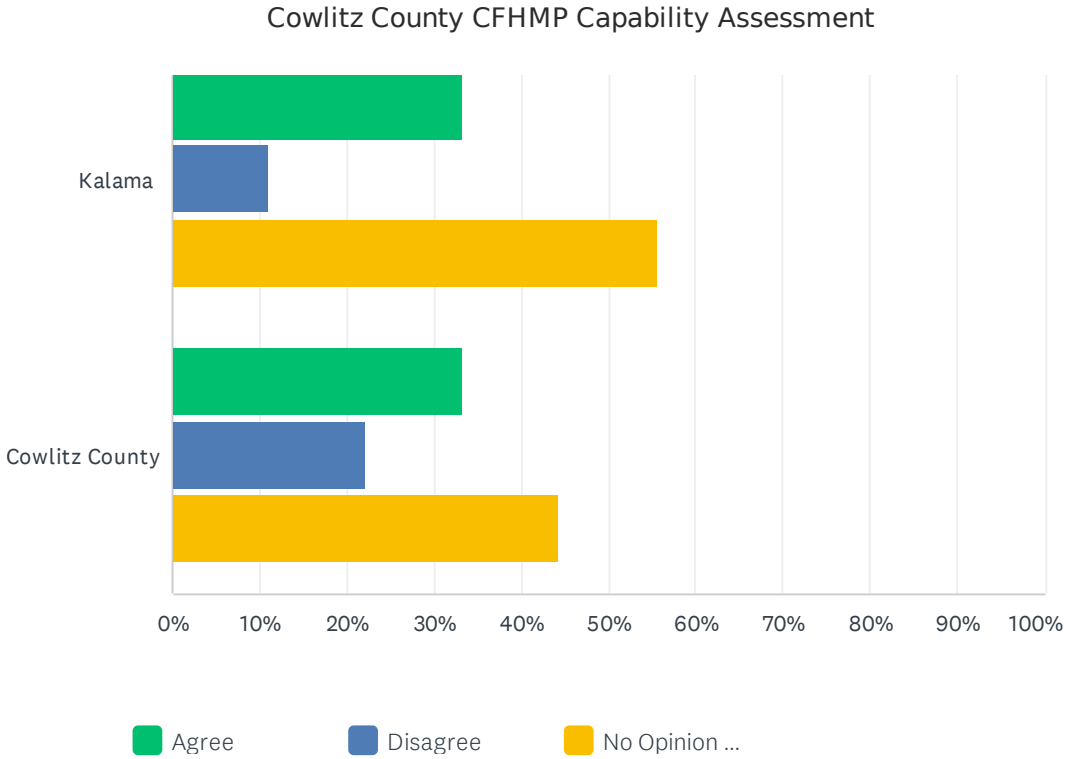

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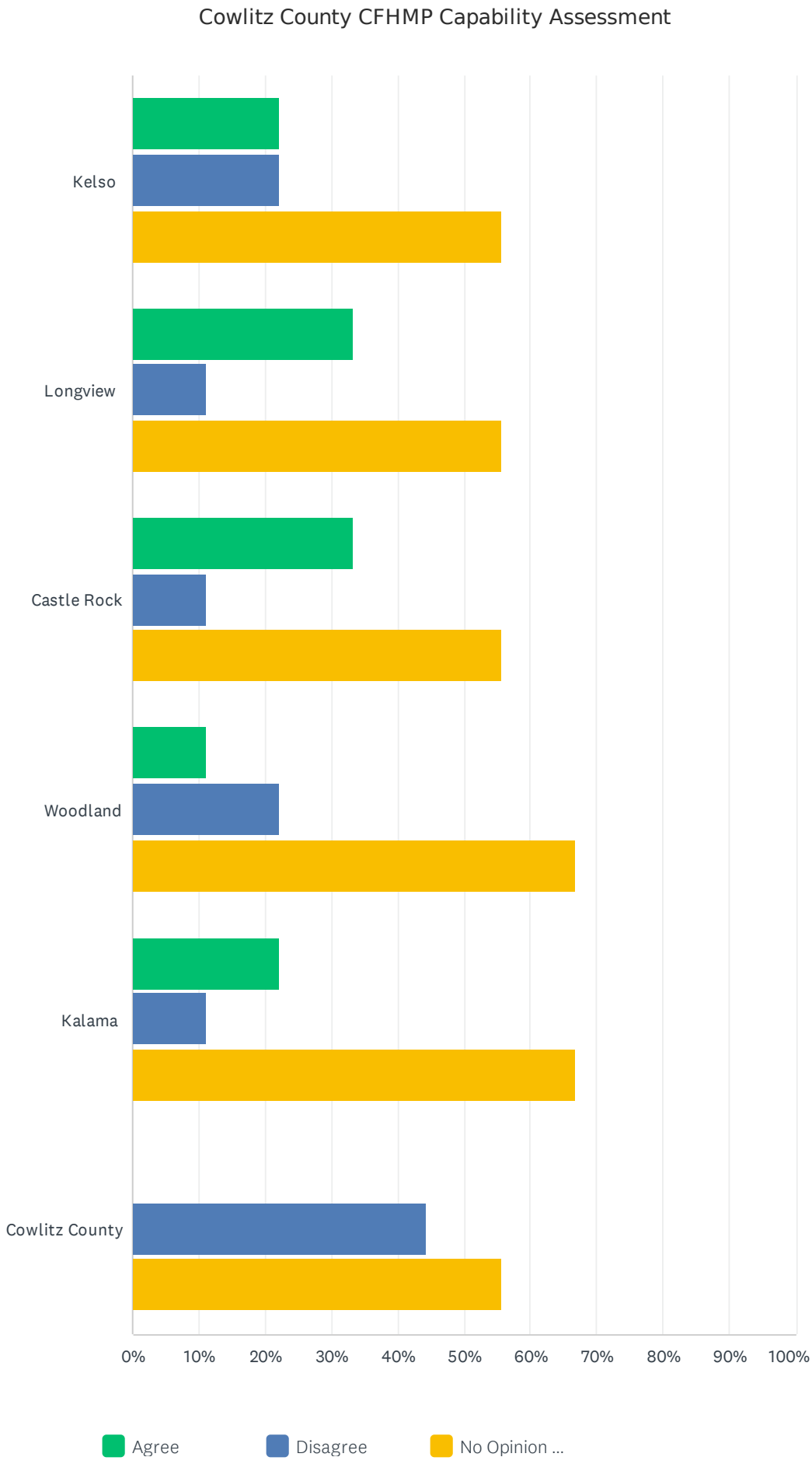
Woodland	22.22% 2	11.11% 1	66.67% 6	9
Kalama	33.33% 3	11.11% 1	55.56% 5	9
Cowlitz County	33.33% 3	22.22% 2	44.44% 4	9

Q17 The cities and county currently have adequate, adopted policies and encourage development to be located outside of high risk areas.

Answered: 9 Skipped: 0


Cowlitz County CFHMP Capability Assessment
Kelso
Longview
Castle Rock
Woodland
Kalama
Cowlitz County
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Agree
Disagree
No Opinion ...

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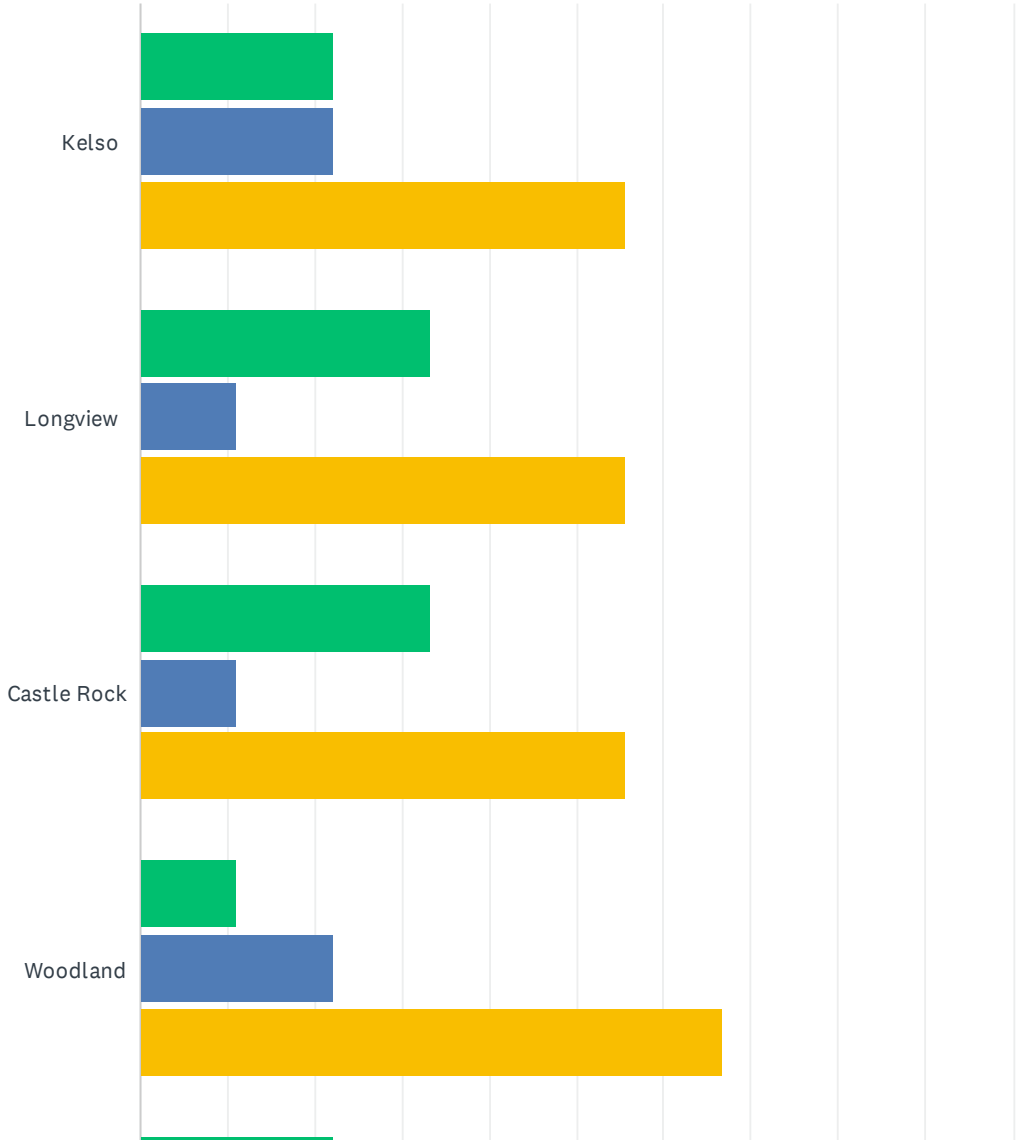
Woodland	11.11% 1	22.22% 2	66.67% 6	9
Kalama	22.22% 2	11.11% 1	66.67% 6	9
Cowlitz County	0.00% 0	44.44% 4	55.56% 5	9

Q17 The cities and county currently have adequate, adopted policies and encourage development to be located outside of high risk areas.

Answered: 9 Skipped: 0



Strengths

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Weaknesses

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Opportunities

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Obstacles

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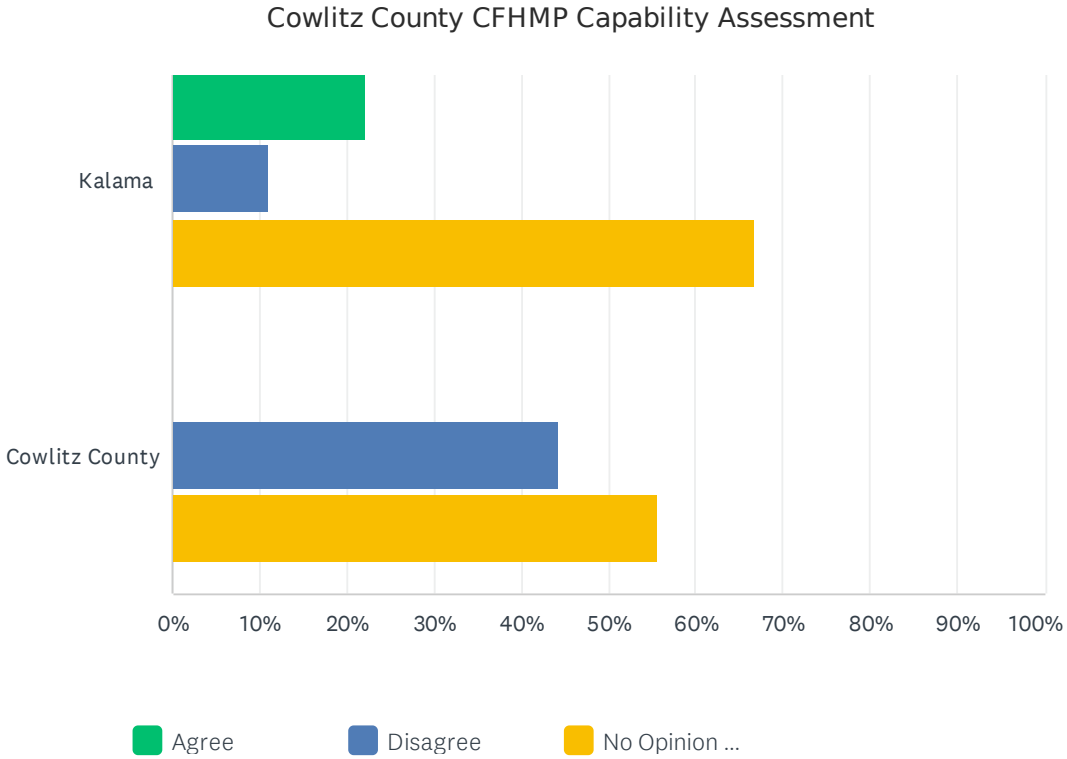

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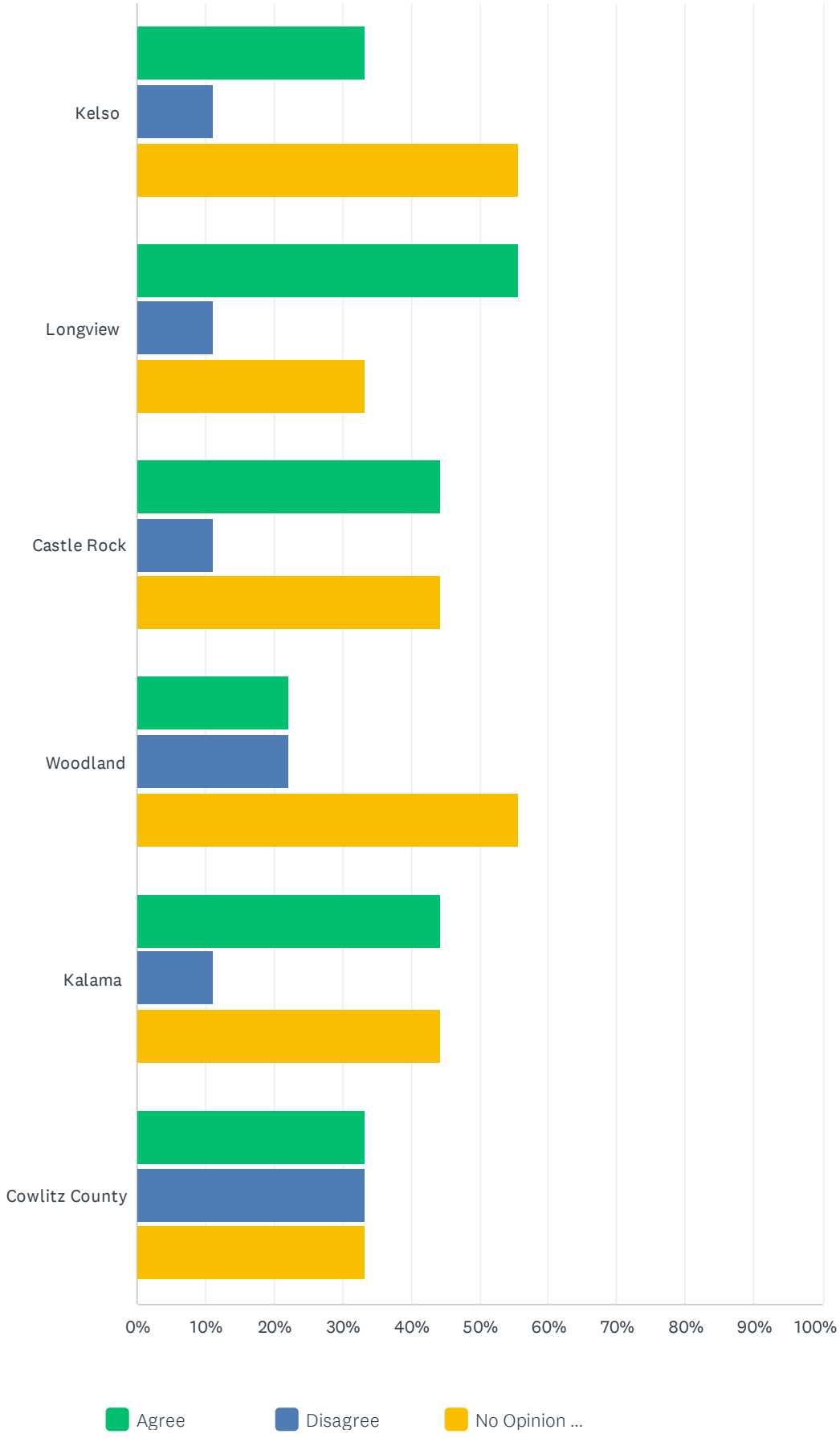
Woodland	11.11% 1	22.22% 2	66.67% 6	9
Kalama	22.22% 2	11.11% 1	66.67% 6	9
Cowlitz County	0.00% 0	44.44% 4	55.56% 5	9

Q18 Risk from flood hazard areas within the cities and county is adequately managed and regulated.

Answered: 9 Skipped: 0

Cowlitz County CFHMP Capability Assessment



	AGREE	DISAGREE	NO OPINION / DON'T KNOW	TOTAL
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Longview	55.56% 5	11.11% 1	33.33% 3	9
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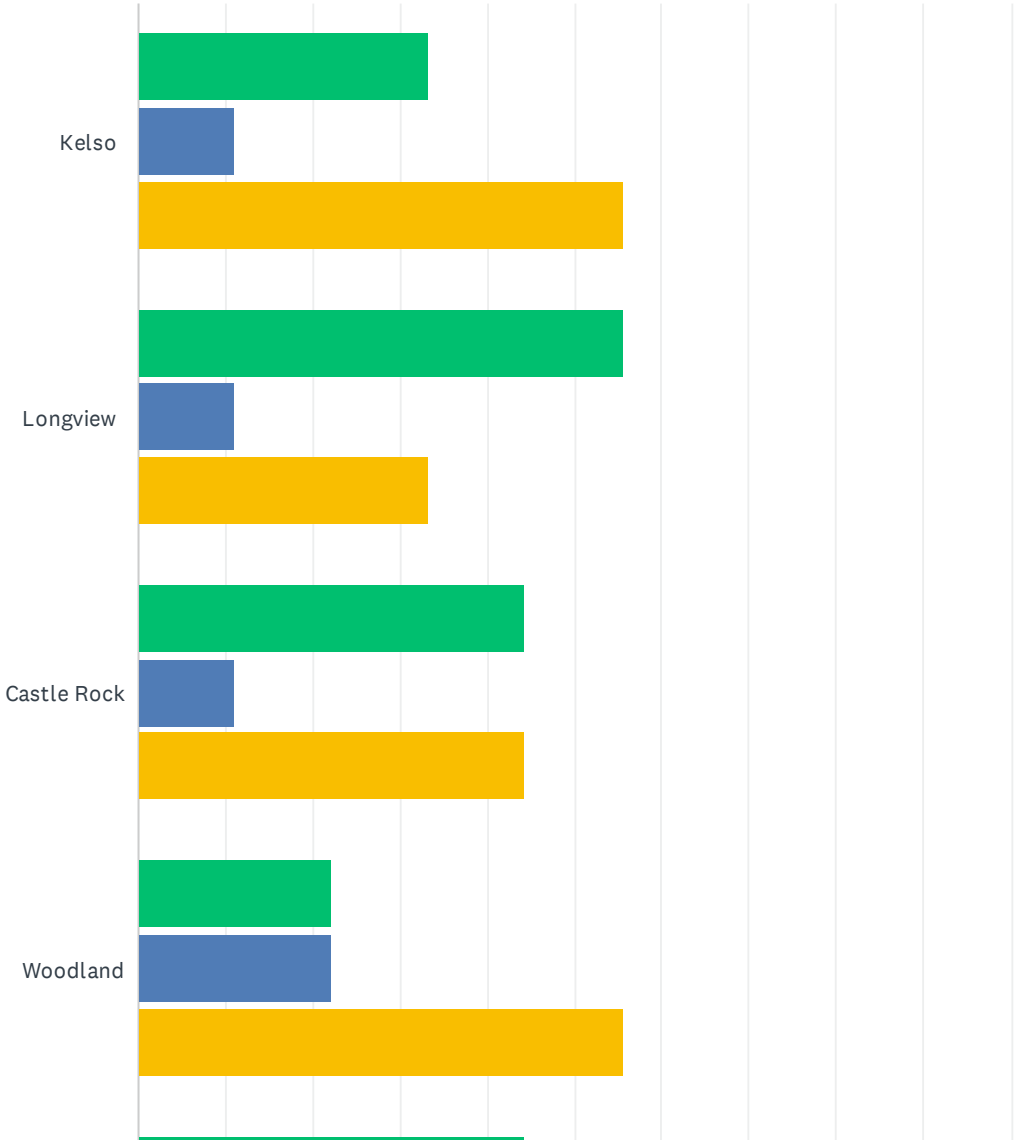
Woodland	22.22% 2	22.22% 2	55.56% 5	9
Kalama	44.44% 4	11.11% 1	44.44% 4	9
Cowlitz County	33.33% 3	33.33% 3	33.33% 3	9

Q18 Risk from flood hazard areas within the cities and county is adequately managed and regulated.

Answered: 9 Skipped: 0



Strengths

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Weaknesses

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Opportunities

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Obstacles

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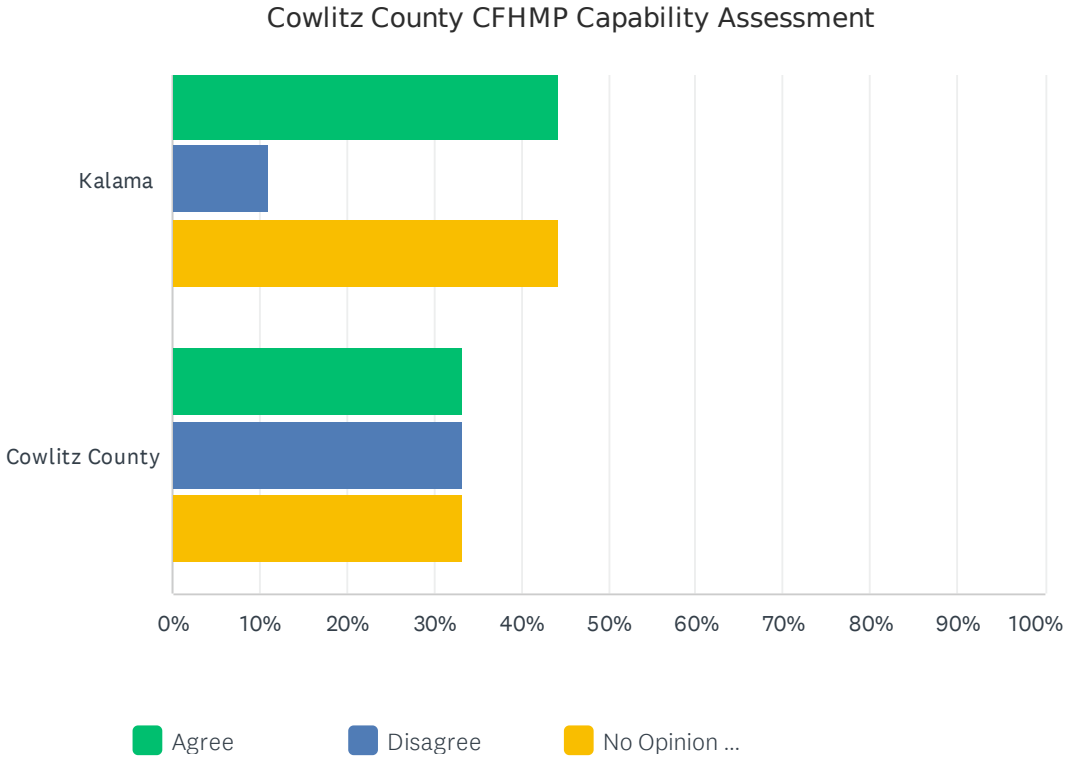

	AGREE	DISAGREE	NO OPINION / DON'T KNOW	TOTAL
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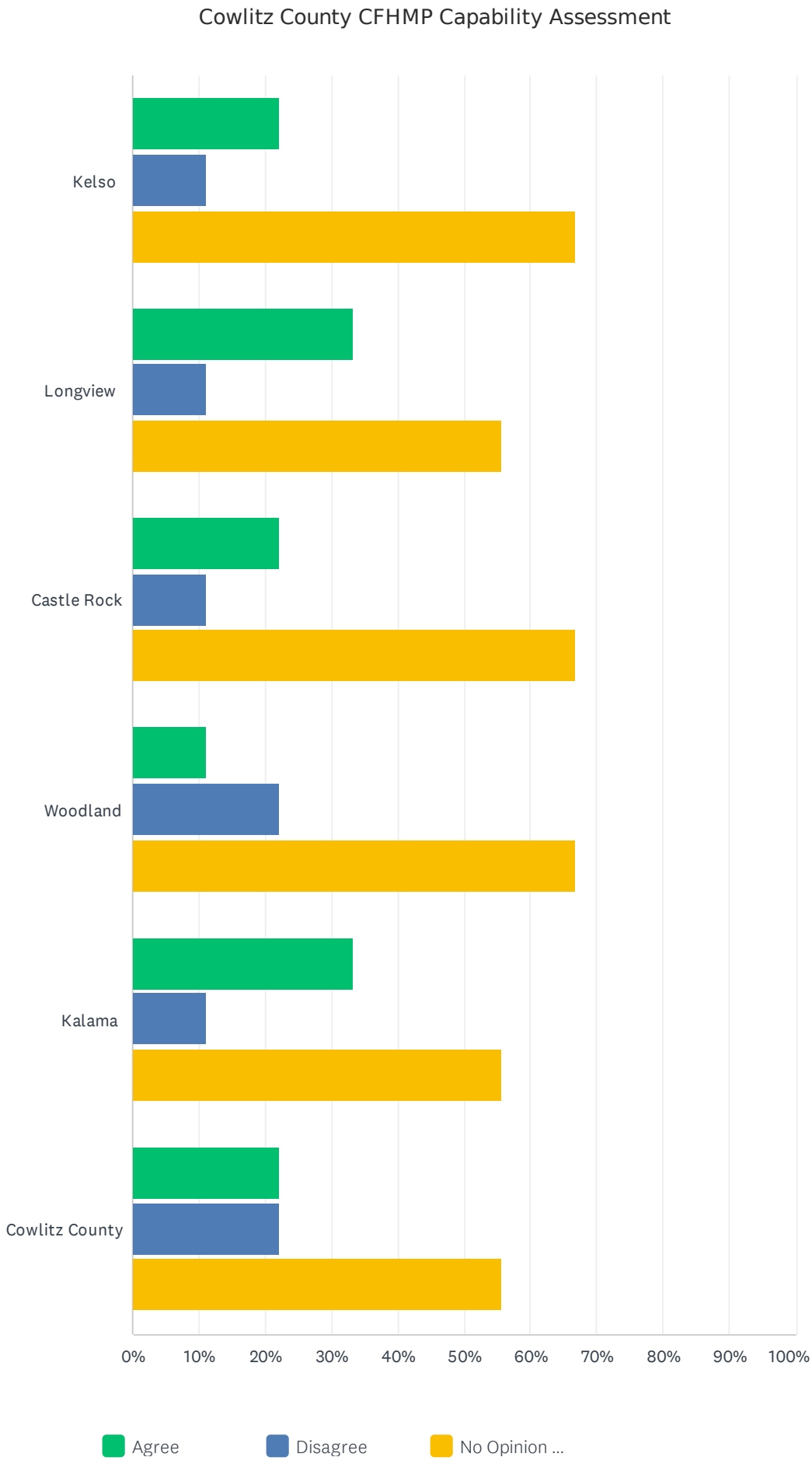
Longview	55.56% 5	11.11% 1	33.33% 3	9
Castle Rock	44.44% 4	11.11% 1	44.44% 4	9
Woodland	22.22% 2	22.22% 2	55.56% 5	9
Kalama	44.44% 4	11.11% 1	44.44% 4	9
Cowlitz County	33.33% 3	33.33% 3	33.33% 3	9

Q19 The cities and county development regulations for the new development within identified flood hazard zones are clear and adequate to address flood risk.

Answered: 9 Skipped: 0


Cowlitz County CFHMP Capability Assessment
Kelso
Longview
Castle Rock
Woodland
Kalama
Cowlitz County
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Agree
Disagree
No Opinion ...

	AGREE	DISAGREE	NO OPINION / DON'T KNOW	TOTAL
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Longview	33.33% 3	11.11% 1	55.56% 5	9
Castle Rock	22.22% 2	11.11% 1	66.67% 6	9
Woodland	11.11% 1	22.22% 2	66.67% 6	9
Kalama	33.33% 3	11.11% 1	55.56% 5	9
Cowlitz County	22.22% 2	22.22% 2	55.56% 5	9

Q19 The cities and county development regulations for the new development within identified flood hazard zones are clear and adequate to address flood risk.

Answered: 9 Skipped: 0

Strengths

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Weaknesses

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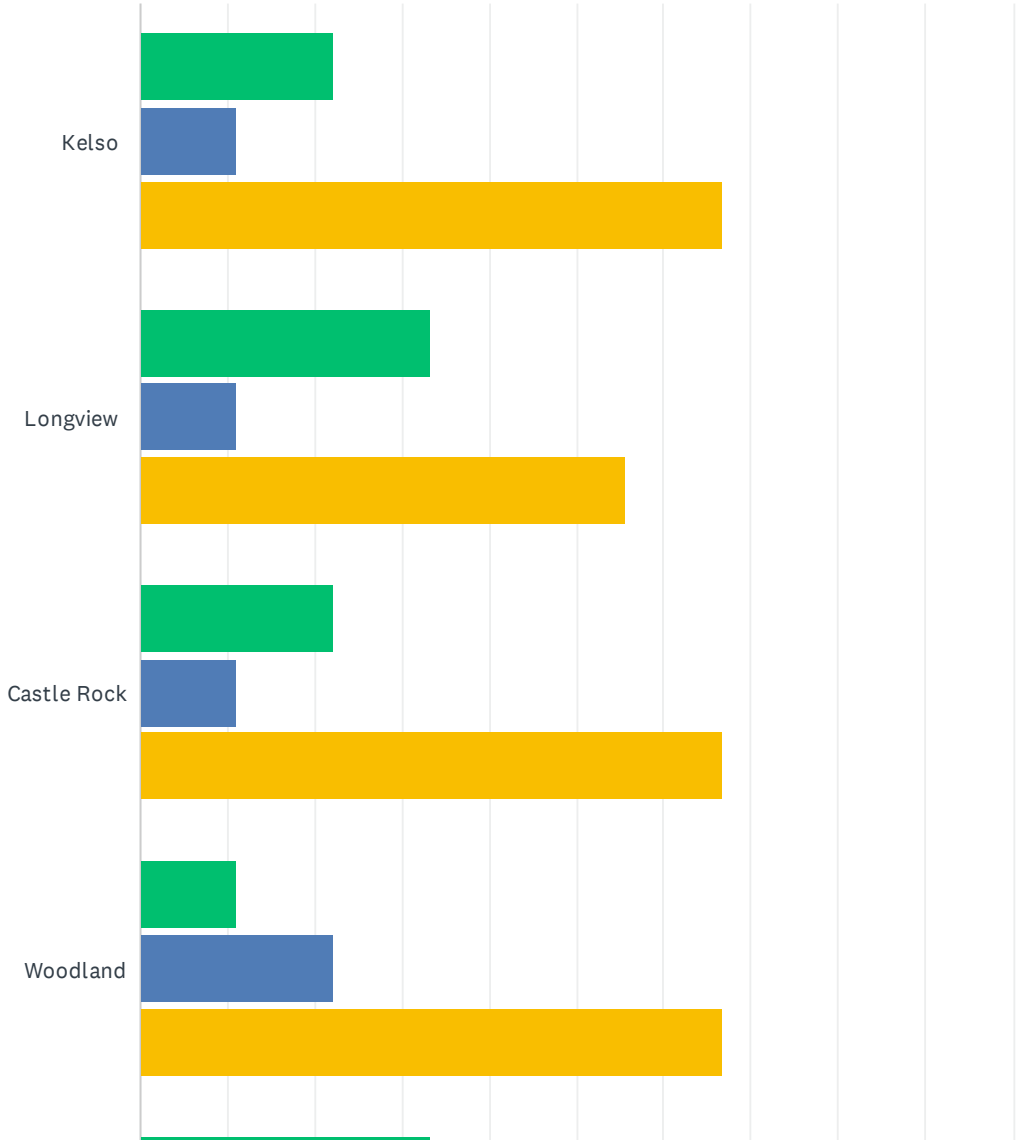

Opportunities

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Obstacles

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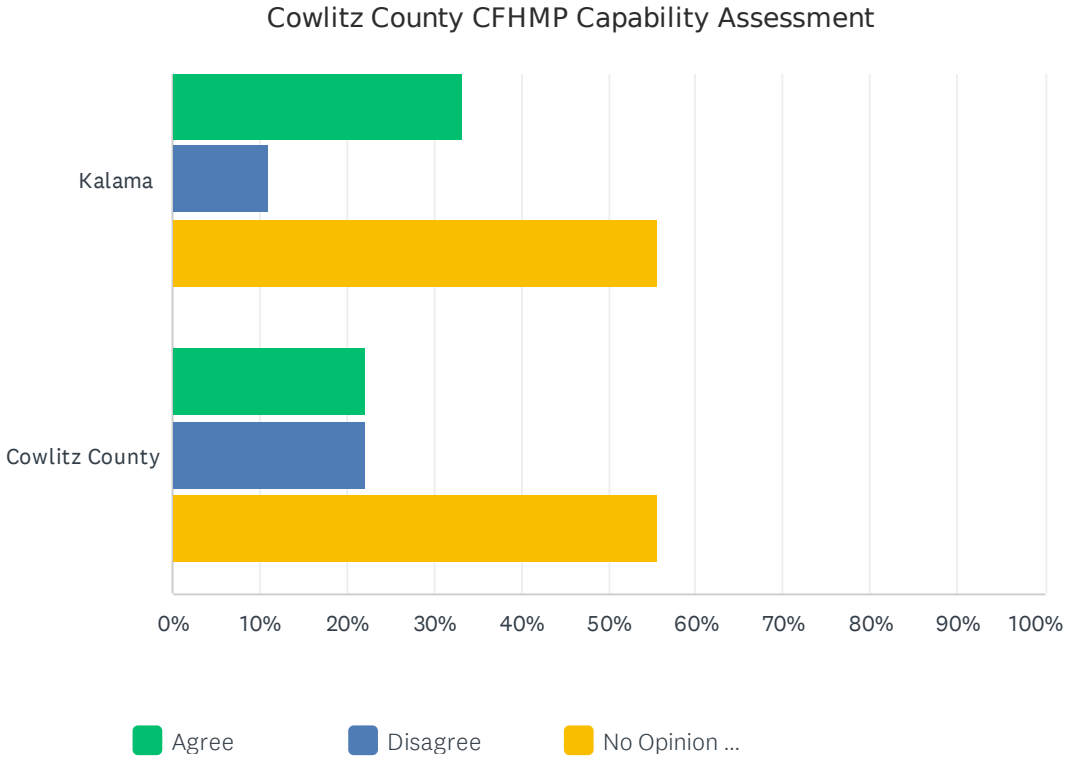
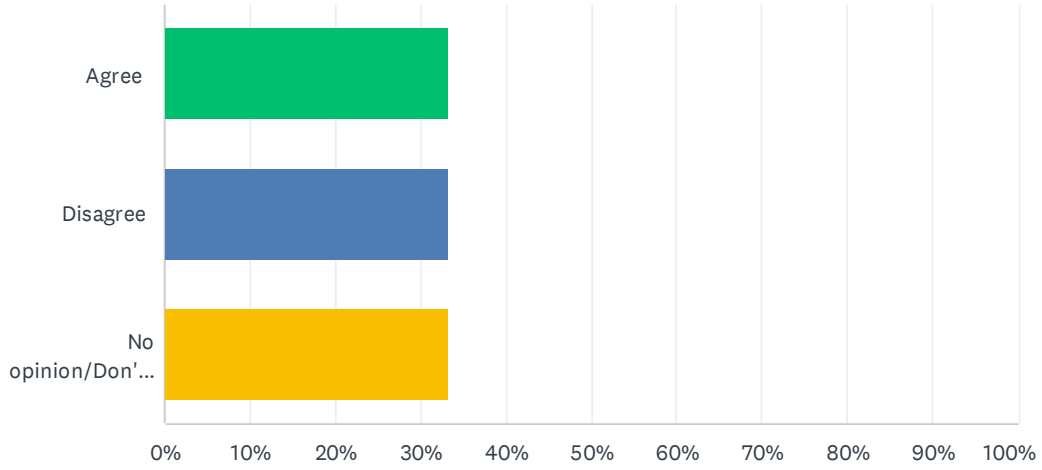


	AGREE	DISAGREE	NO OPINION / DON'T KNOW	TOTAL
Kelso	22.22% 2	11.11% 1	66.67% 6	9
Longview	33.33% 3	11.11% 1	55.56% 5	9
Castle Rock	22.22% 2	11.11% 1	66.67% 6	9
Woodland	11.11% 1	22.22% 2	66.67% 6	9
Kalama	33.33% 3	11.11% 1	55.56% 5	9
Cowlitz County	22.22% 2	22.22% 2	55.56% 5	9

Q20 There is strong public support for flood risk reduction within Cowlitz County.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	33.33%	3
No opinion/Don't know	33.33%	3
TOTAL		9

Q20 There is strong public support for flood risk reduction within Cowlitz County.

Strengths

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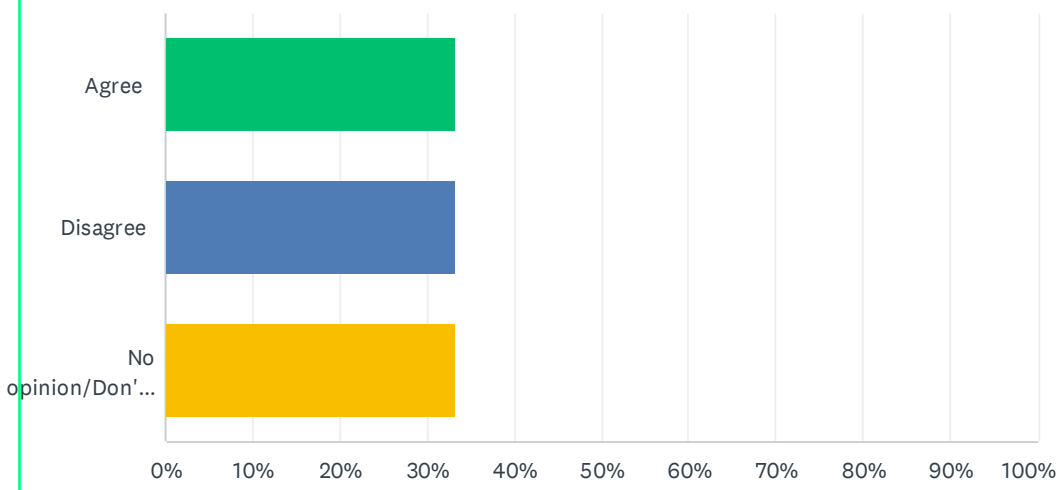
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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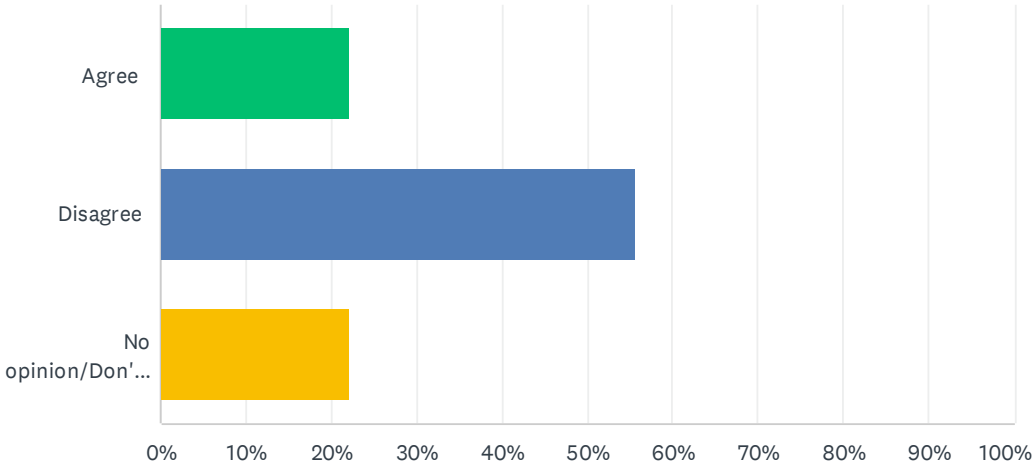
#	COMMENTS?	DATE
	There are no responses.	

Q21 The cities and county are adequately prepared for the probable impacts on flood hazards due to the impacts from a changing climate.

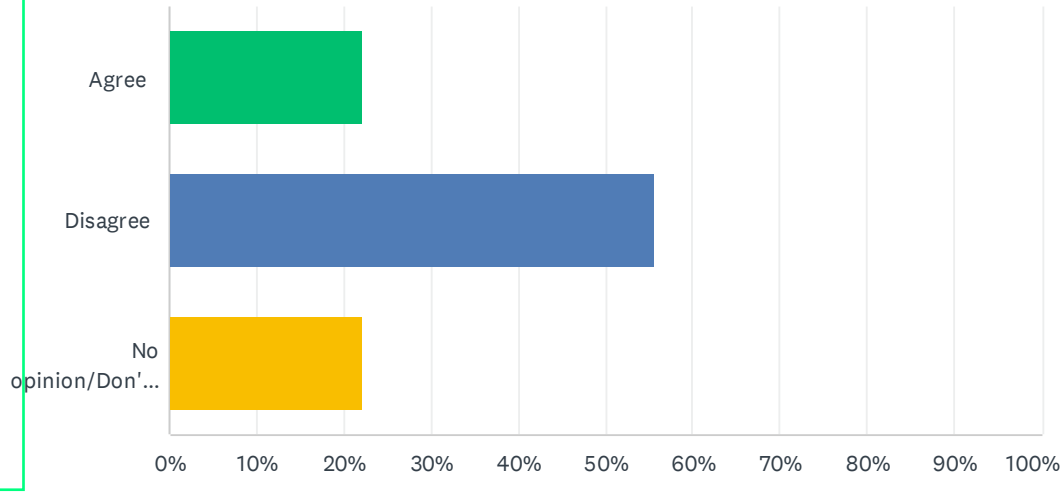
Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	22.22%	2
Disagree	55.56%	5
No opinion/Don't know	22.22%	2
TOTAL		9

Q21 The cities and county are adequately prepared for the probable impacts on flood hazards due to the impacts from a changing climate.

Answered: 9 Skipped: 0



Strengths

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Weaknesses

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Opportunities

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Obstacles

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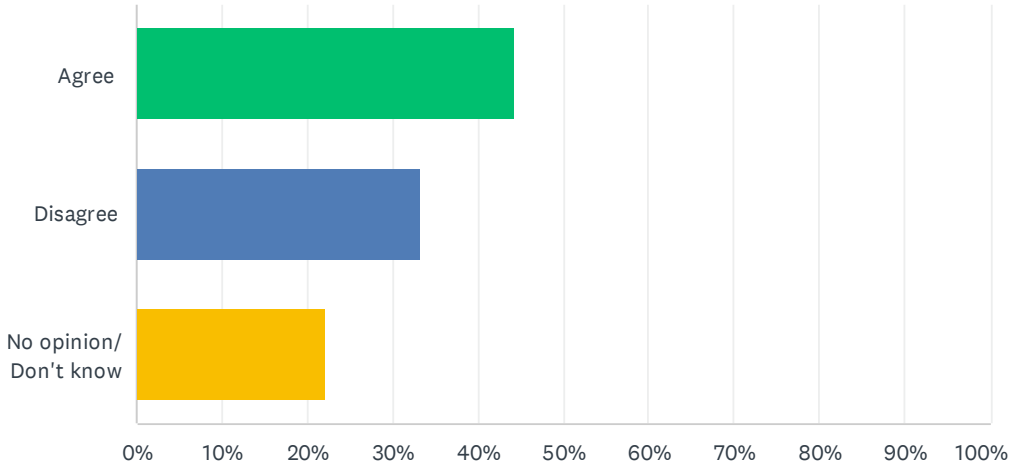
#	COMMENTS?	DATE
	There are no responses.	

Q22 Coordinated public outreach regarding risk from flood hazards convey clear, consistent messaging to the public.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	44.44%	4
Disagree	33.33%	3
No opinion/ Don't know	22.22%	2
TOTAL		9

Q22 Coordinated public outreach regarding risk from flood hazards convey clear, consistent messaging to the public.

Strengths

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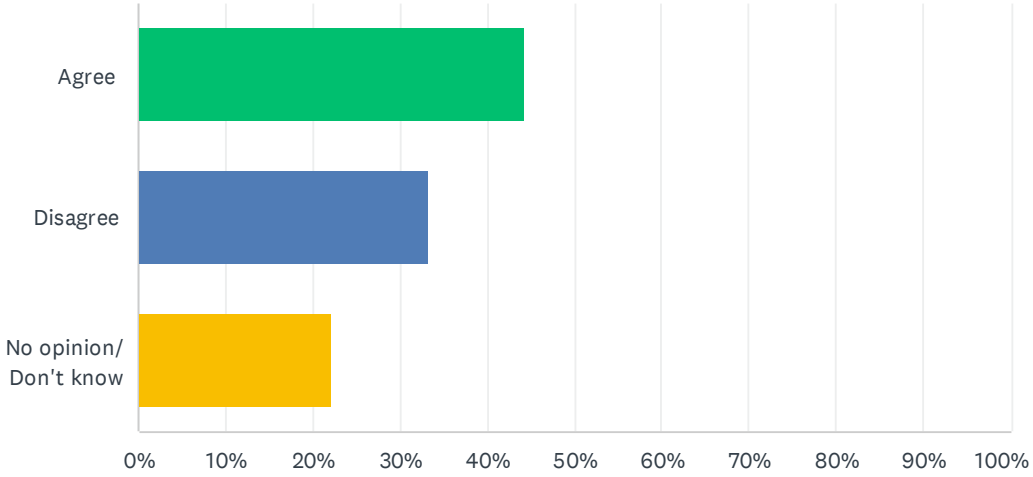
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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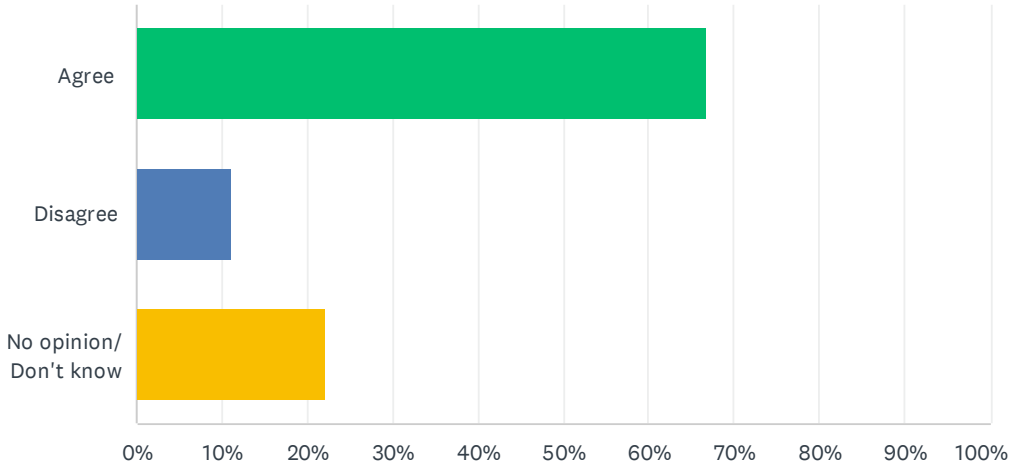
#	COMMENTS?	DATE
	There are no responses.	

Q23 The Cities' and County's flood risk management programs are fair and equitable.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	11.11%	1
No opinion/ Don't know	22.22%	2
TOTAL		9

Q23 The Cities' and County's flood risk management programs are fair and equitable.

Strengths

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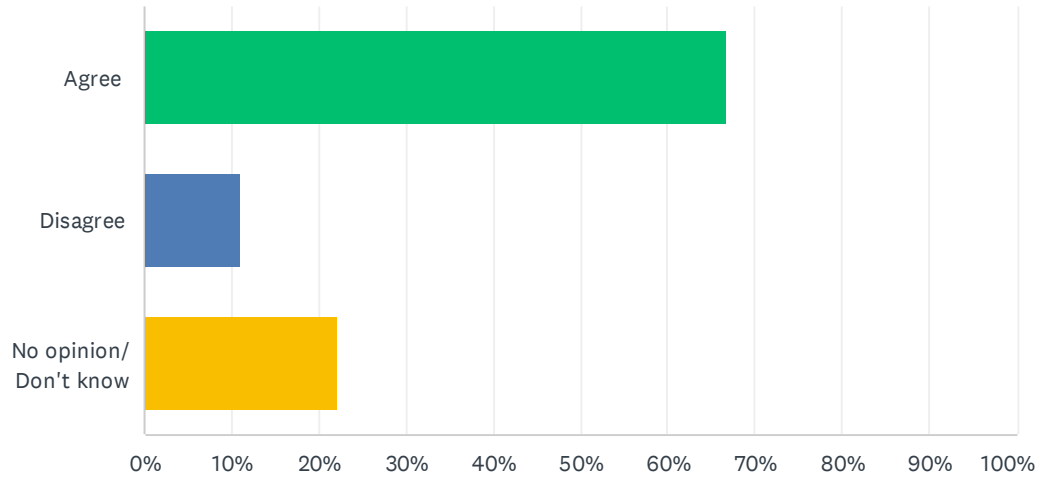
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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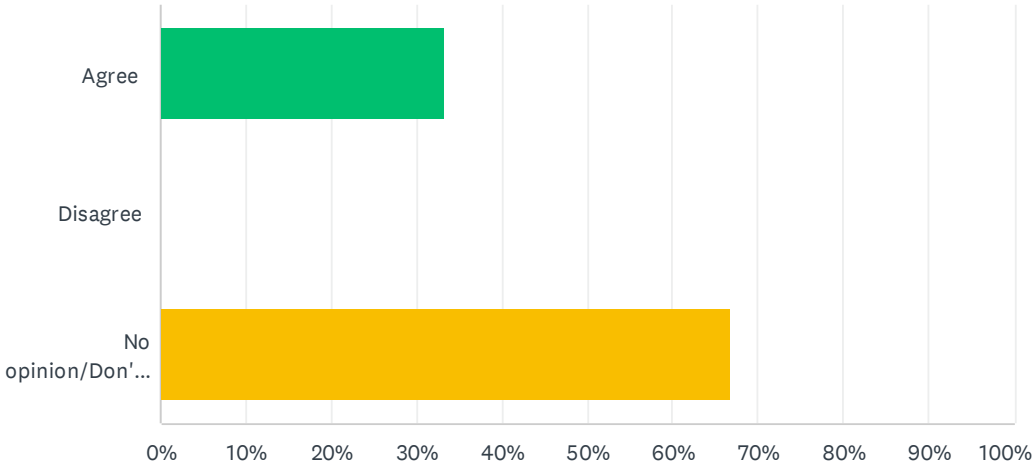
#	COMMENTS?	DATE
	There are no responses.	

Q24 Information on flood insurance is readily available within the cities and county.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	0.00%	0
No opinion/Don't know	66.67%	6
TOTAL		9

Q24 Information on flood insurance is readily available within the cities and county.

Strengths

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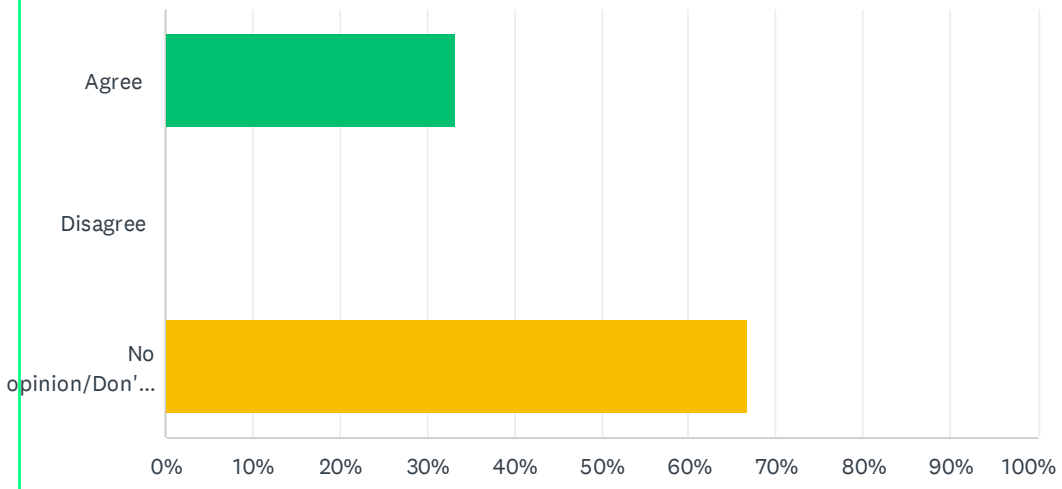
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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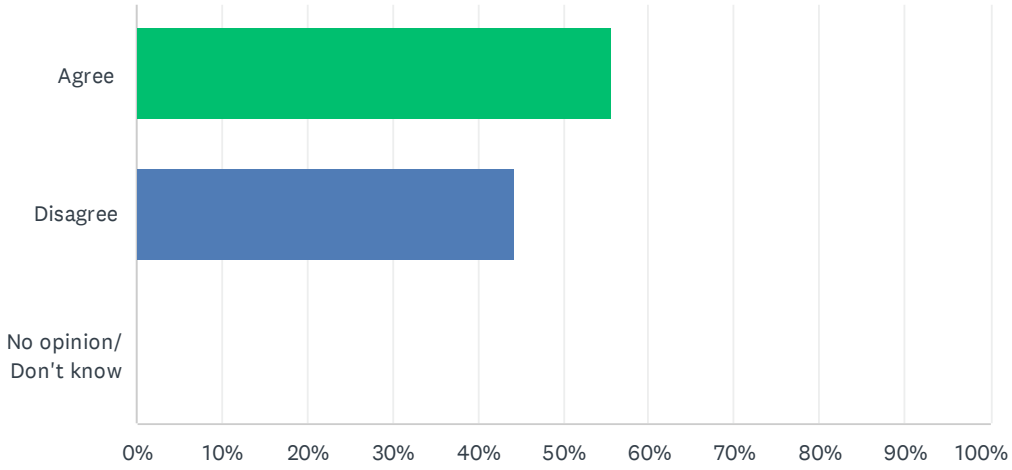
#	COMMENTS?	DATE
1	If you know where to look for it.	4/6/2023 3:42 PM

Q25 There is political support for flood risk management within Cowlitz County.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	55.56%	5
Disagree	44.44%	4
No opinion/ Don't know	0.00%	0
TOTAL		9

Q25 There is political support for flood risk management within Cowlitz County.

Strengths

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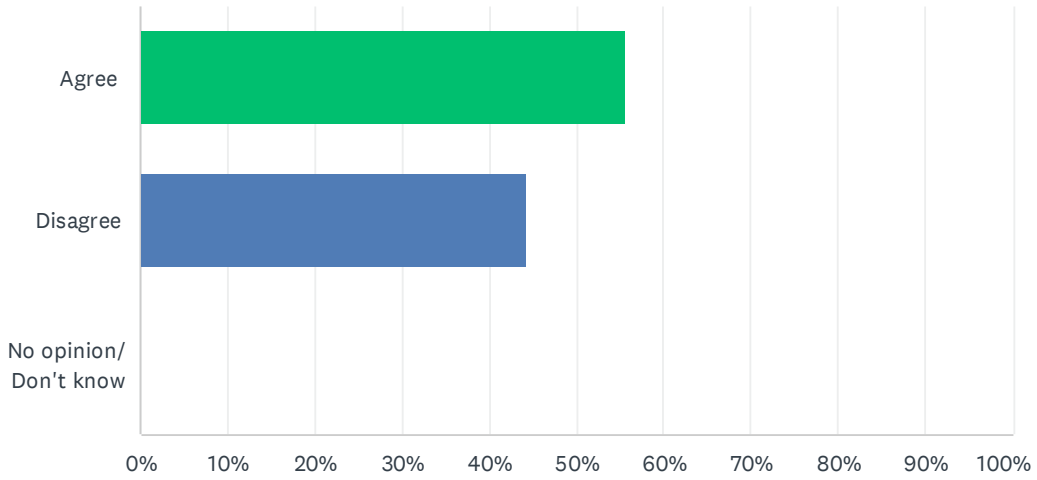
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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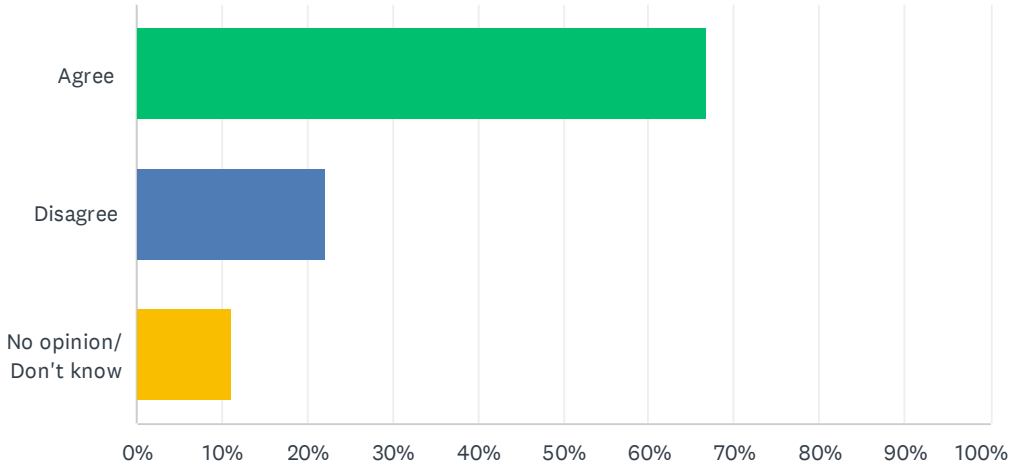
#	COMMENTS?	DATE
1	But< elected people need to understand that flood risks and concerns in Cowlitz County is crucial and can rapidly change year to year, depending on the weather patterns and sediment management in the rivers. I would like to see this risk elevated to a higher level of concern.	4/6/2023 3:42 PM

Q26 All relevant stakeholders are engaged in the flood risk management efforts.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	66.67%	6
Disagree	22.22%	2
No opinion/ Don't know	11.11%	1
TOTAL		9

Q26 All relevant stakeholders are engaged in the flood risk management efforts.

Strengths

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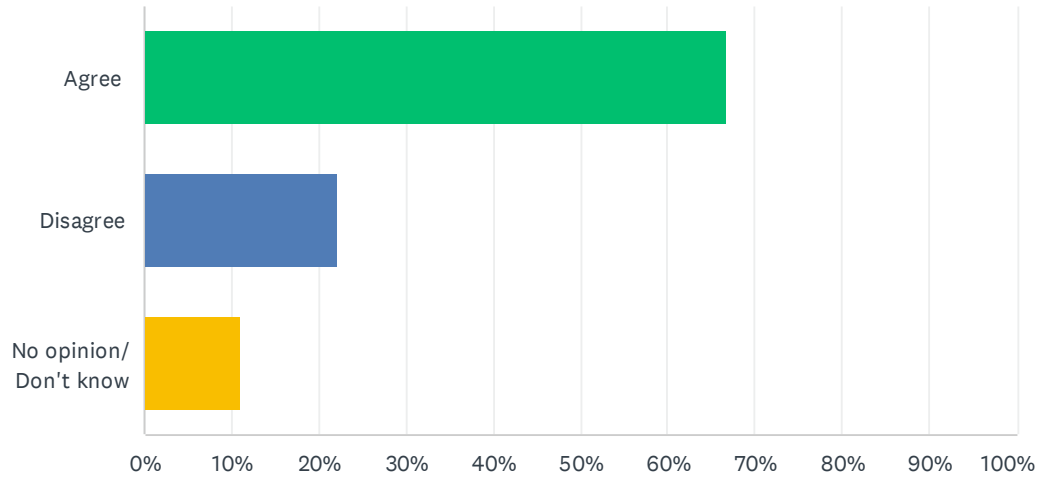
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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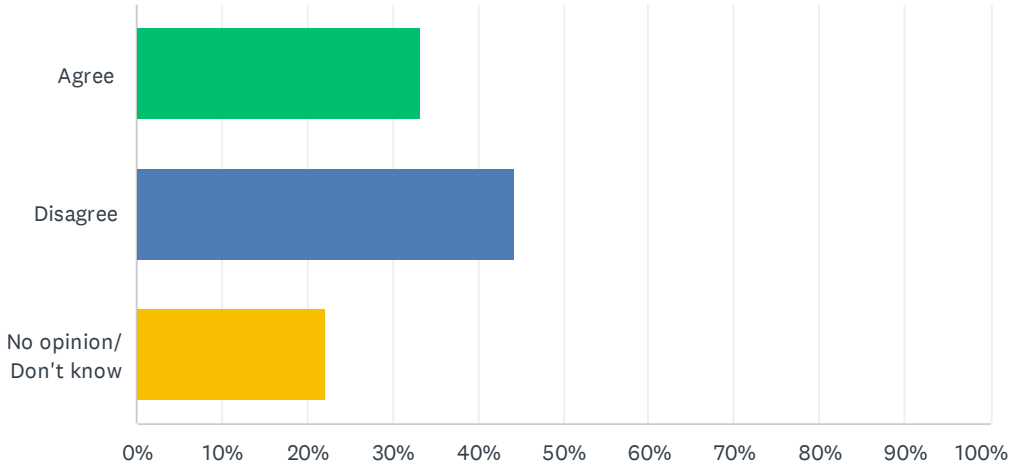
#	COMMENTS?	DATE
1	But, we need to find a way to reach the public and make them more knowledgeable, maybe outreach through public schools to get the message home to our citizens before any events.	4/6/2023 3:42 PM

Q27 There is a coordinated program to maintain drainage systems free of debris.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	44.44%	4
No opinion/ Don't know	22.22%	2
TOTAL		9

Q27 There is a coordinated program to maintain drainage systems free of debris.

Strengths

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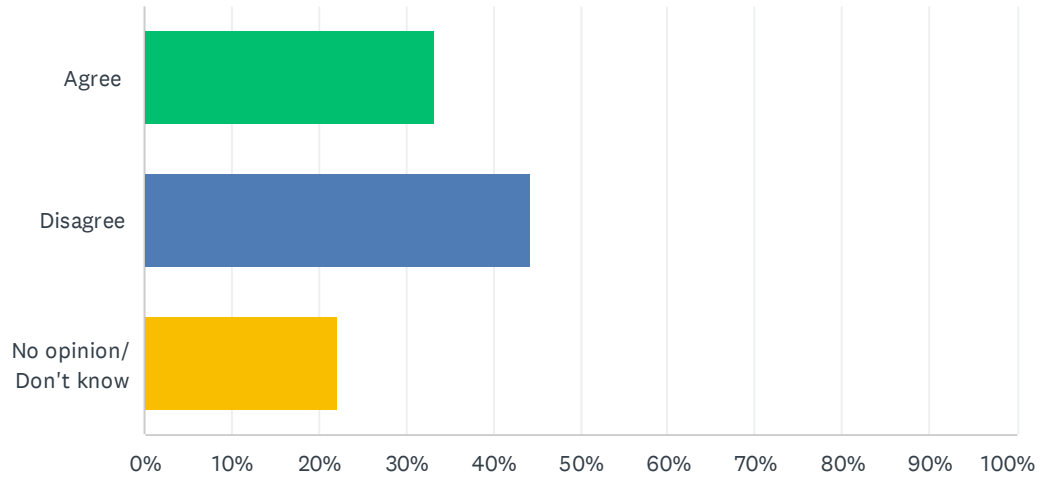
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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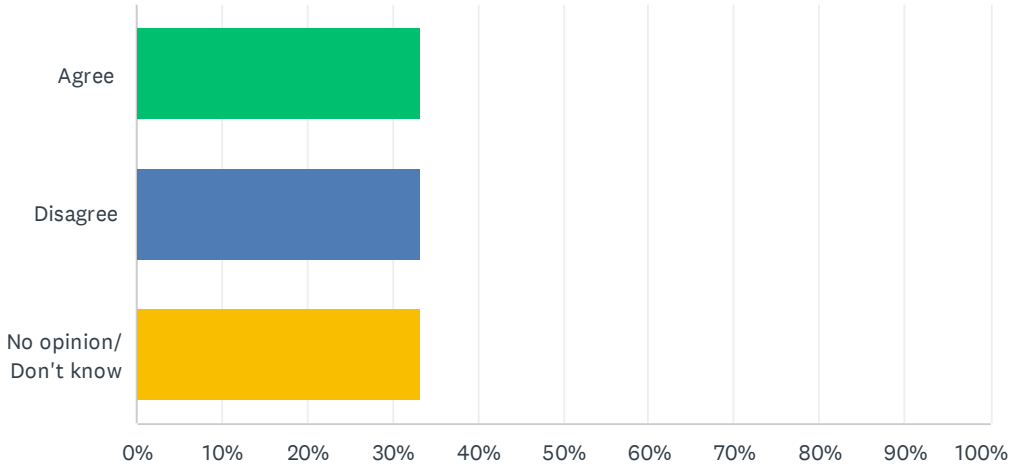
#	COMMENTS?	DATE
	There are no responses.	

Q28 The enforcement of current codes and standards within the planning area is strong.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	33.33%	3
Disagree	33.33%	3
No opinion/ Don't know	33.33%	3
TOTAL		9

Q28 The enforcement of current codes and standards within the planning area is strong.

Strengths

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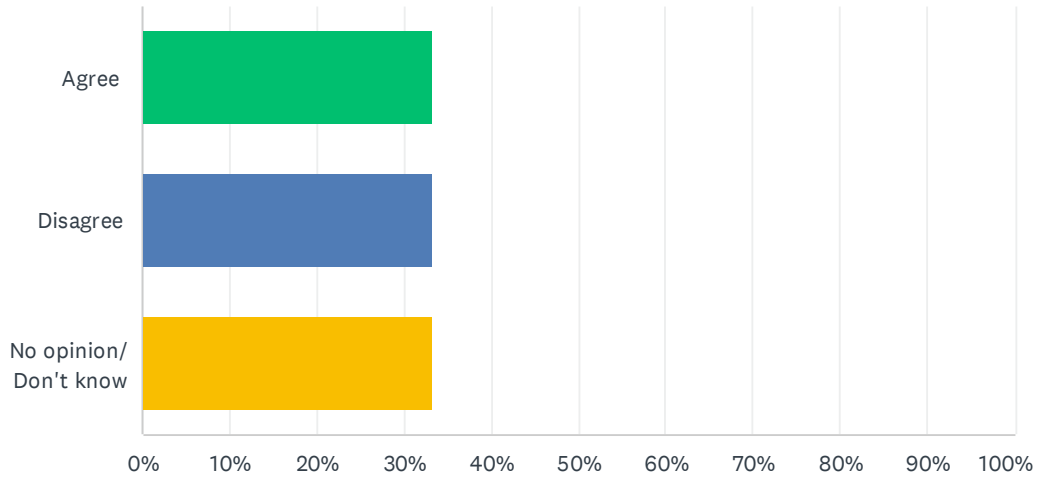
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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-
-

Obstacles

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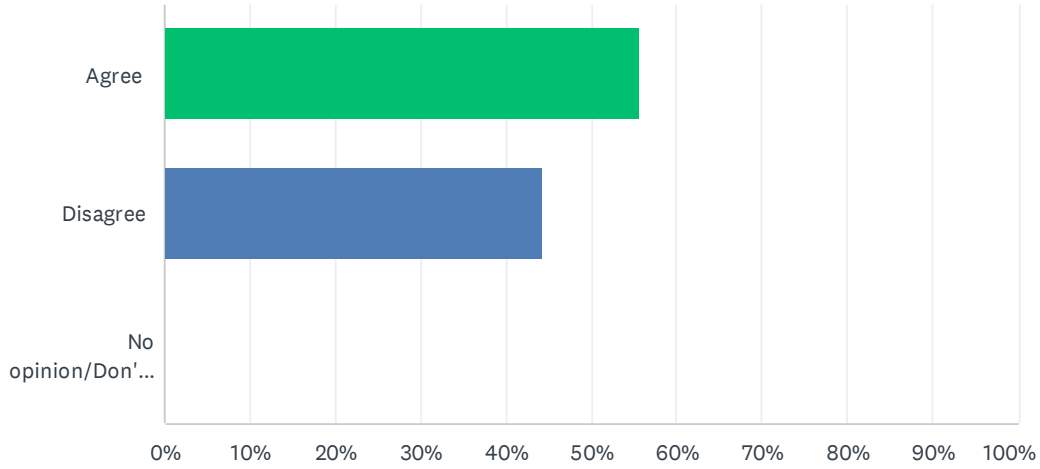
-
-

#	COMMENTS?	DATE
	There are no responses.	

Q29 Cowlitz County residents have the access to information necessary for them to be prepared to respond, recover and mitigate the impacts of flood hazards.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	55.56%	5
Disagree	44.44%	4
No opinion/Don't know	0.00%	0
TOTAL		9

Q29 Cowlitz County residents have the access to information necessary for them to be prepared to respond, recover and mitigate the impacts of flood hazards.

Strengths

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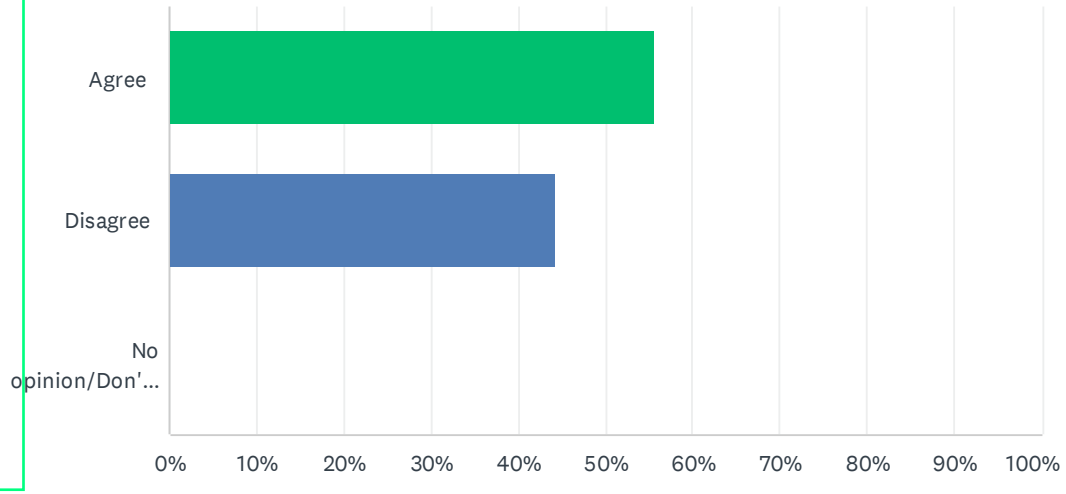
Answered: 9 Skipped: 0



Weaknesses

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Opportunities

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Obstacles

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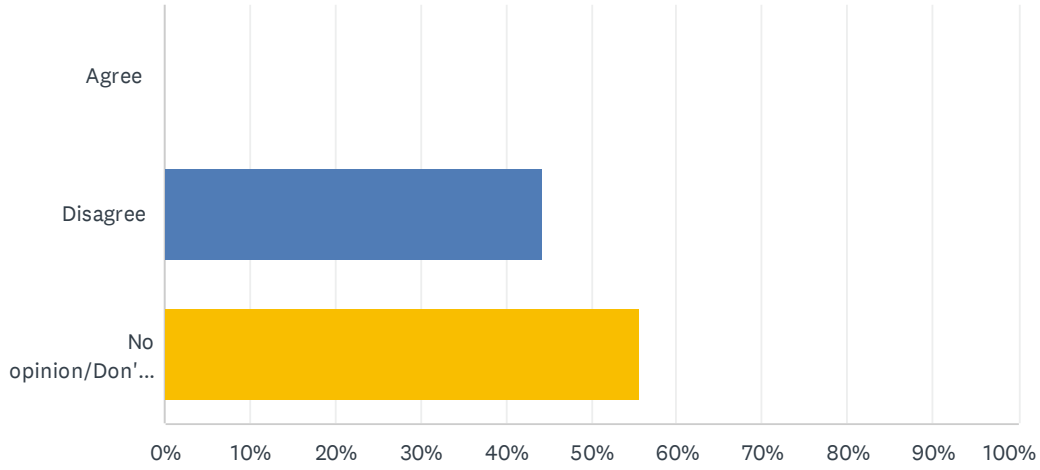
#	COMMENTS?	DATE
1	We have lots of information, it is knowing where to find it	4/6/2023 3:42 PM

Q30 Real Estate professionals adequately disclose risk exposure from natural hazards at the time of sale of real property.

Answered: 9 Skipped: 0



ANSWER CHOICES	RESPONSES	
Agree	0.00%	0
Disagree	44.44%	4
No opinion/Don't know	55.56%	5
TOTAL		9

Q30 Real Estate professionals adequately disclose risk exposure from natural hazards at the time of sale of real property.

Strengths

-
-
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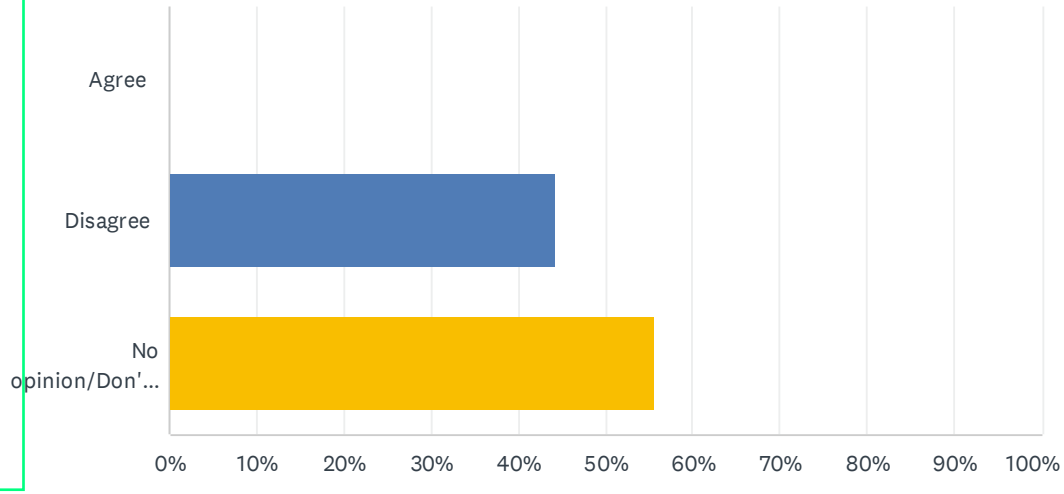
-

Answered: 9 Skipped: 0



Weaknesses

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-

Opportunities

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-
-

Obstacles

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-

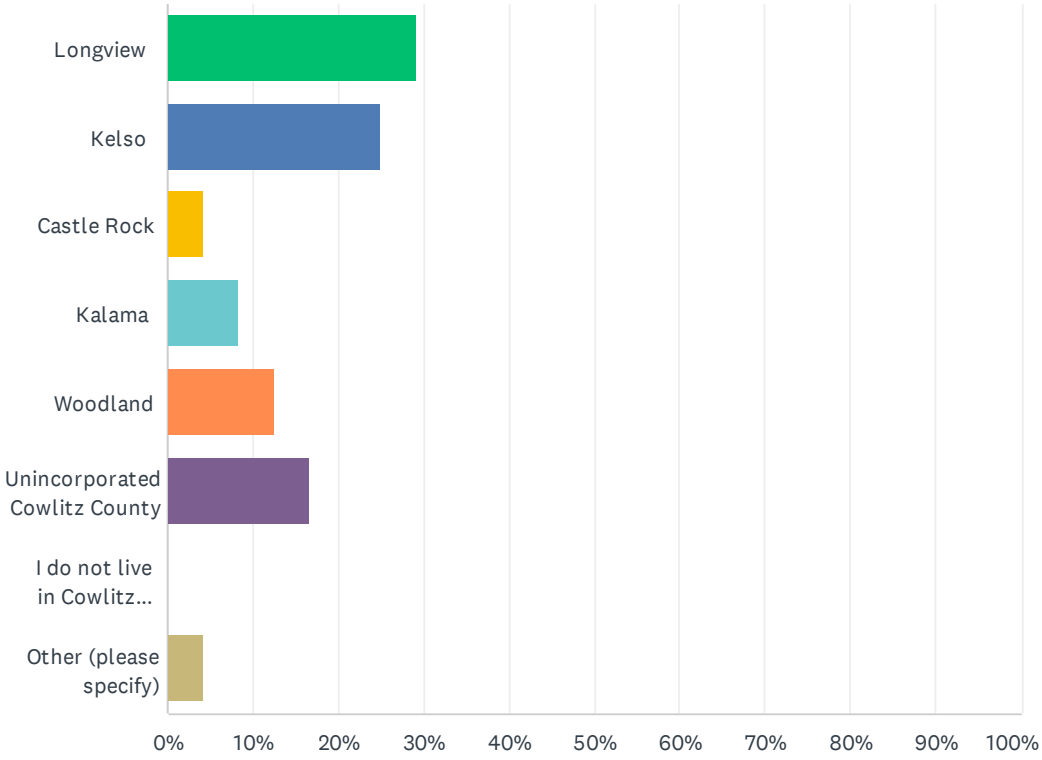
#	COMMENTS?	DATE
1	I have not purchased property in flood zone , I am not sure what level of disclosure is provided.	4/6/2023 3:42 PM

Cowlitz County Comprehensive Flood Hazard Management Plan

Appendix C. Flood Plan Public Survey

Q1 Where in Cowlitz County do you live?

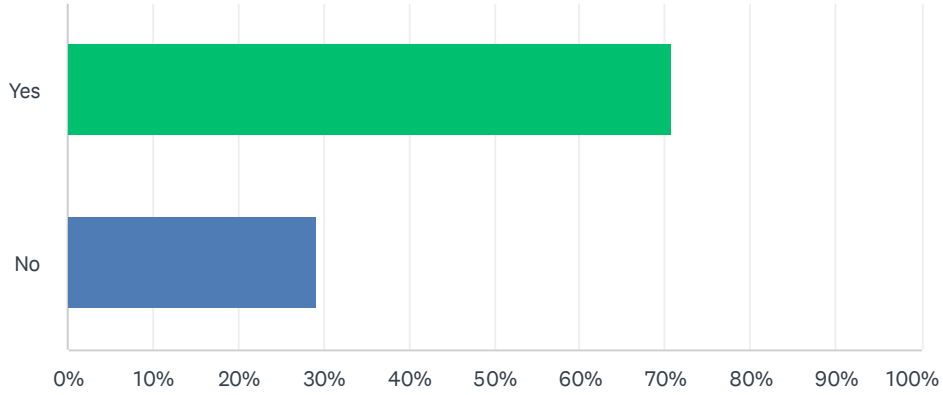
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Longview	29.17%	7
Kelso	25.00%	6
Castle Rock	4.17%	1
Kalama	8.33%	2
Woodland	12.50%	3
Unincorporated Cowlitz County	16.67%	4
I do not live in Cowlitz County	0.00%	0
Other (please specify)	4.17%	1
TOTAL		24

Q2 Do you work in Cowlitz County?

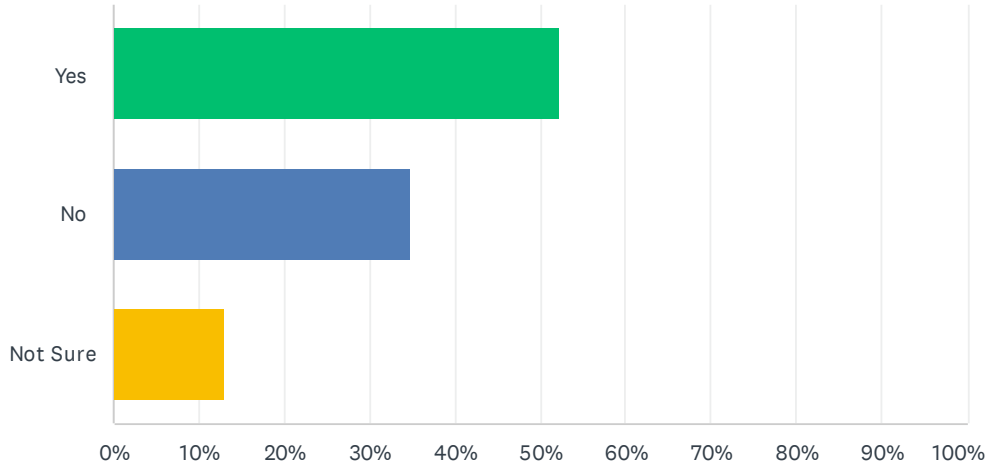
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	70.83%	17
No	29.17%	7
TOTAL		24

Q3 Do you live in a known floodplain or area that has been subject to flooding?

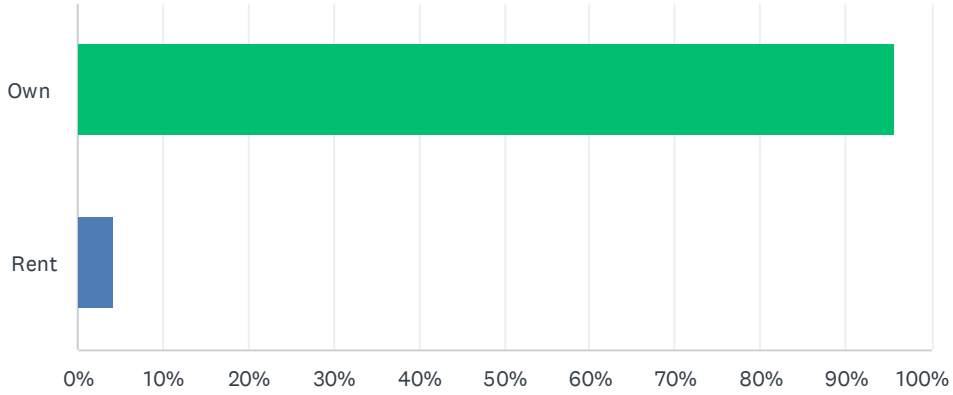
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	52.17%	12
No	34.78%	8
Not Sure	13.04%	3
TOTAL		23

Q4 Do you own or rent your place of residence?

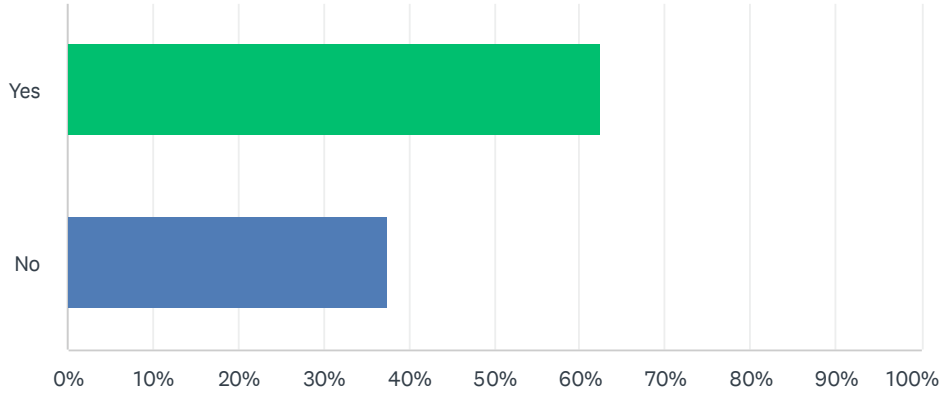
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Own	95.83%	23
Rent	4.17%	1
TOTAL		24

Q5 Do you have a mortgage?

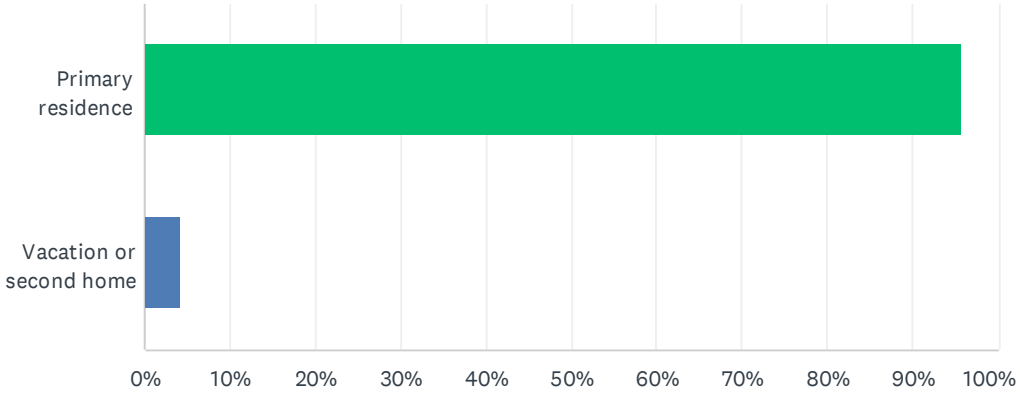
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	62.50%	15
No	37.50%	9
TOTAL		24

Q6 Is this your primary residence or is it your vacation/second home?

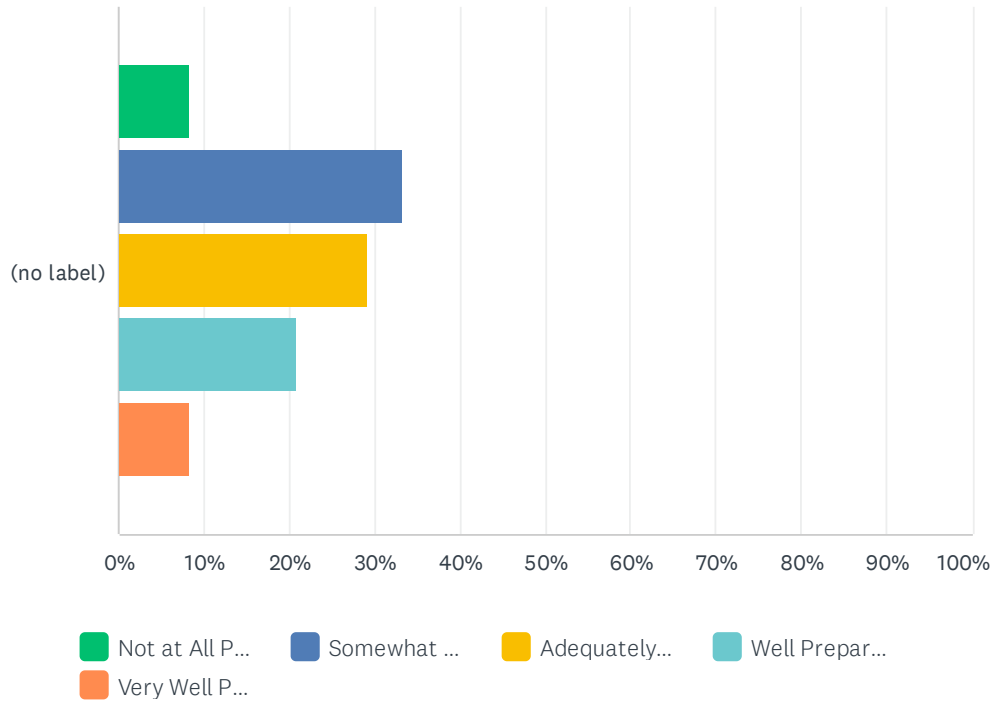
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Primary residence	95.83%	23
Vacation or second home	4.17%	1
TOTAL		24

Q7 How prepared is your household to deal with a flood event?

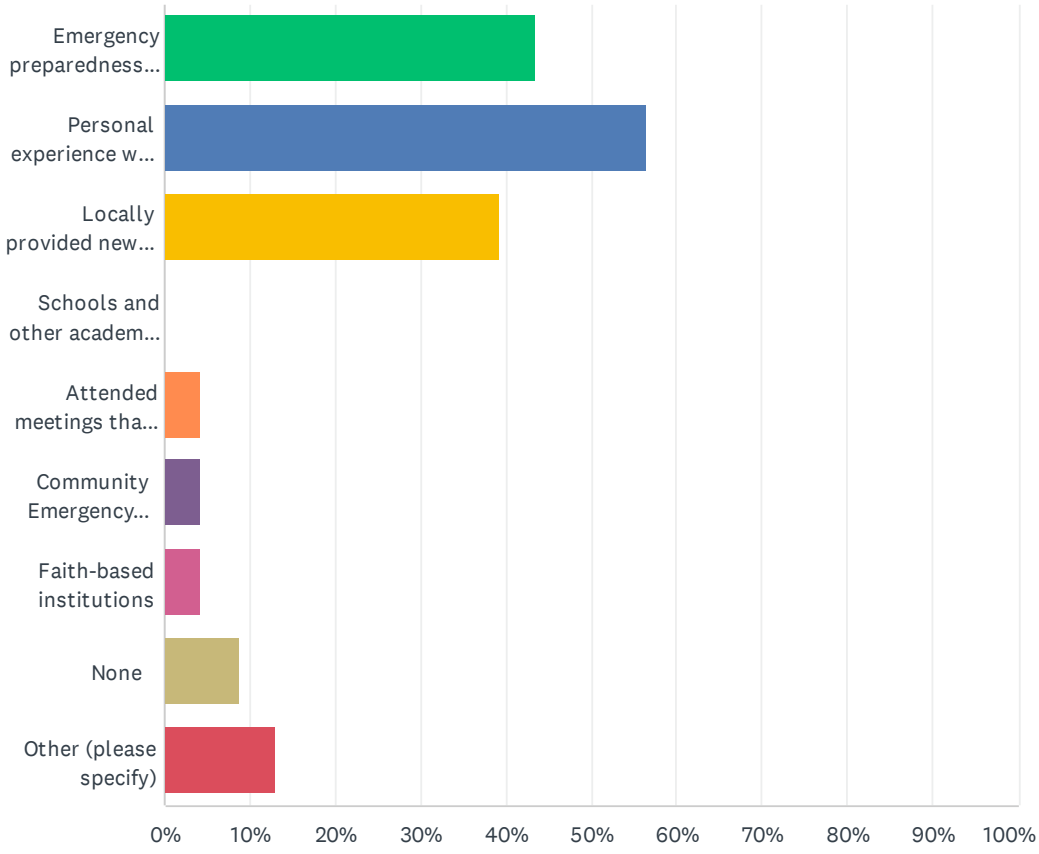
Answered: 24 Skipped: 0



	NOT AT ALL PREPARED	SOMEWHAT PREPARED	ADEQUATELY PREPARED	WELL PREPARED	VERY WELL PREPARED	TOTAL	WEIGHTED AVERAGE
(no label)	8.33% 2	33.33% 8	29.17% 7	20.83% 5	8.33% 2	24	2.88

Q8 Which of the following have provided you with useful information to help you be prepared for a flood event?

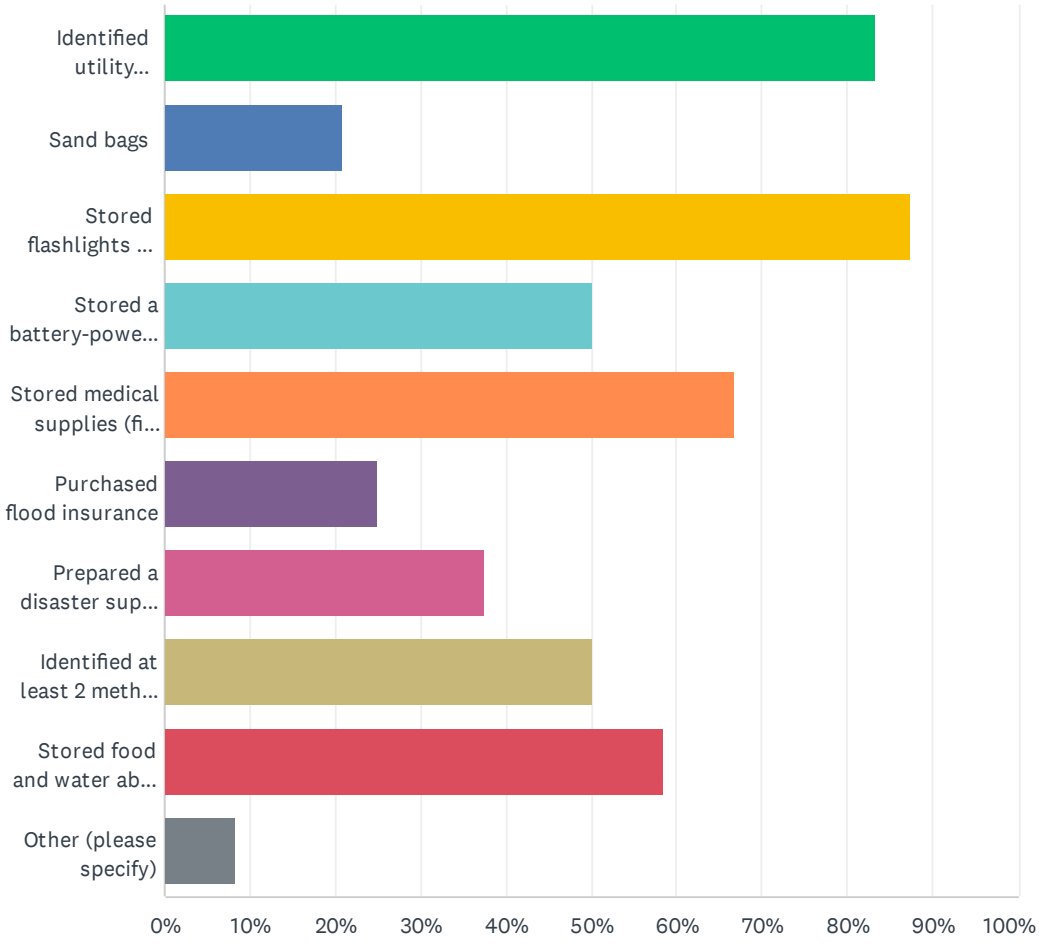
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Emergency preparedness information from a government source (e.g., federal, state, or local emergency management)	43.48%	10
Personal experience with flood events	56.52%	13
Locally provided news or other media information	39.13%	9
Schools and other academic institutions	0.00%	0
Attended meetings that have dealt with flood preparedness	4.35%	1
Community Emergency Response Training (CERT)	4.35%	1
Faith-based institutions	4.35%	1
None	8.70%	2
Other (please specify)	13.04%	3
Total Respondents: 23		

Q9 Which of the following steps has your household taken to prepare for a flood event? (Check all that apply)

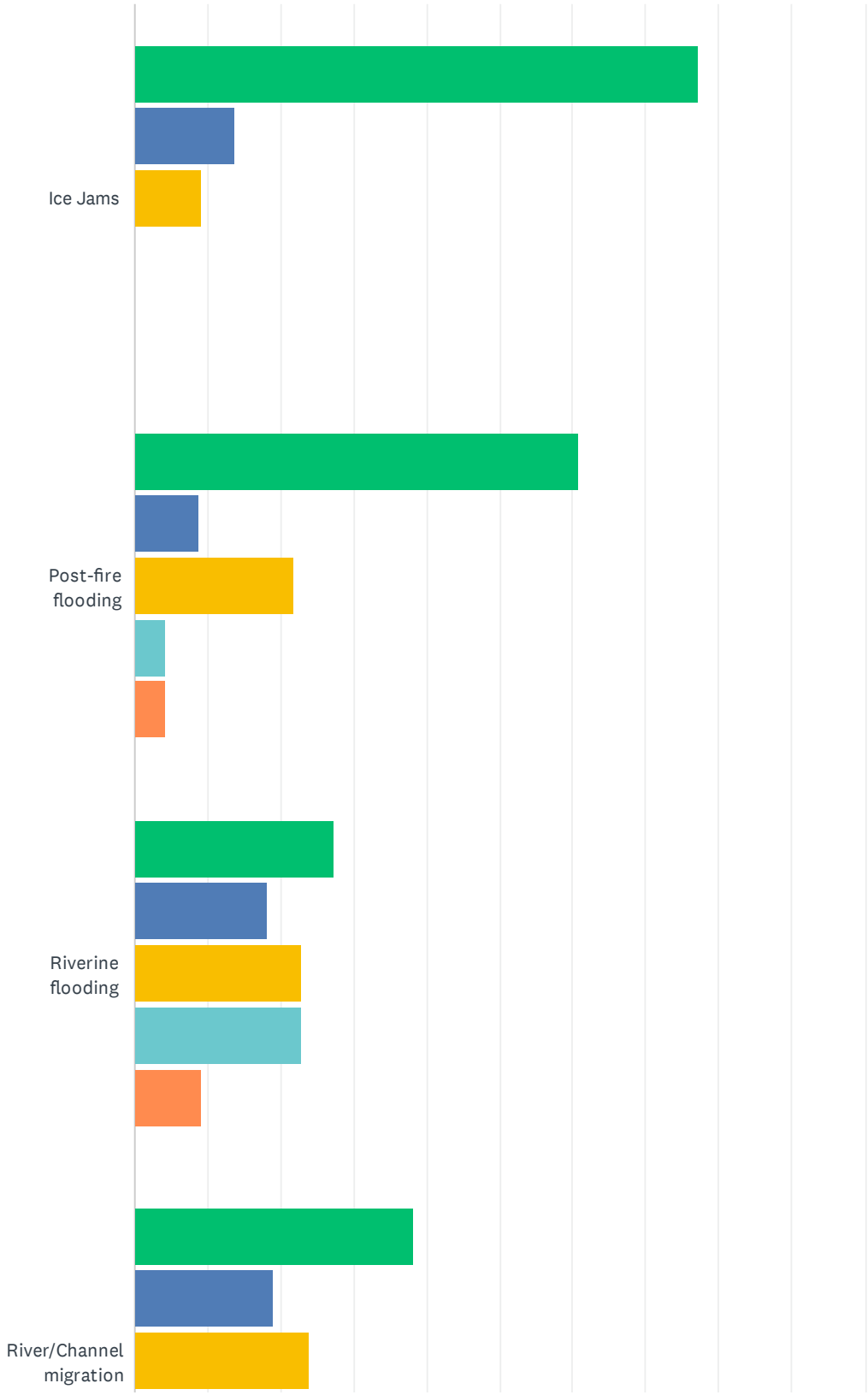
Answered: 24 Skipped: 0

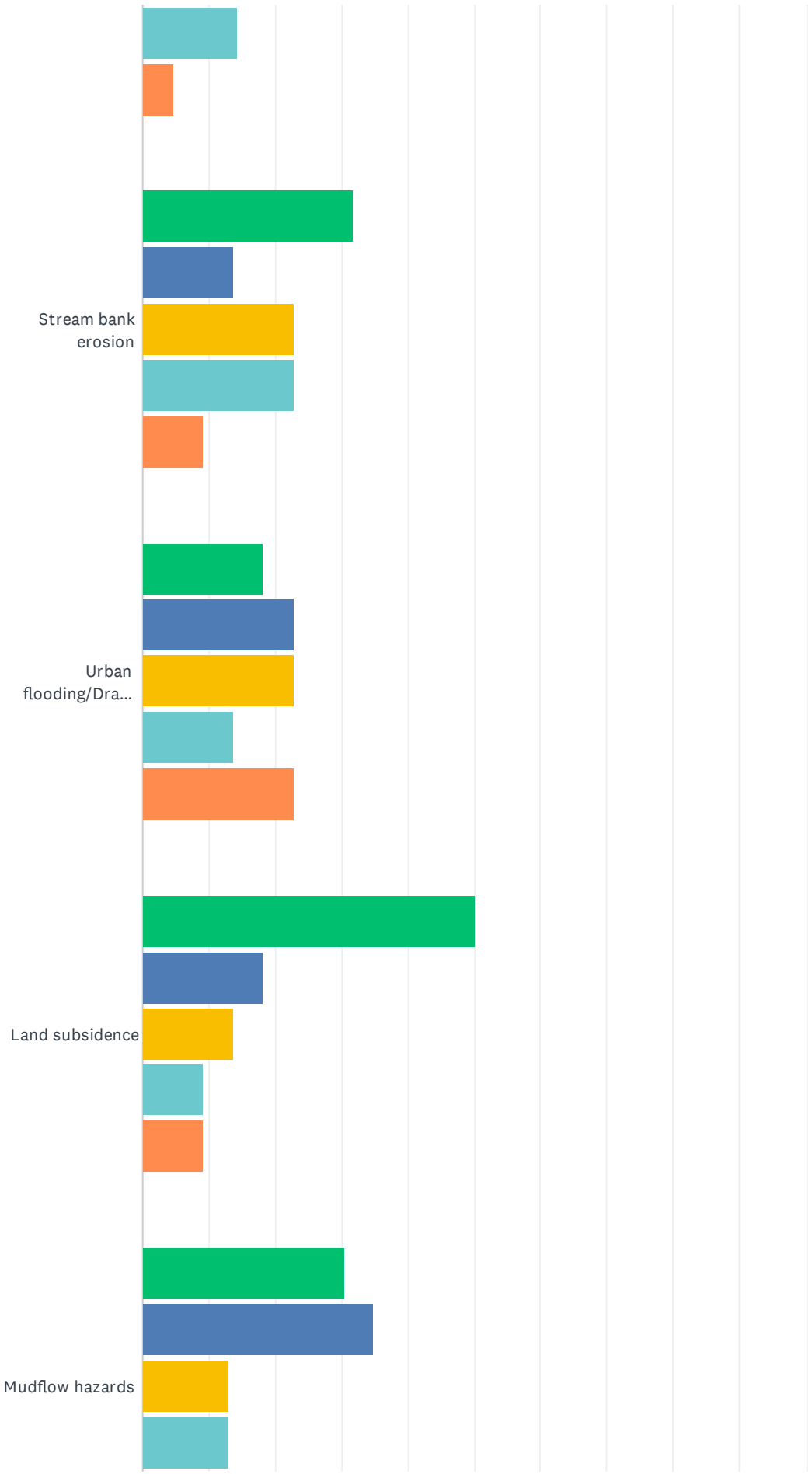


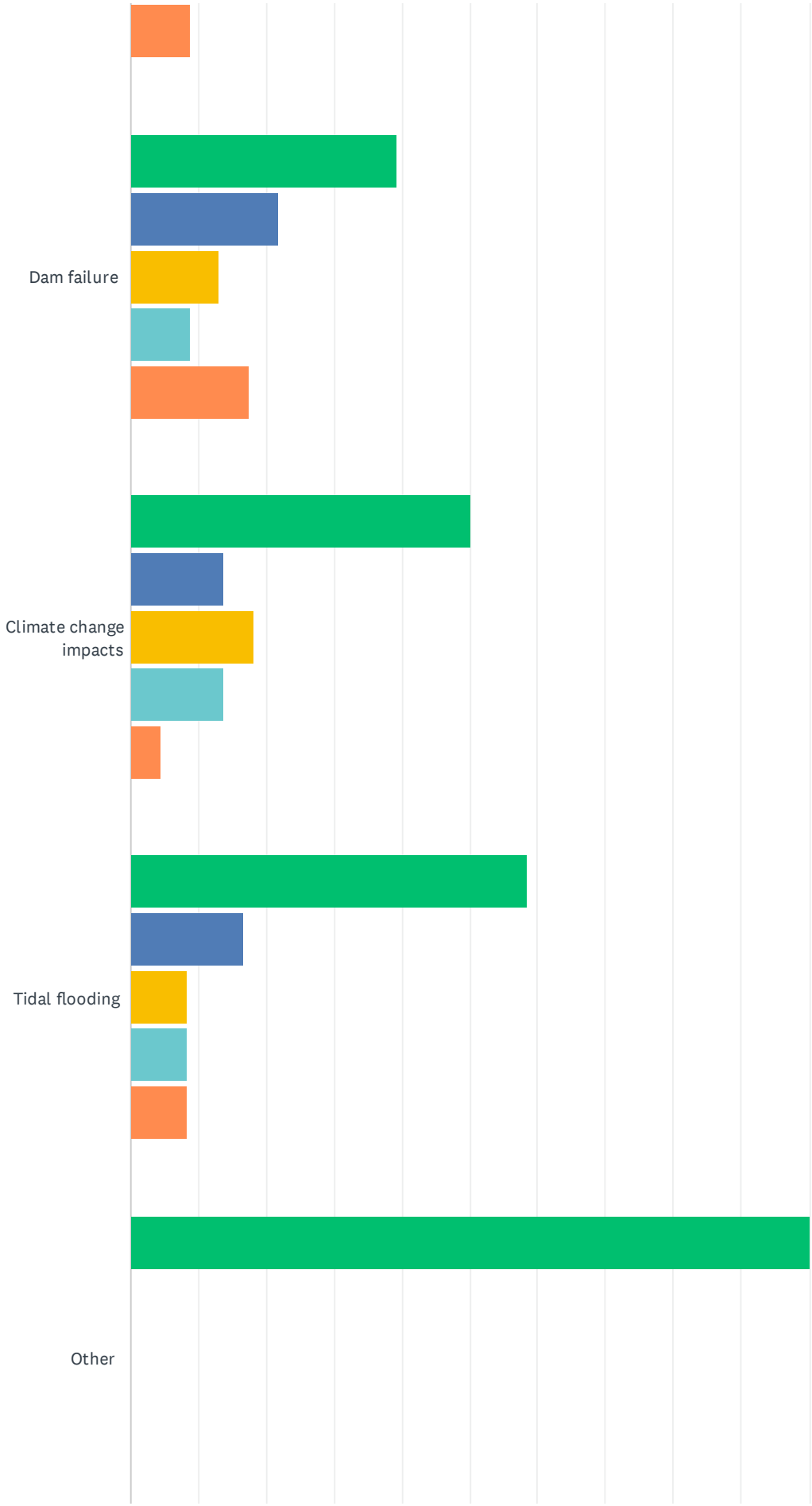
ANSWER CHOICES	RESPONSES	
Identified utility shutoffs	83.33%	20
Sand bags	20.83%	5
Stored flashlights and batteries	87.50%	21
Stored a battery-powered radio	50.00%	12
Stored medical supplies (first aid kit, medications)	66.67%	16
Purchased flood insurance	25.00%	6
Prepared a disaster supply kit	37.50%	9
Identified at least 2 methods for receiving emergency notifications and information during emergencies	50.00%	12
Stored food and water above potential flood levels	58.33%	14
Other (please specify)	8.33%	2
Total Respondents: 24		

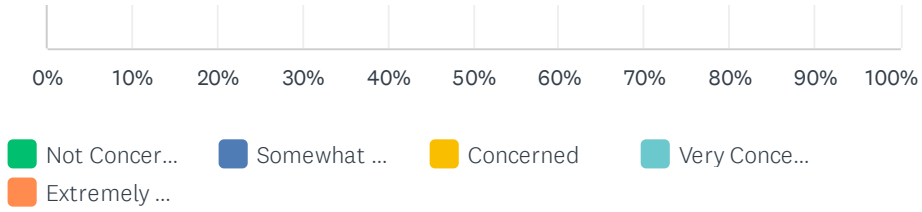
Q10 How concerned are you about the following flood related hazards in Cowlitz County? (Check one response for each hazard)

Answered: 24 Skipped: 0




Stream bank erosion
Urban flooding/Dra...
Land subsidence
Mudflow hazards

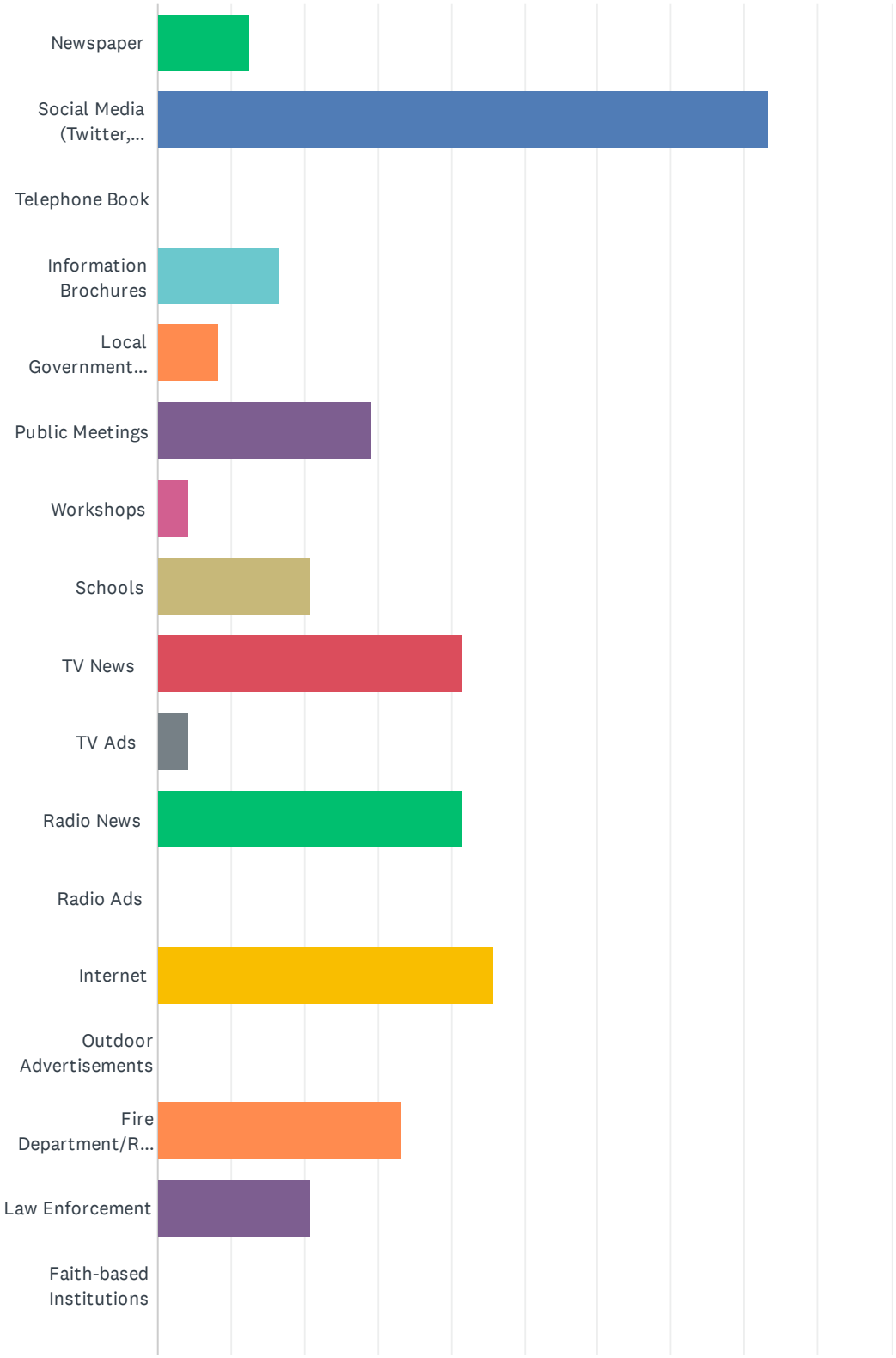

Dam failure
Climate change impacts
Tidal flooding
Other

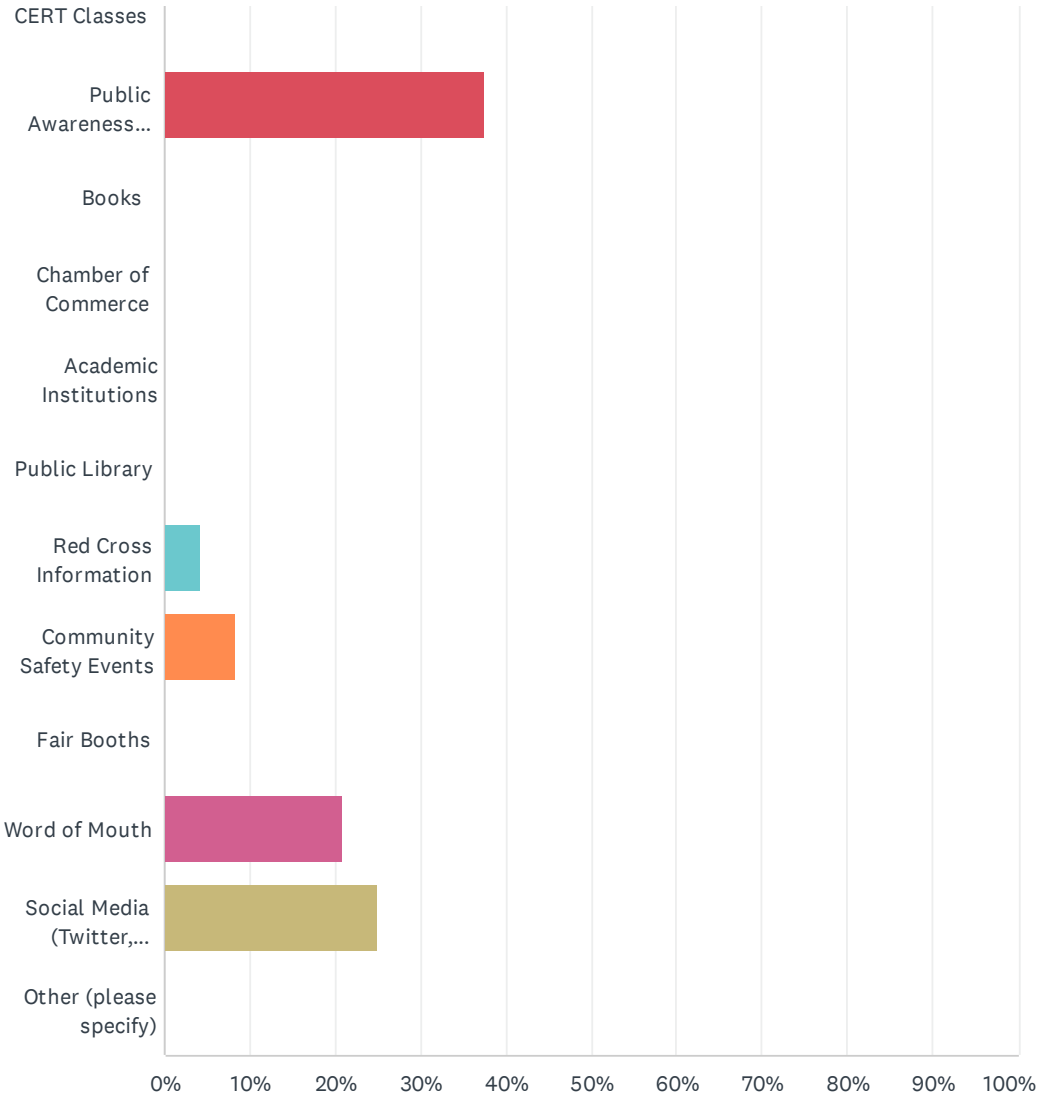


	NOT CONCERNED	SOMEWHAT CONCERNED	CONCERNED	VERY CONCERNED	EXTREMELY CONCERNED	TOTAL
Ice Jams	77.27% 17	13.64% 3	9.09% 2	0.00% 0	0.00% 0	22
Post-fire flooding	60.87% 14	8.70% 2	21.74% 5	4.35% 1	4.35% 1	23
Riverine flooding	27.27% 6	18.18% 4	22.73% 5	22.73% 5	9.09% 2	22
River/Channel migration	38.10% 8	19.05% 4	23.81% 5	14.29% 3	4.76% 1	21
Stream bank erosion	31.82% 7	13.64% 3	22.73% 5	22.73% 5	9.09% 2	22
Urban flooding/Drainage issues	18.18% 4	22.73% 5	22.73% 5	13.64% 3	22.73% 5	22
Land subsidence	50.00% 11	18.18% 4	13.64% 3	9.09% 2	9.09% 2	22
Mudflow hazards	30.43% 7	34.78% 8	13.04% 3	13.04% 3	8.70% 2	23
Dam failure	39.13% 9	21.74% 5	13.04% 3	8.70% 2	17.39% 4	23
Climate change impacts	50.00% 11	13.64% 3	18.18% 4	13.64% 3	4.55% 1	22
Tidal flooding	58.33% 14	16.67% 4	8.33% 2	8.33% 2	8.33% 2	24
Other	100.00% 10	0.00% 0	0.00% 0	0.00% 0	0.00% 0	10

Q11 Choose five (5) of the following methods you think are most effective for providing flood hazard and disaster information? (Choose up to 5 answers)

Answered: 24 Skipped: 0

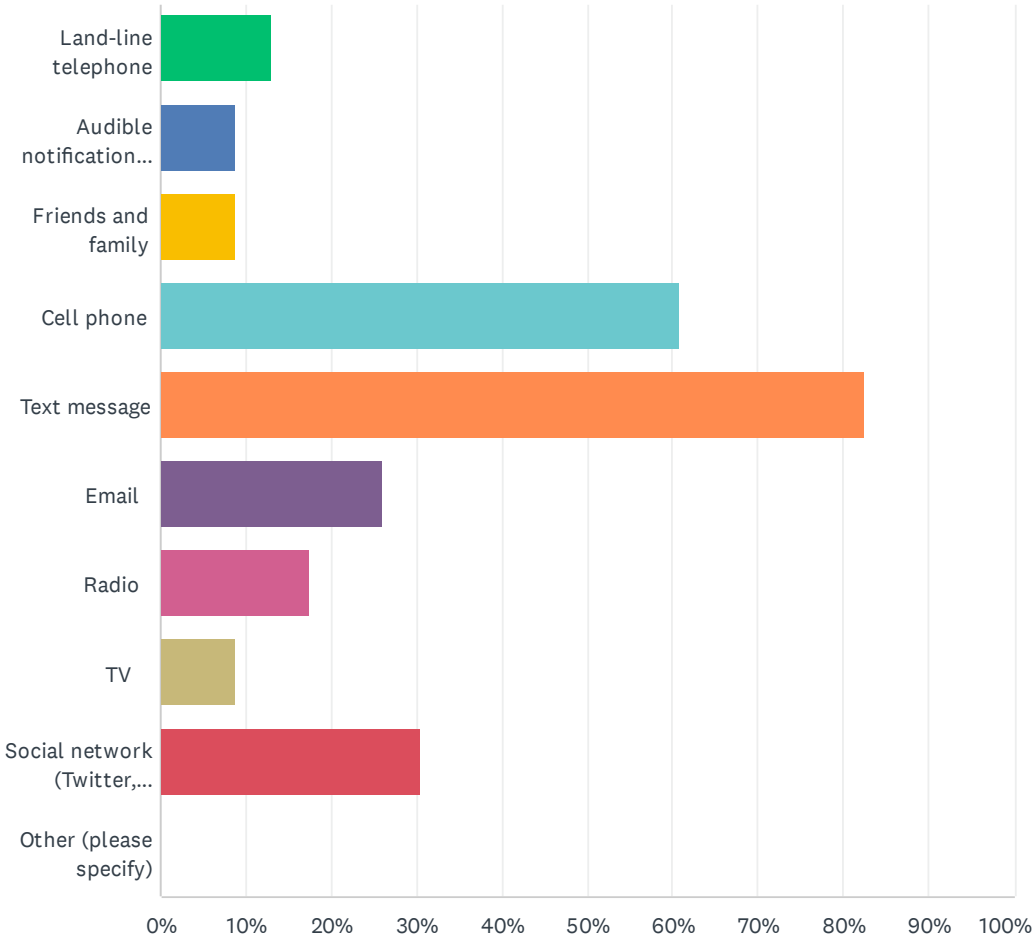



CERT Classes
Public Awareness...
Books
Chamber of Commerce
Academic Institutions
Public Library
Red Cross Information
Community Safety Events
Fair Booths
Word of Mouth
Social Media (Twitter,...
Other (please specify)
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

ANSWER CHOICES	RESPONSES	
Newspaper	12.50%	3
Social Media (Twitter, Facebook, Instagram, etc.)	83.33%	20
Telephone Book	0.00%	0
Information Brochures	16.67%	4
Local Government Newsletters	8.33%	2
Public Meetings	29.17%	7
Workshops	4.17%	1
Schools	20.83%	5
TV News	41.67%	10
TV Ads	4.17%	1
Radio News	41.67%	10
Radio Ads	0.00%	0
Internet	45.83%	11
Outdoor Advertisements	0.00%	0
Fire Department/Rescue	33.33%	8
Law Enforcement	20.83%	5
Faith-based Institutions	0.00%	0
CERT Classes	0.00%	0
Public Awareness Campaign (e.g., Flood Awareness Week, Winter Storm Preparedness Month)	37.50%	9
Books	0.00%	0
Chamber of Commerce	0.00%	0
Academic Institutions	0.00%	0
Public Library	0.00%	0
Red Cross Information	4.17%	1
Community Safety Events	8.33%	2
Fair Booths	0.00%	0
Word of Mouth	20.83%	5
Social Media (Twitter, Facebook, Instagram, etc.)	25.00%	6
Other (please specify)	0.00%	0
Total Respondents: 24		

Q12 What method is best for you and your family to get time sensitive warning information or instructions for action?

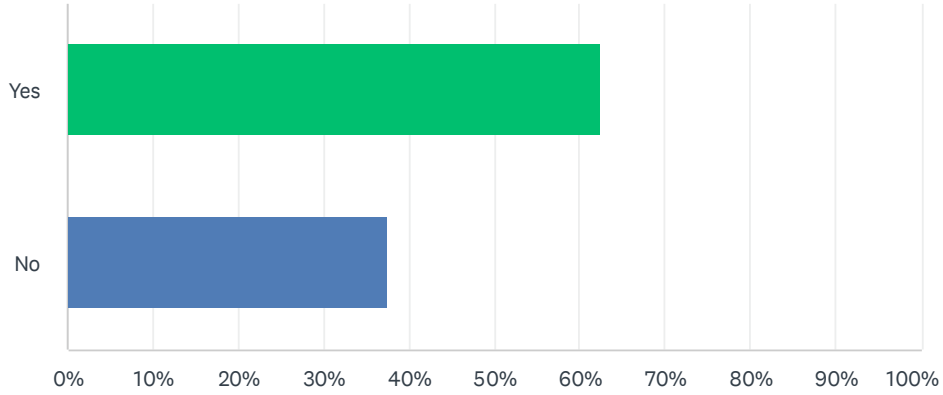
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Land-line telephone	13.04%	3
Audible notification (siren)	8.70%	2
Friends and family	8.70%	2
Cell phone	60.87%	14
Text message	82.61%	19
Email	26.09%	6
Radio	17.39%	4
TV	8.70%	2
Social network (Twitter, Facebook, Instagram, etc.)	30.43%	7
Other (please specify)	0.00%	0
Total Respondents: 23		

Q13 Are you signed up to receive notifications from Cowlitz County Alert?

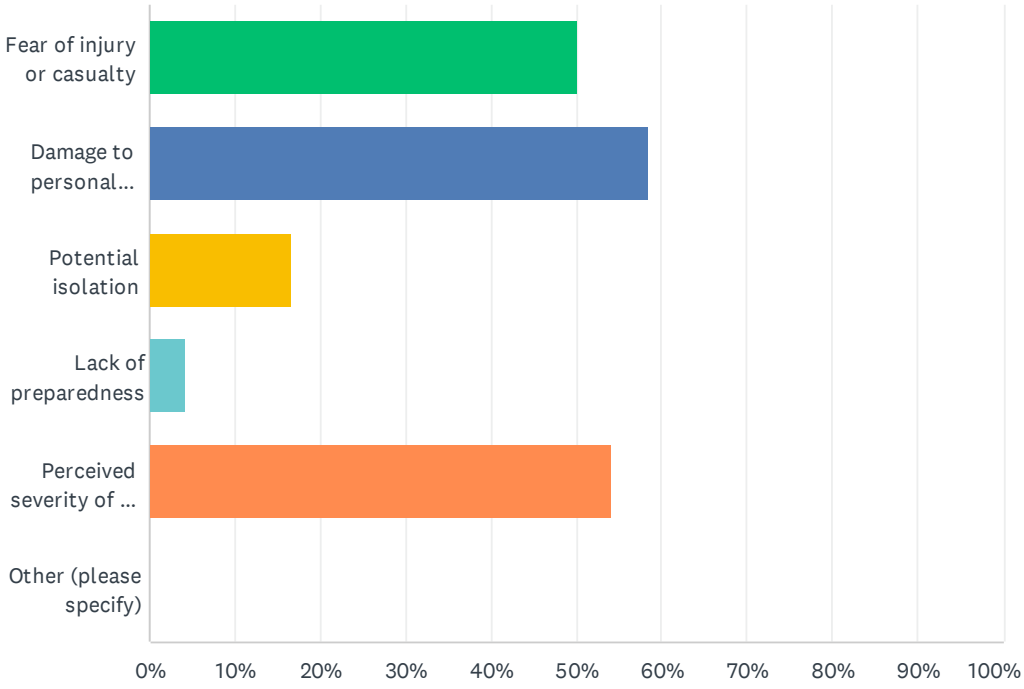
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	62.50%	15
No	37.50%	9
TOTAL		24

Q14 What would drive you to action in response to an emergency notification?

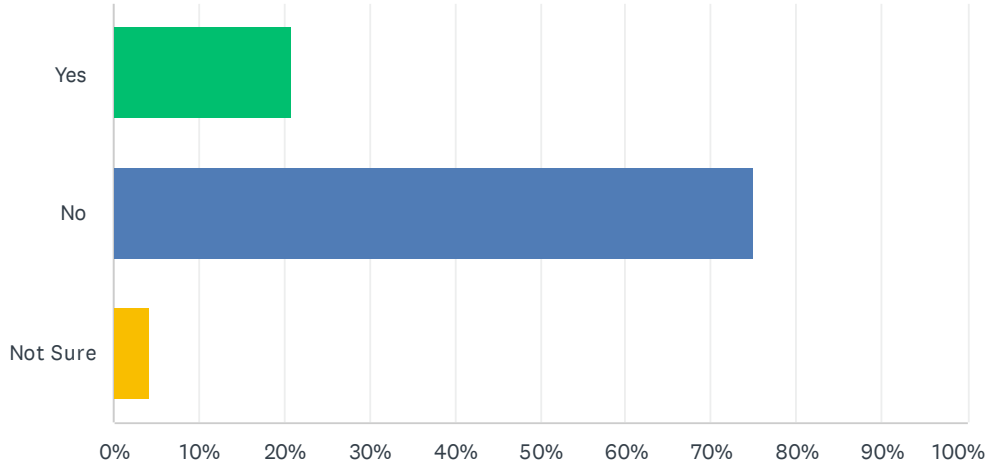
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Fear of injury or casualty	50.00%	12
Damage to personal property	58.33%	14
Potential isolation	16.67%	4
Lack of preparedness	4.17%	1
Perceived severity of the incident	54.17%	13
Other (please specify)	0.00%	0
Total Respondents: 24		

Q15 Do you have flood insurance?

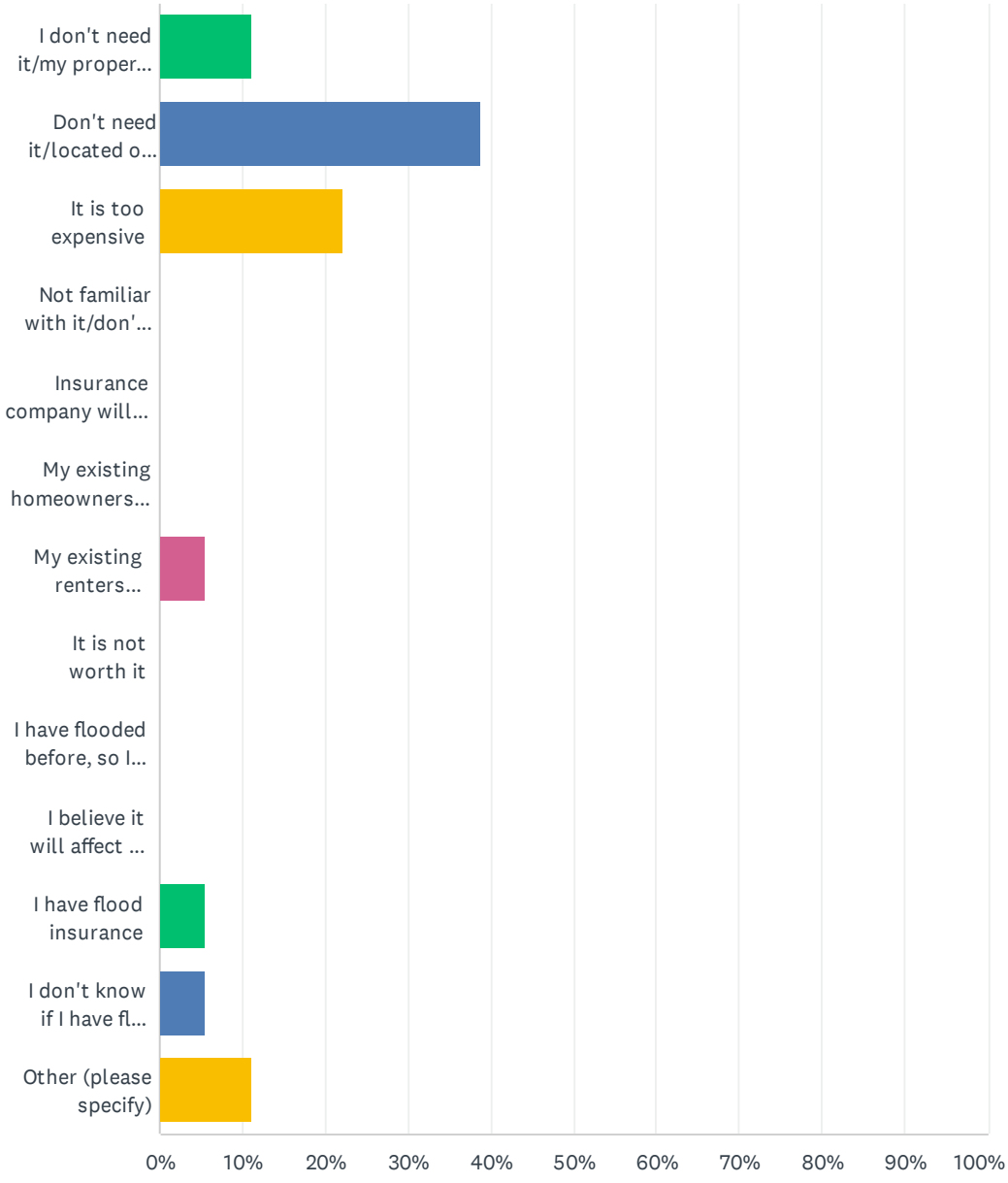
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	20.83%	5
No	75.00%	18
Not Sure	4.17%	1
TOTAL		24

Q16 If you do NOT have flood insurance, what is the primary reason?

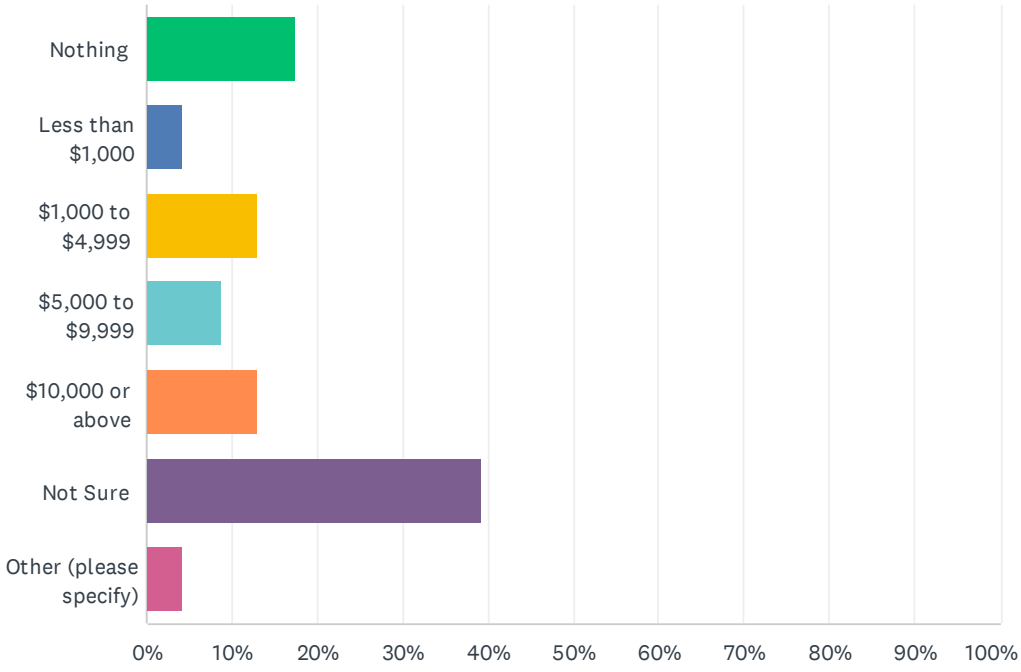
Answered: 18 Skipped: 6



ANSWER CHOICES	RESPONSES	
I don't need it/my property has never flooded	11.11%	2
Don't need it/located on high ground	38.89%	7
It is too expensive	22.22%	4
Not familiar with it/don't know about it	0.00%	0
Insurance company will not provide coverage	0.00%	0
My existing homeowners insurance provides coverage	0.00%	0
My existing renters insurance provides coverage	5.56%	1
It is not worth it	0.00%	0
I have flooded before, so I did not think I qualified for coverage	0.00%	0
I believe it will affect the value of my property	0.00%	0
I have flood insurance	5.56%	1
I don't know if I have flood insurance	5.56%	1
Other (please specify)	11.11%	2
TOTAL		18

Q17 How much money would you be willing to spend to retrofit your home to reduce risks associated with flood disasters? (e.g., elevating a home above flood level, flood-proofing, building berms or floodwalls)

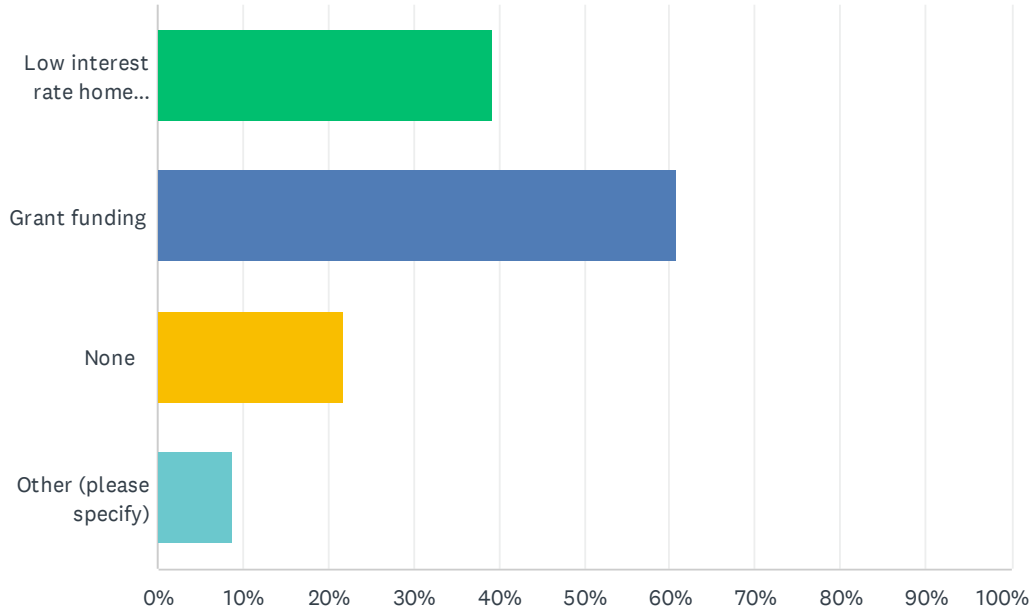
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Nothing	17.39%	4
Less than $1,000	4.35%	1
$1,000 to $4,999	13.04%	3
$5,000 to $9,999	8.70%	2
$10,000 or above	13.04%	3
Not Sure	39.13%	9
Other (please specify)	4.35%	1
TOTAL		23

Q18 Which of the following incentives would encourage you to spend money to retrofit your home to protect against flood disasters (Check all that apply)

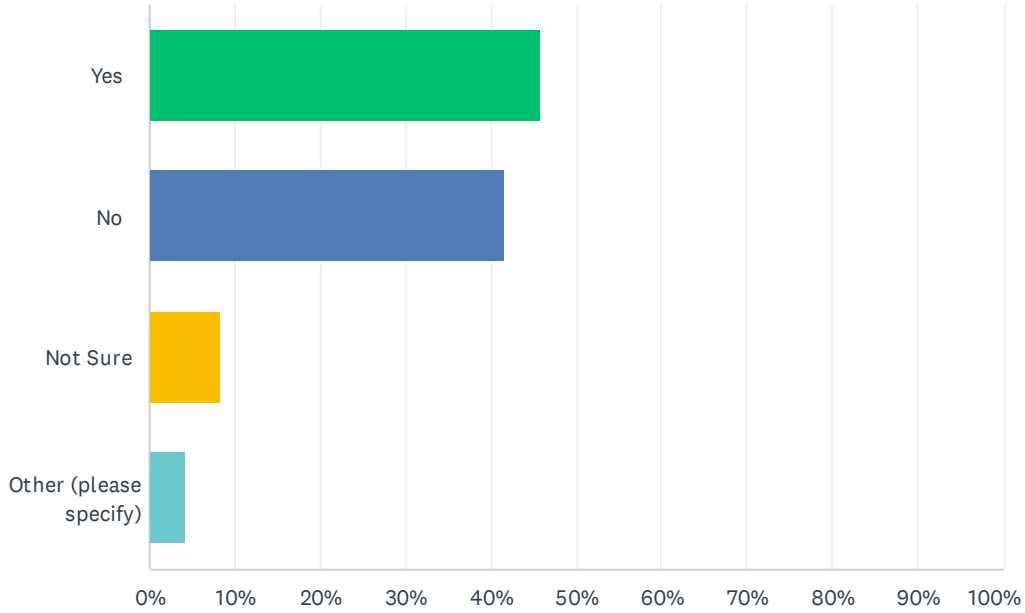
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Low interest rate home improvement plan	39.13%	9
Grant funding	60.87%	14
None	21.74%	5
Other (please specify)	8.70%	2
Total Respondents: 23		

Q19 When you moved into your home, did you consider the impact of a potential flood could have on your home?

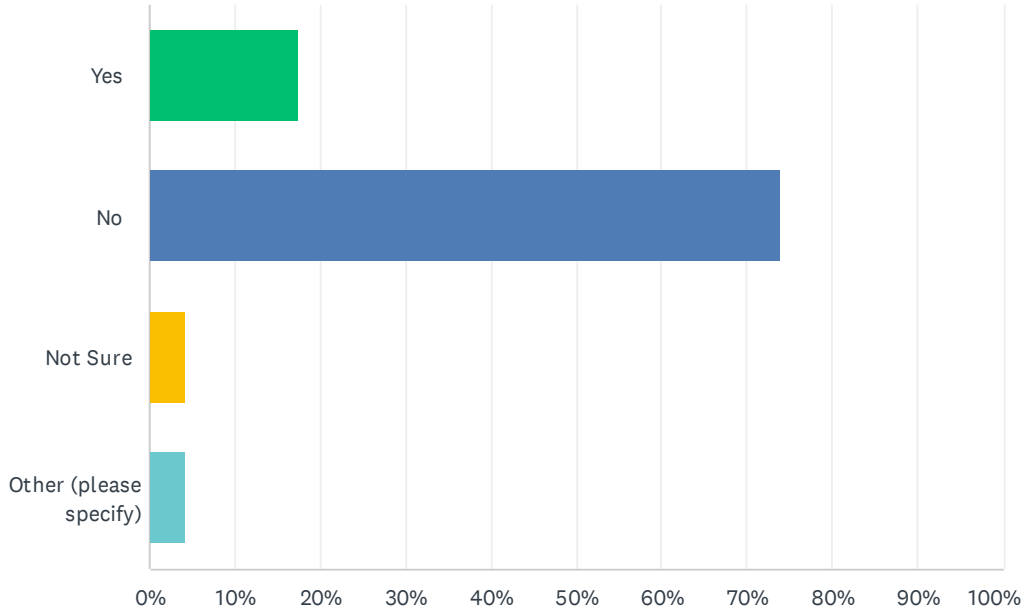
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	45.83%	11
No	41.67%	10
Not Sure	8.33%	2
Other (please specify)	4.17%	1
TOTAL		24

Q20 Was the presence of a flood hazard disclosed to you by a real estate agent, seller, or landlord before you purchased or moved into your home?

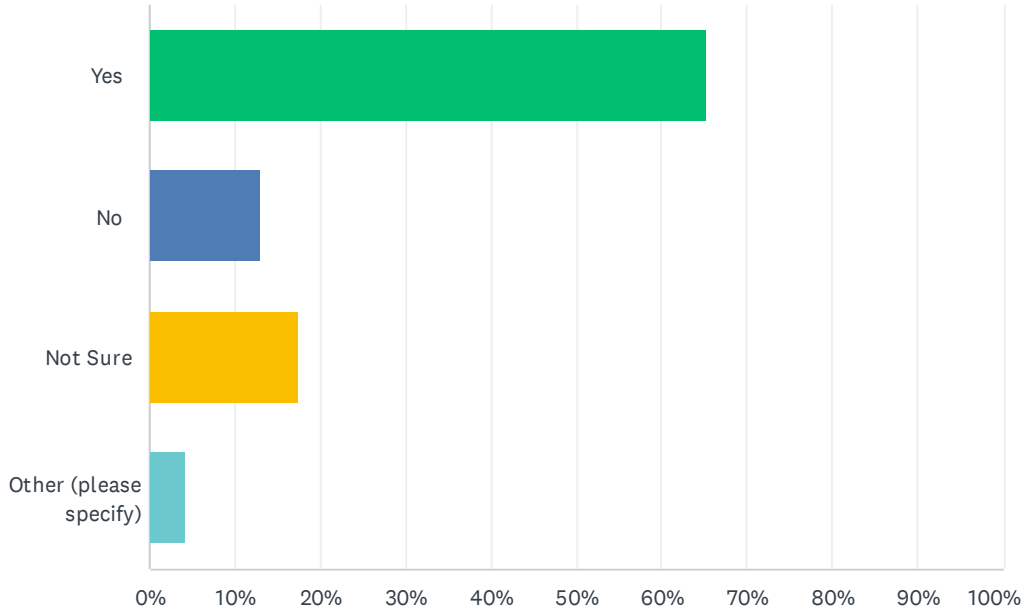
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	17.39%	4
No	73.91%	17
Not Sure	4.35%	1
Other (please specify)	4.35%	1
TOTAL		23

Q21 Would the disclosure of the flood hazard have influenced your decision to buy or rent a home?

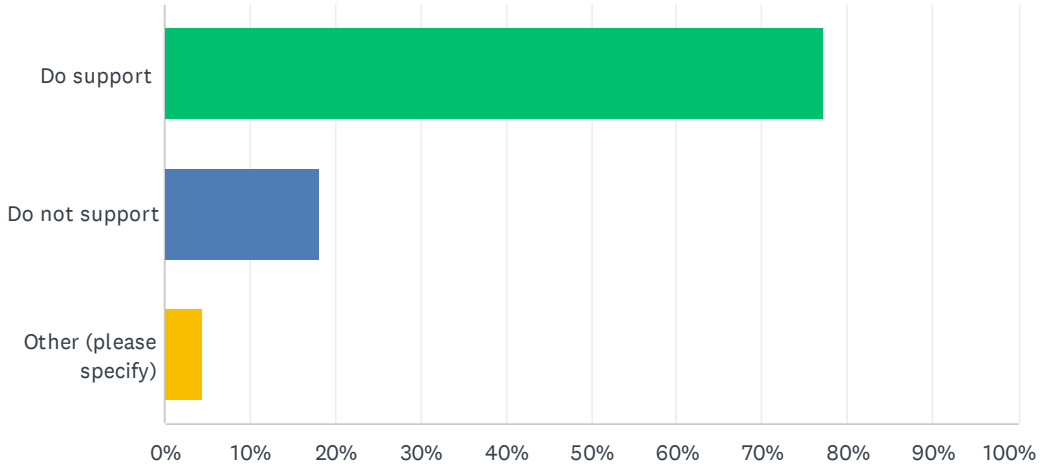
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	65.22%	15
No	13.04%	3
Not Sure	17.39%	4
Other (please specify)	4.35%	1
TOTAL		23

Q22 Do you support the preservation of natural land that contains a flood hazard?

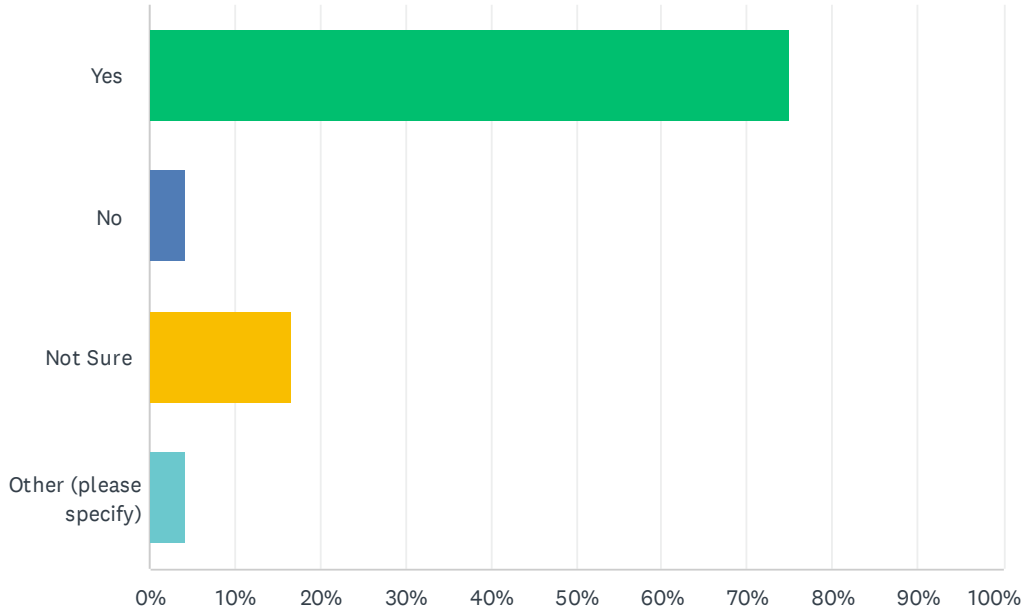
Answered: 22 Skipped: 2



ANSWER CHOICES	RESPONSES	
Do support	77.27%	17
Do not support	18.18%	4
Other (please specify)	4.55%	1
TOTAL		22

Q23 Do you support the regulation (restriction) of land uses within known, high risk, flood hazard areas?

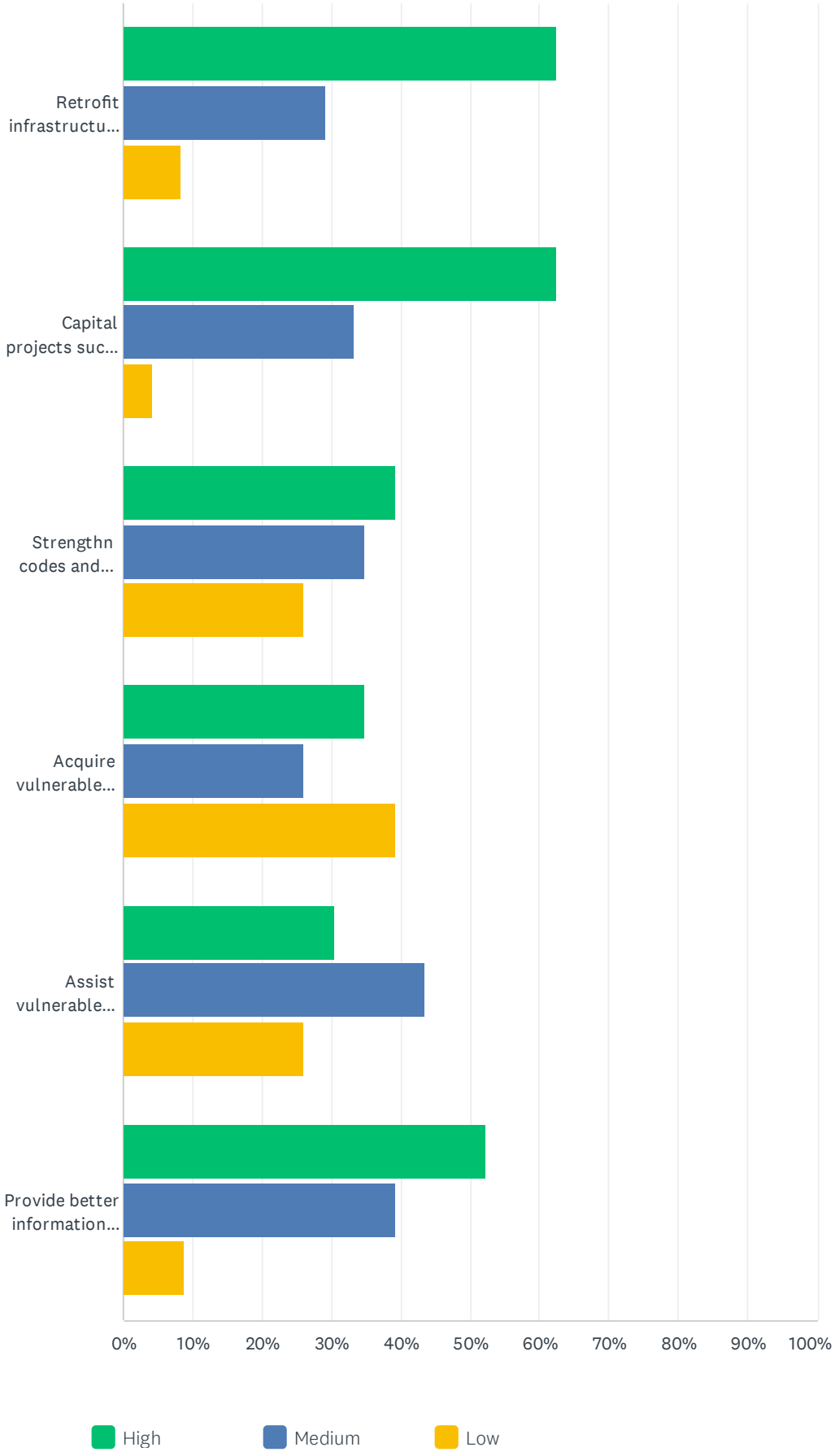
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	75.00%	18
No	4.17%	1
Not Sure	16.67%	4
Other (please specify)	4.17%	1
TOTAL		24

Q24 What types of projects do you believe the Local, State or Federal governemnt agencies should consider to reduce damage and disruption from flooding?

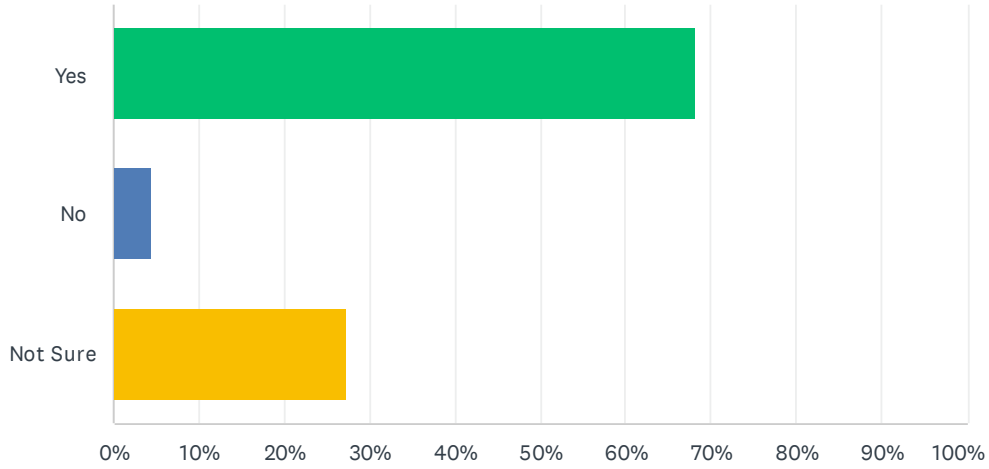
Answered: 24 Skipped: 0


Retrofit infrastructu...
Capital projects suc...
Strengthn codes and...
Acquire vulnerable...
Assist vulnerable...
Provide better information...
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
High
Medium
Low

	HIGH	MEDIUM	LOW	TOTAL	WEIGHTED AVERAGE
Retrofit infrastructure, such as improving cultures, bridges, and local drainage.	62.50% 15	29.17% 7	8.33% 2	24	2.54
Capital projects such as dams, levees, flood walls and drainage improvements.	62.50% 15	33.33% 8	4.17% 1	24	2.58
Strengthn codes and regulations to include higher regulatory standards in flood hazard areas.	39.13% 9	34.78% 8	26.09% 6	23	2.13
Acquire vulnerable properties and maintain as open space.	34.78% 8	26.09% 6	39.13% 9	23	1.96
Assist vulnerable properties owners with securing funding for mitigation.	30.43% 7	43.48% 10	26.09% 6	23	2.04
Provide better information about flood risk to the public.	52.17% 12	39.13% 9	8.70% 2	23	2.43

Q25 If your property were located in a designated "high flood hazard" area or had recieved repetitive damages from flood events, would you consider a "buyout" offered by a public agency?

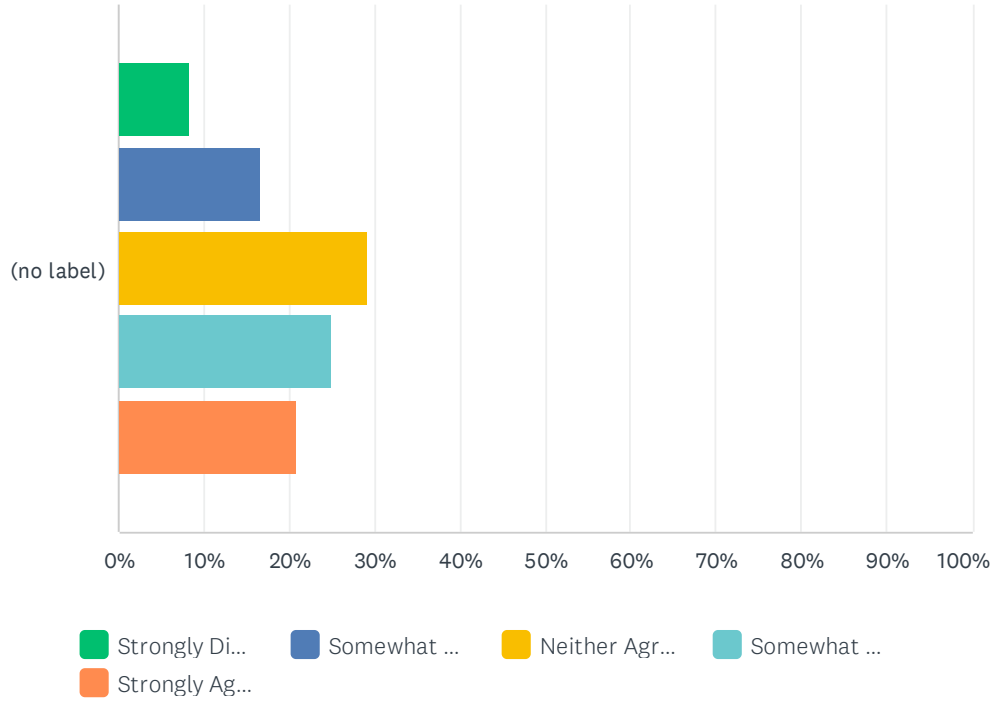
Answered: 22 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	68.18%	15
No	4.55%	1
Not Sure	27.27%	6
TOTAL		22

Q26 Please indicate how you feel about the following statement : It is the responsibility of government (local, state and federal) to provide education and programs that promote citizen actions that will reduce exposure to the risks associated with flood hazards.

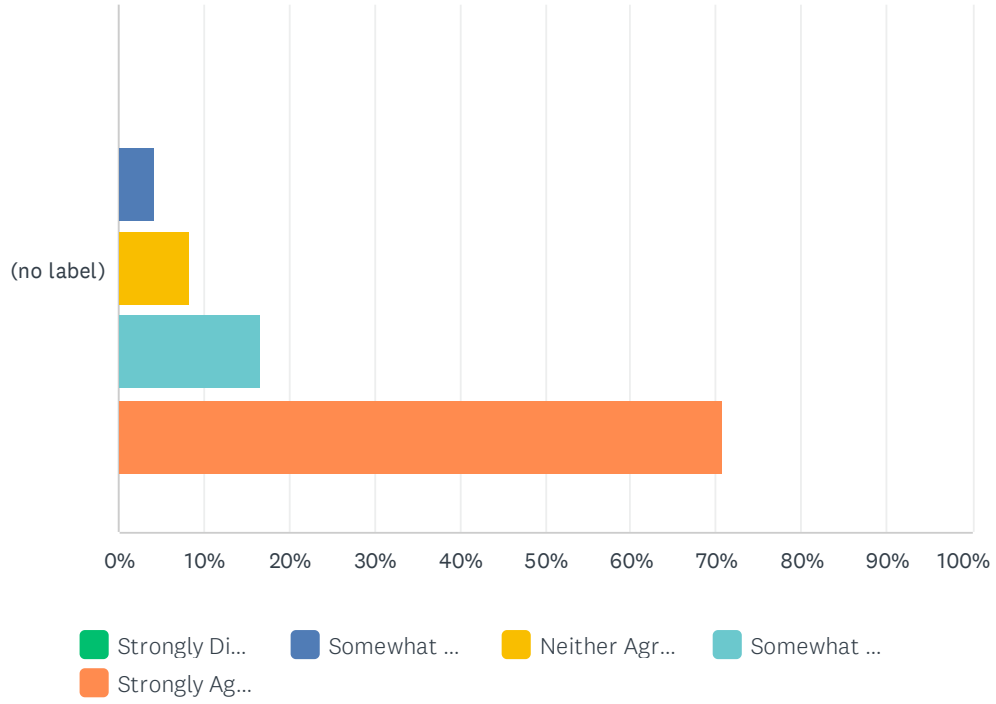
Answered: 24 Skipped: 0



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	8.33% 2	16.67% 4	29.17% 7	25.00% 6	20.83% 5	24	3.33

Q27 Please indicate how you feel about the following statement : It is my responsibility to educate myself and take actions that will reduce my exposure to the risks associated with flood hazards.

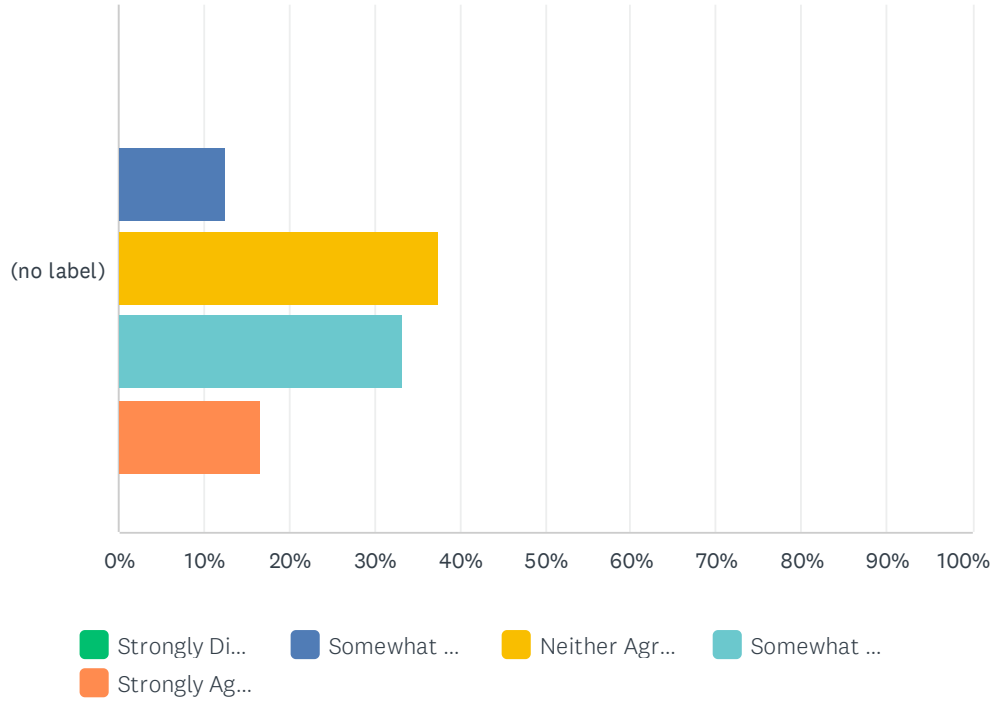
Answered: 24 Skipped: 0



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE OR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	4.17% 1	8.33% 2	16.67% 4	70.83% 17	24	4.54

Q28 Please indicate how you feel about the following statement: Information about the risks associated with flood hazards is readily available and easy to locate.

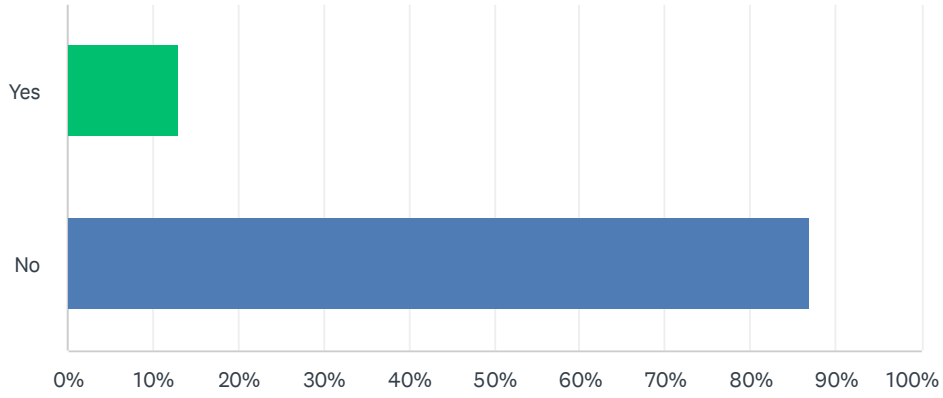
Answered: 24 Skipped: 0



	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
(no label)	0.00% 0	12.50% 3	37.50% 9	33.33% 8	16.67% 4	24	3.54

Q29 Are you aware of any local programs and policies designed to reduce risk from flood hazards?

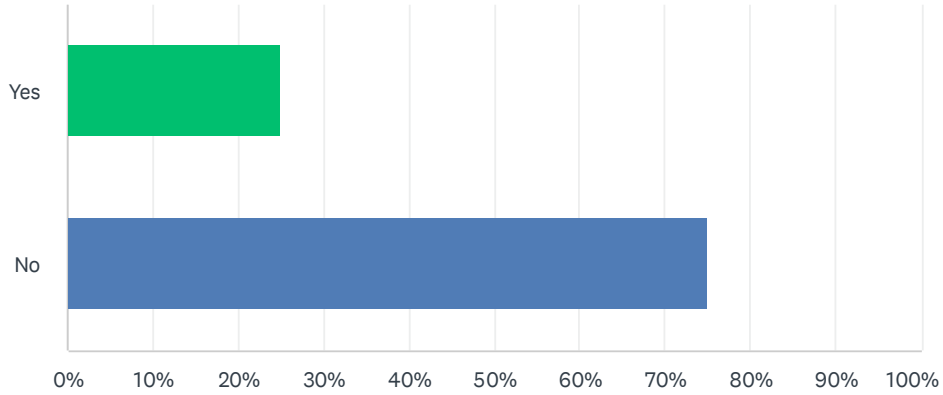
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	13.04%	3
No	86.96%	20
TOTAL		23

Q30 Do you have any special access or functional needs within your household that would require early warning or specialized response during disasters?

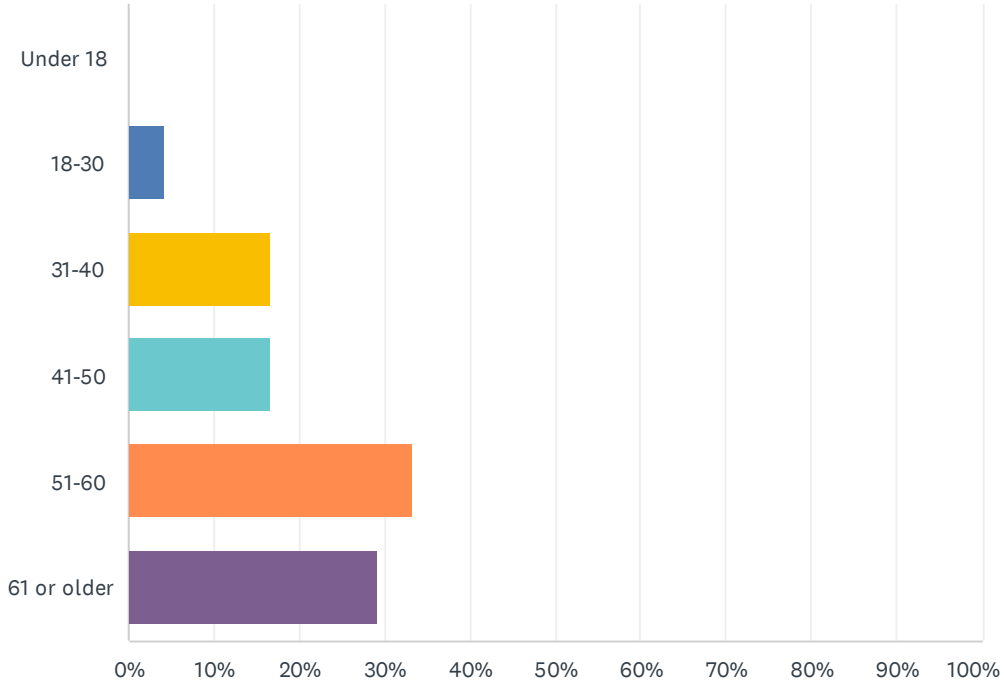
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	25.00%	6
No	75.00%	18
TOTAL		24

Q31 Please indicate your age range:

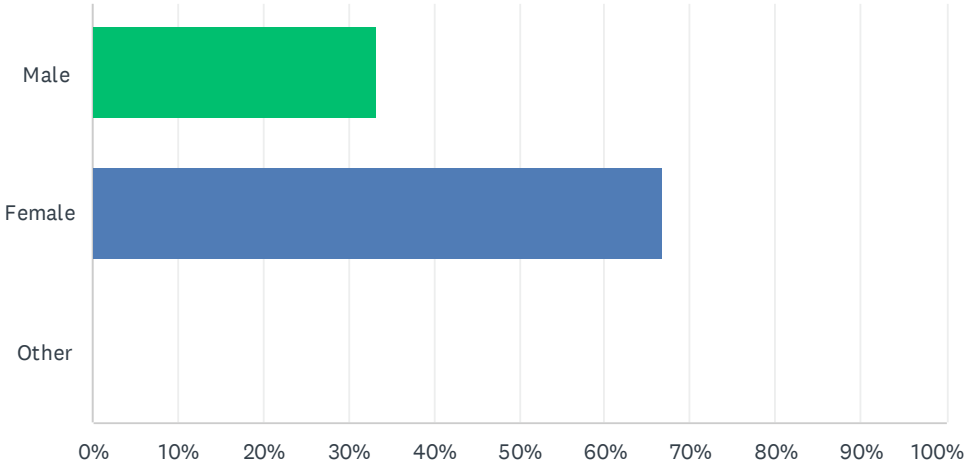
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Under 18	0.00%	0
18-30	4.17%	1
31-40	16.67%	4
41-50	16.67%	4
51-60	33.33%	8
61 or older	29.17%	7
TOTAL		24

Q32 Please indicate your gender:

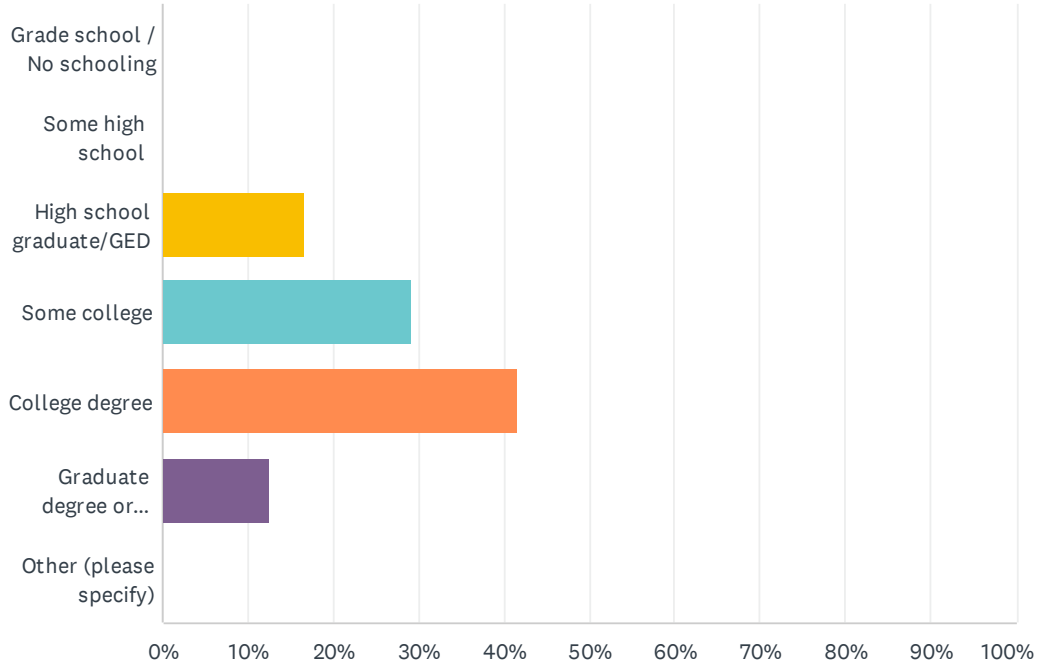
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Male	33.33%	8
Female	66.67%	16
Other	0.00%	0
TOTAL		24

Q33 Please indicate your highest level of education

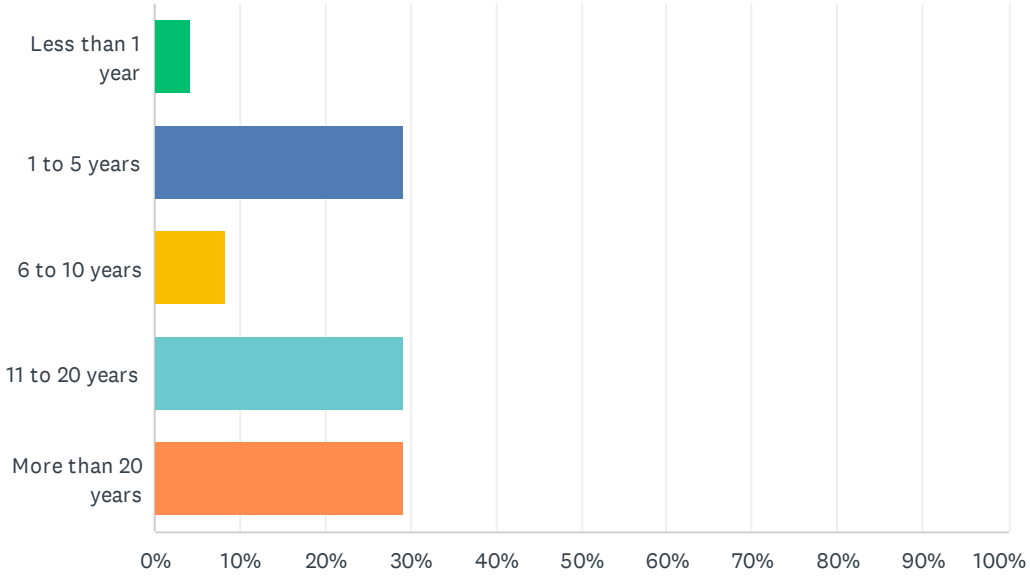
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Grade school / No schooling	0.00%	0
Some high school	0.00%	0
High school graduate/GED	16.67%	4
Some college	29.17%	7
College degree	41.67%	10
Graduate degree or higher	12.50%	3
Other (please specify)	0.00%	0
TOTAL		24

Q34 How long have you lived at your current residence?

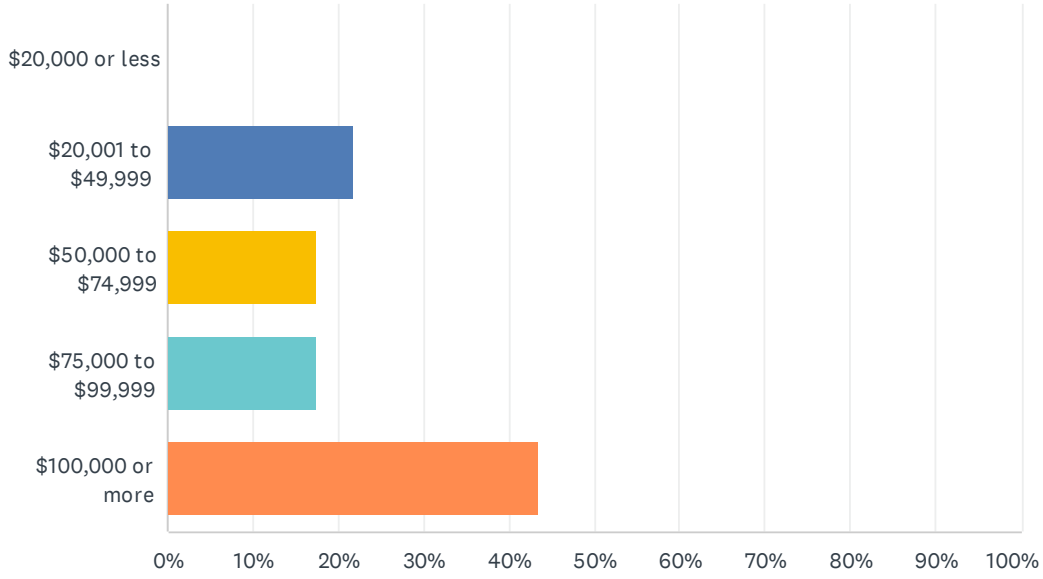
Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Less than 1 year	4.17%	1
1 to 5 years	29.17%	7
6 to 10 years	8.33%	2
11 to 20 years	29.17%	7
More than 20 years	29.17%	7
TOTAL		24

Q35 How much is your gross household income?

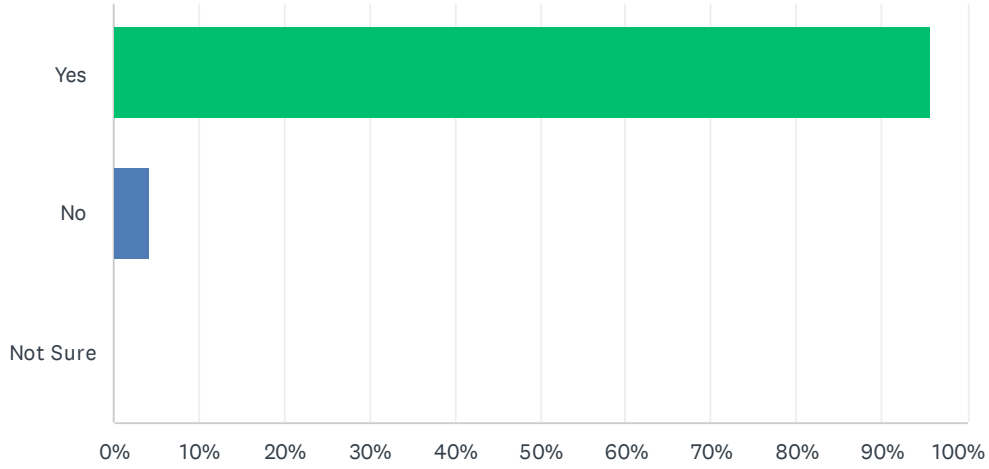
Answered: 23 Skipped: 1



ANSWER CHOICES	RESPONSES	
$20,000 or less	0.00%	0
$20,001 to $49,999	21.74%	5
$50,000 to $74,999	17.39%	4
$75,000 to $99,999	17.39%	4
$100,000 or more	43.48%	10
TOTAL		23

Q36 Do you have regular access to the internet?

Answered: 24 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	95.83%	23
No	4.17%	1
Not Sure	0.00%	0
TOTAL		24

Q37 If you have additional information you would like to share about your knowledge and experience regarding local flood related hazards, we invite you to provide your information in the comment box below.

Answered: 5 Skipped: 19

Appendix D. Federal and State Agencies, Programs and Regulations

D. FEDERAL AND STATE AGENCIES, PROGRAMS AND REGULATIONS

Existing laws, ordinances, plans and programs at the federal and state level can support or impact flood hazard mitigation actions identified in this plan. The following federal and state programs have been identified as programs that may interface with the actions identified in this plan. Each program enhances capabilities to implement recommended actions or has a nexus with a recommended action in this plan.

FEDERAL

National Flood Insurance Program

The NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in participating communities that enact floodplain regulations. For most participating communities, FEMA has prepared a detailed Flood Insurance Study. The study presents water surface elevations for floods of various magnitudes, including the 1-percent annual chance flood (or base flood) and the 0.2-percent annual chance flood. Base flood elevations and the boundaries of the 1-percent and 0.2-percent annual chance floodplains are shown on Flood Insurance Rate Maps (FIRMs), which are the principle tool for identifying the extent and location of the flood hazard. FIRMs are the most detailed and consistent data source available, and for many communities they represent the minimum area of oversight under their floodplain management program.

Participants in the NFIP must, at a minimum, regulate development in floodplain areas in accordance with NFIP criteria. Before issuing a permit to build in a flood-prone area, participating jurisdictions must, at a minimum, ensure that the project meets the following criteria (44 CFR Part 60, Section 60.3):

- Be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy,
- Be constructed with materials resistant to flood damage
- Be constructed by methods and practices that minimize flood damage
- Be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

Additional criteria apply depending on the availability of information about the flood hazard.

Community Rating System

The CRS is a voluntary program within the NFIP that encourages floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premiums are discounted to reflect the reduced flood risk resulting from community actions to meet the CRS goals of reducing flood losses, facilitating accurate insurance rating and promoting awareness of flood insurance.

For participating communities, flood insurance premium rates are discounted in increments of 5 percent. For example, a Class 9 community would receive a 5 percent premium discount, a Class 8 community would receive a 10 percent premium discount, and so on, until reaching a 45 percent premium discount for a Class 1 community. (Class 10 communities are those that do not participate in the CRS; they receive no discount.) The CRS classes for local communities are based on 18 creditable activities in the following categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Flood preparedness.

CRS activities can help to save lives and reduce property damage. Communities participating in the CRS represent a significant portion of the nation's flood risk; over 66 percent of the NFIP's policy base is located in these communities. Communities receiving premium discounts through the CRS range from small to large and represent a broad mixture of flood risks, including both coastal and riverine flood risks.

Disaster Mitigation Act of 2000

The federal Disaster Mitigation Act (DMA) of 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for state, local and Indian tribal governments as a condition of mitigation grant assistance. The DMA replaced previous federal mitigation planning provisions with new requirements that emphasize the need for planning entities to coordinate mitigation planning and implementation efforts. The DMA established a new requirement for local mitigation plans and authorized up to 7 percent of Hazard Mitigation Grant Program funds to be available for development of state, local, and Indian tribal mitigation plans.

Biggert-Waters Flood Insurance Reform Act of 2012 and Homeowner Flood Insurance Affordability Act of 2014

The Biggert-Waters Flood Insurance Reform Act of 2012 authorized and funded a national mapping program. It also authorized insurance premium rate increases to ensure the fiscal soundness of the NFIP by transitioning the program from subsidized rates, also known as artificially low rates, to offer full actuarial rates reflective of risk.

The Homeowner Flood Insurance Affordability Act of 2014 repealed parts of Biggert-Waters, restoring grandfathering, putting limits on certain rate increases and updating the approach to ensuring the fiscal soundness of the fund by applying an annual surcharge to all policyholders.

Endangered Species Act

The federal Endangered Species Act (ESA) was enacted in 1973 to conserve species facing depletion or extinction and the ecosystems that support them. The act sets forth a process for determining which species are threatened

and endangered and requires the conservation of the critical habitat in which those species live. The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species and contains exceptions and exemptions. It is the enabling legislation for the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Criminal and civil penalties are provided for violations of the ESA and the Convention.

In some parts of the country, including the Pacific Northwest and the Sacramento-San Joaquin Delta area, court rulings have found that floodplain management measures can be in conflict with the goals of the endangered species act. Those rulings have required FEMA and local governments to engage in a consultation process with federal wildlife agencies (Section 7 of the ESA) as they work to develop certain floodplain management programs, plans and projects.

Clean Water Act

The federal Clean Water Act (CWA) employs regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's surface waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has included a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach, equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining water quality and other environmental goals is a hallmark of this approach.

National Incident Management System

The National Incident Management System (NIMS) is a systematic approach for government, nongovernmental organizations, and the private sector to work together to manage incidents involving floods and other hazards. The NIMS provides a flexible but standardized set of incident management practices. Incidents typically begin and end locally, and they are managed at the lowest possible geographical, organizational, and jurisdictional level. In other instances, success depends on the involvement of multiple jurisdictions, levels of government, functional agencies, and emergency-responder disciplines. These instances necessitate coordination across this spectrum of organizations. Communities using NIMS follow a comprehensive national approach that improves the effectiveness of emergency management and response personnel across the full spectrum of potential hazards (including natural hazards, terrorist activities, and other human-caused disasters) regardless of size or complexity.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA) seeks to prevent discrimination against people with disabilities in employment, transportation, public accommodation, communications, and government activities. The most recent amendments became effective in January 2009 (Public Law 110-325). Title II of the ADA deals with compliance

with the Act in emergency management and disaster-related programs, services, and activities. It applies to state and local governments as well as third parties, including religious entities and private nonprofit organizations.

The ADA has implications for sheltering requirements and public notifications. During an emergency alert, officials must use a combination of warning methods to ensure that all residents have any necessary information. Those with hearing impairments may not hear radio, television, sirens, or other audible alerts, while those with visual impairments may not see flashing lights or visual alerts. Two stand-alone technical documents have been issued for shelter operators to meet the needs of people with disabilities. These documents address physical accessibility as well as medical needs and service animals.

The ADA also intersects with disaster preparedness programs in regard to transportation, social services, temporary housing, and rebuilding. Persons with disabilities may require additional assistance in evacuation and transit (e.g., vehicles with wheelchair lifts or paratransit buses). Evacuation and other response plans should address the unique needs of residents. Local governments may be interested in implementing a special-needs registry to identify the home addresses, contact information, and needs for residents who may require more assistance.

Public Law 8499, Flood Control and Coastal Emergencies

Federal law that gives the U.S. Army Corps of Engineers the legal authority to conduct emergency preparation, response, and recovery activities and to supplement local efforts in the repair of flood damage reduction projects that have been damaged by floods. Under Public Law 8499, the Corps' Chief of Engineers is authorized to undertake activities including disaster preparedness, advance measures to prevent or reduce damage when there is an imminent threat of unusual flooding, emergency operations (flood response and post-flood response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair of federally authorized shore protective works threatened or damaged by coastal storm, and provision of emergency water in the event of drought or contaminated source.

STATE

Washington State Floodplain Management Law

Washington's floodplain management law (Revised Code of Washington (RCW) 86.16, implemented through Washington Administrative Code (WAC) 173-158) states that prevention of flood damage is a matter of statewide public concern and places regulatory control with the Department of Ecology. RCW 86.16 is cited in floodplain management literature, including FEMA's national assessment, as one of the first and strongest in the nation. A 1978 major challenge to the law—Maple Leaf Investors Inc. v. Department of Ecology—is cited in legal references to flood hazard management issues. The court upheld the law, declaring that denial of a permit to build residential structures in the floodway is a valid exercise of police power and did not constitute a taking. RCW Chapter 86.12 (Flood Control by Counties) authorizes county governments to levy taxes, condemn properties and undertake flood control activities directed toward a public purpose.

Department of Ecology Grants

Washington's first flood control maintenance program, passed in 1951, was called the Flood Control Maintenance Program. In 1984, the state Legislature established the Flood Control Assistance Account Program (FCAAP) to

assist local jurisdictions in comprehensive planning and flood control maintenance (RCW 86.26; WAC 173-145). This is one of the few state programs in the country that provides grant funding to local governments for flood hazard management planning and implementation. The account is funded at $4 million per state biennium, unless modified by the Legislature. Projects include comprehensive flood hazard management planning, maintenance projects, feasibility studies, purchase of flood-prone properties, matches for federal projects, and emergency projects. FCAAP grants for non-emergency projects may not exceed $500,000 per county. Due to funding cuts, applications to this program are currently being accepted only for emergency projects.

In 2013, the Legislature authorized $44 million in new funding for integrated projects consistent with Floodplains by Design, an emerging partnership of local, state, federal and private organizations focused on coordinating investment in and strengthening the integrated management of floodplain areas. A similar level of funding was authorized for the 2015-17 biennium. The Department of Ecology's Floods and Floodplain Management Division administers the Floodplains by Design grant program. Ecology awards grants on a competitive basis to eligible entities for collaborative and innovative projects in Washington that support the integration of flood hazard reduction with ecological preservation and restoration. Proposed projects may also address other community needs, such as preservation of agriculture, improvements in water quality, or increased recreational opportunities, provided they are part of a larger strategy to restore ecological functions and reduce flood hazards.

Shoreline Management Act

The 1971 Shoreline Management Act (RCW 90.58) was enacted to manage and protect the shorelines of the state by regulating development in the shoreline area. A major goal of the act is to prevent the "inherent harm in an uncoordinated and piecemeal development of the state's shorelines." Its jurisdiction includes all water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them, except shorelines of statewide significance, streams upstream of where the mean annual flow is 20 cubic feet per second or less, and lakes smaller than 20 acres.

Growth Management Act

The 1990 Washington State Growth Management Act (RCW Chapter 36.70A) mandates that local jurisdictions adopt land use ordinances to protect the following critical areas:

- Wetlands
- Critical aquifer recharge areas
- Fish and wildlife habitat conservation areas
- Frequently flooded areas
- Geologically hazardous areas.

The Growth Management Act regulates development in these areas, and therefore has the potential to affect hazard vulnerability and exposure at the local level.

Washington State Building Code

The Washington State Building Code Council adopted the 2015 editions of national model codes, with some amendments (RCW 19.27.074). The Council also adopted changes to the Washington State Energy Code. Washington's state-developed codes are mandatory statewide for residential and commercial buildings. The

residential code exceeds the 2006 International Energy Conservation Code standards (as amended) for most homes, and the commercial code meets or exceeds standards of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE 90.1-2004). For residential construction covered by ASHRAE 90.1-2007 (buildings with four or more stories), the state code is more stringent. The 2015 International Building Code went into effect as the Washington model code on July 1, 2016.

Comprehensive Emergency Management Planning

Washington's Comprehensive Emergency Management Planning law (RCW 38.52) establishes parameters to ensure that preparations of the state will be adequate to deal with disasters, to ensure the administration of state and federal programs providing disaster relief to individuals, to ensure adequate support for search and rescue operations, to protect the public peace, health and safety, and to preserve the lives and property of the people of the state. It achieves the following:

- Provides for emergency management by the state, and authorizes the creation of local organizations for emergency management in political subdivisions of the state.
- Confers emergency powers upon the governor and upon the executive heads of political subdivisions of the state.
- Provides for the rendering of mutual aid among political subdivisions of the state and with other states and for cooperation with the federal government with respect to the carrying out of emergency management functions.
- Provides a means of compensating emergency management workers who may suffer any injury or death, who suffer economic harm including personal property damage or loss, or who incur expenses for transportation, telephone or other methods of communication, and the use of personal supplies as a result of participation in emergency management activities.
- Provides programs, with intergovernmental cooperation, to educate and train the public to be prepared for emergencies.

It is policy under this law that emergency management functions of the state and its political subdivisions be coordinated to the maximum extent with comparable functions of the federal government and agencies of other states and localities, and of private agencies of every type, to the end that the most effective preparation and use may be made of manpower, resources, and facilities for dealing with disasters.

WAC 118-30-060(1) requires each political subdivision to base its comprehensive emergency management plan on a hazard analysis, and makes the following definitions related to hazards:

- Hazards are conditions that can threaten human life as the result of three main factors:
  - Natural conditions, such as weather and seismic activity
  - Human interference with natural processes, such as a levee that displaces the natural flow of floodwaters
  - Human activity and its products, such as homes in a flood hazard area.
- The definitions for hazard, hazard event, hazard identification, and flood hazard include related concepts:
  - A hazard may be connected to human activity.
  - Hazards are extreme events.

Hazards generally pose a risk of damage, loss, or harm to people and/or their property

Watershed Management Act

Washington's Watershed Management Act of 1998 encourages local communities to develop plans for protecting local water resources and habitat. Lawmakers wanted local governments and citizens to develop plans since they know their own regions best. WRIA is an acronym for "Water Resource Inventory Area." WRIAs are watershed planning areas established by the Department of Ecology. Washington State is divided into 62 WRIAs, each loosely drawn around a natural watershed or group of watersheds. A watershed is an area of land that drains into a common river, lake or the ocean.

Washington State Enhanced Mitigation Plan

The Washington State Enhanced Hazard Mitigation Plan provides guidance for hazard mitigation throughout Washington (Washington Emergency Management Division 2018). The plan identifies hazard mitigation goals, objectives and actions for state government to reduce injury and damage from natural hazards. By meeting federal requirements for an enhanced state plan (44 CFR Parts 201.4 and 201.5), the plan allows the state to seek significantly higher funding from the Hazard Mitigation Grant Program following presidential declared disasters (20 percent of federal disaster expenditures vs. 15 percent with a standard plan).

Washington Silver Jackets

The Washington Silver Jackets team was formed in 2010 and is a mix of federal and state agencies that work together to address flood risk priorities in the state. Federal agencies include the Corps of Engineers, which facilitates coordination within the group, FEMA, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Geological Survey (USGS). Participating state agencies include the Department of Ecology, the Emergency Management Division, and the Department of Transportation. The team's projects are intended to address state needs and improve flood risk management throughout the full flood life cycle (Silver Jackets, 2016).

Land and Water Conservation Fund

Congress established the Land and Water Conservation Fund in 1965 and authorized the Secretary of the Interior to provide financial assistance to the states for the acquisition and development of public outdoor recreation areas. The Washington State Recreation and Conservation Office administers the program in Washington. Funding comes from a portion of federal revenue from selling and leasing off-shore oil and gas resources. Eligible projects include land acquisition and development or renovation projects, such as natural areas and open space. The Washington State Recreation and Conservation Office administers the program.

Salmon Recovery Fund

In 1999, the Washington State Legislature created the Salmon Recovery Funding Board. The board provides grants to protect or restore salmon habitat. Funded projects may include activities that protect existing, high quality habitat for salmon or that restore degraded habitat to increase overall habitat health and biological productivity. Funding also is available for feasibility assessments to determine future projects and for other salmon related activities. Projects may include the actual habitat used by salmon and the land and water that support ecosystem functions and processes important to salmon.

State Environmental Policy Act

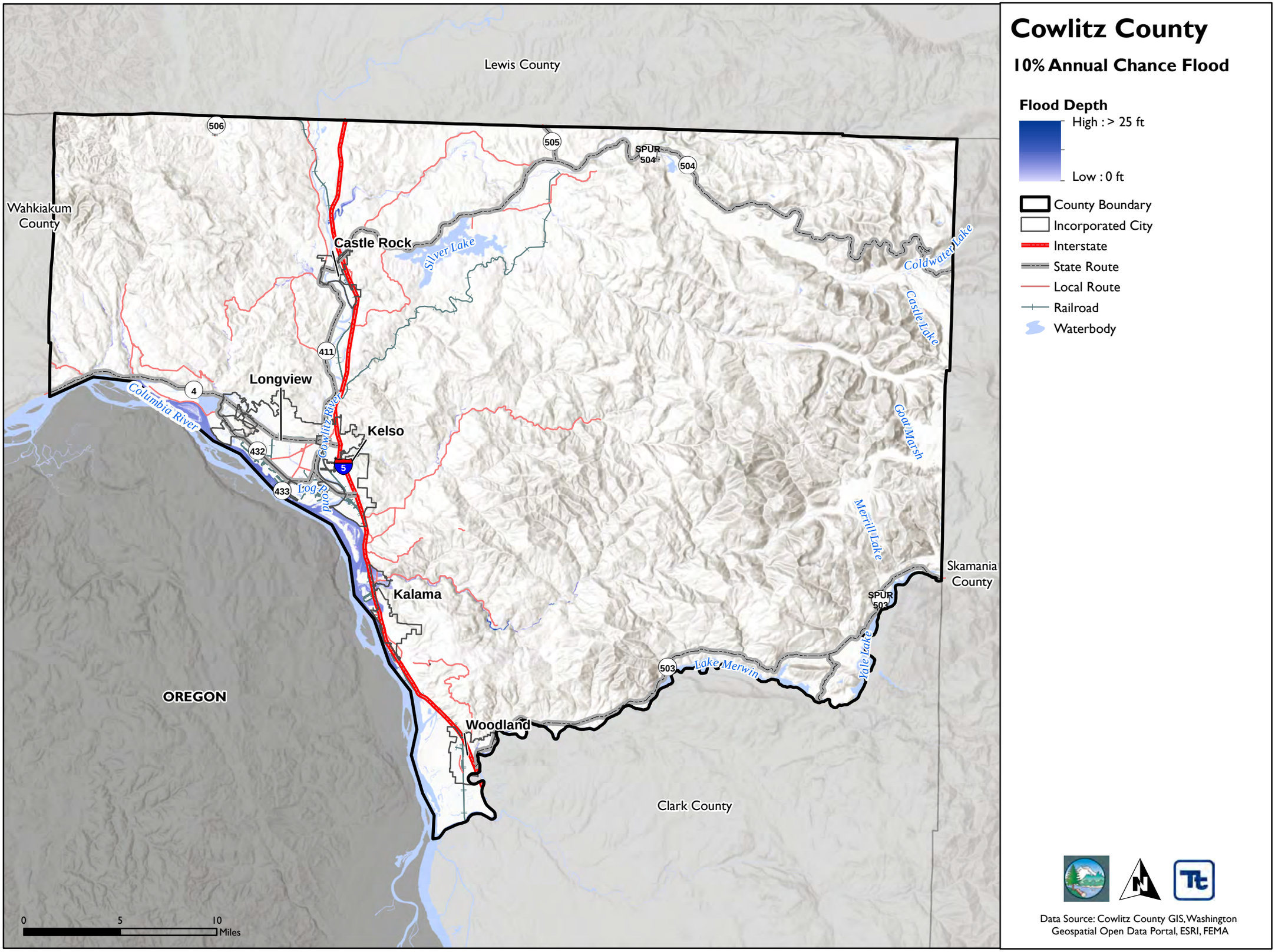
The State Environmental Policy Act (SEPA) provides a way to identify possible environmental impacts of governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilities, or adopting regulations, policies, or plans. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a proposal will affect the environment. This information can be used to change a proposal to reduce likely impacts, or to condition or deny a proposal when adverse environmental impacts are identified. Actions identified in hazard mitigation plans are frequently subject to SEPA review requirements before implementation (Washington Department of Ecology, 2016).

Non-project actions are governmental actions involving decisions on policies, plans, or programs that contain standards controlling use or modification of the environment, or that will govern a series of connected actions. This includes, but is not limited to, the adoption or amendment of comprehensive plans (WAC 197-11-704(2)(b)). Adoption of the Comprehensive Flood Hazard Management Plan will have no probable significant adverse impact on the environment; therefore, an environmental impact statement will not be required under RCW 43.21C.030(2)(c).

State Hydraulic Code

Washington's Hydraulic Code states that any person or government agency intending to undertake a hydraulic project shall, before commencing work, secure a Hydraulic Project Approval from the Washington Department of Fish and Wildlife verifying the adequacy of the proposed means for protecting fish (RCW 77.55.021 (1)). The code defines a hydraulic project as work that will use, divert, obstruct, or change the natural flow or bed of any salt or freshwaters of the state. Approval is required for projects at or waterward of the ordinary high water line and for projects landward of the ordinary high water line that are immediately adjacent to waters of the state.

Appendix E. FEMA Flood Zone Maps



Cowlitz County

10% Annual Chance Flood

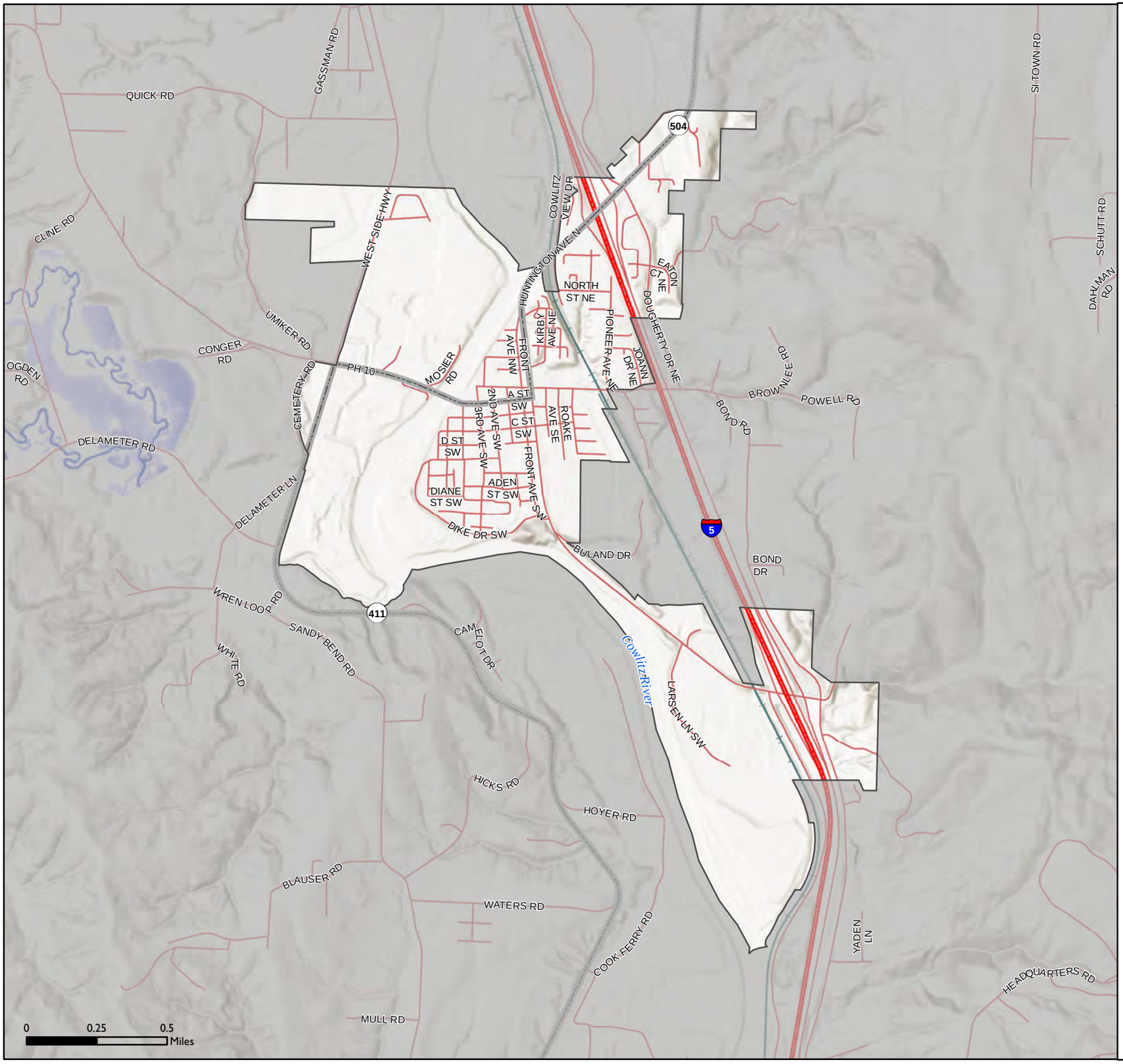
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



CASTLE ROCK

10% Annual Chance Flood

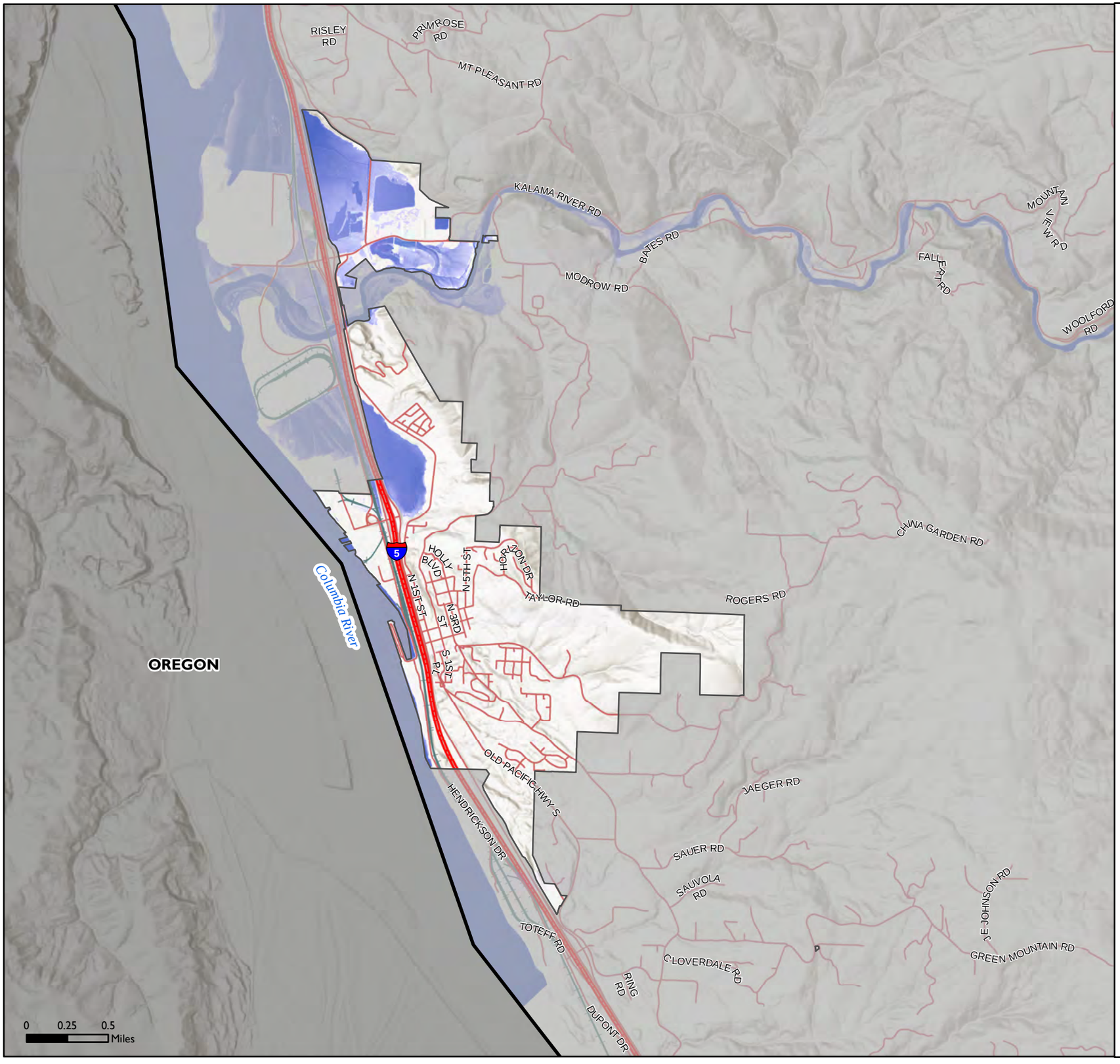
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KALAMA

10% Annual Chance Flood

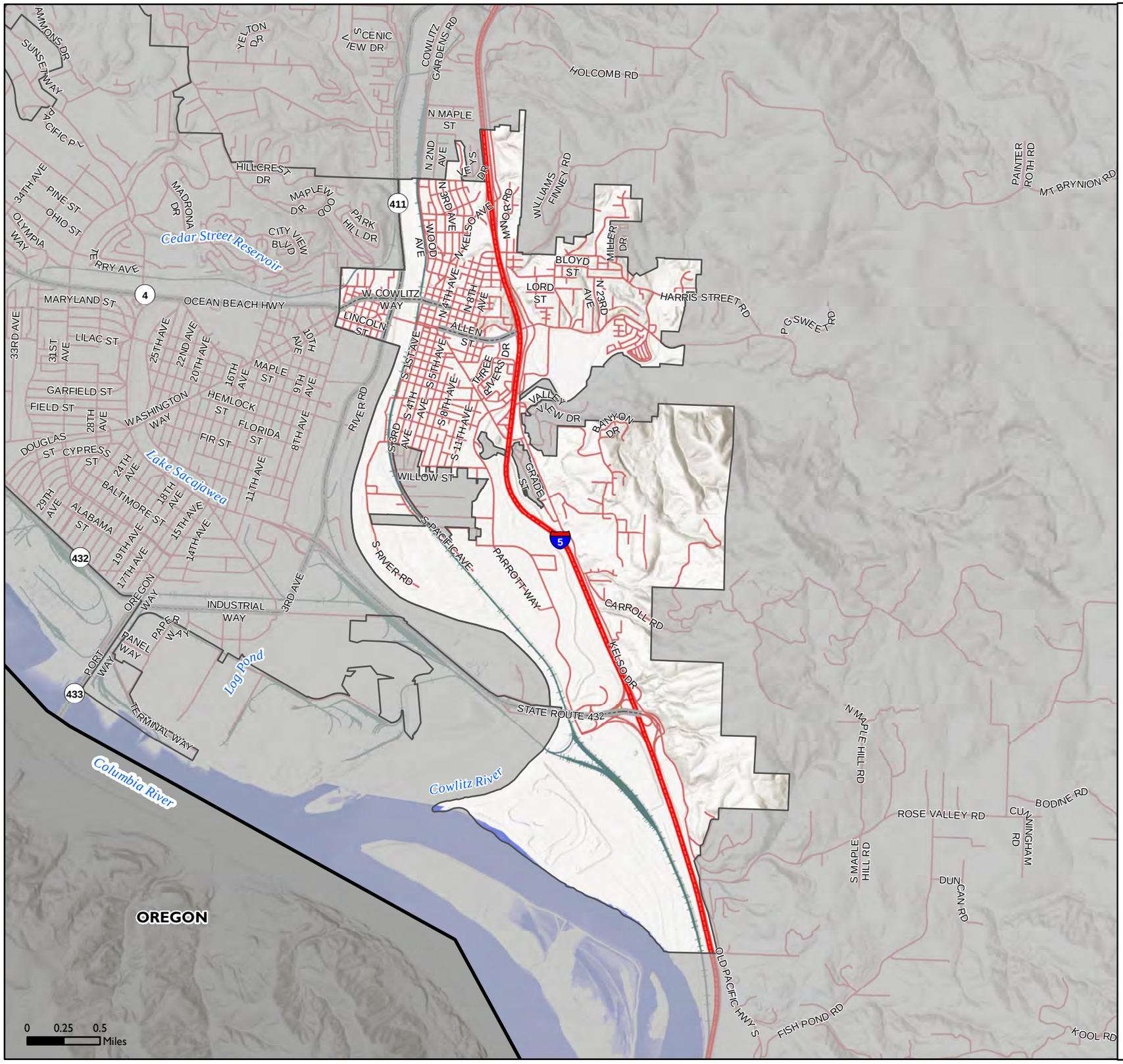
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KELSO

10% Annual Chance Flood

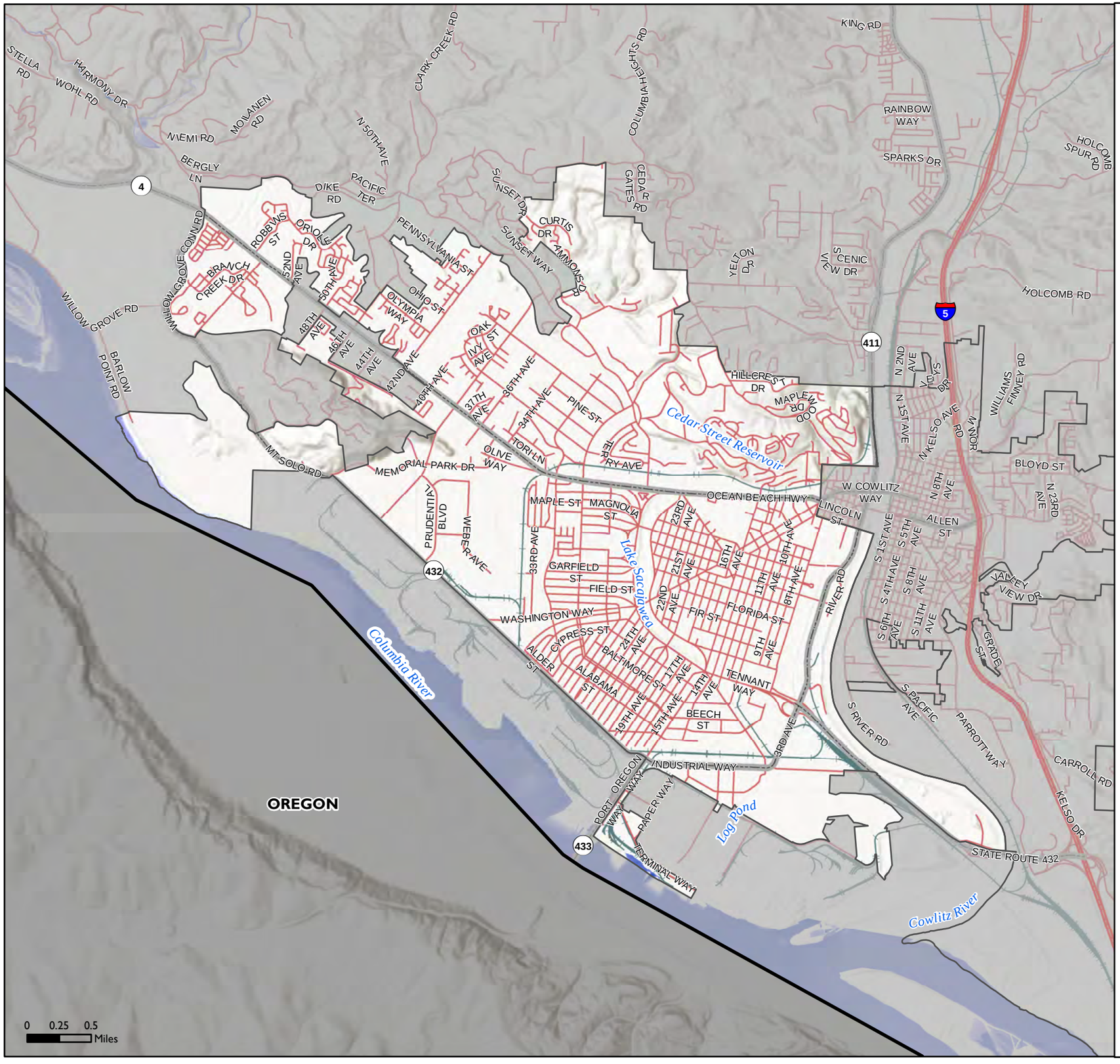
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



LONGVIEW

10% Annual Chance Flood

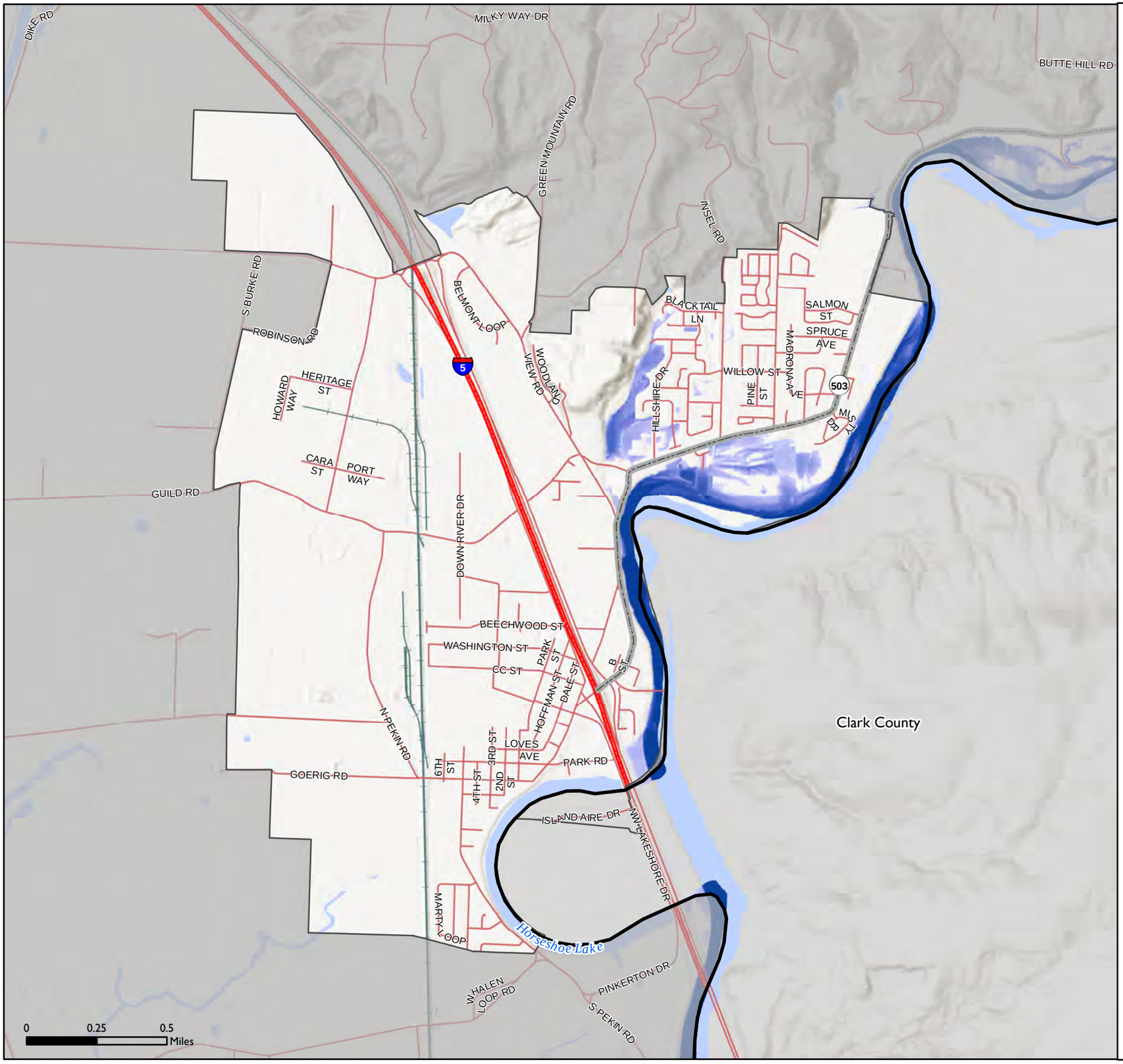
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



WOODLAND

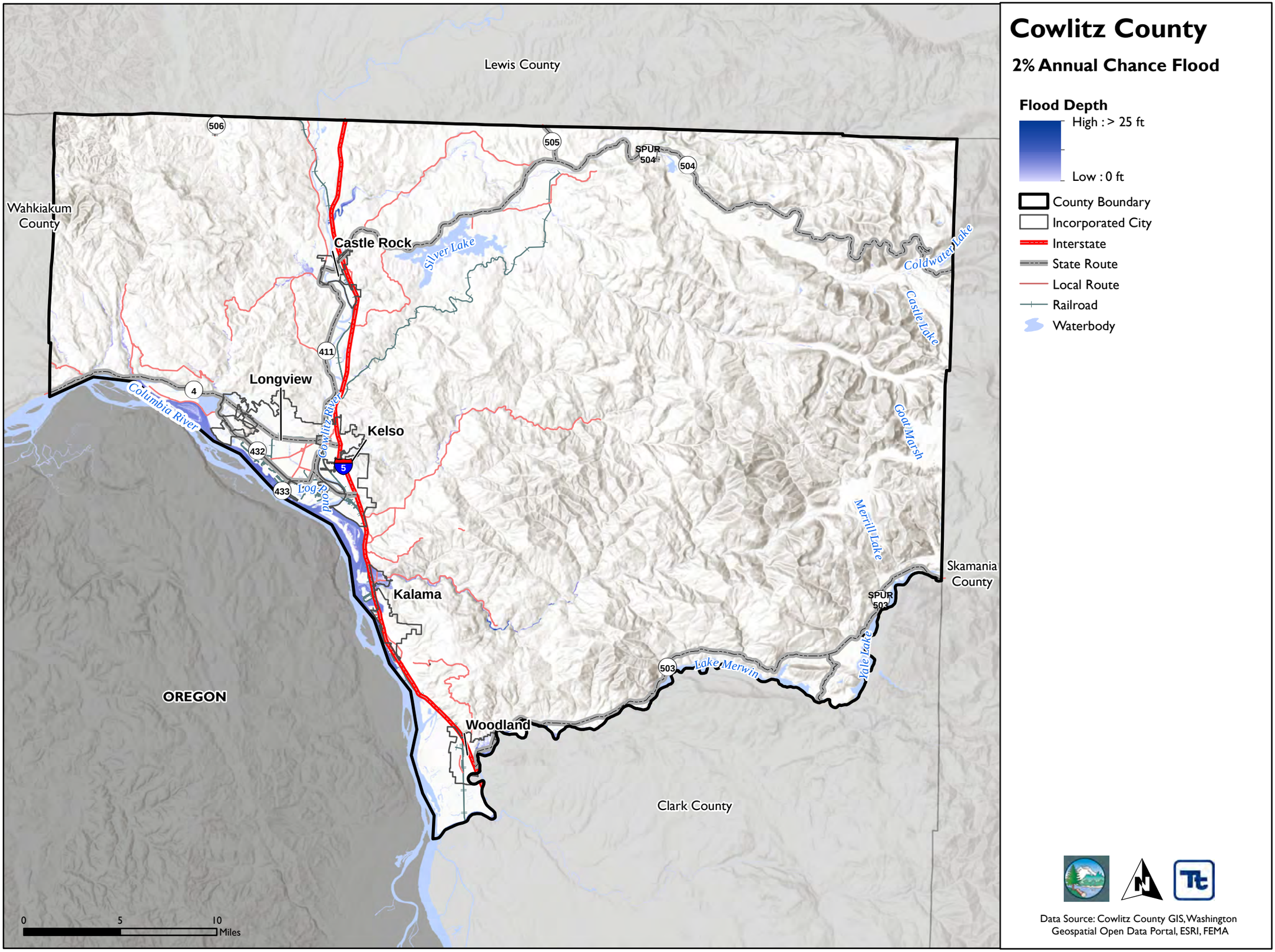
10% Annual Chance Flood

Flood Depth

- High : > 25 ft
- Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



Cowlitz County

2% Annual Chance Flood

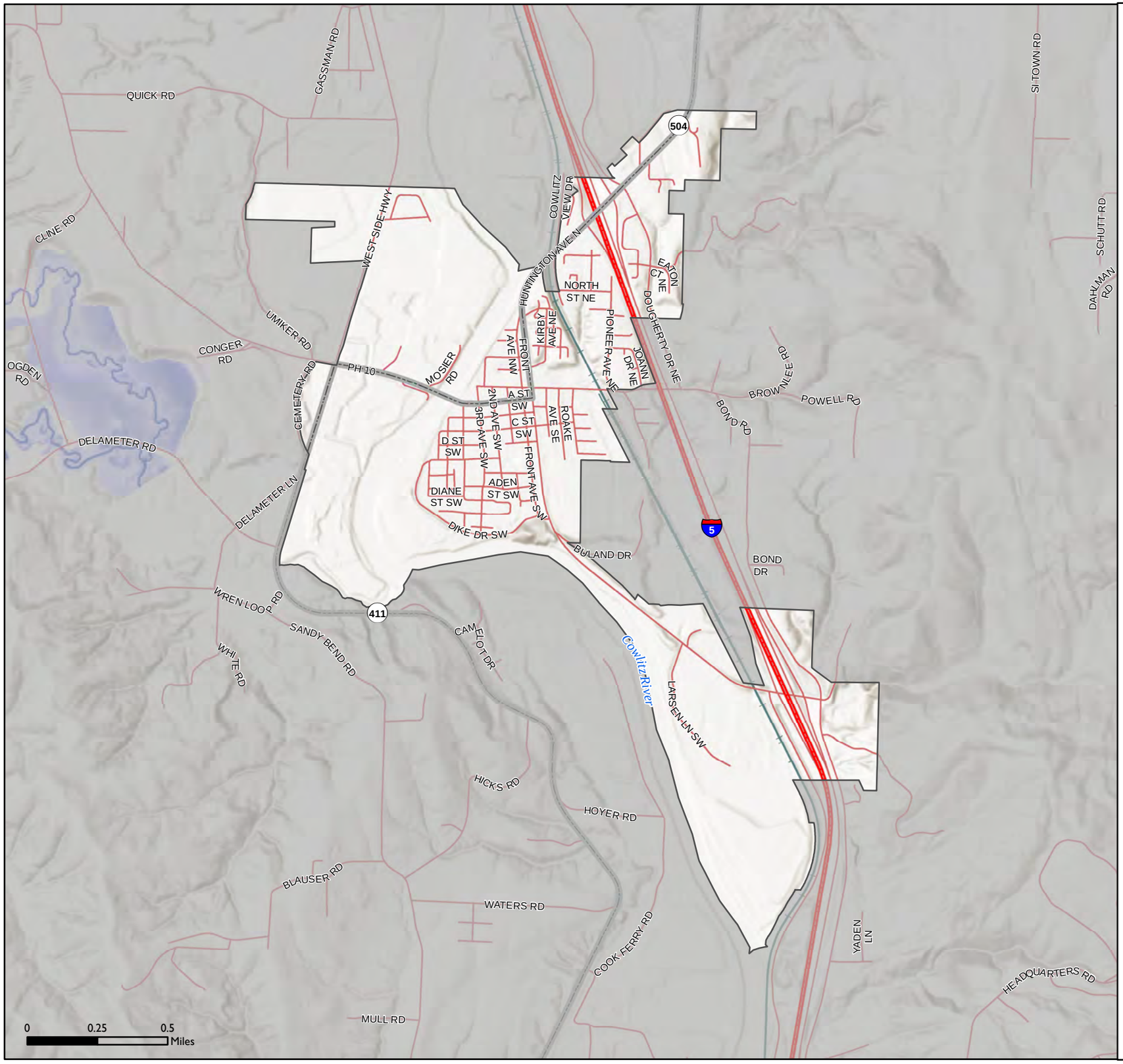
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



CASTLE ROCK

2% Annual Chance Flood

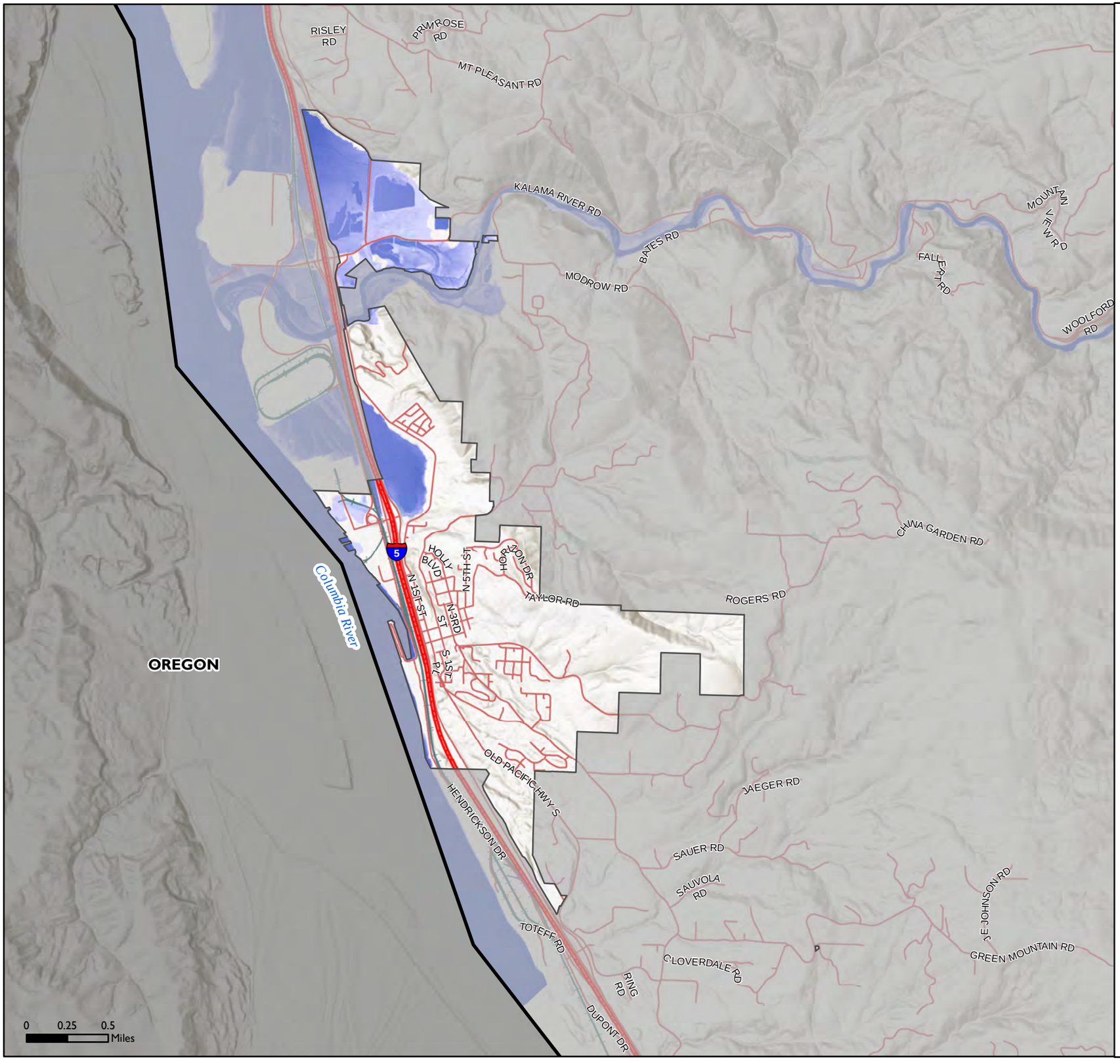
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KALAMA

2% Annual Chance Flood

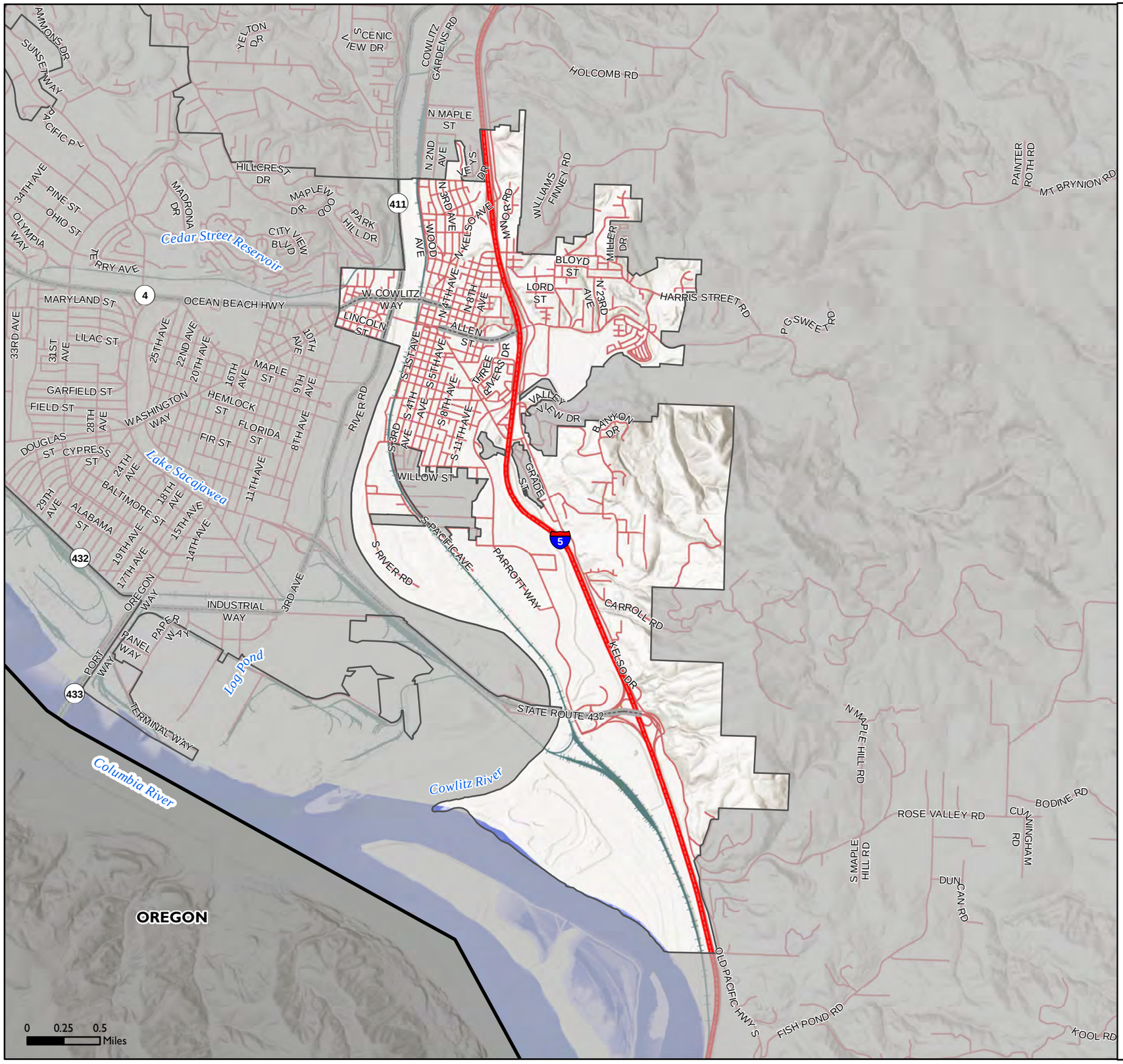
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KELSO

2% Annual Chance Flood

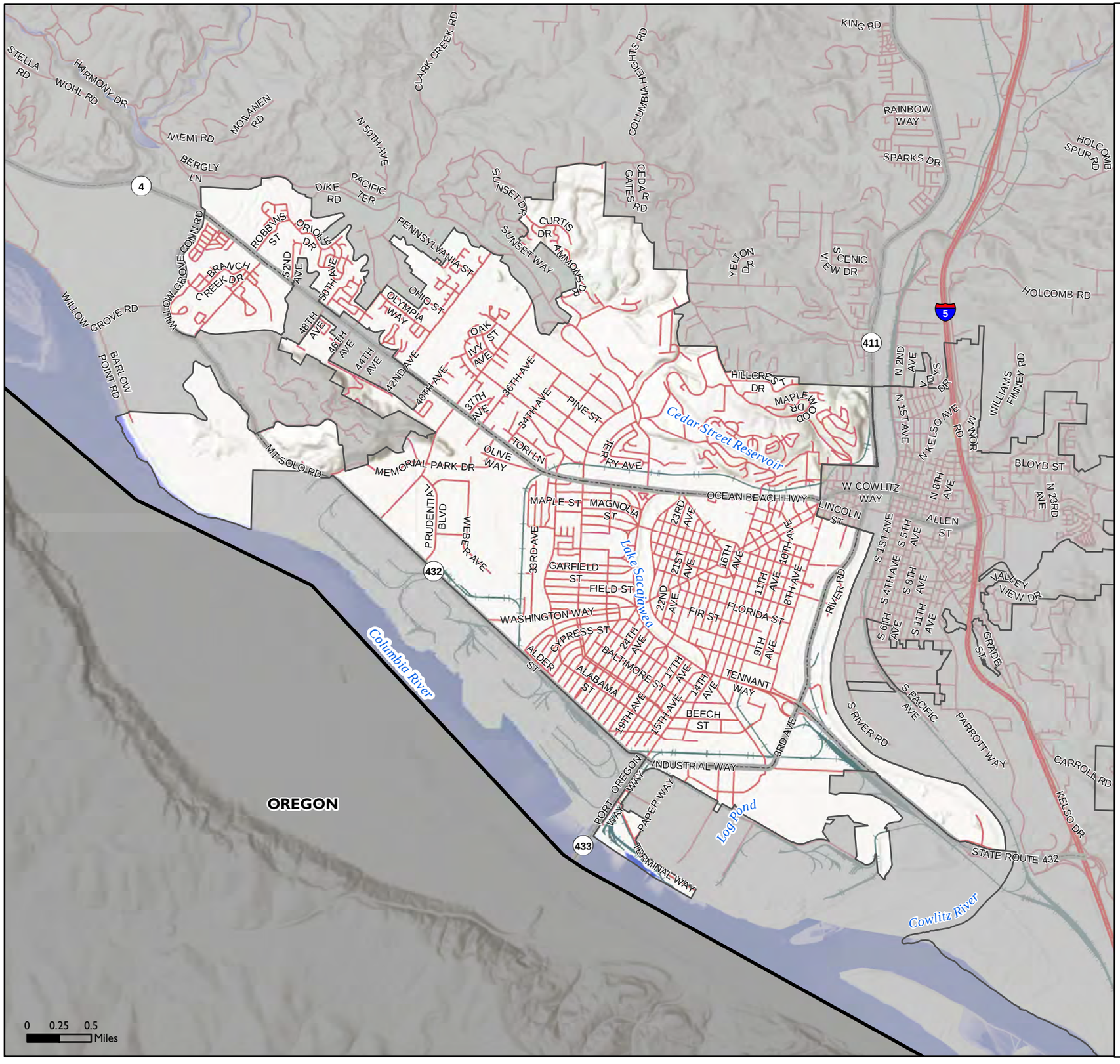
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



LONGVIEW

2% Annual Chance Flood

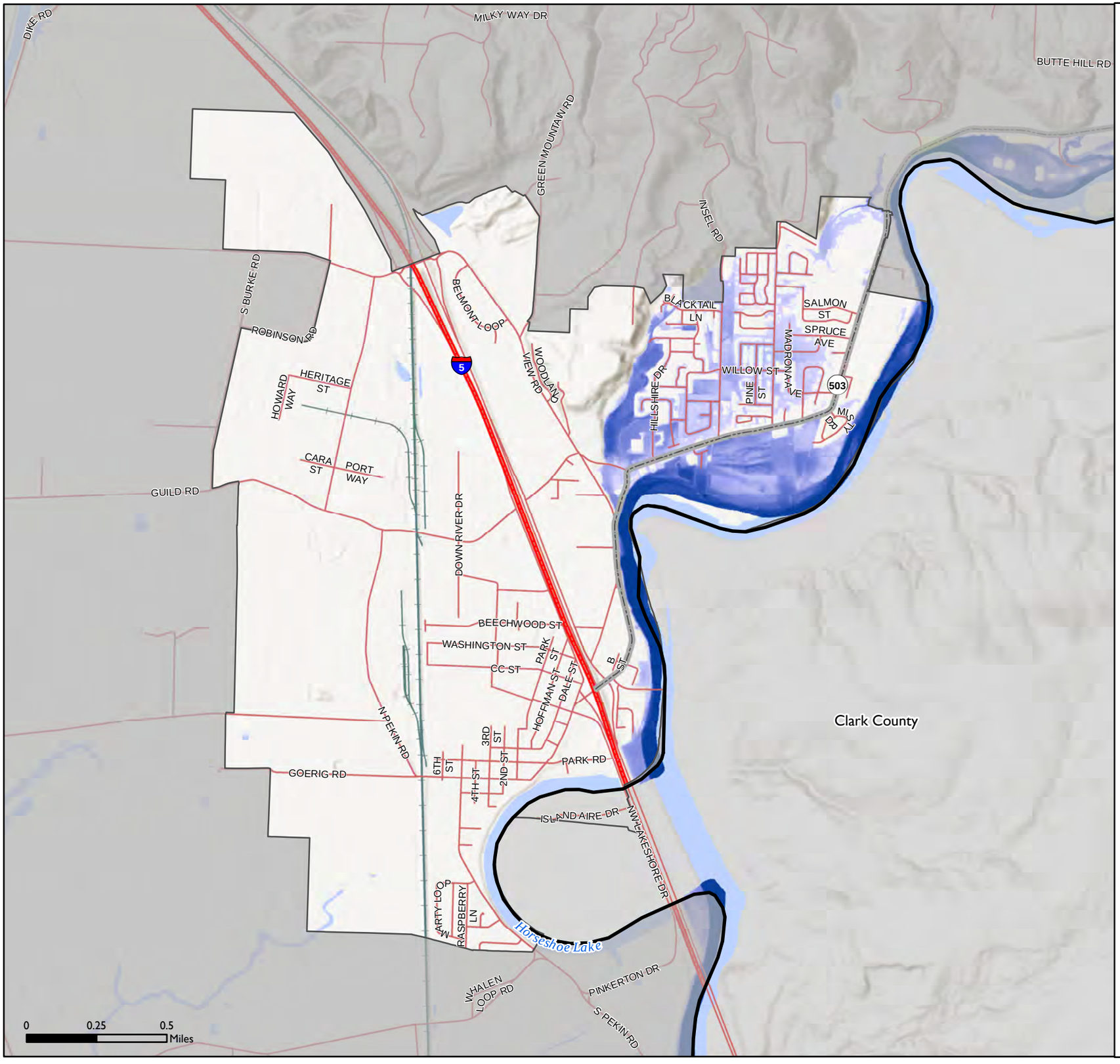
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



WOODLAND

2% Annual Chance Flood

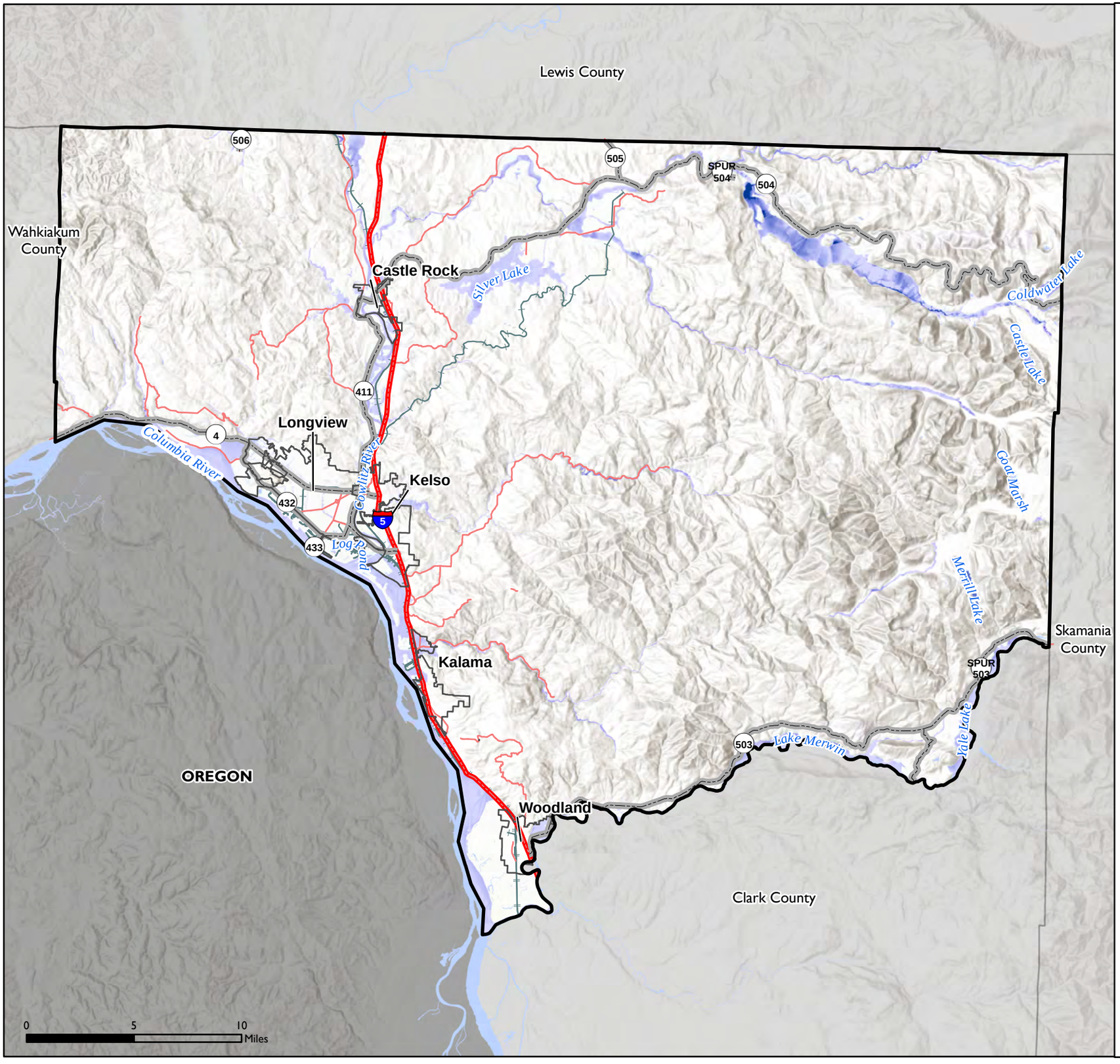
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



Cowlitz County

1% Annual Chance Flood

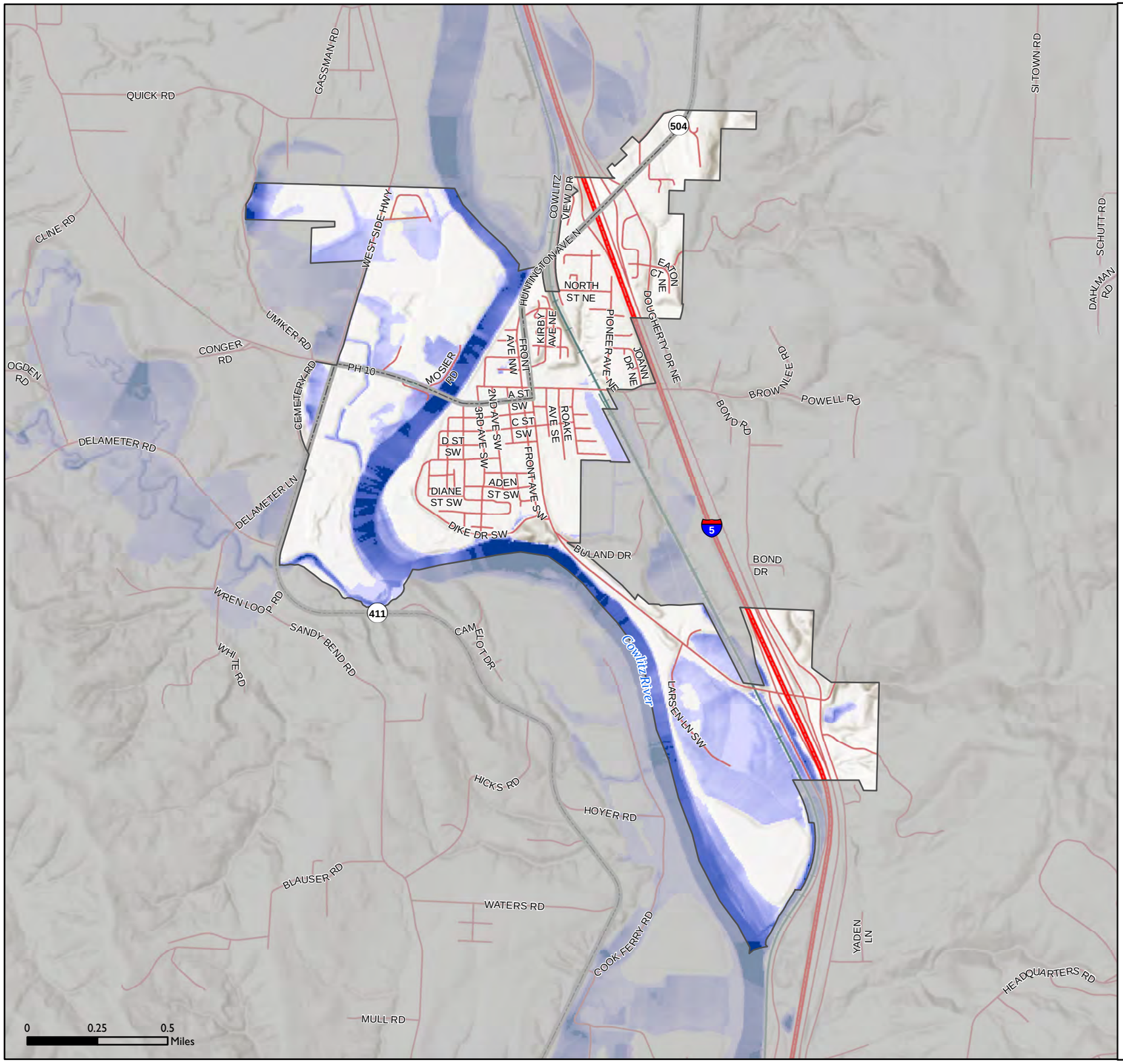
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



CASTLE ROCK

1% Annual Chance Flood

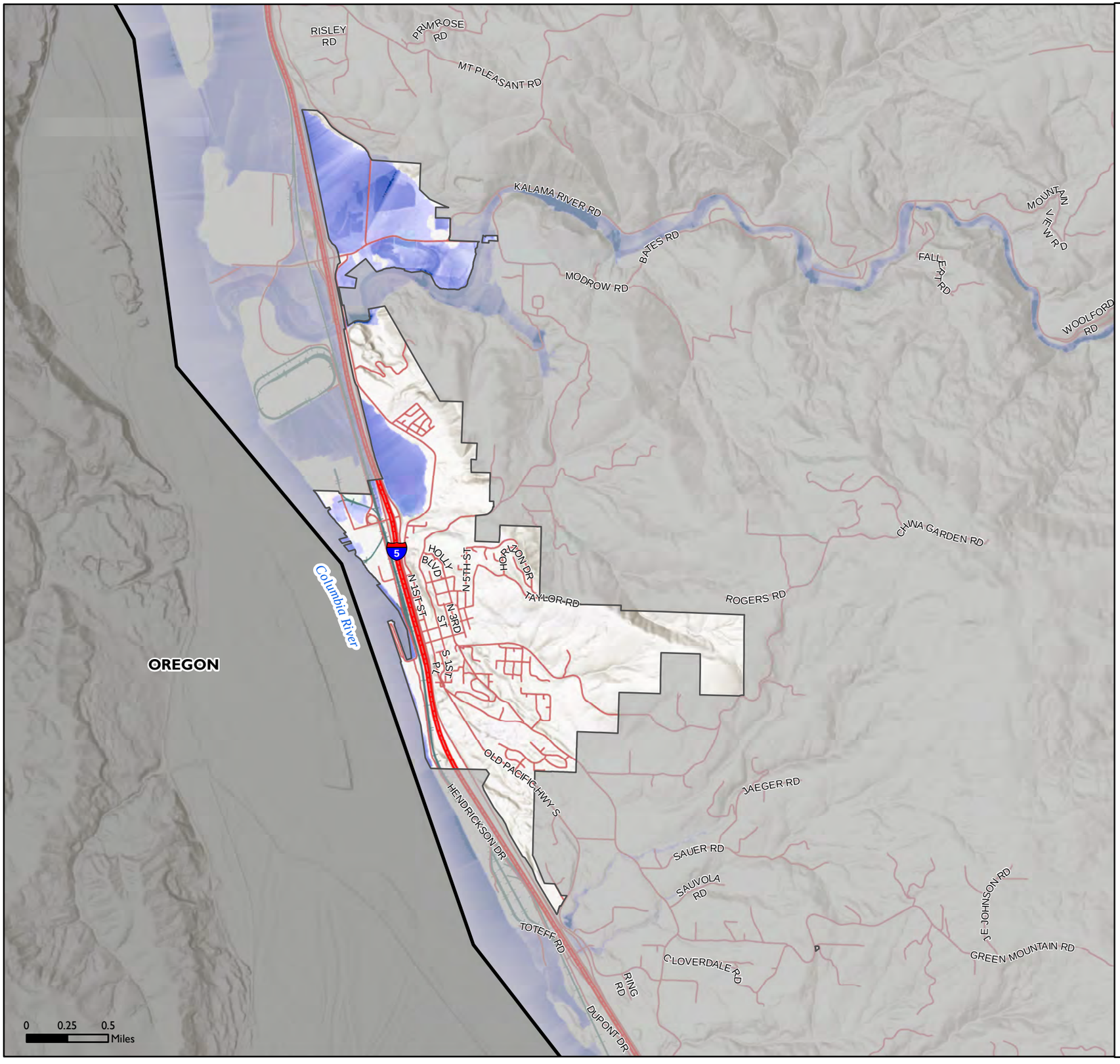
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KALAMA

1% Annual Chance Flood

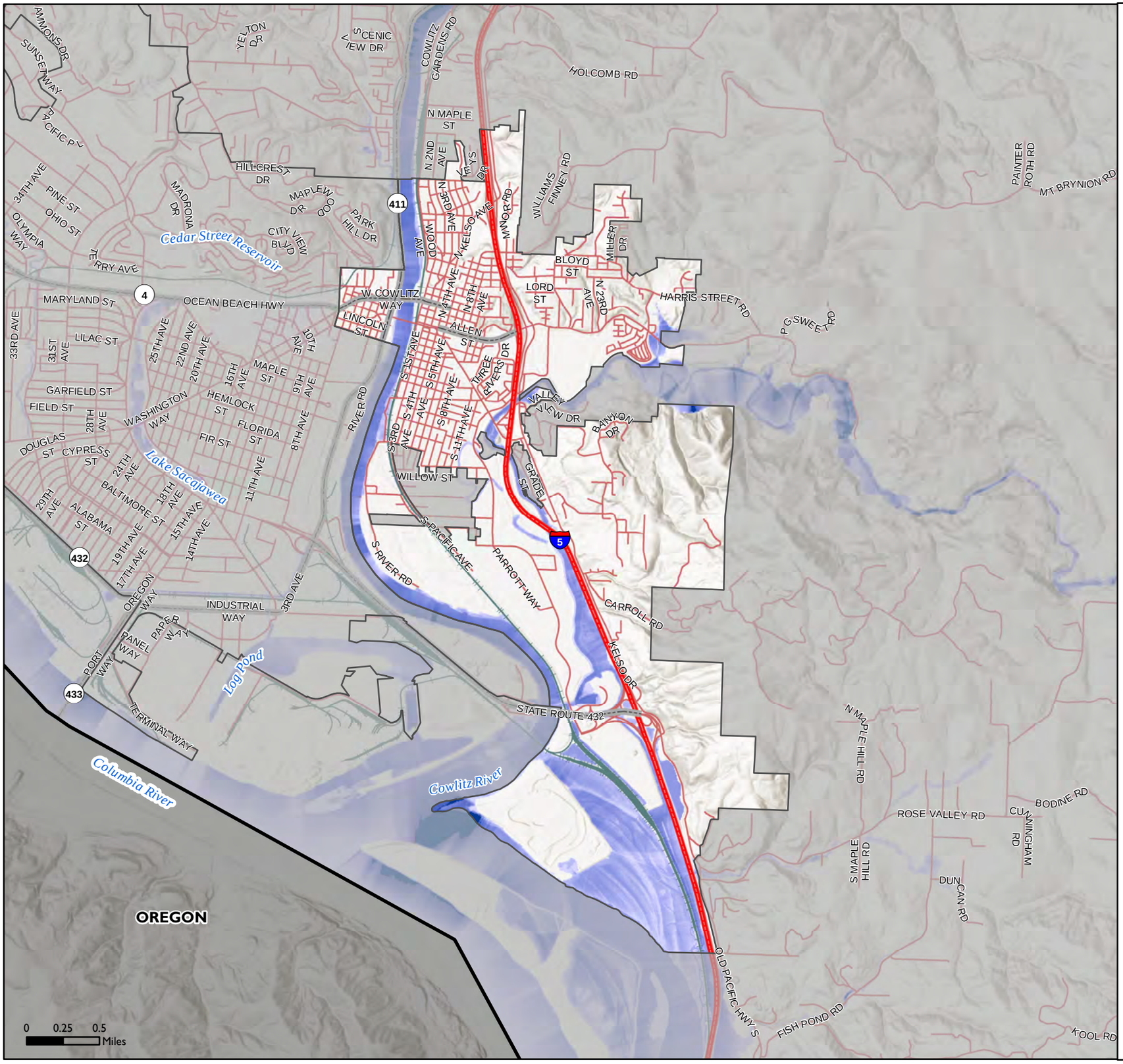
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KELSO

1% Annual Chance Flood

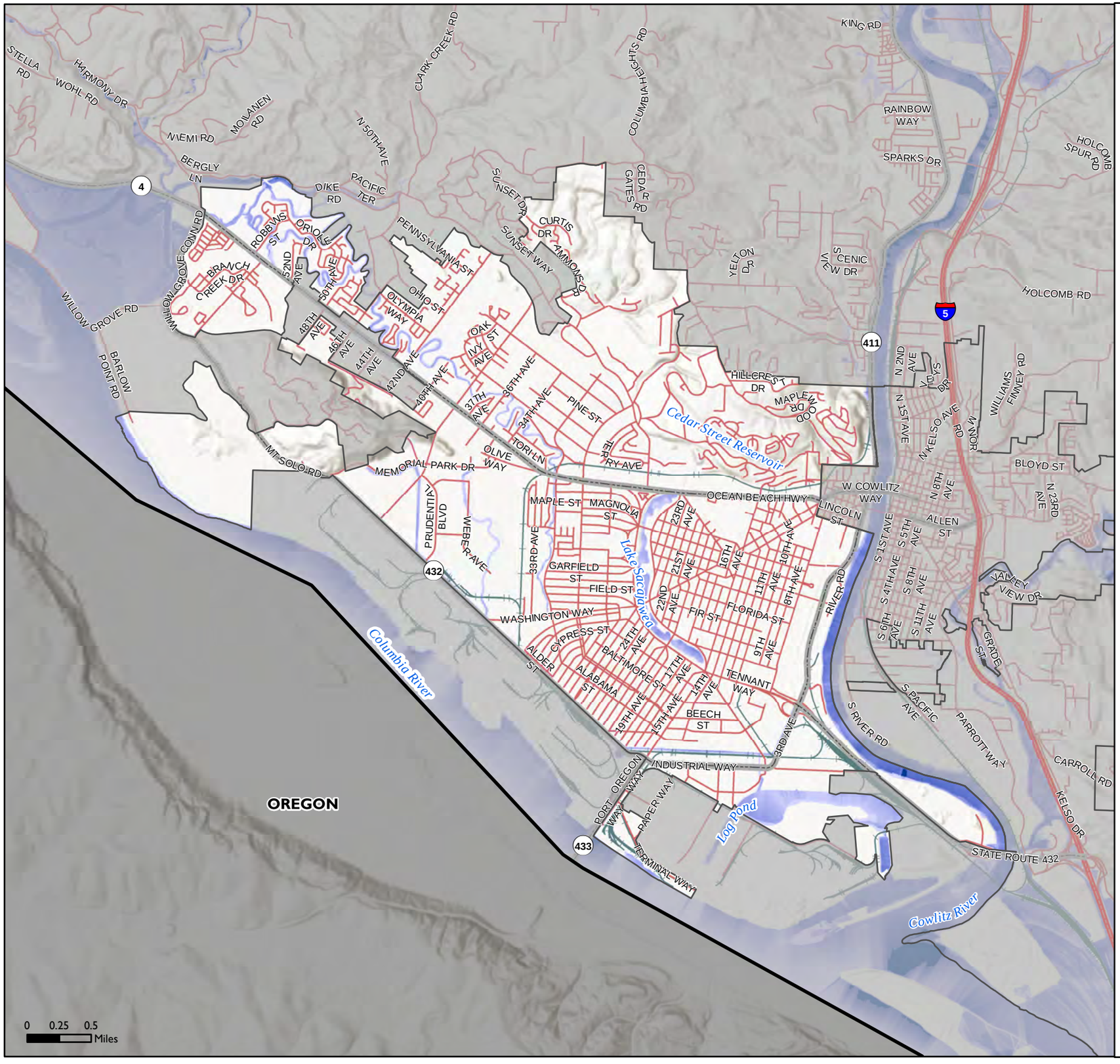
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



LONGVIEW

1% Annual Chance Flood

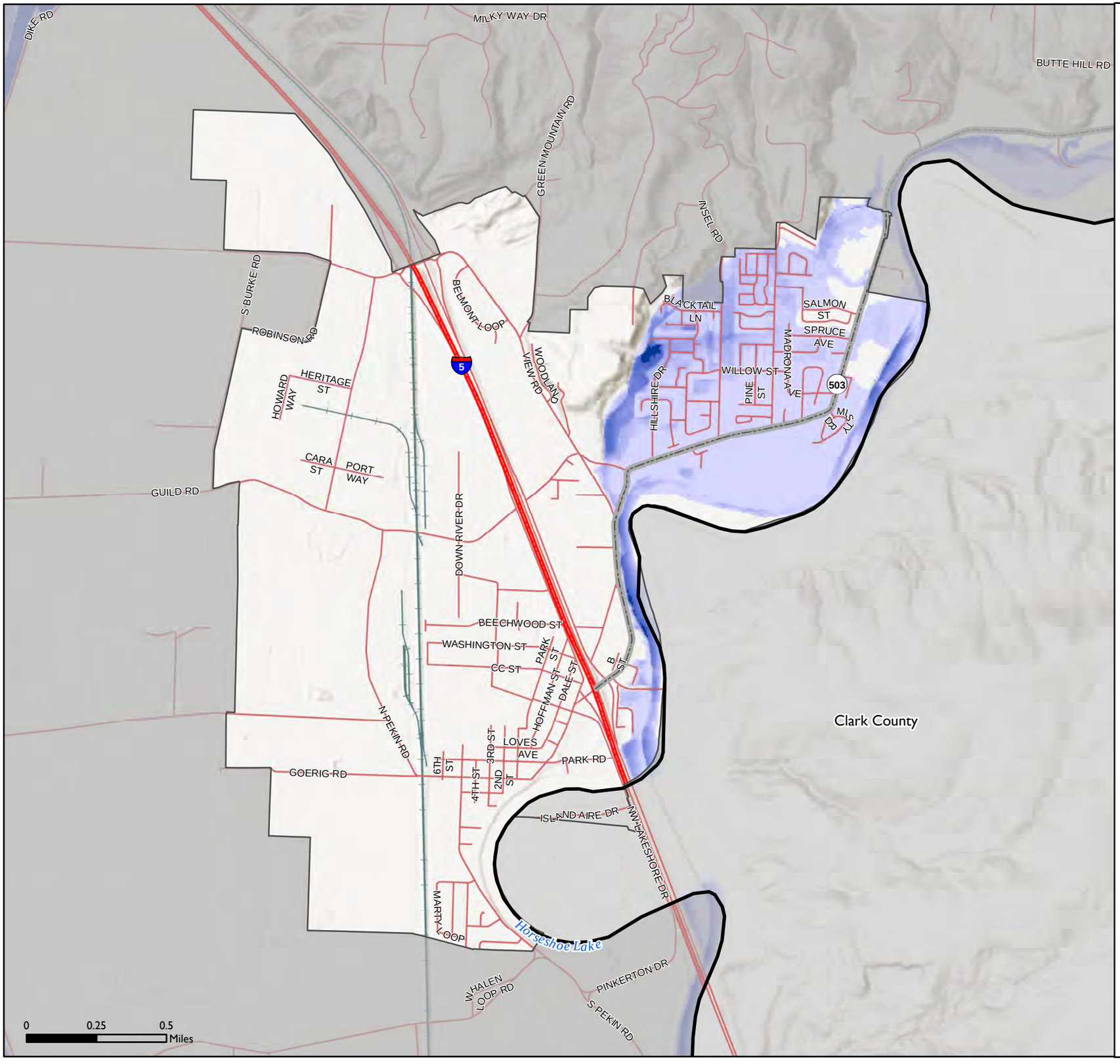
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



WOODLAND

1% Annual Chance Flood

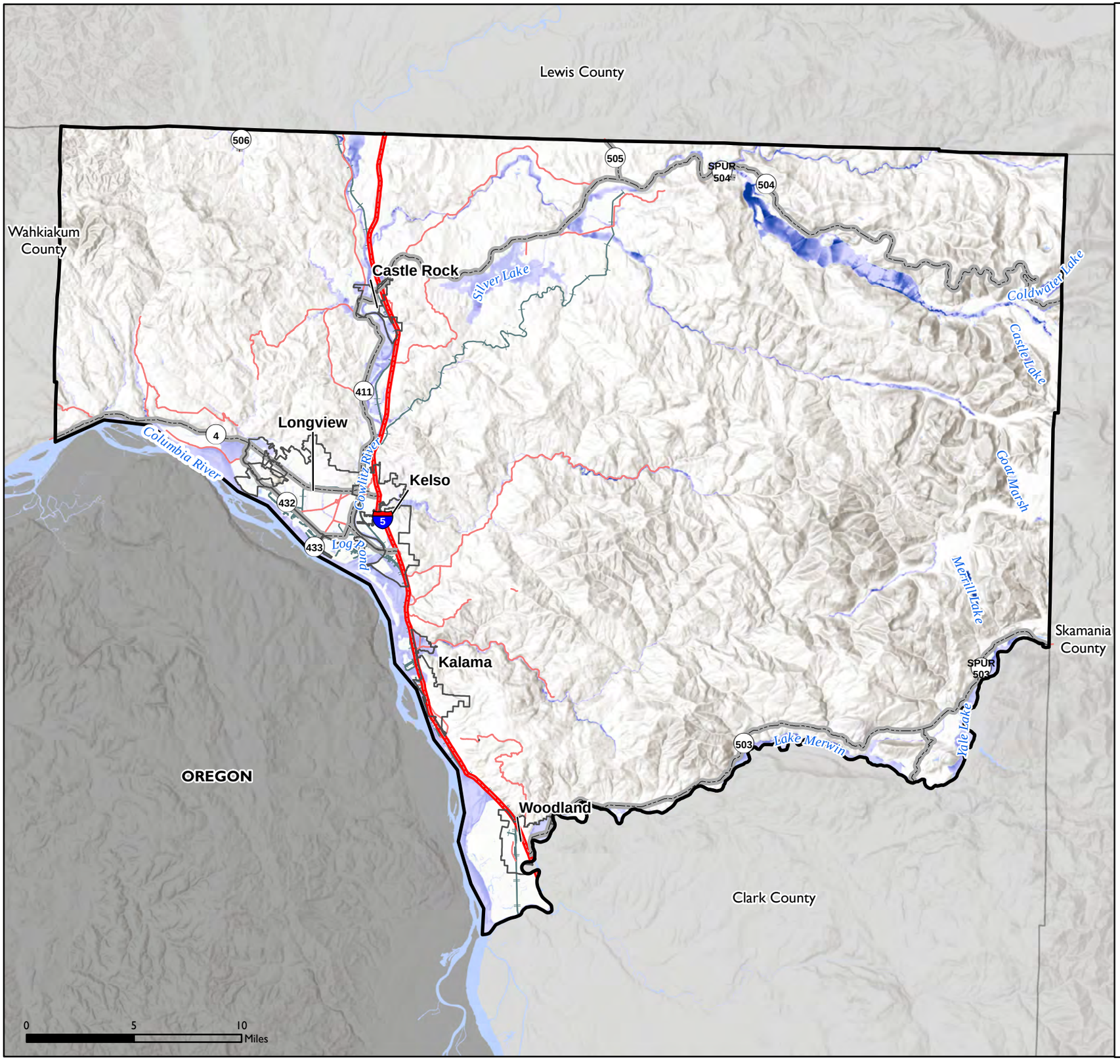
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



Cowlitz County

0.2% Annual Chance Flood

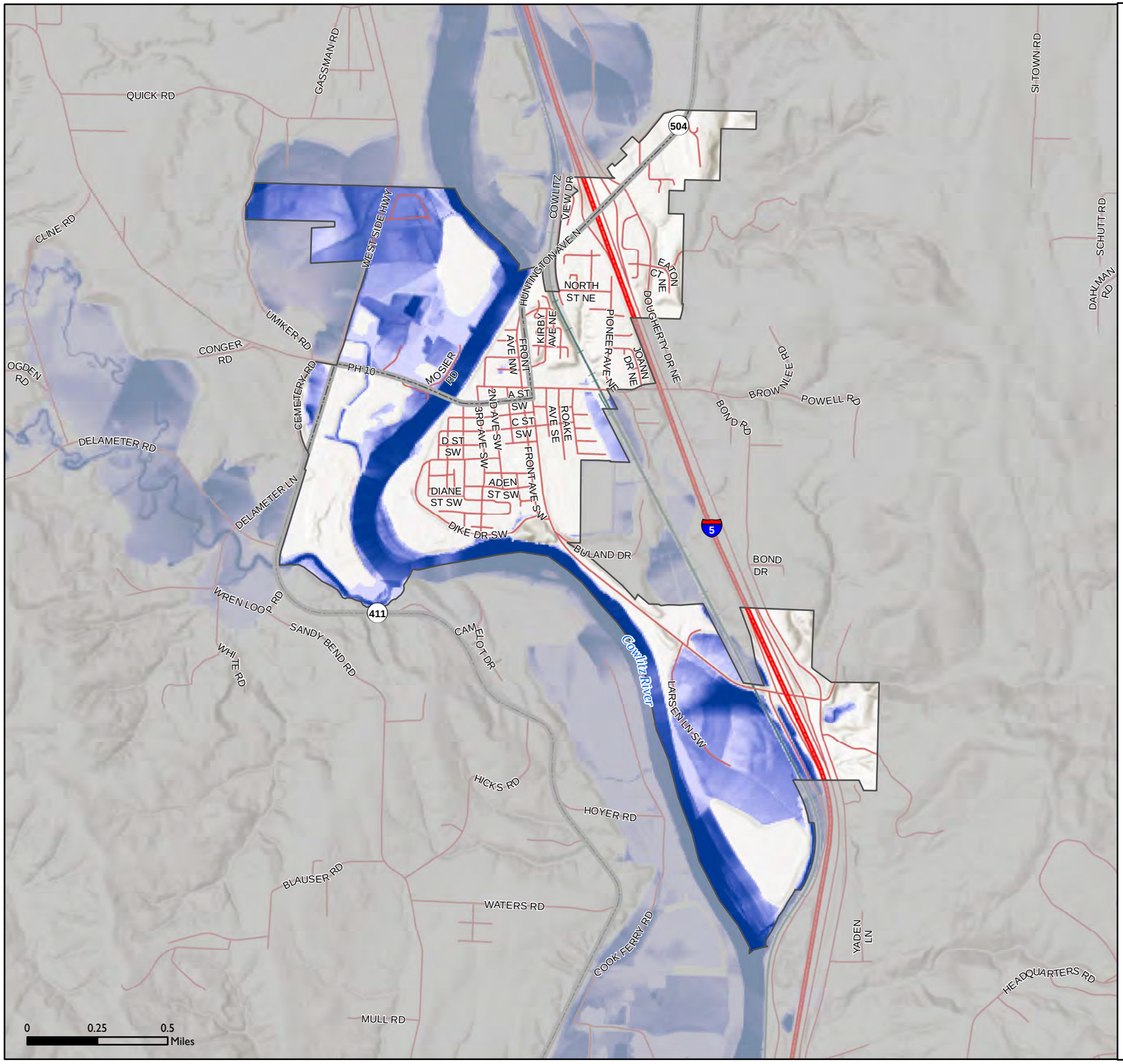
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



CASTLE ROCK

0.2% Annual Chance Flood

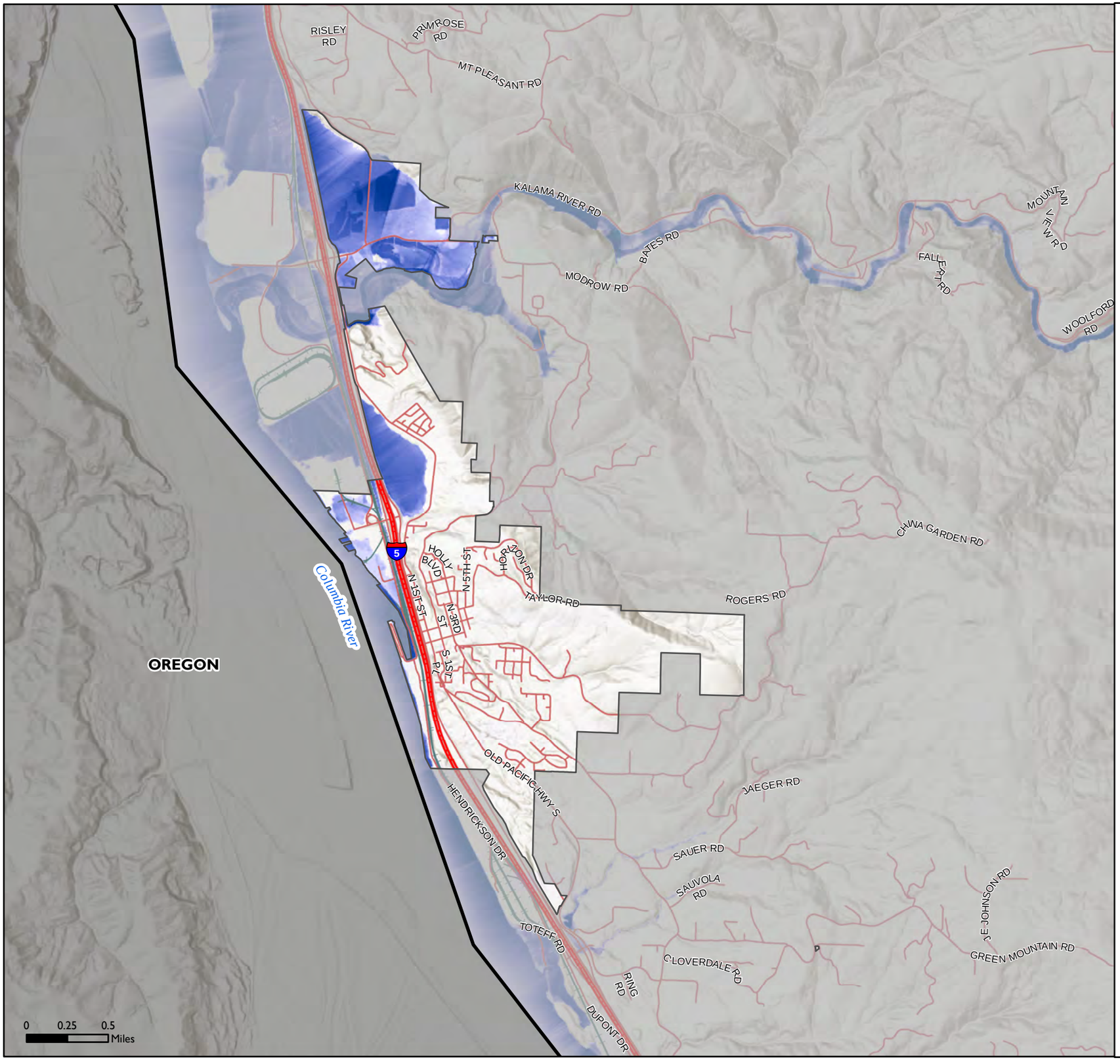
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KALAMA

0.2% Annual Chance Flood

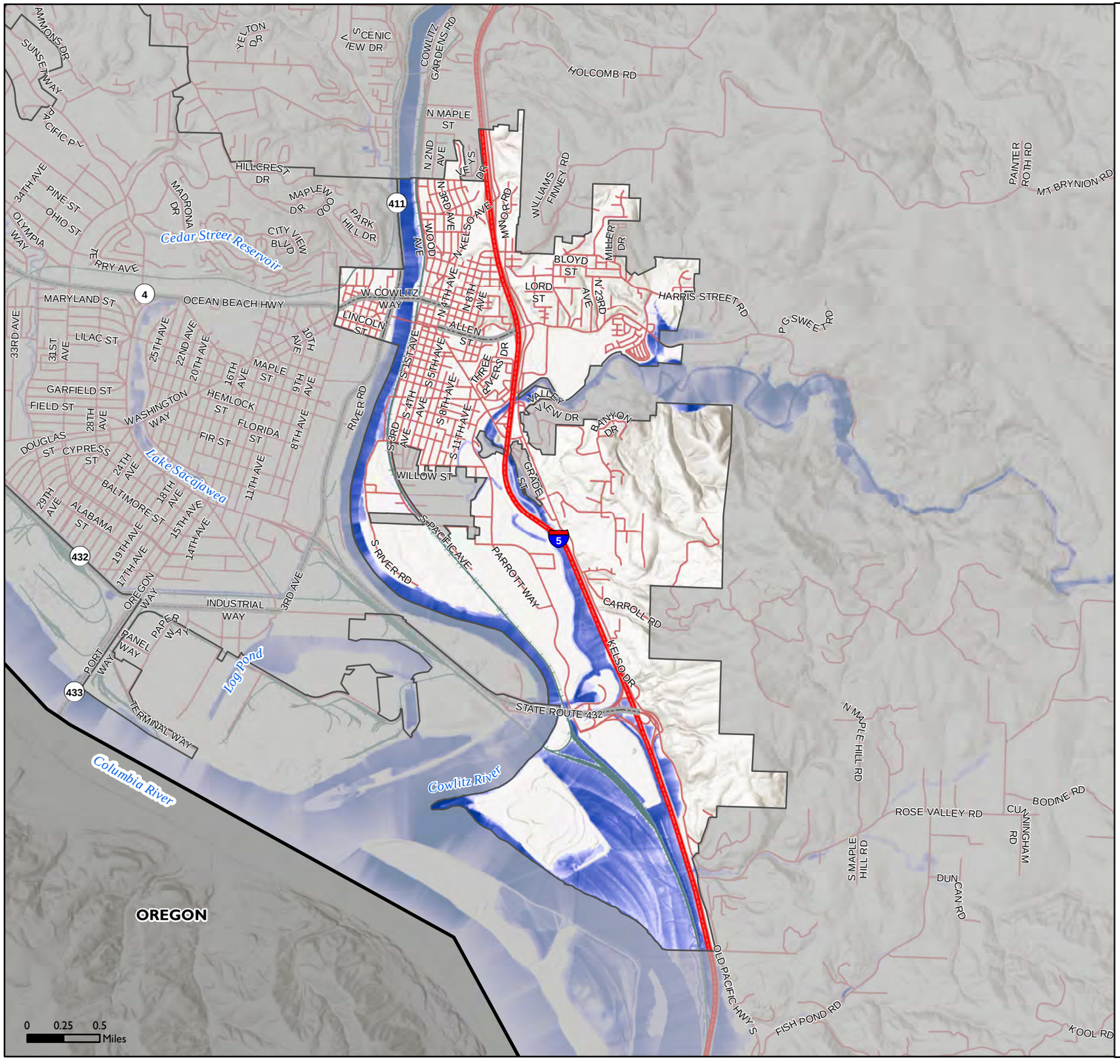
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KELSO

0.2% Annual Chance Flood

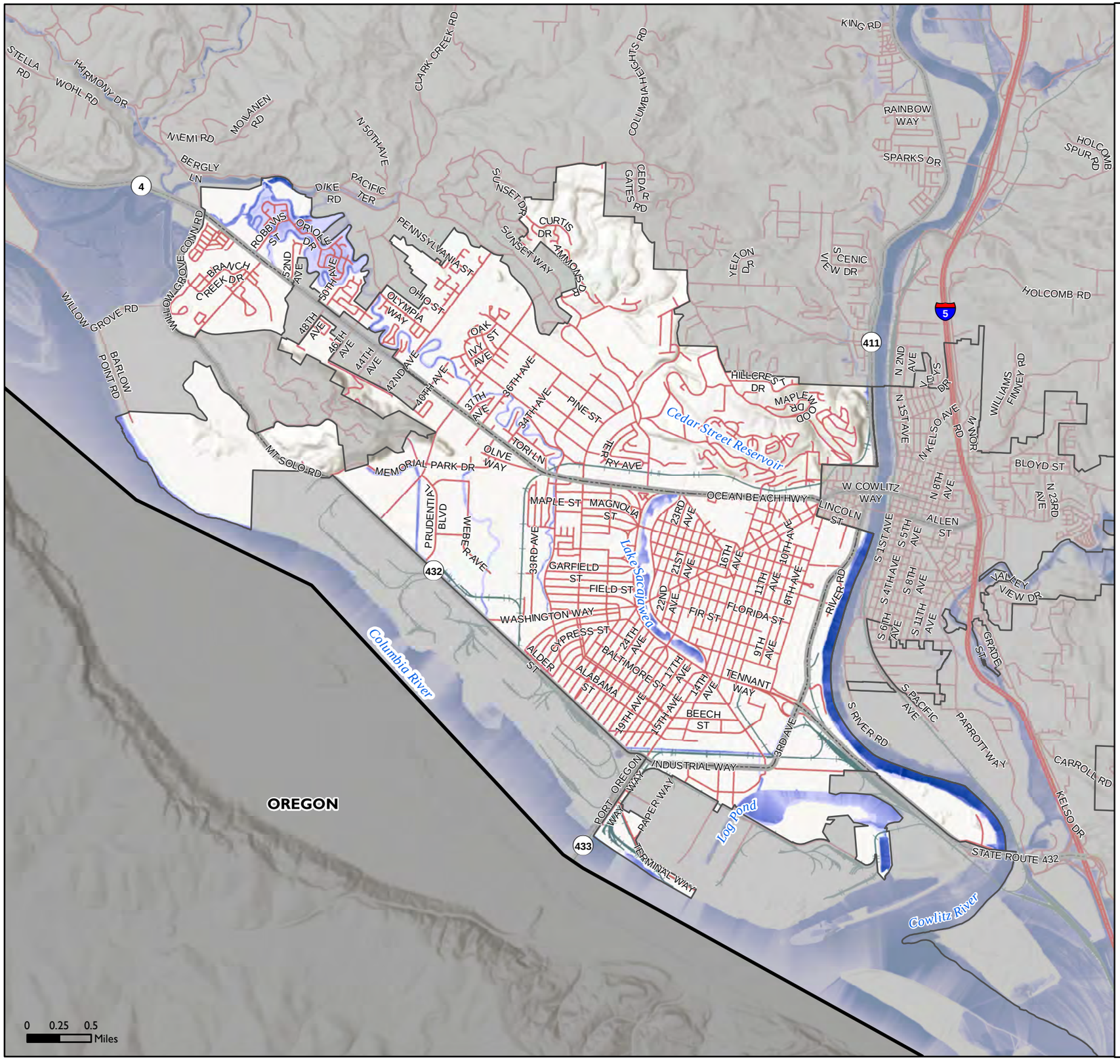
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



LONGVIEW

0.2% Annual Chance Flood

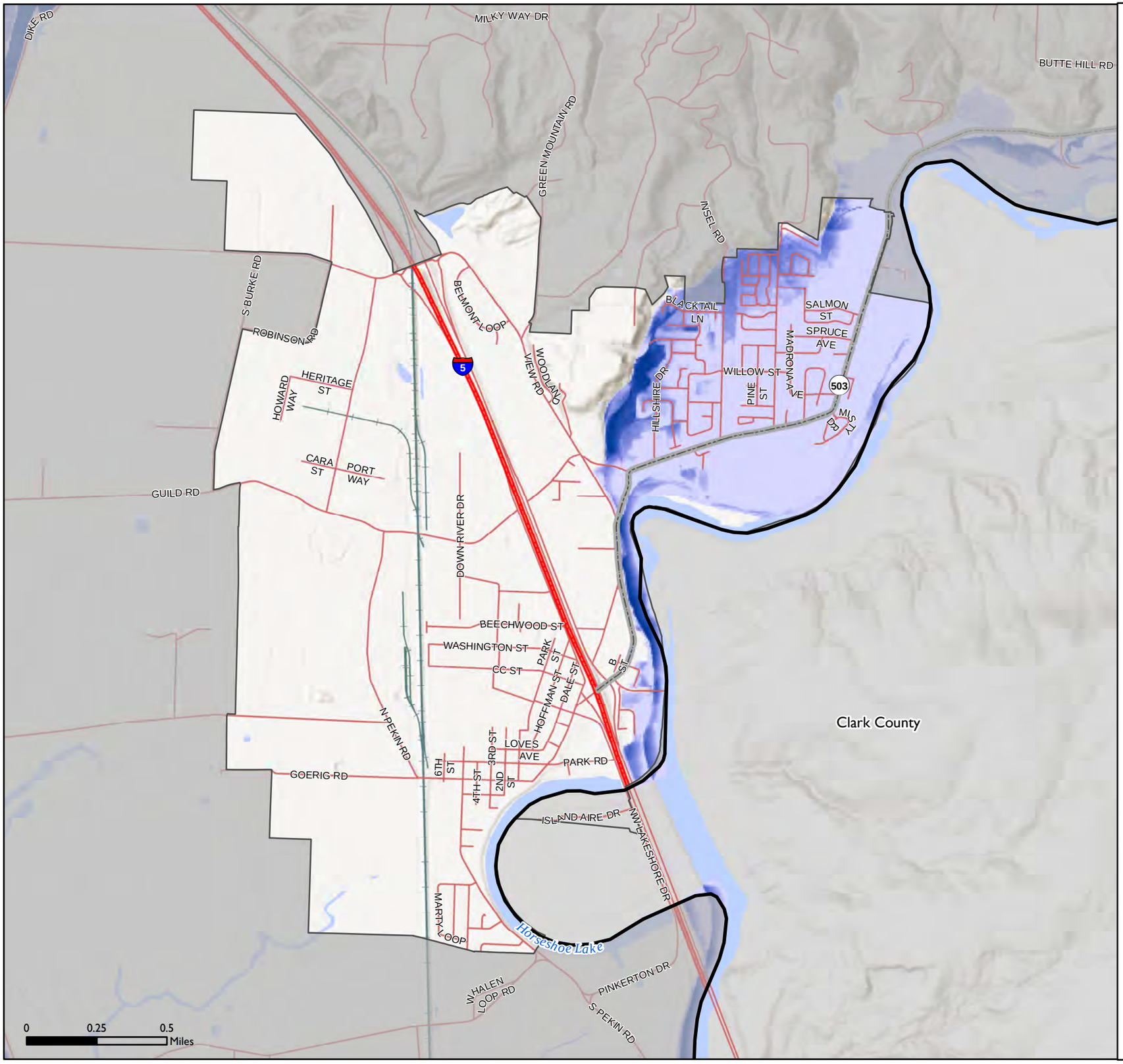
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



WOODLAND

0.2% Annual Chance Flood

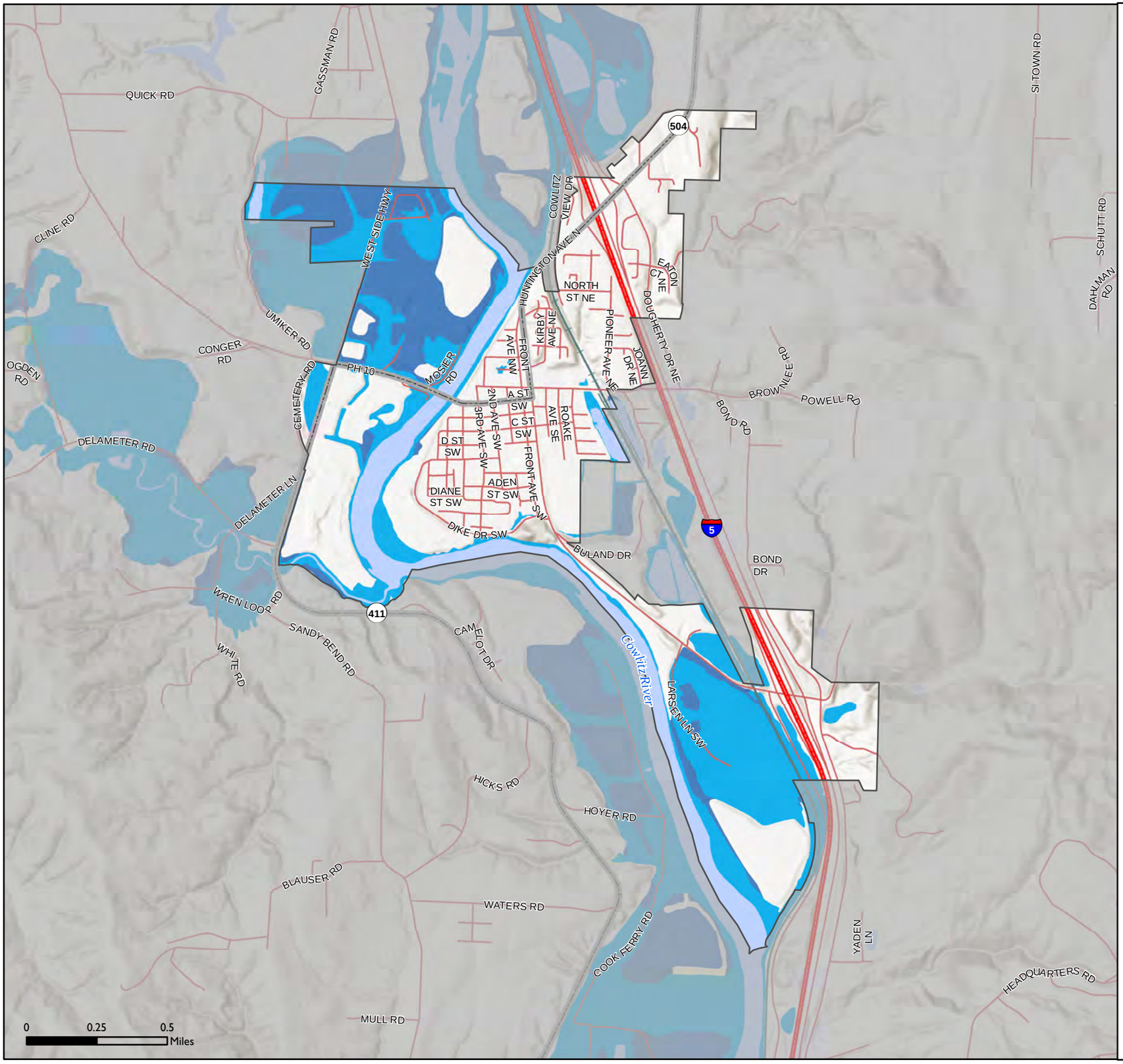
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



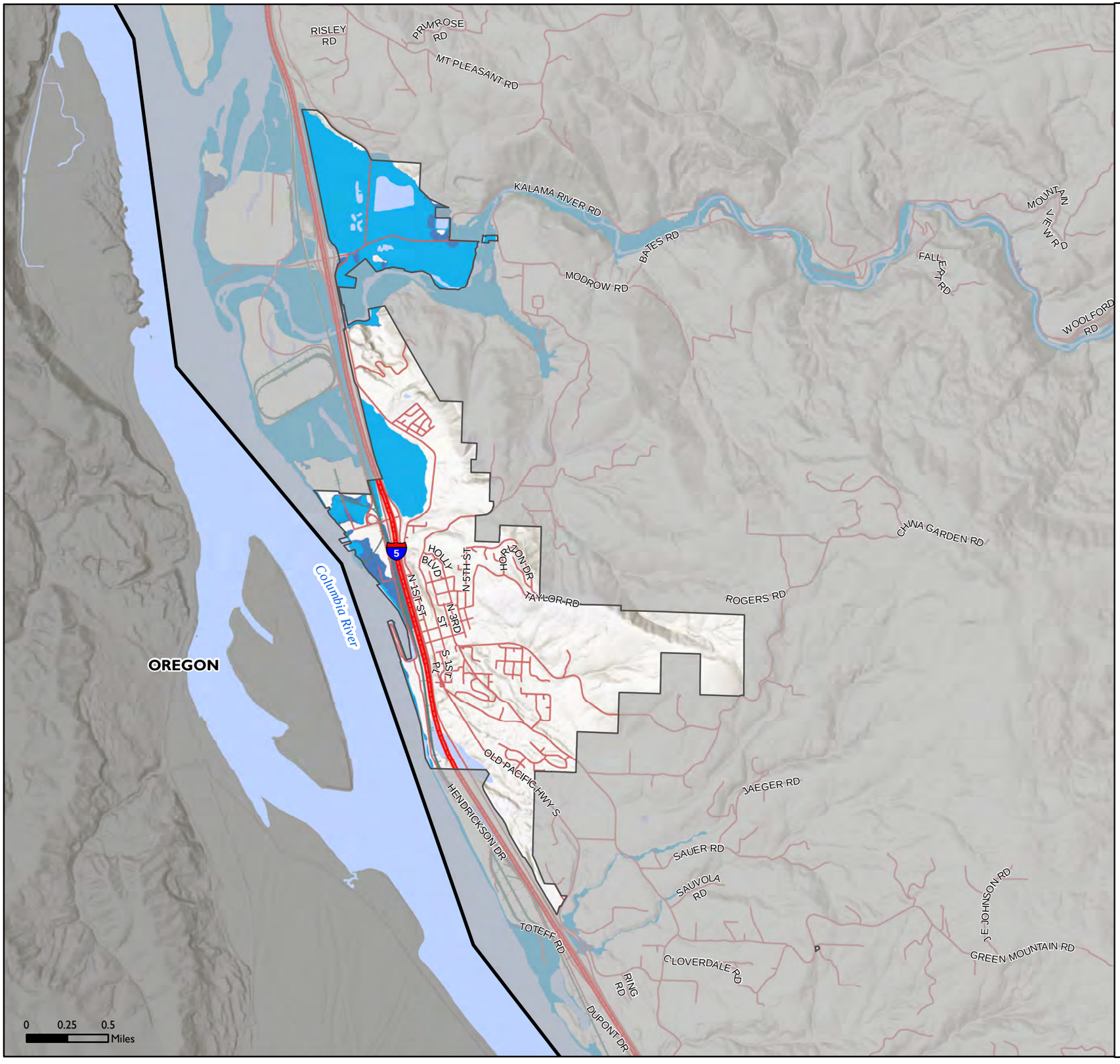
CASTLE ROCK

FEMA Flood Hazard

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody
- 1-Percent Annual Chance Flood
- 0.2-Percent Annual Chance Flood

The flood hazard area depicted is the 12/16/2015 effective DFIRM.

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



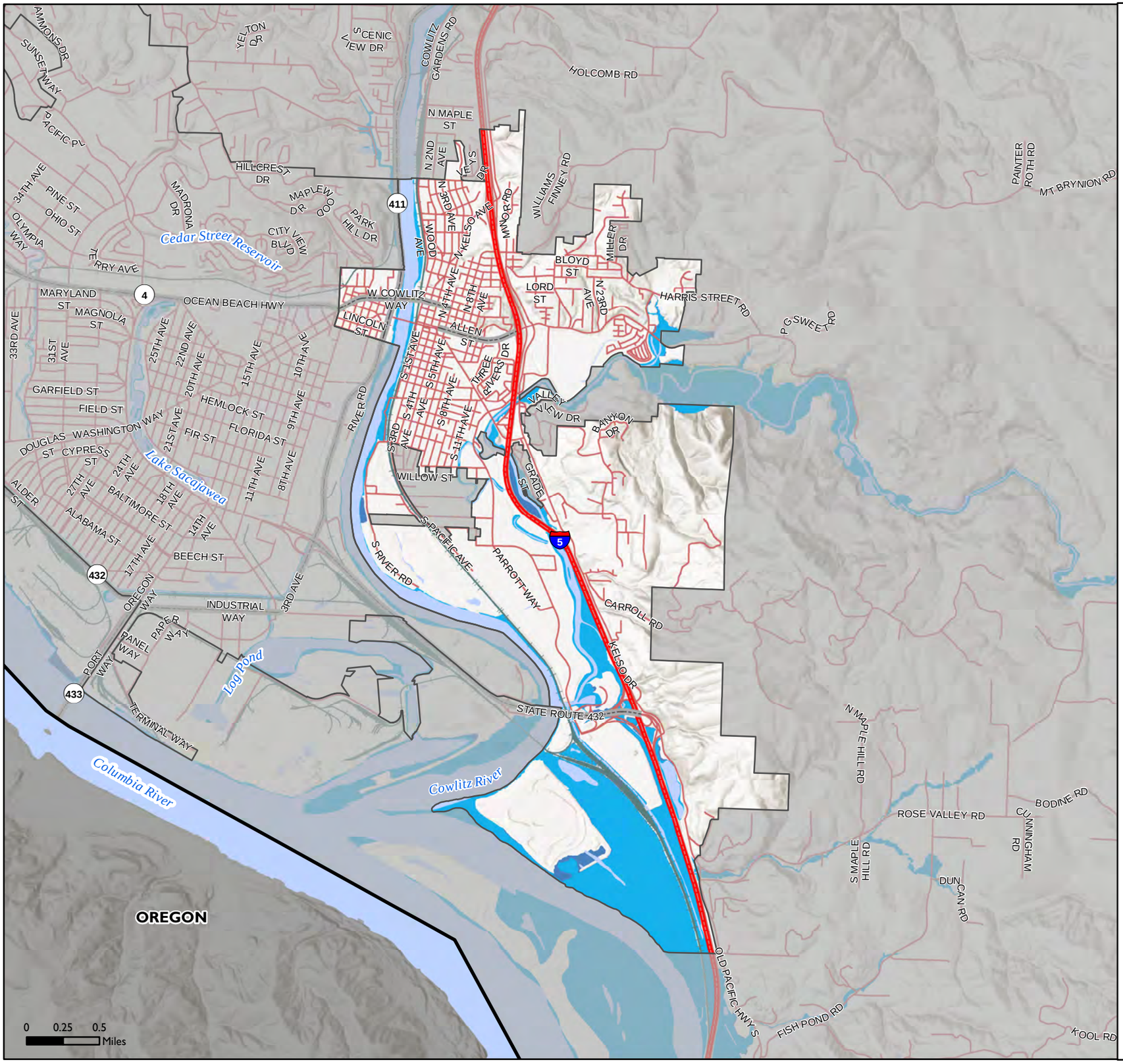
KALAMA

FEMA Flood Hazard

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody
- 1-Percent Annual Chance Flood
- 0.2-Percent Annual Chance Flood

The flood hazard area depicted is the 12/16/2015 effective DFIRM.

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



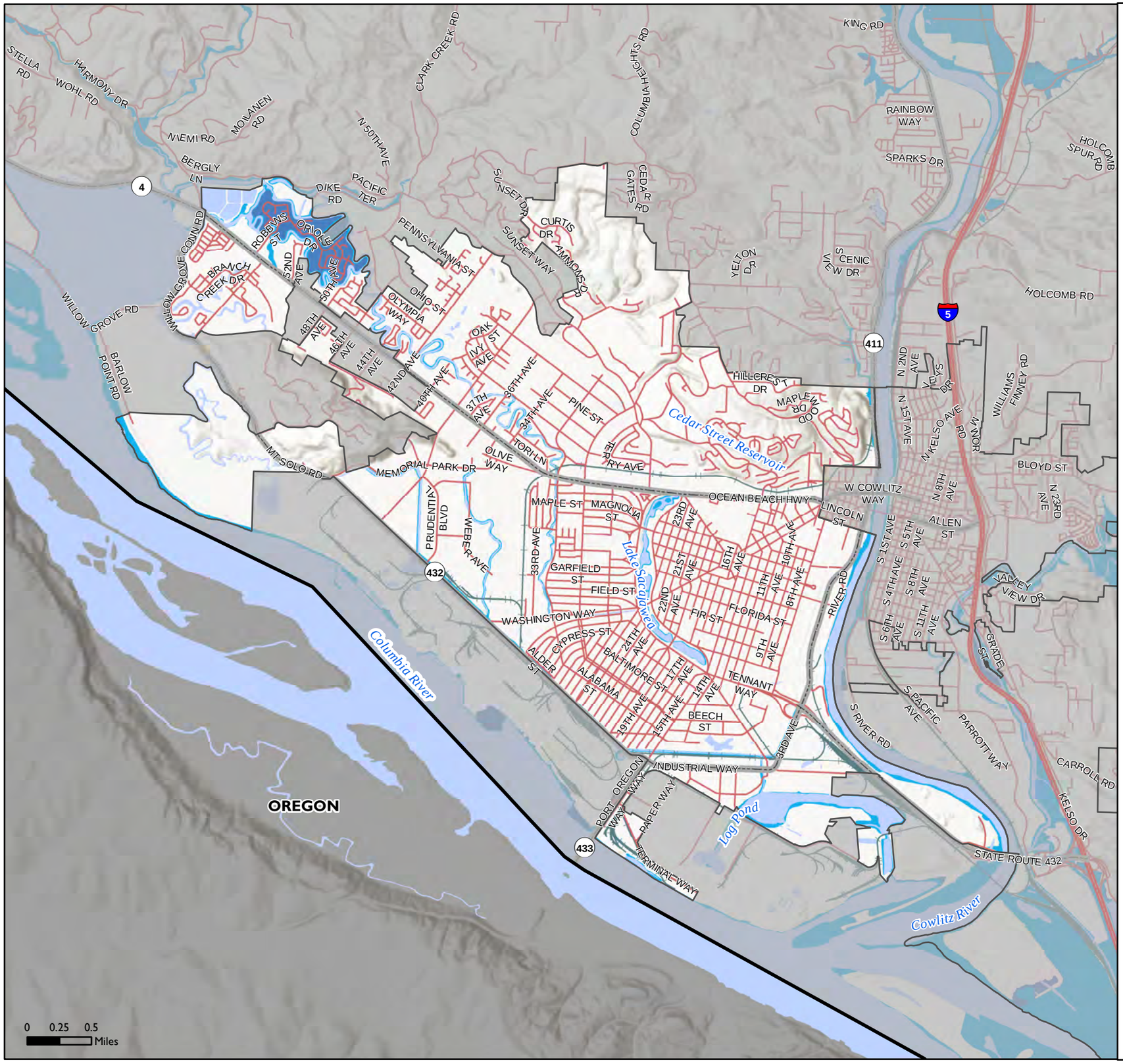
KELSO

FEMA Flood Hazard

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody
- 1-Percent Annual Chance Flood
- 0.2-Percent Annual Chance Flood

The flood hazard area depicted is the 12/16/2015 effective DFIRM.

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



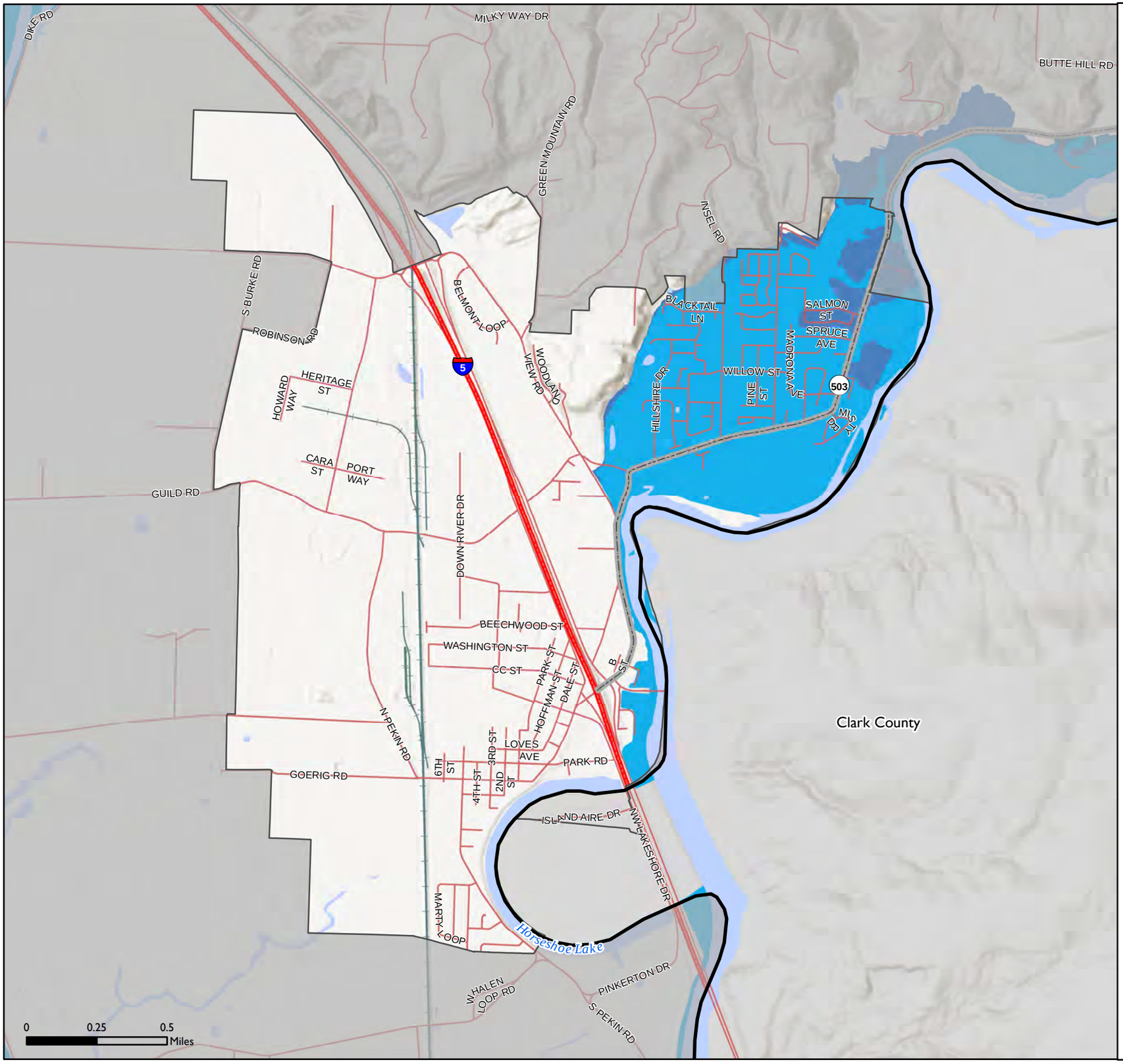
LONGVIEW

FEMA Flood Hazard

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody
- 1-Percent Annual Chance Flood
- 0.2-Percent Annual Chance Flood

The flood hazard area depicted is the 12/16/2015 effective DFIRM.

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



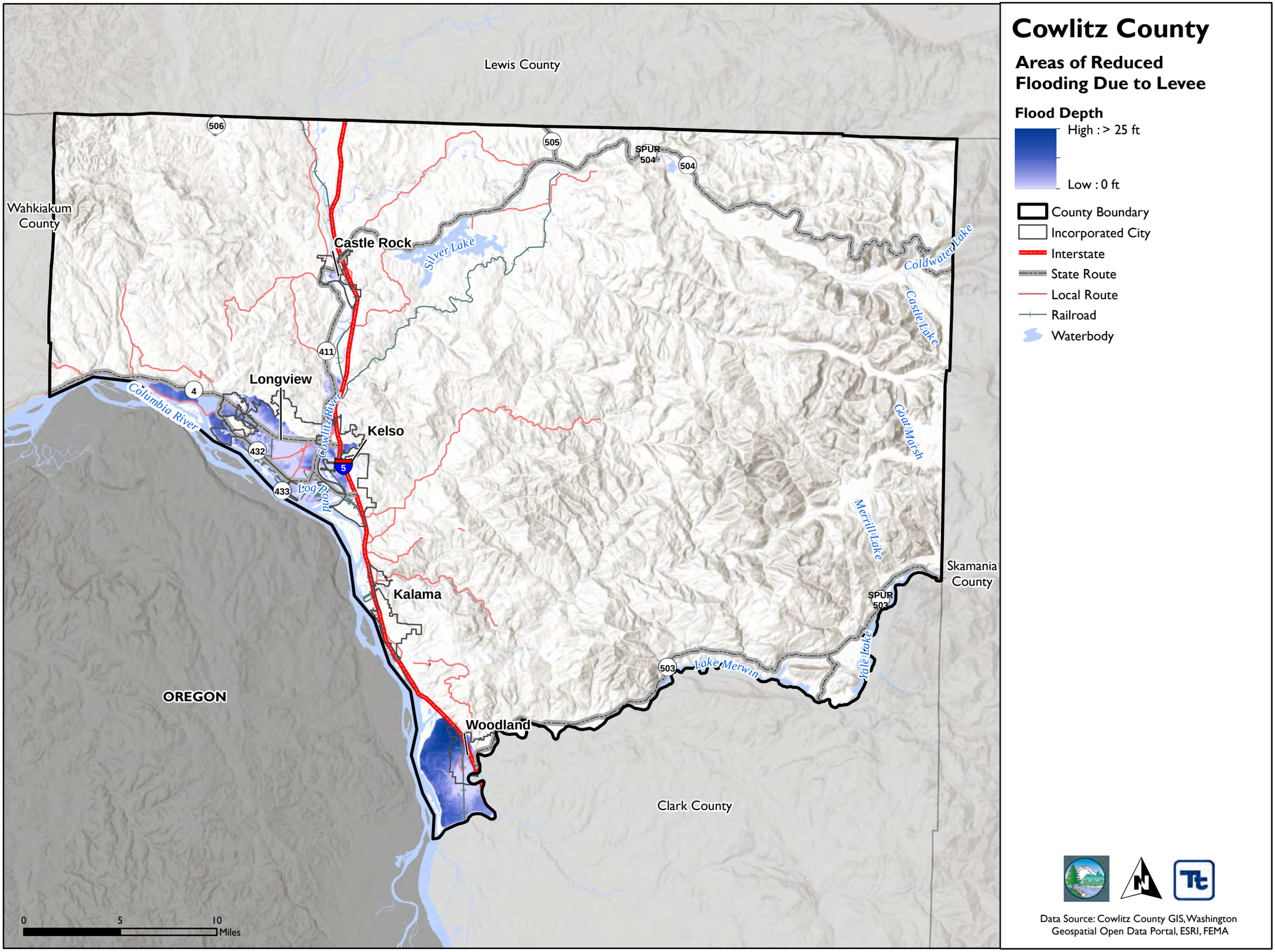
WOODLAND

FEMA Flood Hazard

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody
- 1-Percent Annual Chance Flood
- 0.2-Percent Annual Chance Flood

The flood hazard area depicted is the 12/16/2015 effective DFIRM.

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



Cowlitz County

Areas of Reduced Flooding Due to Levee

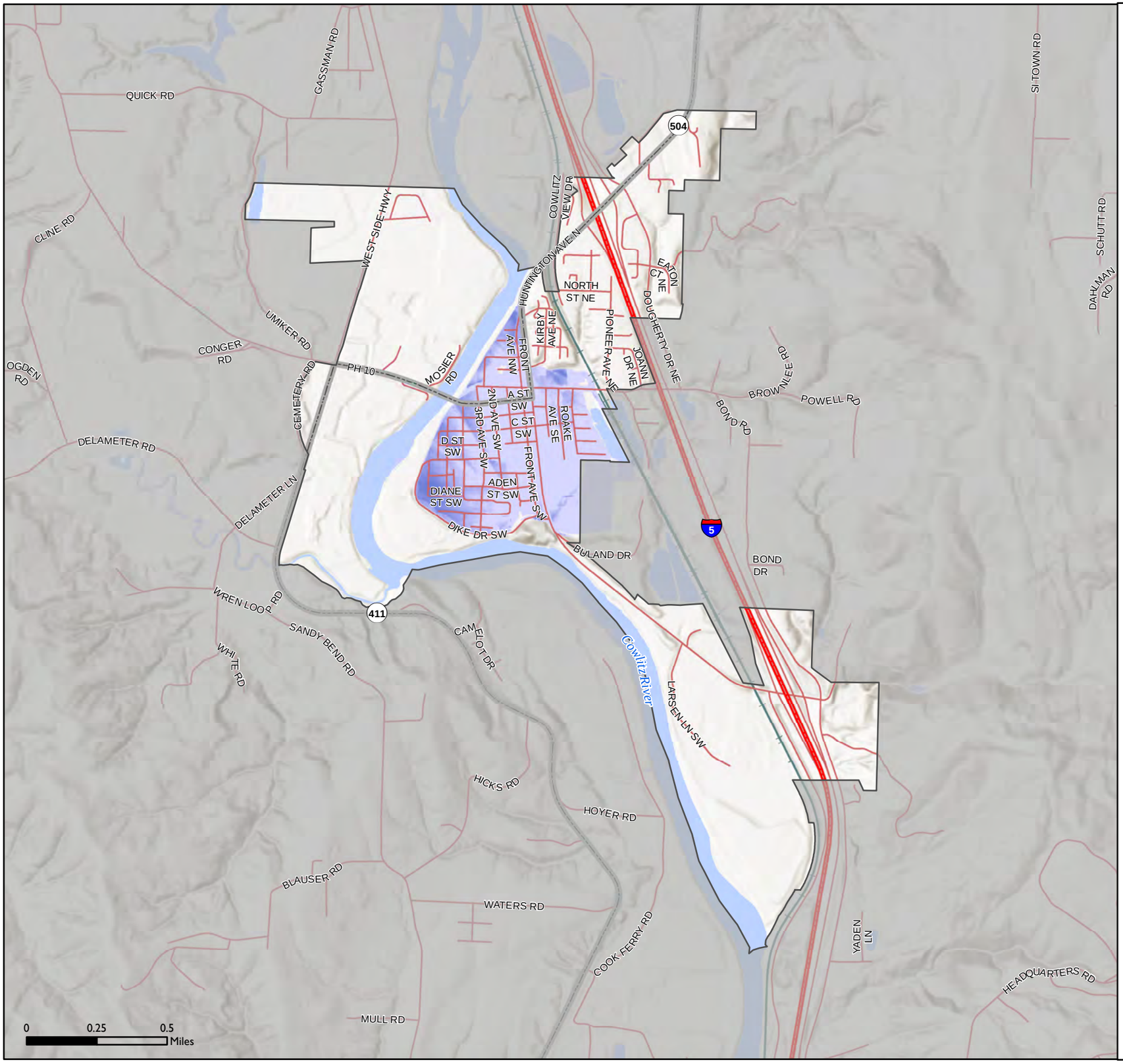
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



CASTLE ROCK

Areas of Reduced Flooding Due to Levee

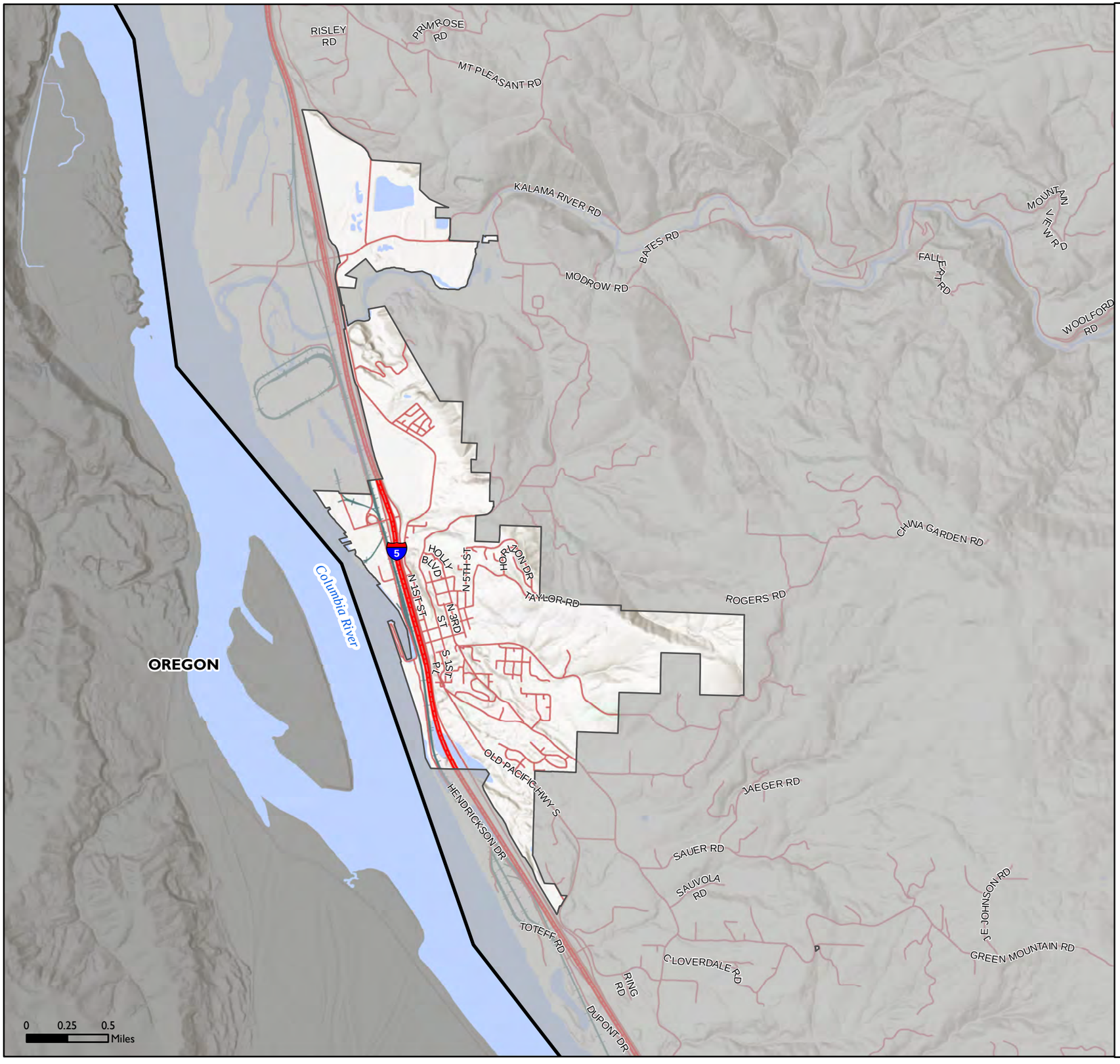
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KALAMA

Areas of Reduced Flooding Due to Levee

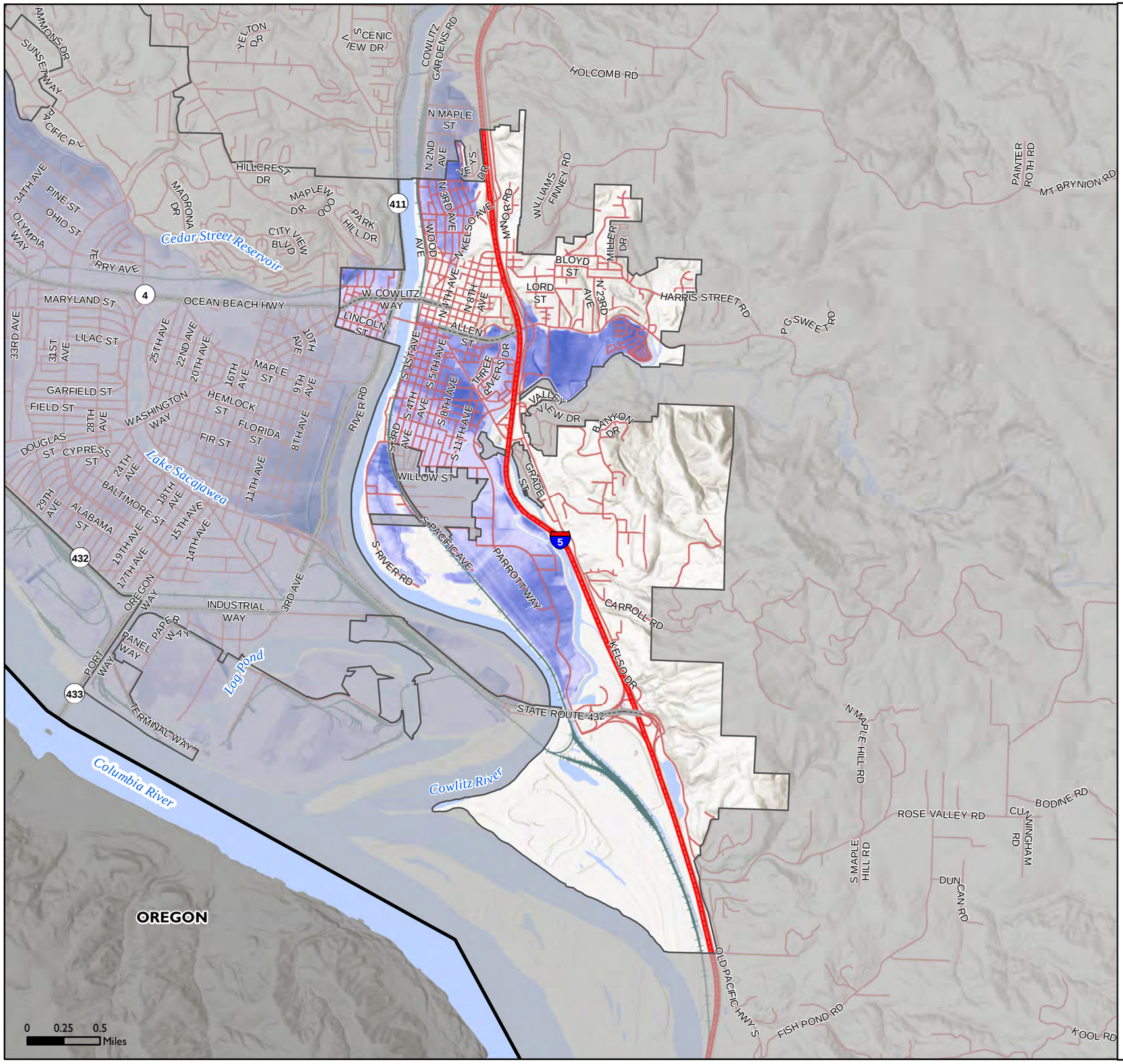
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



KELSO

Areas of Reduced Flooding Due to Levee

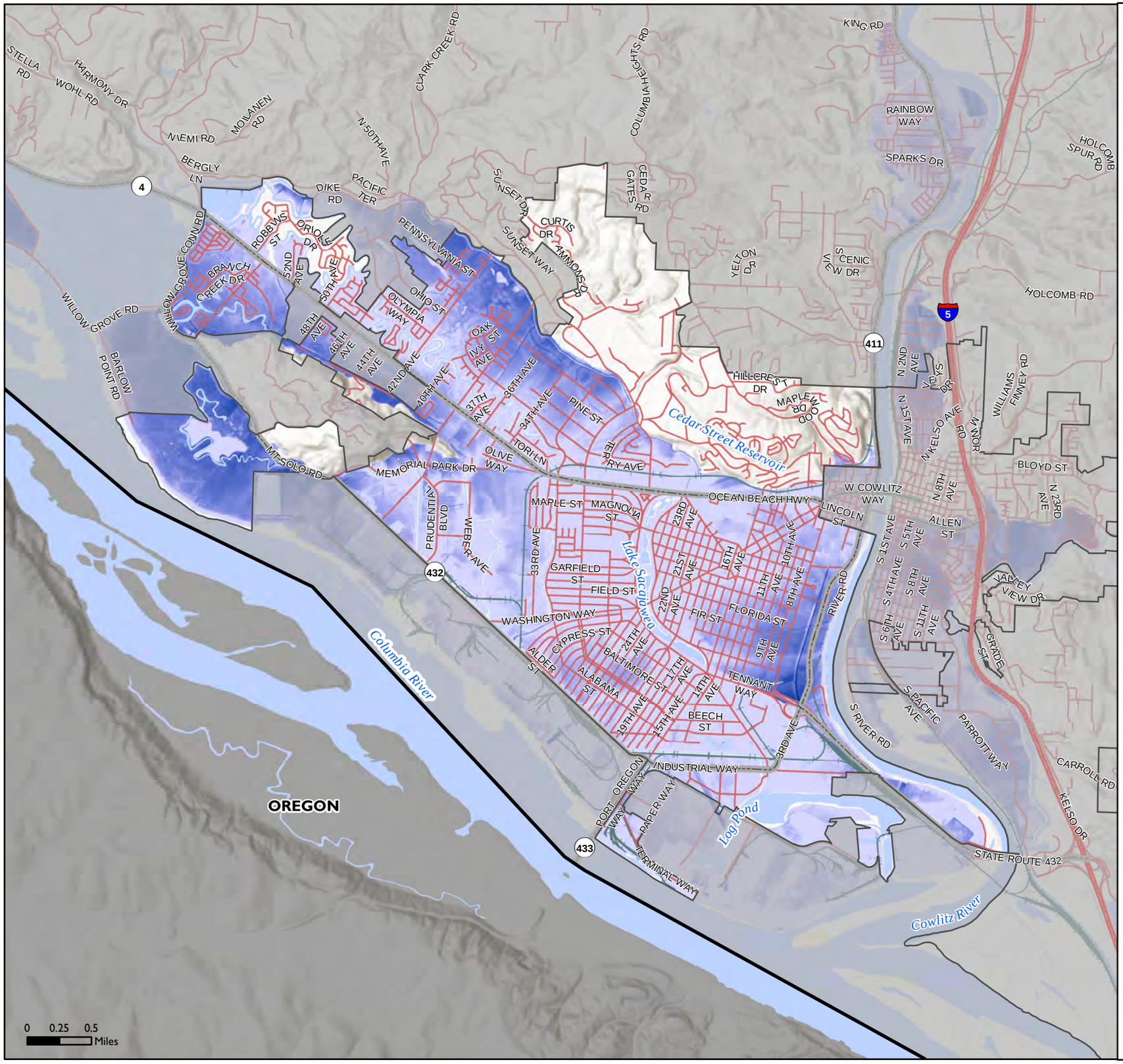
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



LONGVIEW

Areas of Reduced Flooding Due to Levee

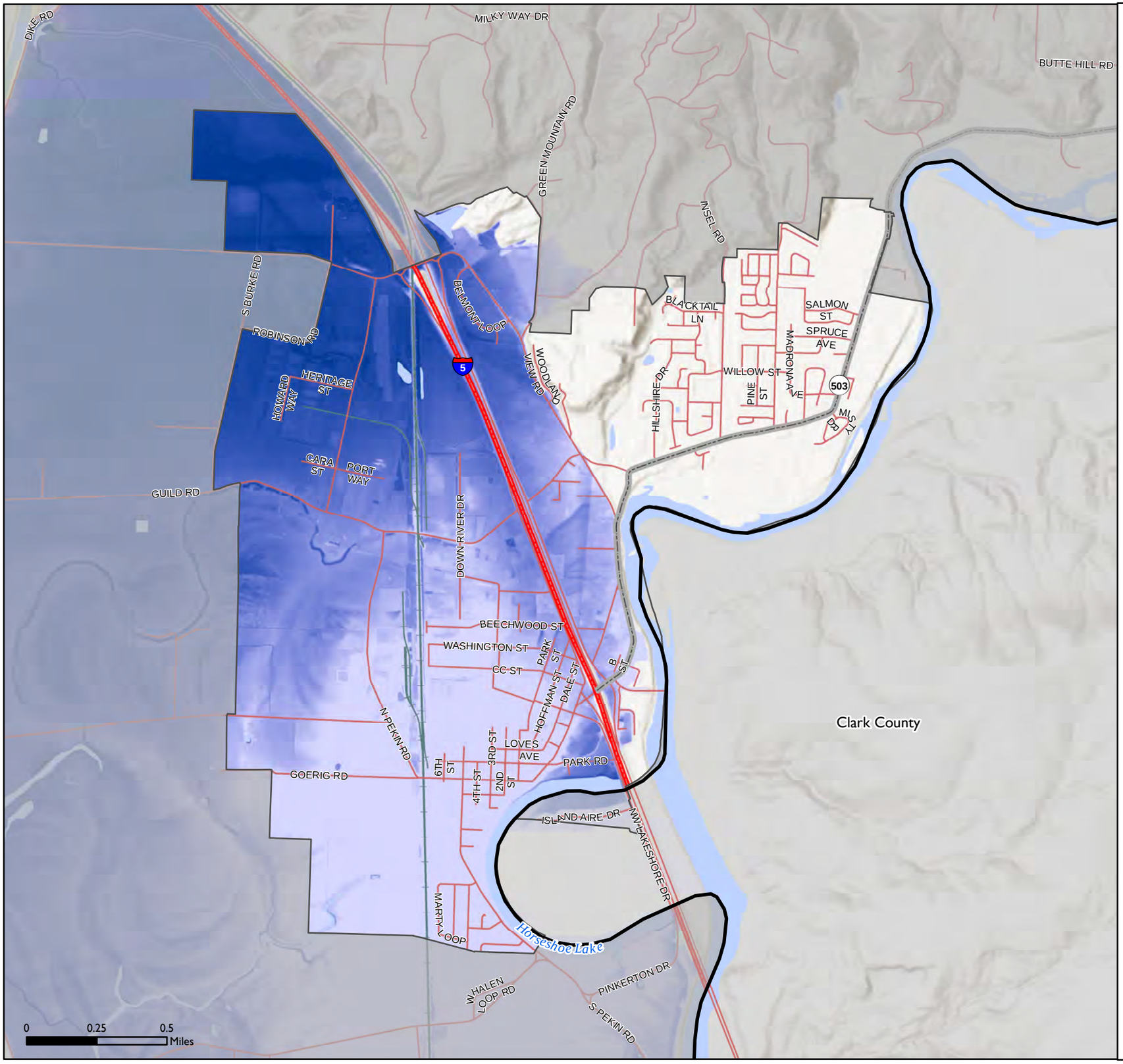
Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA



WOODLAND

Areas of Reduced Flooding Due to Levee

Flood Depth

High : > 25 ft

Low : 0 ft

- County Boundary
- Incorporated City
- Interstate
- State Route
- Local Route
- Railroad
- Waterbody

Data Source: Cowlitz County GIS, Washington Geospatial Open Data Portal, ESRI, FEMA

Appendix F. Detailed Risk Assessment Results

F. Detailed Risk Assessment Results

EXISTING COUNTYWIDE CONDITIONS

Population and Building Count

Jurisdiction	Estimated Population	Total Number of Buildings	Total Number of Residential Buildings	Total Building Value (Structure and contents in $)
Castle Rock	2,445	948	825	$1,038,833,188
Kalama	3,065	1,118	1,044	$908,493,468
Kelso	12,720	3,906	3,540	$4,413,987,297
Longview	37,780	12,444	11,484	$10,937,028,891
Woodland (Cowlitz Co.)	6,490	1,933	1,652	$3,026,005,912
Uninc. Co - CDID 1	1,450	636	573	$4,402,853,148
Uninc. Co - CDID 3	3	1	1	$457,475
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	5,918	2,363	2,339	$1,059,695,023
Uninc. Co - Columbia	33	16	13	$69,886,252
Uninc. Co - Delameter	1,384	553	547	$258,613,672
Uninc. Co - Diking Improvement District 1	496	204	196	$68,578,211
Uninc. Co - Drains to Diking Improvement District 1	122	48	48	$15,883,251
Uninc. Co - Kalama	2,748	1,103	1,086	$741,031,487
Uninc. Co - Leckler	1,665	664	658	$316,992,381
Uninc. Co - Lewis - Woodland Cougar	7,907	3,200	3,125	$1,872,582,609
Uninc. Co - Lewis - Woodland Cougar - CDID 2	737	308	291	$258,159,506
Uninc. Co - Lexington Flood Control District	3,365	1,359	1,330	$813,550,294
Uninc. Co - Ostrander	2,057	830	813	$335,070,603

Jurisdiction	Estimated Population	Total Number of Buildings	Total Number of Residential Buildings	Total Building Value (Structure and contents in $)
Uninc. Co - Rose Valley - Coweeman	5,362	2,176	2,119	$990,736,558
Uninc. Co - Ryderwood	734	300	290	$90,525,608
Uninc. Co - Silver Lake Flood Control District	1,382	554	546	$183,135,240
Uninc. Co - Toutle	5,346	2,153	2,113	$979,954,943
Uninc. Co - Upper Cowlitz	1,615	645	638	$405,406,026
Uninc. Co - Westover	3,864	1,540	1,527	$688,113,869
Uninc. Co - Willow Grove Diking District	147	58	58	$22,083,450
Total	**108,835**	**39,060**	**36,856**	**$33,897,658,363**

Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	1	0	2	8	5	**16**
Kalama	0	0	0	0	0	6	5	**11**
Kelso	1	0	2	0	4	17	25	**49**
Longview	4	0	2	0	30	37	9	**82**
Woodland (Cowlitz Co.)	4	0	0	0	4	12	9	**29**
Unincorporated	33	5	5	0	13	43	135	**234**
Total	**42**	**5**	**10**	**0**	**53**	**123**	**188**	**421**

10% ANNUAL CHANCE (10-YEAR) FLOOD

Exposed Population and Buildings by Value

Jurisdiction	Buildings Exposed	Population Exposed	% of Population Exposed	Value Structure in $ Exposed	Value Contents in $ Exposed	Value (Structure and contents in $) Exposed	% of Total Value Exposed
Castle Rock	0	0	0.0%	$0	$0	$0	0.0%
Kalama	4	0	0.0%	$20,183,280	$20,183,280	$40,366,560	4.4%
Kelso	0	0	0.0%	$0	$0	$0	0.0%
Longview	0	0	0.0%	$0	$0	$0	0.0%
Woodland (Cowlitz Co.)	31	122	1.9%	$8,219,341	$4,109,671	$12,329,012	0.4%
Uninc. Co - CDID 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - CDID 3	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	11	28	0.5%	$1,760,174	$880,087	$2,640,260	0.2%
Uninc. Co - Columbia	10	23	69.2%	$5,736,666	$5,352,892	$11,089,558	15.9%
Uninc. Co - Delameter	1	3	0.2%	$183,295	$91,647	$274,942	0.1%
Uninc. Co - Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Kalama	44	106	3.9%	$7,851,843	$5,115,170	$12,967,013	1.7%
Uninc. Co - Leckler	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar	3	8	0.1%	$709,216	$354,608	$1,063,825	0.1%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	4	10	1.4%	$247,005	$123,502	$370,507	0.1%
Uninc. Co - Lexington Flood Control District	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Ostrander	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Rose Valley - Coweeman	4	10	0.2%	$539,631	$269,816	$809,447	0.1%
Uninc. Co - Ryderwood	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Toutle	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	0	0	0.0%	$0	$0	$0	0.0%
Total	**112**	**309**	**0.3%**	**$45,430,450**	**$36,480,673**	**$81,911,123**	**0.2%**

Exposed Area and Buildings by Occupancy Class

Jurisdiction	Acres of Floodplain	Number of Structures in the Floodplain							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	0	0	0	0	0	0	0	0	0
Kalama	388	0	4	0	0	0	0	0	4
Kelso	20	0	0	0	0	0	0	0	0
Longview	25	0	0	0	0	0	0	0	0
Woodland (Cowlitz Co.)	167	31	0	0	0	0	0	0	31
Uninc. Co - CDID 1	9	0	0	0	0	0	0	0	0
Uninc. Co - CDID 3	0	0	0	0	0	0	0	0	0
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	383	11	0	0	0	0	0	0	11
Uninc. Co - Columbia	5,189	9	0	0	0	1	0	0	10
Uninc. Co - Delameter	170	1	0	0	0	0	0	0	1
Uninc. Co - Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Kalama	925	42	1	0	0	1	0	0	44
Uninc. Co - Leckler	0	0	0	0	0	0	0	0	0
Uninc. Co - Lewis - Woodland Cougar	230	3	0	0	0	0	0	0	3
Uninc. Co - Lewis - Woodland Cougar - CDID 2	198	4	0	0	0	0	0	0	4
Uninc. Co - Lexington Flood Control District	0	0	0	0	0	0	0	0	0
Uninc. Co - Ostrander	16	0	0	0	0	0	0	0	0
Uninc. Co - Rose Valley - Coweeman	117	4	0	0	0	0	0	0	4
Uninc. Co - Ryderwood	0	0	0	0	0	0	0	0	0
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	0	0	0	0	0
Uninc. Co - Toutle	214	0	0	0	0	0	0	0	0
Uninc. Co - Upper Cowlitz	15	0	0	0	0	0	0	0	0
Uninc. Co - Westover	0	0	0	0	0	0	0	0	0
Uninc. Co - Willow Grove Diking District	0	0	0	0	0	0	0	0	0
Total	**8,066**	**105**	**5**	**0**	**0**	**2**	**0**	**0**	**112**

Estimated Flood Damage

Jurisdiction	Structure Debris (Tons)	Displaced Population	People Requiring Short-Term Shelter	Buildings Impacted	Value Structure in $ Damaged	Value Contents in $ Damaged	Total Value (Structure and Contents in $) Damaged	% of Total Value Damaged
Castle Rock	0	0	0	0	$0	$0	$0	0.0%
Kalama	123	0	0	4	$2,320,135	$5,376,826	$7,696,960	0.8%
Kelso	0	0	0	0	$0	$0	$0	0.0%
Longview	0	0	0	0	$0	$0	$0	0.0%
Woodland (Cowlitz Co.)	359	93	4	19	$600,814	$280,741	$881,555	0.0%
Uninc. Co - CDID 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - CDID 3	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	100	1	0	4	$140,228	$59,156	$199,384	0.0%
Uninc. Co - Columbia	9	2	1	10	$1,304,161	$5,239,745	$6,543,906	9.4%
Uninc. Co - Delameter	118	0	0	1	$108,213	$40,703	$148,916	0.1%
Uninc. Co - Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Kalama	340	18	2	19	$310,643	$337,740	$648,382	0.1%
Uninc. Co - Leckler	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar	210	1	0	0	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	182	1	0	4	$209,707	$102,507	$312,214	0.1%
Uninc. Co - Lexington Flood Control District	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Ostrander	1	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Rose Valley - Coweeman	22	0	0	2	$31,057	$11,078	$42,135	0.0%
Uninc. Co - Ryderwood	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Toutle	8	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	12	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	0	0	0	0	$0	$0	$0	0.0%
Total	**1,484**	**117**	**8**	**63**	**$5,024,958**	**$11,448,495**	**$16,473,452**	**0.0%**

Exposed Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	0	0	0	0	0	**0**
Kalama	0	0	0	0	0	0	0	**0**
Kelso	0	0	0	0	0	0	0	**0**
Longview	0	0	0	0	0	0	0	**0**
Woodland (Cowlitz Co.)	0	0	0	0	0	0	1	**1**
Unincorporated	0	0	1	0	0	0	9	**10**
Total	**0**	**0**	**1**	**0**	**0**	**0**	**10**	**11**

Critical Facilities Damage

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety and Security	0	N/A	N/A
Food, Water and Sheltering	1	15.85	N/A
Health and Medical	0	N/A	N/A
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	1	11.85	19.18
Hazardous Material	0	N/A	N/A
Total/Average	**2**	**13.85**	**19.18**

2% ANNUAL CHANCE (50-YEAR) FLOOD

Exposed Population and Buildings by Value

Jurisdiction	Buildings Exposed	Population Exposed	% of Population Exposed	Value Structure in $ Exposed	Value Contents in $ Exposed	Value (Structure and contents in $) Exposed	% of Total Value Exposed
Castle Rock	0	0	0.0%	$0	$0	$0	0.0%
Kalama	7	6	0.2%	$29,956,339	$29,685,200	$59,641,538	6.6%
Kelso	0	0	0.0%	$0	$0	$0	0.0%
Longview	0	0	0.0%	$0	$0	$0	0.0%
Woodland (Cowlitz Co.)	248	951	14.6%	$70,862,959	$4,242	$70,867,201	2.3%
Uninc. Co - CDID 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - CDID 3	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	15	38	0.6%	$2,437,100	$1,218,550	$3,655,651	0.3%
Uninc. Co - Columbia	10	23	69.2%	$5,736,666	$5,352,892	$11,089,558	15.9%
Uninc. Co - Delameter	1	3	0.2%	$183,295	$91,647	$274,942	0.1%
Uninc. Co - Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Kalama	82	202	7.4%	$13,797,795	$8,088,146	$21,885,940	3.0%
Uninc. Co - Leckler	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar	9	23	0.3%	$3,425,764	$1,712,882	$5,138,646	0.3%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	4	10	1.4%	$247,005	$123,502	$370,507	0.1%
Uninc. Co - Lexington Flood Control District	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Ostrander	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Rose Valley - Coweeman	4	10	0.2%	$539,631	$269,816	$809,447	0.1%
Uninc. Co - Ryderwood	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Toutle	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	0	0	0.0%	$0	$0	$0	0.0%
Total	**380**	**1,265**	**1.2%**	**$127,186,553**	**$46,546,877**	**$173,733,430**	**0.5%**

Exposed Area and Buildings by Occupancy Class

Jurisdiction	Acres of Floodplain	Number of Structures in the Floodplain							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	0	0	0	0	0	0	0	0	0
Kalama	456	2	5	0	0	0	0	0	7
Kelso	23	0	0	0	0	0	0	0	0
Longview	30	0	0	0	0	0	0	0	0
Woodland (Cowlitz Co.)	350	242	0	3	0	1	2	0	248
Uninc. Co - CDID 1	13	0	0	0	0	0	0	0	0
Uninc. Co - CDID 3	0	0	0	0	0	0	0	0	0
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	443	15	0	0	0	0	0	0	15
Uninc. Co - Columbia	5,311	9	0	0	0	1	0	0	10
Uninc. Co - Delameter	239	1	0	0	0	0	0	0	1
Uninc. Co - Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Kalama	998	80	1	0	0	1	0	0	82
Uninc. Co - Leckler	0	0	0	0	0	0	0	0	0
Uninc. Co - Lewis - Woodland Cougar	289	9	0	0	0	0	0	0	9
Uninc. Co - Lewis - Woodland Cougar - CDID 2	220	4	0	0	0	0	0	0	4
Uninc. Co - Lexington Flood Control District	0	0	0	0	0	0	0	0	0
Uninc. Co - Ostrander	24	0	0	0	0	0	0	0	0
Uninc. Co - Rose Valley - Coweeman	133	4	0	0	0	0	0	0	4
Uninc. Co - Ryderwood	0	0	0	0	0	0	0	0	0
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	0	0	0	0	0
Uninc. Co - Toutle	229	0	0	0	0	0	0	0	0
Uninc. Co - Upper Cowlitz	15	0	0	0	0	0	0	0	0
Uninc. Co - Westover	0	0	0	0	0	0	0	0	0
Uninc. Co - Willow Grove Diking District	0	0	0	0	0	0	0	0	0
Total	**8,773**	**366**	**6**	**3**	**0**	**3**	**2**	**0**	**380**

Estimated Flood Damage

Jurisdiction	Structure Debris (Tons)	Displaced Population	People Requiring Short-Term Shelter	Buildings Impacted	Value Structure in $ Damaged	Value Contents in $ Damaged	Total Value (Structure and Contents in $) Damaged	% of Total Value Damaged
Castle Rock	0	0	0	0	$0	$0	$0	0.0%
Kalama	220	4	0	5	$4,870,643	$9,600,796	$14,471,439	1.6%
Kelso	0	0	0	0	$0	$0	$0	0.0%
Longview	0	0	0	0	$0	$0	$0	0.0%
Woodland (Cowlitz Co.)	1,103	727	30	126	$7,623,330	$8,732,963	$16,356,293	0.5%
Uninc. Co - CDID 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - CDID 3	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	144	1	0	6	$228,509	$108,065	$336,574	0.0%
Uninc. Co - Columbia	23	2	1	10	$1,435,768	$5,273,259	$6,709,027	9.6%
Uninc. Co - Delameter	176	0	0	1	$122,844	$50,434	$173,278	0.1%
Uninc. Co - Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Kalama	572	34	4	59	$1,370,835	$2,170,972	$3,541,807	0.5%
Uninc. Co - Leckler	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar	434	3	0	6	$376,774	$162,994	$539,768	0.0%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	259	1	0	4	$220,336	$102,507	$322,843	0.1%
Uninc. Co - Lexington Flood Control District	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Ostrander	16	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Rose Valley - Coweeman	34	0	0	3	$72,226	$33,400	$105,626	0.0%
Uninc. Co - Ryderwood	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Toutle	19	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	15	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	0	0	0	0	$0	$0	$0	0.0%
Total	**3,015**	**773**	**36**	**220**	**$16,321,265**	**$26,235,389**	**$42,556,654**	**0.1%**

Exposed Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	0	0	0	0	0	**0**
Kalama	0	0	0	0	0	0	0	**0**
Kelso	0	0	0	0	0	0	0	**0**
Longview	0	0	0	0	0	0	0	**0**
Woodland (Cowlitz Co.)	0	0	0	0	0	1	1	**2**
Unincorporated	0	0	1	0	0	0	13	**14**
Total	**0**	**0**	**1**	**0**	**0**	**1**	**14**	**16**

Critical Facilities Damage

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety and Security	1	10.94	36.91
Food, Water and Sheltering	1	26.48	N/A
Health and Medical	0	N/A	N/A
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	1	37.72	51.72
Hazardous Material	0	N/A	N/A
Total/Average	**3**	**25.05**	**44.32**

1% ANNUAL CHANCE (100-YEAR) FLOOD

Exposed Population and Buildings by Value

Jurisdiction	Buildings Exposed	Population Exposed	% of Population Exposed	Value Structure in $ Exposed	Value Contents in $ Exposed	Value (Structure and contents in $) Exposed	% of Total Value Exposed
Castle Rock	49	139	5.7%	$14,877,346	$10,140,925	$25,018,271	2.4%
Kalama	12	18	0.6%	$32,703,259	$31,575,690	$64,278,948	7.1%
Kelso	19	47	0.4%	$61,513,113	$56,535,265	$118,048,377	2.7%
Longview	36	92	0.2%	$21,359,488	$15,264,240	$36,623,729	0.3%
Woodland (Cowlitz Co.)	876	3,375	52.0%	$278,834,295	$157,159,565	$435,993,859	14.4%
Uninc. Co - CDID 1	6	15	1.0%	$1,514,483	$757,242	$2,271,725	0.1%
Uninc. Co - CDID 3	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	50	121	2.1%	$14,822,339	$9,849,985	$24,672,324	2.3%
Uninc. Co - Columbia	14	33	100.0%	$6,395,263	$5,682,191	$12,077,453	17.3%
Uninc. Co - Delameter	18	43	3.1%	$6,029,113	$4,299,987	$10,329,100	4.0%
Uninc. Co - Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Kalama	129	321	11.7%	$26,490,826	$14,434,661	$40,925,487	5.5%
Uninc. Co - Leckler	49	121	7.3%	$10,439,118	$5,378,866	$15,817,984	5.0%
Uninc. Co - Lewis - Woodland Cougar	74	177	2.2%	$49,371,370	$38,916,626	$88,287,996	4.7%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	22	56	7.6%	$9,578,932	$4,789,466	$14,368,399	5.6%
Uninc. Co - Lexington Flood Control District	18	38	1.1%	$27,854,005	$26,632,501	$54,486,506	6.7%
Uninc. Co - Ostrander	15	33	1.6%	$4,155,079	$2,815,616	$6,970,695	2.1%
Uninc. Co - Rose Valley - Coweeman	63	159	3.0%	$12,022,257	$6,011,128	$18,033,385	1.8%
Uninc. Co - Ryderwood	8	20	2.8%	$1,361,341	$680,670	$2,042,011	2.3%
Uninc. Co - Silver Lake Flood Control District	26	63	4.6%	$6,198,179	$3,727,770	$9,925,949	5.4%
Uninc. Co - Toutle	49	119	2.2%	$28,600,093	$23,134,326	$51,734,419	5.3%
Uninc. Co - Upper Cowlitz	20	48	3.0%	$21,079,580	$18,745,390	$39,824,970	9.8%
Uninc. Co - Westover	11	23	0.6%	$3,843,013	$3,029,512	$6,872,525	1.0%
Uninc. Co - Willow Grove Diking District	0	0	0.0%	$0	$0	$0	0.0%
Total	**1,564**	**5,062**	**4.7%**	**$639,042,491**	**$439,561,622**	**$1,078,604,113**	**3.2%**

Exposed Area and Buildings by Occupancy Class

Jurisdiction	Acres of Floodplain	Number of Structures in the Floodplain							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	433	47	1	0	0	1	0	0	49
Kalama	488	6	6	0	0	0	0	0	12
Kelso	960	13	6	0	0	0	0	0	19
Longview	664	28	7	0	0	0	1	0	36
Woodland (Cowlitz Co.)	533	859	7	3	0	5	2	0	876
Uninc. Co - CDID 1	100	6	0	0	0	0	0	0	6
Uninc. Co - CDID 3	9	0	0	0	0	0	0	0	0
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	1,630	48	2	0	0	0	0	0	50
Uninc. Co - Columbia	9,054	13	0	0	0	1	0	0	14
Uninc. Co - Delameter	580	17	1	0	0	0	0	0	18
Uninc. Co - Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Kalama	2,056	127	1	0	0	1	0	0	129
Uninc. Co - Leckler	1,586	48	1	0	0	0	0	0	49
Uninc. Co - Lewis - Woodland Cougar	4,027	70	4	0	0	0	0	0	74
Uninc. Co - Lewis - Woodland Cougar - CDID 2	669	22	0	0	0	0	0	0	22
Uninc. Co - Lexington Flood Control District	21	15	1	0	0	1	0	1	18
Uninc. Co - Ostrander	338	13	2	0	0	0	0	0	15
Uninc. Co - Rose Valley - Coweeman	1,368	63	0	0	0	0	0	0	63
Uninc. Co - Ryderwood	235	8	0	0	0	0	0	0	8
Uninc. Co - Silver Lake Flood Control District	3,930	25	1	0	0	0	0	0	26
Uninc. Co - Toutle	13,231	47	2	0	0	0	0	0	49
Uninc. Co - Upper Cowlitz	1,365	19	1	0	0	0	0	0	20
Uninc. Co - Westover	25	9	2	0	0	0	0	0	11
Uninc. Co - Willow Grove Diking District	0	0	0	0	0	0	0	0	0
Total	**43,304**	**1,503**	**45**	**3**	**0**	**9**	**3**	**1**	**1564**

Estimated Flood Damage

Jurisdiction	Structure Debris (Tons)	Displaced Population	People Requiring Short-Term Shelter	Buildings Impacted	Value Structure in $ Damaged	Value Contents in $ Damaged	Total Value (Structure and Contents in $) Damaged	% of Total Value Damaged
Castle Rock	592	32	5	18	$698,634	$383,191	$1,081,826	0.1%
Kalama	286	13	1	6	$6,912,764	$12,493,035	$19,405,799	2.1%
Kelso	268	4	2	11	$19,347,929	$25,294,815	$44,642,745	1.0%
Longview	1,184	12	3	8	$641,096	$882,514	$1,523,610	0.0%
Woodland (Cowlitz Co.)	1,902	2,580	106	289	$16,235,338	$15,755,990	$31,991,327	1.1%
Uninc. Co - CDID 1	103	1	0	1	$38,168	$11,902	$50,070	0.0%
Uninc. Co - CDID 3	10	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	255	5	1	19	$1,535,460	$802,560	$2,338,020	0.2%
Uninc. Co - Columbia	25	3	1	14	$2,003,100	$5,449,547	$7,452,647	10.7%
Uninc. Co - Delameter	906	9	2	4	$252,123	$107,606	$359,729	0.1%
Uninc. Co - Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Kalama	901	49	6	89	$4,067,702	$3,806,745	$7,874,447	1.1%
Uninc. Co - Leckler	879	23	3	16	$1,058,904	$508,897	$1,567,801	0.5%
Uninc. Co - Lewis - Woodland Cougar	668	14	3	27	$2,739,846	$1,794,194	$4,534,040	0.2%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	402	9	2	13	$2,534,269	$774,547	$3,308,816	1.3%
Uninc. Co - Lexington Flood Control District	177	3	1	2	$6,903,388	$9,138,702	$16,042,090	2.0%
Uninc. Co - Ostrander	558	2	1	4	$428,118	$1,046,726	$1,474,844	0.4%
Uninc. Co - Rose Valley - Coweeman	1,067	12	4	28	$1,869,392	$886,596	$2,755,988	0.3%
Uninc. Co - Ryderwood	28	4	0	0	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	87	12	2	3	$187,142	$106,850	$293,992	0.2%
Uninc. Co - Toutle	847	8	3	23	$1,725,045	$988,460	$2,713,505	0.3%
Uninc. Co - Upper Cowlitz	1,931	8	1	16	$4,348,862	$4,422,853	$8,771,715	2.2%
Uninc. Co - Westover	210	3	1	3	$126,093	$253,655	$379,747	0.1%
Uninc. Co - Willow Grove Diking District	461	0	0	0	$0	$0	$0	0.0%
Total	**13,747**	**2,803**	**146**	**594**	**$73,653,373**	**$84,909,384**	**$158,562,757**	**0.5%**

Exposed Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	0	0	0	0	1	1
Kalama	0	0	0	0	0	0	0	0
Kelso	0	0	0	0	0	0	4	4
Longview	0	0	0	0	0	1	6	7
Woodland (Cowlitz Co.)	0	0	0	0	1	1	1	3
Unincorporated	0	0	2	0	0	2	48	52
Total	**0**	**0**	**2**	**0**	**1**	**4**	**60**	**67**

Critical Facilities Damage

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety and Security	1	14.69	68.46
Food, Water and Sheltering	2	35.00	N/A
Health and Medical	0	N/A	N/A
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	12	4.29	55.95
Hazardous Material	0	N/A	N/A
Total/Average	**15**	**17.99**	**62.21**

0.2% ANNUAL CHANCE (500-YEAR) FLOOD

Exposed Population and Buildings by Value

Jurisdiction	Buildings Exposed	Population Exposed	% of Population Exposed	Value Structure in $ Exposed	Value Contents in $ Exposed	Value (Structure and contents in $) Exposed	% of Total Value Exposed
Castle Rock	85	225	9.2%	$54,320,555	$46,420,557	$100,741,113	9.7%
Kalama	14	21	0.7%	$41,548,519	$40,202,510	$81,751,029	9.0%
Kelso	21	54	0.4%	$66,805,476	$59,181,447	$125,986,922	2.9%
Longview	370	1,188	3.1%	$118,780,227	$64,041,003	$182,821,229	1.7%
Woodland (Cowlitz Co.)	939	3,610	55.6%	$305,013,659	$175,355,500	$480,369,158	15.9%
Uninc. Co - CDID 1	8	18	1.2%	$2,519,609	$1,987,123	$4,506,732	0.1%
Uninc. Co - CDID 3	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	56	137	2.3%	$16,072,161	$10,474,896	$26,547,057	2.5%
Uninc. Co - Columbia	14	33	100.0%	$6,395,263	$5,682,191	$12,077,453	17.3%
Uninc. Co - Delameter	20	48	3.5%	$6,412,127	$4,491,495	$10,903,622	4.2%
Uninc. Co - Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Kalama	138	339	12.3%	$35,996,740	$22,911,258	$58,907,998	7.9%
Uninc. Co - Leckler	72	180	10.8%	$19,106,925	$9,712,770	$28,819,695	9.1%
Uninc. Co - Lewis - Woodland Cougar	130	306	3.9%	$72,364,232	$55,567,688	$127,931,920	6.8%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	22	56	7.6%	$9,578,932	$4,789,466	$14,368,399	5.6%
Uninc. Co - Lexington Flood Control District	19	40	1.2%	$28,090,780	$26,750,888	$54,841,668	6.7%
Uninc. Co - Ostrander	34	78	3.8%	$12,907,521	$9,566,156	$22,473,677	6.7%
Uninc. Co - Rose Valley - Coweeman	64	162	3.0%	$12,362,046	$6,181,023	$18,543,069	1.9%
Uninc. Co - Ryderwood	8	20	2.8%	$1,361,341	$680,670	$2,042,011	2.3%
Uninc. Co - Silver Lake Flood Control District	26	63	4.6%	$6,198,179	$3,727,770	$9,925,949	5.4%
Uninc. Co - Toutle	61	149	2.8%	$31,626,994	$24,647,777	$56,274,770	5.7%
Uninc. Co - Upper Cowlitz	74	185	11.4%	$38,184,540	$27,297,870	$65,482,410	16.2%
Uninc. Co - Westover	13	23	0.6%	$4,087,167	$3,273,666	$7,360,833	1.1%
Uninc. Co - Willow Grove Diking District	0	0	0.0%	$0	$0	$0	0.0%
Total	**2,188**	**6,935**	**6.4%**	**$889,732,991**	**$602,943,723**	**$1,492,676,714**	**4.4%**

Exposed Area and Buildings by Occupancy Class

Jurisdiction	Acres of Floodplain	Number of Structures in the Floodplain							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	578	76	7	0	0	1	0	1	85
Kalama	548	7	7	0	0	0	0	0	14
Kelso	1,006	15	6	0	0	0	0	0	21
Longview	792	361	8	0	0	0	1	0	370
Woodland (Cowlitz Co.)	588	919	8	3	0	5	2	2	939
Uninc. Co - CDID 1	111	7	0	1	0	0	0	0	8
Uninc. Co - CDID 3	9	0	0	0	0	0	0	0	0
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	1,675	54	2	0	0	0	0	0	56
Uninc. Co - Columbia	9,092	13	0	0	0	1	0	0	14
Uninc. Co - Delameter	657	19	1	0	0	0	0	0	20
Uninc. Co - Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	0	0	0	0	0
Uninc. Co - Kalama	2,105	134	3	0	0	1	0	0	138
Uninc. Co - Leckler	1,834	71	1	0	0	0	0	0	72
Uninc. Co - Lewis - Woodland Cougar	4,181	121	9	0	0	0	0	0	130
Uninc. Co - Lewis - Woodland Cougar - CDID 2	670	22	0	0	0	0	0	0	22
Uninc. Co - Lexington Flood Control District	31	16	1	0	0	1	0	1	19
Uninc. Co - Ostrander	364	31	3	0	0	0	0	0	34
Uninc. Co - Rose Valley - Coweeman	1,383	64	0	0	0	0	0	0	64
Uninc. Co - Ryderwood	235	8	0	0	0	0	0	0	8
Uninc. Co - Silver Lake Flood Control District	3,930	25	1	0	0	0	0	0	26
Uninc. Co - Toutle	13,301	59	2	0	0	0	0	0	61
Uninc. Co - Upper Cowlitz	1,534	73	1	0	0	0	0	0	74
Uninc. Co - Westover	32	9	4	0	0	0	0	0	13
Uninc. Co - Willow Grove Diking District	0	0	0	0	0	0	0	0	0
Total	**44,656**	**2,104**	**64**	**4**	**0**	**9**	**3**	**4**	**2188**

Estimated Flood Damage

Jurisdiction	Structure Debris (Tons)	Displaced Population	People Requiring Short-Term Shelter	Buildings Impacted	Value Structure in $ Damaged	Value Contents in $ Damaged	Total Value (Structure and Contents in $) Damaged	% of Total Value Damaged
Castle Rock	1,278	80	8	69	$7,610,003	$17,759,804	$25,369,807	2.4%
Kalama	367	16	1	7	$7,648,882	$14,526,589	$22,175,471	2.4%
Kelso	852	4	2	11	$19,265,870	$25,260,210	$44,526,080	1.0%
Longview	1,506	281	35	143	$2,565,016	$2,031,929	$4,596,945	0.0%
Woodland (Cowlitz Co.)	4,053	2,951	113	879	$94,880,705	$66,831,129	$161,711,834	5.3%
Uninc. Co - CDID 1	88	2	0	2	$102,428	$31,770	$134,198	0.0%
Uninc. Co - CDID 3	10	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	1,186	8	2	24	$2,111,638	$1,092,501	$3,204,139	0.3%
Uninc. Co - Columbia	0	0	0	14	$2,266,187	$5,460,045	$7,726,232	11.1%
Uninc. Co - Delameter	1,122	12	2	9	$1,154,991	$1,916,274	$3,071,265	1.2%
Uninc. Co - Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Kalama	1,165	55	8	110	$6,702,355	$9,566,452	$16,268,807	2.2%
Uninc. Co - Leckler	969	45	4	18	$1,095,541	$523,637	$1,619,178	0.5%
Uninc. Co - Lewis - Woodland Cougar	1,037	37	6	39	$5,417,557	$3,034,429	$8,451,986	0.5%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	524	9	2	19	$4,019,182	$1,193,909	$5,213,091	2.0%
Uninc. Co - Lexington Flood Control District	183	2	1	2	$6,903,388	$9,138,702	$16,042,090	2.0%
Uninc. Co - Ostrander	721	8	2	16	$844,964	$2,107,142	$2,952,106	0.9%
Uninc. Co - Rose Valley - Coweeman	1,307	12	4	29	$2,040,252	$977,878	$3,018,130	0.3%
Uninc. Co - Ryderwood	28	4	0	0	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	66	11	2	3	$187,141	$106,849	$293,991	0.2%
Uninc. Co - Toutle	1,263	13	3	35	$2,959,895	$1,648,876	$4,608,771	0.5%
Uninc. Co - Upper Cowlitz	2,362	53	5	58	$8,152,964	$6,400,220	$14,553,184	3.6%
Uninc. Co - Westover	213	3	1	4	$149,113	$334,710	$483,824	0.1%
Uninc. Co - Willow Grove Diking District	0	0	0	0	$0	$0	$0	0.0%
Total	**20,299**	**3,606**	**200**	**1,491**	**$176,078,072**	**$169,943,056**	**$346,021,129**	**1.0%**

Exposed Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	0	0	0	1	1	**2**
Kalama	0	0	0	0	0	0	0	**0**
Kelso	0	0	0	0	0	0	4	**4**
Longview	0	0	0	0	4	1	6	**11**
Woodland (Cowlitz Co.)	0	0	0	0	1	2	1	**4**
Unincorporated	0	0	2	0	0	2	53	**57**
Total	**0**	**0**	**2**	**0**	**5**	**6**	**65**	**78**

Critical Facilities Damage

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety and Security	2	21.19	85.31
Food, Water and Sheltering	2	35.00	N/A
Health and Medical	1	31.80	42.59
Energy	0	N/A	N/A
Communications	0	N/A	N/A
Transportation	12	6.35	67.63
Hazardous Material	0	N/A	N/A
Total/Average	**17**	**23.59**	**65.18**

OVERTOPPING INUNDATION OF AREAS PROTECTED BY LEVEES

Exposed Population and Buildings by Value

Jurisdiction	Buildings Exposed	Population Exposed	% of Population Exposed	Value Structure in $ Exposed	Value Contents in $ Exposed	Value (Structure and contents in $) Exposed	% of Total Value Exposed
Castle Rock	582	1,464	59.9%	$372,972,449	$326,015,911	$698,988,360	67.3%
Kalama	0	0	0.0%	$0	$0	$0	0.0%
Kelso	2,126	6,568	51.6%	$1,711,589,593	$1,557,802,227	$3,269,391,820	74.1%
Longview	10,527	31,523	83.4%	$5,480,332,630	$4,381,899,132	$9,862,231,762	90.2%
Woodland (Cowlitz Co.)	966	2,774	42.7%	$1,268,333,369	$1,260,470,887	$2,528,804,255	83.6%
Uninc. Co - CDID 1	568	1,301	89.7%	$1,839,260,126	$2,487,158,819	$4,326,418,945	98.3%
Uninc. Co - CDID 3	1	3	100.0%	$304,983	$152,492	$457,475	100.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	57	139	2.4%	$24,458,430	$14,297,617	$38,756,047	3.7%
Uninc. Co - Columbia	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Delameter	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Diking Improvement District 1	204	496	100.0%	$42,492,866	$26,085,345	$68,578,211	100.0%
Uninc. Co - Drains to Diking Improvement District 1	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Kalama	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Leckler	4	10	0.6%	$358,164	$179,082	$537,246	0.2%
Uninc. Co - Lewis - Woodland Cougar	8	10	0.1%	$5,070,133	$4,721,763	$9,791,896	0.5%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	279	664	90.0%	$136,529,115	$100,874,087	$237,403,202	92.0%
Uninc. Co - Lexington Flood Control District	1,106	2,745	81.6%	$345,746,279	$210,239,283	$555,985,563	68.3%
Uninc. Co - Ostrander	12	23	1.1%	$3,130,032	$2,196,577	$5,326,609	1.6%
Uninc. Co - Rose Valley - Coweeman	246	539	10.1%	$62,826,459	$48,775,070	$111,601,528	11.3%
Uninc. Co - Ryderwood	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Toutle	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0.0%	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	58	147	100.0%	$14,722,300	$7,361,150	$22,083,450	100.0%
Total	**16,744**	**48,405**	**44.5%**	**$11,308,126,928**	**$10,428,229,440**	**$21,736,356,369**	**64.1%**

Exposed Area and Buildings by Occupancy Class

Jurisdiction	Acres of Floodplain	Number of Structures in the Floodplain							
		Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Castle Rock	208	494	64	0	0	14	7	3	582
Kalama	0	0	0	0	0	0	0	0	0
Kelso	1,522	1,828	257	7	0	14	6	14	2126
Longview	7,039	9,582	815	25	0	67	18	20	10527
Woodland (Cowlitz Co.)	1,954	706	210	27	1	11	5	6	966
Uninc. Co - CDID 1	2,947	514	34	12	0	7	0	1	568
Uninc. Co - CDID 3	151	1	0	0	0	0	0	0	1
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	166	55	1	0	0	1	0	0	57
Uninc. Co - Columbia	22	0	0	0	0	0	0	0	0
Uninc. Co - Delameter	0	0	0	0	0	0	0	0	0
Uninc. Co - Diking Improvement District 1	91	196	7	0	0	1	0	0	204
Uninc. Co - Drains to Diking Improvement District 1	1	0	0	0	0	0	0	0	0
Uninc. Co - Kalama	0	0	0	0	0	0	0	0	0
Uninc. Co - Leckler	4	4	0	0	0	0	0	0	4
Uninc. Co - Lewis - Woodland Cougar	20	4	3	0	0	1	0	0	8
Uninc. Co - Lewis - Woodland Cougar - CDID 2	5,760	262	15	0	1	0	1	0	279
Uninc. Co - Lexington Flood Control District	571	1,085	16	0	0	3	1	1	1106
Uninc. Co - Ostrander	33	9	3	0	0	0	0	0	12
Uninc. Co - Rose Valley - Coweeman	6	213	30	1	0	1	0	1	246
Uninc. Co - Ryderwood	0	0	0	0	0	0	0	0	0
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	0	0	0	0	0
Uninc. Co - Toutle	0	0	0	0	0	0	0	0	0
Uninc. Co - Upper Cowlitz	0	0	0	0	0	0	0	0	0
Uninc. Co - Westover	0	0	0	0	0	0	0	0	0
Uninc. Co - Willow Grove Diking District	875	58	0	0	0	0	0	0	58
Total	**21,369**	**15,011**	**1455**	**72**	**2**	**120**	**38**	**46**	**16744**

Estimated Flood Damage

Jurisdiction	Structure Debris (Tons)	Displaced Population	People Requiring Short-Term Shelter	Buildings Impacted	Value Structure in $ Damaged	Value Contents in $ Damaged	Total Value (Structure and Contents in $) Damaged	% of Total Value Damaged
Castle Rock	1,588	1,318	45	237	$21,776,468	$24,532,213	$46,308,681	4.5%
Kalama	0	0	0	0	$0	$0	$0	0.0%
Kelso	20,308	5,906	210	1,593	$272,751,520	$521,579,091	$794,330,612	18.0%
Longview	42,199	29,235	1,247	4,407	$513,416,728	$773,497,278	$1,286,914,006	11.8%
Woodland (Cowlitz Co.)	777	2,451	82	399	$349,265,525	$586,534,002	$935,799,528	30.9%
Uninc. Co - CDID 1	4,015	1,147	46	423	$191,100,255	$445,320,263	$636,420,517	14.5%
Uninc. Co - CDID 3	1	2	0	0	$0	$0	$0	0.0%
Uninc. Co - Coal Creek, Eufala Heights, Bunker Hill	169	10	2	2	$89,918	$31,698	$121,616	0.0%
Uninc. Co - Columbia	2	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Delameter	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Diking Improvement District 1	3,263	385	17	187	$15,650,321	$13,782,007	$29,432,328	42.9%
Uninc. Co - Drains to Diking Improvement District 1	24	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Kalama	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Leckler	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Lewis - Woodland Cougar	139	0	0	8	$236,460	$1,147,830	$1,384,290	0.1%
Uninc. Co - Lewis - Woodland Cougar - CDID 2	11,679	632	24	226	$43,836,274	$34,636,476	$78,472,750	30.4%
Uninc. Co - Lexington Flood Control District	2,582	2,461	97	556	$30,854,341	$38,460,116	$69,314,457	8.5%
Uninc. Co - Ostrander	59	4	1	12	$226,817	$308,797	$535,614	0.2%
Uninc. Co - Rose Valley - Coweeman	0	0	0	59	$811,210	$1,454,198	$2,265,407	0.2%
Uninc. Co - Ryderwood	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Silver Lake Flood Control District	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Toutle	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Upper Cowlitz	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Westover	0	0	0	0	$0	$0	$0	0.0%
Uninc. Co - Willow Grove Diking District	1,749	104	7	57	$8,050,339	$3,749,233	$11,799,572	53.4%
Total	**88,554**	**43,656**	**1,776**	**8,166**	**$1,448,066,176**	**$2,445,033,202**	**$3,893,099,378**	**11.5%**

Exposed Critical Facilities

Planning Area	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health & Medical	Safety & Security	Transportation	Total
Castle Rock	0	0	0	0	2	7	0	**9**
Kalama	0	0	0	0	0	0	0	**0**
Kelso	0	0	1	0	3	13	3	**20**
Longview	4	0	2	0	22	32	3	**63**
Woodland (Cowlitz Co.)	4	0	0	0	3	10	5	**22**
Unincorporated	0	0	1	0	3	7	2	**13**
Total	**8**	**0**	**4**	**0**	**33**	**69**	**13**	**127**

Critical Facilities Damage

	Number of Facilities Affected	Average % of Total Value Damaged	
		Structure	Content
Safety and Security	33	12.19	48.92
Food, Water and Sheltering	2	18.22	32.62
Health and Medical	22	32.22	53.48
Energy	0	N/A	N/A
Communications	2	8.57	N/A
Transportation	5	8.91	53.57
Hazardous Material	0	N/A	N/A
Total/Average	**64**	**16.02**	**47.15**

Appendix G. Flood Plan Adoption Resolution

G. Flood Plan Adoption Resolution

To Be Provided With Final Draft

Appendix H. Example Progress Report

H. EXAMPLE PROGRESS REPORT

COWLITZ COUNTY, WASHINGTON
COMPREHENSIVE FLOOD HAZARD MANAGEMENT PLAN AND
ANNUAL PROGRESS REPORT

OVERVIEW

Reporting Period

(Insert reporting period)

Background

Cowlitz County [DEPARTMENT] developed a Comprehensive Flood Hazard Management Plan to reduce risk from flooding through identified resources, information, and strategies. To prepare the plan, Cowlitz County organized resources, assessed risks from flooding, developed planning goals and objectives, reviewed mitigation alternatives, and developed an action plan to address probable impacts from floods. The plan can be viewed on-line:

[WEBSITE LINK].:

Purpose

The purpose of this report is to provide an annual update on the implementation of the action plan identified in the *Cowlitz County Flood Hazard Management Plan*. The objective is to ensure that there is a continuing and responsive planning process that will keep the floodplain management plan and related outreach efforts dynamic and responsive to the needs and capabilities of Cowlitz County and stakeholders. This report discusses the following:

- Flood events that have occurred within the last year
- Changes in risk exposure within the planning area
- Mitigation success stories
- Changes in capabilities that could impact plan implementation
- Floodplain management plan implementation status
  - Review of the action plan
  - Recommendations for changes/enhancement

Flood Events within the Planning Area

During the reporting period, there were __ flood events in the planning area that had a measurable impact on people or property. A summary of these events is as follows: *(Include a narrative of each flood event. What type of flood event? When it occurred? Where it occurred? How long did it last? What types of damages did it do?)*

- _____
- _____
- _____
- _____
- _____

Changes in Risk Exposure in the Planning Area

(Insert brief overview of any flood event in the planning area that changed the probability of occurrence of flooding as presented in the floodplain management plan)

Mitigation Success Stories

(Insert brief overview of mitigation accomplishments during the reporting period, including notably successful public outreach efforts)

Changes That May Impact Implementation of the Plan

(Insert brief overview of any significant changes in the planning area that would have a profound impact on the implementation of the plan or on public outreach efforts. Specify any changes in technical, regulatory and financial capabilities identified during the plan's development)

FLOODPLAIN MANAGEMENT PLAN PROGRESS

Summary Overview of the Plan's Progress

The performance period for the floodplain management plan became effective on ____, 2023, with the adoption of the Flood Plan by the Cowlitz County Board of Commissioners. The initial performance period for this plan will be every 5 years beginning from the date the plan is incorporated into the next update of the County's Hazard Mitigation Plan, with an anticipated update to the plan to occur before _____, 2032. As of this reporting period, the performance period for this plan is considered to be __% complete. The floodplain management plan has targeted ___ flood hazard mitigation actions to be pursued during the 5-year performance period. As of the reporting period, the following overall progress can be reported:

- __ out of __ actions (__%) reported ongoing action toward completion.
- __ out of __ actions (__%) were reported as being complete.
- __ out of __ actions (___%) reported no action taken.

The Floodplain Management Plan Steering Committee

The floodplain management plan steering committee, made up of stakeholders within the planning area, reviewed and approved this progress report at its annual meeting held on _____, 2023. It was determined through the plan's development process that a steering committee would remain in service to oversee maintenance of the plan. At a minimum, the Steering Committee will provide technical review and oversight on the development of the annual progress report. It is anticipated that there will be turnover in the membership annually, which will be documented in the progress reports. For this reporting period, the Steering Committee membership is as indicated in Table 1.

Table 1. Steering Committee Members

Name	Title	Jurisdiction/Agency

Review of the Action Plan

Table 2 reviews the action plan, reporting the status of each action. Reviewers of this report should refer to the floodplain management plan for more detailed descriptions of each action and the prioritization process.

Address the following in the "status" column of the following table:

- *Was any element of the action carried out during the reporting period?*
- *If no action was completed, why?*
- *Is the timeline for implementation for the action still appropriate?*
- *If the action was completed, does it need to be changed or removed from the action plan?*

Table 2. Action Plan Matrix

Action Taken? (Yes or No)	Timeline	Priority	Status	Status (X, O,✓)
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				
Action #__—_____[description]				

Completion status legend:
✓= Project Completed
O = Action ongoing toward completion
X = No progress at this time

Recommendations for Changes or Enhancements

Based on the review of this report by the floodplain management plan Steering Committee, the following recommendations will be noted for future updates or revisions to the plan:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

PUBLIC REVIEW NOTICE

The contents of this report are considered to be public knowledge and have been prepared for total public disclosure. Copies of the report have been provided to the Cowlitz County Board of County Commissioners and to local media outlets and the report is posted on the floodplain management plan website. Any questions or comments regarding the contents of this report should be directed to:

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312 SW 1st Ave
Kelso, WA 98626
(360) 557-3009
(EMAIL)