

City of Cannon Beach

Natural Hazards Mitigation Plan Addendum

APRIL 2015

City of Cannon Beach
163 E. Gower
Cannon Beach, OR 97110

THIS PAGE LEFT INTENTIONALLY BLANK

Table of Contents

OVERVIEW	1
PLAN HISTORY	2
COMMUNITY PROFILE.....	8
RISK ASSESSMENT	20
Coastal Erosion.....	21
Drought	22
Earthquake.....	22
Flood	28
Landslide.....	29
Tsunami	29
Volcanic Ash	33
Wildfire	33
Wind/Winter Storm	34
ACTION ITEMS.....	34

THIS PAGE LEFT INTENTIONALLY BLANK

Volume 3: City Addendum City of Cannon Beach

Overview

The City of Cannon Beach developed this addendum to the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan in an effort to increase the community's resilience to natural hazards. The addendum focuses on the natural hazards that could affect Cannon Beach, Oregon, which include: coastal erosion, drought, earthquake, flood, landslide, tsunami, volcano, wildfire, windstorms and winter storms. It is impossible to predict exactly when disasters may occur, or the extent to which they will affect the City. With careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural hazards.

This report provides a set of actions that aim to reduce the risks posed by natural hazards through education and outreach programs, development of partnerships, and the implementation of preventative activities such as land use or watershed management programs, hardening community facilities and infrastructure, pre-deployed emergency supplies and evacuation sites. The actions described in the addendum are intended to be implemented through existing plans and programs within the City.

The addendum is comprised of the following sections:

- | | |
|----------------------------------|---------|
| 1. How the addendum as developed | page 1 |
| 2. Community Profile | page 8 |
| 3. Risk Assessment | page 20 |
| 4. Action Items | page 34 |

2013 Plan Update

Historical Report Development Process

2006-2007 Planning Process

In Fall 2006, the Oregon Partnership for Disaster Resilience (OPDR/The Partnership) at the University of Oregon's Community Service Center partnered with Oregon Emergency Management (OEM) and Clatsop and Lincoln counties to develop a Pre-Disaster Mitigation Planning Grant proposal. Each county joined The Partnership by signing (through their County Commissions) a

Memorandum of Understanding for this project. FEMA awarded the Oregon Coast Region a grant to support the development of the natural hazard mitigation plans for the two counties and the cities therein. The Partnership, OEM, and the participating communities were awarded the grant in the Fall of 2006 and local planning efforts in this region began in the Fall of 2007.

The Columbia River Estuary Studies Taskforce (CREST) was hired by Clatsop County to lead the development of the County's Multi-Jurisdictional Plan. A graduate student with OPDR assisted CREST with data collection and plan writing to support the development of the County's Community Overview and Risk Assessment as well as similar components for the city addenda. Two representatives from Cannon Beach served on the Countywide Steering Committee that helped guide the development of the County's Plan. Representatives included Rich Mays, City Manager, and Cleve Rooper, Fire Chief of the Cannon Beach Rural Fire Protection District (RFPD). Cannon Beach's City Planner (Rainmar Bartl) and Public Works Director (Mark See) assisted in drafting the Cannon Beach Addendum. City specific work sessions with Rich Mays and Cleve Rooper facilitated the Addendum's development.

Cannon Beach has conducted annual forums at the Coaster Theater to both educate the public to the tsunami threat and to gather public input. These take place in April or May each year. In early 2006, many civic and community leaders met to discuss long-term disaster recovery planning under the guidance of the Oregon Partnership for Disaster Resilience. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness. This committee also held neighborhood-specific meetings in 2001 to detail evacuation routes and procedures for each area of the city. Following the windstorm of December 2007, a public meeting was held at the Coaster Theater to gather feedback from the public regarding the local response to the incident.

Historical Report Development Process

All of the below listed processes and outcomes have provided input used to prepare this report for inclusion in the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan.

2008 Planning Process

1. Cannon Beach has conducted annual forums at the Coaster Theater to both educate the public to the earthquake / tsunami threat and to gather public input. These forums or outreach efforts take place at least twice a year.
2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
3. As a result of the 2007 public meeting held at the Coaster Theater to gather feedback regarding local response and community preparation for natural hazards a Post Emergency Recovery Committee (PERC)

was formed. The PERC Committee membership included:

- a. Rich Mays (Cannon Beach City Manager),
 - b. Cleve Rooper (Fire Chief of the Cannon Beach Rural Fire Protection District (RFPD))
 - c. Gene Halliburton (Cannon Beach Chief of Police)
 - d. Les Wiersen (Cannon Beach EPREP Committee)
 - e. Mark See (Cannon Beach Public Works Director)
 - f. Mark Brien (Cannon Beach Building Inspector)
4. Committee natural hazard mitigation projects for City Council review are introduced to the council by the City Manager. The City Council considers the project and either approves or send the project back to committee for further development.

2008 Mitigation Activities Completed

1. Completed the first phase automatic (dual fuel) emergency generator install. These two generators service City Hall and the Police Department.
2. Purchased two portable HAM radios and three public works staff were certified as HAM radio operators.
3. Shelter Committee completed the following emergency management projects:
 - a. Volunteer training,
 - b. Installed additional emergency stock shelving,
 - c. Replaced existing food stocks and increased stocks through donations and increased purchasing.
 - d. Purchased and installed an emergency generator (15 KW) for lighting and kitchen electrical needs.
4. Consolidated 911 operations from a stand-alone to an integrated system with Seaside 911.
5. Completed initial "S" stabilization work to reduce risk of landslides that could interfere with utility lines in the Hemlock Street right-of-way.
(Note: This mitigation project requires ongoing maintenance)

2009 Planning Process

1. Cannon Beach has conducted annual forums at the Coaster Theater to both educate the public to the tsunami threat and to gather public input. These take place in April or May each year.
2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
3. The PERC Committee meets on a monthly basis.
4. The City Council meets at least once a month.

2009 Mitigation Activities Completed

1. Constructed and outfitted the Old Cannon Beach Road (north city) emergency cache site with water and protein bars.
2. Completed the City Center waste-water lagoon pedestrian path

- connecting Monroe Street and 2nd Street for to facilitate city evacuation.
- 3. Pacific Power and Public Works cleared and widened the main electrical power corridor between the City and Highway 26 of trees that could interfere with power lines within the power corridor.
- 4. Basic Spanish was offered to interested city staff and seven employees were trained in Spanish for emergency translation or direction purposes.
- 5. Purchased and installed a portable diesel emergency generator (30 KVA) for the waste water plant.

2010 Planning Process

- 1. Cannon Beach has conducted annual forums at the Coaster Theater to both educate the public to the tsunami threat and to gather public input. These take place in April or May each year.
- 2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
- 3. The PERC Committee meets on a monthly basis.
- 4. The City Council meets at least once a month.

2010 Mitigation Activities Completed

- 1. Cannon Beach commissioned a Tsunami Inundation and Evacuation Study that began in 2010 and was completed in late 2011. Tappister developed a comprehensive tsunami evacuation simulator for Cannon Beach. Several simulations were run for a tsunami event originating from the Cascadia Subduction Zone. Results showed the following:
 - a. 11% reduction in fatalities if a tsunami evacuation building (TEB) at the present City Hall.
 - b. Proper construction of a earthquake hardened bridge across Ecola Creek at the site of the current roadway bridge could reduce fatalities by 55%; however it was found the bridge must be constructed with sufficiently high elevation.
 - c. A TEB at an alternate location near the intersection of Washington and Spruce St. is more effective than at City Hall: such a TEB could reduce fatalities by 65%.
- 2. A geological technical study was commissioned to study the feasibility of locating a TEB at the City Hall location. It was determined the maximum supporting infrastructure required was cost prohibitive.
- 3. The Radar Road connection project was completed. This project allowed those who live north of Ecola Creek an exit to US 101.
- 4. Constructed and outfitted the Tolovana (south city) emergency cache site with water and protein bars.
- 5. Added two excess property emergency generators (100 KW & 60 KW) to power Ecola Lift Station.

2011 Planning Process

- 1. Cannon Beach has conducted annual forums at the Coaster Theater to

both educate the public to the tsunami threat and to gather public input. These take place in April or May each year.

2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
3. The PERC Committee meets on a monthly basis.
4. The City Council meets at least once a month.

2011 Mitigation Activities Completed

1. Tsunami evacuation routes posted and completed.
2. OBEC Study for the feasibility of a footbridge across Ecola Creek.
3. Hired Emergency Management consultant
 - a. Evaluate and update Emergency Operation Plan
 - b. Train City employees, volunteers and citizens
 - i. ICS 100
 - ii. ICS 200
 - iii. EOC
 - iv. Tabletop exercises (4)
 1. Wind
 2. Flood
 3. Earthquake/Tsunami (2)
4. Upgraded the Ash Street water boost pump station generator.
5. The City of Cannon Beach held a Community Forum: Cascadia Event Preparedness, at the Surf Sand Ballroom to discuss eight (8) potential alternatives for Cannon Beach to facilitate the City in emergency preparedness.
6. An outcome of the Cascadia Preparedness Community Forum and the tabletop exercises the City began a Pre-Deployed Cache Container Project.
7. Completed tide gate upgrade protecting city businesses from tidal flooding and storm water runoff.

2012 Planning Process

1. Cannon Beach has conducted annual forums at the Coaster Theater to both educate the public to the tsunami threat and to gather public input. These take place in April or May each year.
2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
3. The PERC Committee meets on a monthly basis.
4. As a result of the Pre-Deployed Container Program a sub-committee to PERC was formed. The PreCon sub-committee membership included:
 - Rich Mays (Cannon Beach City Manager)
 - Bill Vanderberg (Emergency Management Consultant)
 - Mark See (Public Works Director)
 - Matthew Gardner (Cannon Beach Rural Fire Protection District)
 - Bill Brehm (Cannon Beach EPREP)
 - Doug Wood (Cannon Beach EPREP)
 - Les Wierson (Cannon Beach EPREP)

Bob Mushen (Cannon Beach EPREP)
Jason Schermerhorn (Cannon Beach Police Chief)
Sam Steidel (Cannon Beach City Council)

2012 Mitigation Activities Completed

1. Pre-Deployed Cache Container project completed.
2. Located an Evacuation Site (cache container) branch within the Cannon Beach ICS.
3. The PERC/PreCon Committee began a six-step strategic plan for 2012-13 focusing on:
 - a. Training and education,
 - b. Volunteer recruitment,
 - c. Pre-Deployed cache container expansion,
 - d. Program marketing and
 - e. Post Cascadia Subduction Zone event emergency management preparedness.
4. Developed a graphic concept of operations that explains the orderly flow of survivors from:
 - a. Location within the City,
 - b. Assembly areas,
 - c. Evacuation site.
5. Opened cache container site for citizen storage of personal cache containers.
6. Established a Family Cache Container newsletter to inform and educate citizens as to community progress and future emergency management events concerning the cache container program. There were 12 family cache container updates in 2012.
7. Purchased and installed a diesel emergency generator (30 KW) to power the Elkland lift pump station.
8. Conducted weekly evacuation route walks from various points within the City to all ten assembly areas.
9. Van Buren Foot Path completed allowing for quicker access to assembly areas.
10. Completed Ecola Creek diking inspection for stability and hardened for seismic stability.
11. Coaster Construction remodeled shops and offices to serve as an evacuation site. In addition, stored tents, food, water and added a dual fuel emergency generator (30 KW).
12. Implemented and continue to update a "wiki" which is a vehicle for internal and external cache container education, volunteer recruitment, training and information exchange.
13. Conducted two community outreach events. Each focused on cache container education, cache container sign-ups, evacuation map updates and explained the City operations plan.

2013 Planning Process

1. Cannon Beach has conducted annual forums at the Coaster Theater to

both educate the public to the tsunami threat and to gather public input. These take place in April or May each year.

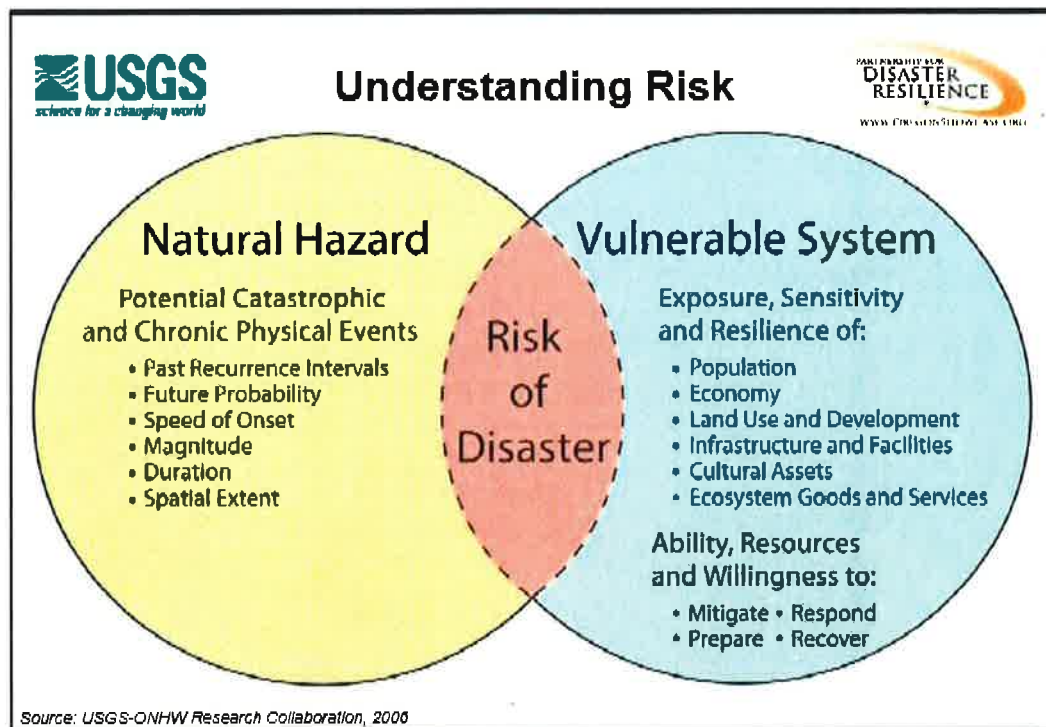
2. The Cannon Beach Emergency Preparedness Committee meets monthly, in public, to discuss disaster preparedness.
3. The PERC Committee meets on a monthly basis.
4. The PreCon Committee meets on a bi-weekly basis
5. The City Council meets at least once a month.

2013 Mitigation Activities Completed

1. The Family Cache Container newsletter program continues to update citizens as program progress. There have been 8 family cache updates in 2013.
2. Closed the Cannon Beach Elementary School.
3. Implemented the PERC/PreCon Oregon Unlimited digital forum for information exchange and project management.
4. Implemented a Business Training Program for local business evacuation to assembly areas.
5. Completed a Cascadia Subduction Zone Tabletop Exercise focused on the initial reaction phase.
6. Completed a Cascadia Subduction Zone Communications Functional Exercise.
7. Trained 15 citizens in Red Cross shelter operations.
8. Completed a Cascadia Subduction Zone Tabletop Exercise focused on response phase evacuation site setup and shelter operations.
9. Purchase a BGAN Satellite Internet receiver for communications.
10. Developed a community-training framework to include CERT, Red Cross and a Cannon Beach Basic Operations training program.
11. Created an evacuation-site leader operations guide.
12. Completed orders for all evacuation site Tourist/Employee/Visitor kits. These individual kits include food and water for four days plus a shelter system consisting of a tube tent, space blanket and rain proof poncho.
13. Developed and implemented a marketing media pamphlet for community cache container education.
14. Earth Week event that consisted of the following:
 - a. A cache container booth for education and volunteer recruitment.
 - b. A shuttle to evacuation sites for community education.
15. Opened cache container site for citizen storage of personal cache containers.
16. Completed two educational community outreach events focused on cache containers and emergency evacuation.
17. Implemented an emergency management innovation queue. Where new technology is reviewed, quantified and a cost benefit analysis is accomplished prior to placement in the queue. Once funds become available PERC/PreCon review the prioritized items for purchase.

Community Profile

The following section describes the City of Cannon Beach from a number of perspectives in order to help define and understand the City's sensitivity and resilience to natural hazards. Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the City when the plan was developed. The information documented below, along with the hazard assessments should be used as the local level rationale for the risk reduction actions identified in this addendum. The identification of actions that reduce the City's sensitivity and increase its resilience assist in reducing overall risk, or the area of overlap in Figure 2.1 below.



Geography & Climate

The City of Cannon Beach is located on the Oregon Coast 80 miles west of Portland and 25 miles south of Astoria (Figure 2.2). Ecola Creek runs through the northern

part of the town and empties into the Pacific Ocean. Cannon Beach's urban growth boundary contains 1.4 square miles (890 acres).

The climate in the City of Cannon Beach is considered moderate. During the summer and winter, temperatures tend to be in the 60s and 40s, respectively (Table 2.1). September is the warmest month with an average maximum temperature of 70°F, while the coldest month of the year is December with an average minimum temperature of 38 °F (Table 2.1). The City receives approximately 75.74 inches of precipitation annually, mostly in winter. Monthly precipitation ranges from a maximum of 11.38 inches in November to 1.34 inches in September (Table 2.2).ⁱⁱ

Figure 2.2 Map of Cannon Beach



Source: Yahoo Maps

Table 2.1 Average Temperature in Cannon Beach, OR

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max °F	52	54	56	58	62	65	68	69	70	64	56	52	60.5
Mean °F	45	47	48	50	54	58	60	61	60	55	49	45	52.7
Min °F	38	39	40	42	46	50	53	53	50	46	42	38	44.8

Source: weather.com 2013

Table 2.2 Average Precipitation in Cannon Beach, OR

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Inch	10.8	8.75	8.75	5.91	4.08	3.10	1.45	1.39	2.44	6.52	11.80	10.55	75.54

Source: weather.com

City monthly averages 2013

Knowledge of geographic factors like soil types can help identify areas vulnerable to natural hazards, specifically landslides and earthquake related hazards such as liquefaction, and can assist in mitigation planning. The types of soil found in Cannon Beach can be characterized as being sedimentary rocks, mudstones, siltstones, clay stones, silt clay and basalts. The majority of soil types in the City have a potentially moderate to severe erosion hazard ($K = 0.02-0.37$).ⁱⁱⁱ Other soils are poorly drained and are subject to flood hazards.

Population & Demographics

Cannon Beach is known as a resort area and hosts over 750,000 visitors annually. Cannon Beach was first incorporated as a City in 1957, but was settled before that by native cultures, and, since the late 1800s, by American settlers.^{iv} In 2010, the City was home to 1,692 permanent residents, which made up approximately 4.5% of Clatsop County's total population.

Table 2.3 Population Growth, City of Cannon Beach, 1990-2010

Census	Population	Percent Change
1990	1,221	2.90%
2000	1,588	30.10%
2010	1,692	6.54%

Source: City of Cannon Beach <<http://www.ci.cannon-beach.or.us/docs/census.pdf>>

The impact in terms of loss and the ability to recover vary among population groups following a disaster. Historically, 80% of the disaster burden falls on the public. Of this number, a disproportionate burden is placed upon special needs groups, particularly children, the elderly, the disabled, minorities, and low-income persons. Portions of Cannon Beach's residents fall into these special needs populations.

According to the US Census, 13% of the City's population speaks a language other than English at home.

Table 2.4 Population by Age, City of Cannon Beach, 2010

Age	Year			
	2000		2010	
	Number	Percent	Number	Percent
Under 5 years	79	5%	79	5%
5-19 years	292	18%	292	18%
20-44 years	442	28%	442	28%
45-64 years	510	32%	510	32%
65+ years	265	17%	265	17%
Median Age	43	3%	43.7	3%

Source: US Census, 2010

Employment & Economics

As of 2010, 23% of Cannon Beach's employed population was employed in "Arts, entertainment, recreation, accommodation and food services," 17% in "retail trade," and 2% in "educational, health and social services" (Table 2.7). This is expected given Cannon Beach's reliance on the tourism industry. The top five employers in Cannon Beach are Martin Hospitality (Tourist Facilities – 240 employees), Cannon Beach Conference Center (80 employees), Hallmark Resort (50 employees) and the City of Cannon (30 employees).

Table 2.7 Employment by Industry, City of Cannon Beach, 2010

Industry	Percent
Arts, entertainment, recreation, accommodation and food services	23%
Retail trade	17%
Educational, health and social services	2%
Professional, scientific, management, administrative, and waste	
Management services	16%
Finance, insurance, real estate and rental and leasing	14%
Construction	5%
Other services (except public administration)	4%
Manufacturing	6%
Public administration	2%
Wholesale trade	0%
Transportation and warehousing, and utilities	2%
Agriculture, forestry, fishing and hunting, and mining	3%
Information	6%

Source: US Census, 2010

Median income can be used as an indicator of the strength of the region's economic stability. In 1999, the median household income in Cannon Beach was \$39,271. This is nearly \$3,000 below the 1999 national median household income of \$41,994, but almost \$3,000 above the \$36,301 median household income for Clatsop County. Although it can be used to compare areas as a whole, this number does not reflect how income is divided among area residents.

Housing

Housing type and year-built dates are important factors in mitigation planning. Certain housing types tend to be less disaster resistant and warrant special attention; mobile homes, for example, are generally more prone to wind and water damage than standard stick-built homes. Generally the older the home is, the greater the risk of damage from natural disasters. This is because stricter building codes have been developed following improved scientific understanding of plate tectonics and earthquake risk. For example, structures built after the late 1960s in the Northwest and California use earthquake resistant designs and construction techniques. In addition, FEMA began assisting communities with floodplain mapping during the 1970s, and communities developed ordinances that required homes in the floodplain to be elevated to one foot above Base Flood Elevation.

In 2000, the City of Cannon Beach had 1,641 housing units. Of those, 26.4% (433) were owner occupied, 16.9% (277) were renter occupied, and 56.7% were vacant (931). 86.9% (849) of the vacant housing units are for seasonal or recreational use.^{ix} Around 53% of the City's housing stock was built prior to 1980, before stronger seismic building codes were put into place. Other housing characteristics for Cannon Beach are provided in Tables 2.8 and 2.9 below.

Table 2.8 Housing Type, City of Cannon Beach, 2000

Housing Type	Percentage
Single-Family	83.4%
Multi-Family	15.4%
Mobile Home	1.1%
Boat, RV, Van, Etc.	0.1%

Table 2.9 Housing Structure Age, City of Cannon Beach, 200

Year Built	Percent of Structures
1980-2000	47%
1960-1980	18.7%
Before 1960	34.3%

Source: US Census, 2000

Land Use & Development

Development in Cannon Beach is primarily residential with a significant mixture of tourist accommodations, and is located between the Pacific Ocean and Highway 101 (Figure 2.3). Most of the housing is located between the coast and Hemlock Street, the main road through Cannon Beach that connects to Hwy 101. According to the Cannon Beach Comprehensive Plan (2010), there were 236 undeveloped single-family lots within the City Limits. Within the UGB there were an additional 102 lots available, resulting in 338 potential lots available for construction. ^x

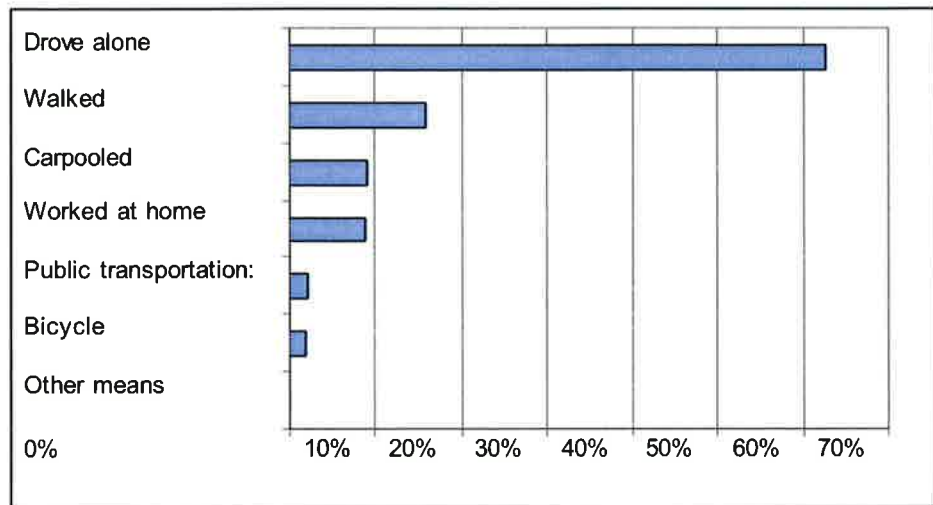
Cannon Beach also has a central business district that contains retail shops, restaurants, and other commercial buildings and hotels. There are two other commercial areas, Midtown and Tolovana Park, which also contain a mixture of commercial uses, including hotels. The oceanfront is a mixture of dwellings.

Transportation & Commuting Patterns

One major transportation route runs past Cannon Beach - Federal Highway 101. The major arterial going through Cannon Beach, Hemlock St., connects to Highway 101 on its northern and southern ends. U.S. Highway 101 connects Cannon Beach with Astoria and Washington to the north and Newport and California to the south. There is access to State Highway 26 approximately four miles north of Cannon Beach, which is the main east- west route between the Pacific coast and Portland. Figure 2.3 is a map detailing the transportation routes in Cannon Beach.

Transportation is an important consideration when planning for emergency service provisions. Growth within the City will put pressure on both major and minor roads, especially if the main mode of travel is by single occupancy vehicles. How people travel to work is indicative of the prevalence of single occupancy vehicle travel, and can help predict the amount of traffic congestion and the potential for accidents. Figure 2.4 represents the different methods city residents use to travel to work.

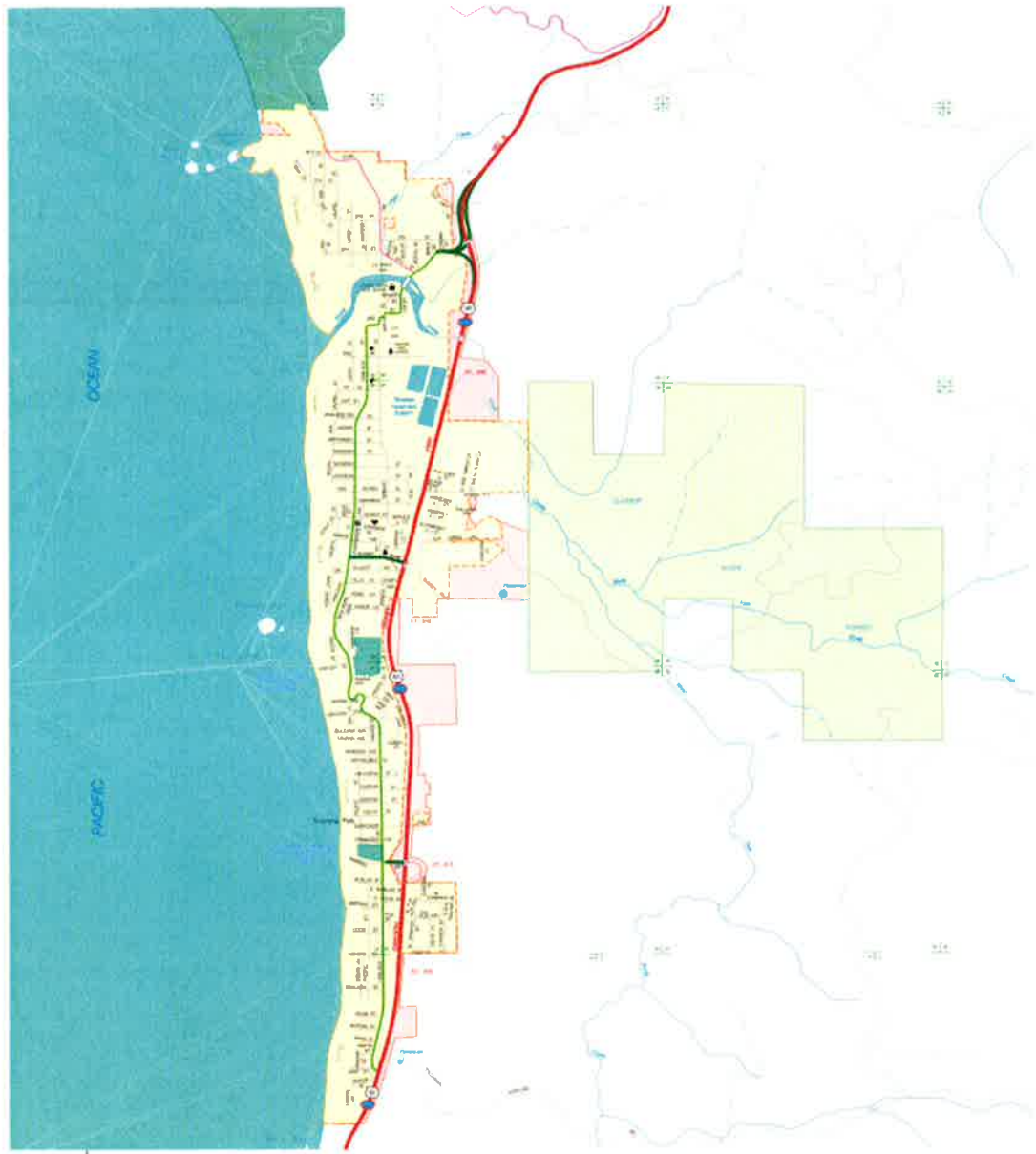
Figure 2.4 Transport Mode Used to Commute to Work in Cannon Beach



Source: US Census, 2000

Currently, Cannon Beach is served by the "Blue Star Fish Route" of the Sunset Empire Transportation District. The bus travels to various locations within Cannon Beach seven days a week and connects with other bus routes that go to Seaside, Gearhart, Warrenton and Astoria. The bus runs hourly from approximately 9AM to 6PM.^{xi}

Figure 2.3 Transportation Map of Cannon Beach



Source City of Cannon Beach <<http://www.ci.cannon-beach.or.us/docs/News/CannonBeach2006.pdf>>

Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to take action in an emergency. They are a top priority in any comprehensive hazard mitigation plan. Individual communities should inventory their critical facilities to include locally designated shelters and other essential assets, such as fire stations, and water and waste treatment facilities.

According to the Cannon Beach Case Study Report, the City of Cannon Beach owns its drinking water system and waste management facilities. Pacific Power Company supplies electricity to the City, and Northwest Natural Gas provides the natural gas service. Other utilities include telephone services, provided by CenturyLink, and data lines, provided by Charter Communications.

The Providence North Coast Clinic is located in downtown Cannon Beach. This facility offers a limited range of medical services. The closest hospital is located in Seaside, 11 miles north of Cannon Beach. Columbia Memorial Hospital is located 24 miles to the north in Astoria. Also, the Cannon Beach Fire Protection District has two main stations, the Cannon Beach Station and the Arch Cape Station. Cannon Beach also has one police station. There is currently no active school in the City of Cannon Beach. For elementary, middle, and high school, Cannon Beach students attend schools located in Seaside.

Historic & Cultural Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

The National Register of Historic Places lists four historic sites within the City of Cannon Beach. These sites include 3 Native American Archeological Sites - Bald Point, Ecola Site and Indian Creek Village Site – and the Oswald West Coastal Retreat.

Cannon Beach is also a major tourist destination. For outdoor recreation, there is Ecola State Park, Ecola Point, Haystack Rock and the Coast Range. There is also a hiking trail from Ecola Point to Indian Beach, and another trail that leads to Tillamook Head. Cannon Beach also hosts a number of festivals every year that draw thousands of tourists. These festivals include the Stormy Weather Art Festival and Haystack Holidays in November and December along with Sandcastle Day in June.^{xiv}

Government Structure

According to the City Charter, Cannon Beach has a council composed of a mayor and four councilors elected from the City at large. The councilors serve four-year terms with two of the councilors being elected in biennial elections. The mayor is elected for four-year terms. The council appoints a City Manager, City Attorney, and Municipal Judge. The City of Cannon Beach currently has the following departments: ^{xvi}

Administration: The Administration Department of City Hall is responsible for all

the City's general governmental functions: financial planning and budgeting; accounts receivable, payable, and payroll; building maintenance; public contracts; meeting agendas and minutes; legislation; records retention; community services; personnel; and information technology planning and implementation. The Administration Department also administers the City's Municipal Court.

Building: The Building Department provides plan review for construction and remodeling plans for buildings within the City limits. This plan review, along with subsequent structural, plumbing and mechanical inspections, assures compliance with state building codes.

Planning: The Planning Department prepares short-term and long-term recommendations for land use in compliance with City and State policies, and implements adopted development goals and visions for the community. Planning Department Staff support the Planning Commission and the Design Review Board; provide land use and planning assistance to residents and property owners, and coordinates with other departments on related issues.

Public Works: The Public Works Department plans, organizes, integrates and directs the programs and maintenance functions of the City's water treatment and distribution system, roads and streets, wastewater treatment plant and wastewater collection system, storm water, and parks and community services, to ensure the safe and ongoing operations of the City's utility systems and services and overall infrastructure.

Public Safety: The Public Safety Department is dedicated to providing services which improve quality of life by protecting life and property, maintaining order, and reducing crime and disorder through education and prevention. The Public Safety Department consists of two components:

- The Cannon Beach Police Department consists of seven sworn members and three administrative/support members. The department provides service seven days a week on a 24-hour basis. In addition to responding to emergency and non-emergency calls for service, the department provides patrol and investigative services.
- The Community Policing Team was established for the purpose to encourage and expand citizen participation in public safety and welfare issues. The team is a collaboration of law enforcement and community members working to protect and improve the quality of life in the community.

Existing Plans & Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies.

Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

The City of Cannon Beach's Addendum to the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan includes a range of recommended action items that, when implemented, will reduce the City's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the City's existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the City's resources.

The following table documents the plans and policies already in place in Cannon Beach.

Table 2.10 Existing Plans, City of Cannon Beach

Parking and Traffic Management Plan	Updated Annually	City of Cannon Beach	This plan addresses specific issues concerning parking and traffic in Cannon Beach
Cannon Beach Municipal Code	updated continuously	City of Cannon Beach	The Code covers such things as fees, zoning, construction, traffic laws, utility guidelines, and taxes. It also dictates powers held by governing bodies. It provides a framework for regulation on many issues.
Cannon Beach Municipal Code: Chapter 17, Zoning Ordinance of Cannon Beach, Oregon	January-08	City of Cannon Beach	Chapter 17 is the Zoning Ordinance for the City of Cannon Beach. The zoning ordinance chapter sets up and encourages standards for development throughout the City
Ecola Creek Forest Management Plan		City of Cannon Beach	Cannon Beach owns the 220-acre Ecola Creek Forest Reserve. The City's largest source of drinking water exists here, along with its water treatment facility. This plan lays out strategies for the protection of the City's drinking water source.
Cannon Beach Emergency Management Plan	January-06	City of Cannon Beach	This document is an inventory of the different procedures that the public agencies will follow in a disaster evenly. The primary focus of this document is the immediate response during the 72 hours following the disaster.

City of Cannon Beach Residential Building Permit and Zoning Information	May-08	City of Cannon Beach Planning Department	This manual is designed to provide individuals with information about building permit and zoning
--	--------	---	--

Community Organizations and Programs

Social systems can be defined as community organizations and programs that provide social and community-based services, such as health care or housing assistance, to the public. In planning for natural hazard mitigation, it is important to know what social systems exist within the community because of their existing connections to the public. Often, actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The County and cities can use existing social systems as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues, one of which could be natural hazard preparedness and mitigation.

The Countywide Community Organizations and Programs table can be found in Section 2: Community Overview of the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan. The table highlights organizations that are active within the County and may be potential partners for implementing mitigation actions.

Existing Mitigation Activities

Existing mitigation activities include:

- “S-Curve” stabilization maintenance; a drainage improvement project aimed at stabilizing the windy section of roadway that separates Cannon Beach from Tolovana Park, the two primary sections of the City (winter storm, flooding, earthquake, landslide).
- Emergency Preparedness Committee; a citizen committee tasked with developing evacuation routes and providing signage for the routes, and keeping the public educated as to the hazard.
- Prepare for Emergency Recovery Committee (PERC) meets periodically with the goal of caching adequate shelter, food, water, survival blankets, etc. to meet the needs of residents and visitors following a severe earthquake/tsunami event.
- Shelter Committee; a group dedicated to the staffing and operation of community shelter sites when disaster disrupts normal community services (multi-hazard).

- Resilience Committee; a group of community leaders working to develop a plan for getting the community back to economic stability following a major disaster (multi-hazard).
- Emergency Helipad; the City has graded and maintained a large clear area suitable for landing large military helicopters should they be needed to bring in relief supplies and transport out the sick and injured. This project is 90% complete. (multi-hazard).
- Setup a reserve fund for matching monies to upgrade or replace the Ecola Creek Bridge on Fir Street (earthquake / tsunami).
- Cannon Beach is currently addressing ODOT with its concerns concerning seismic upgrades for the following bridges; 1) Highway 101 overpass at Warren Way (MP 30.3); 2) Hwy 101 overpass at Sunset Blvd. (MP 29.5); and 3) Hwy 101 at Ecola Creek Bridge. Each of these bridges is in the statewide bridge sufficiency-rating plan (earthquake).
- Conduct a seismic evaluation of the City water treatment plant and make any necessary upgrades required to ensure continuity of operations following a severe earthquake (earthquake).
- Held annual public educational forums regarding Cascadia Subduction Zone Earthquakes and subsequent tsunamis (see Emergency Preparedness Committee above).
- Disaster Medical Supplies; purchased and cached trauma supplies at various locations in the City. The Clatsop County Health Department has also staged disaster supplies (multi-hazard) in the Cannon Beach Fire Station.
- Red Cross Trailer; the American Red Cross has staged a disaster-supplied trailer at the Cannon Beach Public Works facility (multi-hazard).

Communications Upgrades; the City has purchased upgrade satellite telephones for disaster use and has installed Ham Radio equipment in the each of the evacuation sites for use during a disaster (earthquake/tsunami) when other communication systems are not operational. In addition, the City now has a BGAN satellite Internet receiver for communication and information exchange.

- Warning Sirens: the Cannon Beach Fire District has installed multiple outdoor warning sirens intended to warn people on the beach and in the low-lying commercial areas of Cannon Beach of possible tsunami inundation, in operation since 1986.

Risk Assessment

The following hazards have been addressed in the Clatsop County Natural Hazard Mitigation Plan. The City of Cannon Beach reviewed the County's plan and

assessed how Cannon Beach's risks vary from the risks facing the entire planning area.

Coastal Erosion

Clatsop County's Coastal Erosion Hazard Annex adequately describes the causes and characteristics of coastal erosion hazards. Cannon Beach is a city of roughly 4 miles in length and ½ mile in width. All four miles are bordered on the west by the Pacific Ocean. While there has been relatively little significant erosion in the past two or three decades, the threat is always present, especially during the winter months when Pacific storms bring huge surf, heavy rain, and strong winds to the region.

There are five primary areas of concern to Cannon Beach regarding coastal erosion. These are: 1) Silver Point at the south end of Cannon Beach; 2) the "S-Curves area in the middle of Cannon Beach; 3) the Ecola Creek mouth just in front of the City's largest commercial area; 4) Ecola State Park; and 5) The Cove Beach / Falcon Cove area, approximately six miles south of Cannon Beach. Although Cove Beach is not within City limits, Cove Beach's residents are a part of Cannon Beach's social fabric. Likewise, Ecola State Park is not in the City Limits but it is adjacent to the City's northern boundary and one of the major tourist attractions to the City of Cannon Beach. All five of these areas are further described below:

- Silver Point ~ this area includes the southern portion of the City and the area immediately adjacent to the City. A large landslide in the early 1970s took out two residential structures and a large portion of Highway 101, interrupting commerce on the north Oregon coast for months. The slide was due to a combination of coastal erosion and poor drainage in the sub soils.
- S-Curves ~ this area is at risk due to a combination of poor drainage and coastal erosion. The City continues maintain this area as needed.
- Drainage mitigation measures and monitors the ground motion. Most of the recent problems have been associated with exceptionally wet winters. Sliding in this area has the potential to damage water and sewer services to the Tolovana Park area of Cannon Beach, disrupt the major north-south City street, and compromise public safety operations.
- Ecola Creek ~ the point where Ecola Creek meets the Pacific Ocean is subject to coastal erosion due to the combination of incoming wave action and outgoing creek drainage. The resultant turbulence has undermined seawalls and eroded large amounts of fore dune on various occasions during the past three decades.
- Ecola State Park ~ while not part of the City Limits, this park has had a history of active slides caused by coastal erosion. In the 1960s, most of what is now the main park area slid into the ocean. Within the past 5 years, the trail to Crescent Beach, the southern part of the State Park, slid away due to erosion and has not been repaired. This park is a major draw for the tourists who visit Cannon Beach and without it, the City's economy

would suffer greatly. The City is at this time, unaware of any mitigation efforts that could be made to harden the park against such erosion.

- Cove Beach/Falcon Cove ~ this area forms the southern-most part of the Clatsop County coastline. During the past 40 years, some homes have been lost to the sea due to erosion and several have been moved eastward to new foundations in an effort to protect. Cove Beach/Falcon Cove is entirely residential.

A mixture of fore-dunes and manmade structures protects much of the City's frontage on the Pacific Ocean. Significant storms or rising ocean levels may reduce or remove these structures, suddenly or gradually. Additionally, the entire municipal oceanfront is at high risk for coastal erosion due to its proximity to the ocean.

Clatsop County describes coastal erosion as a 'chronic' hazard along the Oregon Coast, especially on sand spits, bluffed coastline, and dune-backed beaches. Damages caused by chronic hazards are usually gradual and cumulative. As such, the County estimates a 'high' probability that coastal erosion will continue to occur along the County's coastline. The same is true for the City of Cannon Beach.

Likewise, the County estimates a 'high' vulnerability to coastal erosion, meaning more than 10% of the population or regional assets are likely to be affected by this hazard. Due to the City's large amount of development along its coastline, Cannon Beach estimates the same level of vulnerability.

Drought

Clatsop County's Plan adequately describes the causes and characteristics of droughts, as well as the location and extent of a potential drought event. Clatsop County has no record of a severe drought affecting the County, and the same is true for Cannon Beach. Drought is averted as a result of the area's high rainfall, especially during winter months. Clatsop County estimates a 'low' probability that drought will occur, meaning no more than one incident is likely within a 75-100 year period. Likewise, the County estimates a 'low' vulnerability to drought hazards; meaning less than 1% of the population or regional assets would be affected by a drought. Both estimates are true for Cannon Beach as well. Potential drought-related community impacts are adequately described within Clatsop County's Drought Hazard Annex.

Earthquake

Cannon Beach's location along the Oregon Coast makes it susceptible to earthquakes, especially a Cascadia Subduction Zone earthquake. The extent of the earthquake hazard includes the entire community of Cannon Beach, although damage from an earthquake may be more severe in the downtown area where buildings are old and sit on fill that has liquefaction potential.

Clatsop County's Natural Hazards Mitigation Plan adequately describes the causes, characteristics, and location of earthquake hazards for the region. The County's

Plan additionally identifies all previous occurrences that have affected the City. It is difficult to estimate recurrence intervals, but the state has experienced seven Cascadia Subduction Zone (CSZ) events in the last 3500 years – some of which were probably as large as magnitude (M) 9. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. The last CSZ event occurred approximately 300 years ago. Scientists estimate that there is a 10-20% probability that a subduction zone earthquake will occur within the next 50 years.^{xviii} Based on this information, Clatsop County estimates a 'high' probability that an earthquake will occur in the future. Cannon Beach agrees.

The Department of Geology and Mineral Industries developed the following earthquake hazard maps. The figures illustrate the location of the amplification, liquefaction, earthquake-induced landslide, and relative earthquake hazards in Cannon Beach, Seaside, and Gearhart.

Figure 2.5 Relative Amplification Hazard Map

The majority of the City's built lands are located in areas of medium amplification hazards. The surrounding areas have a low risk of amplification.

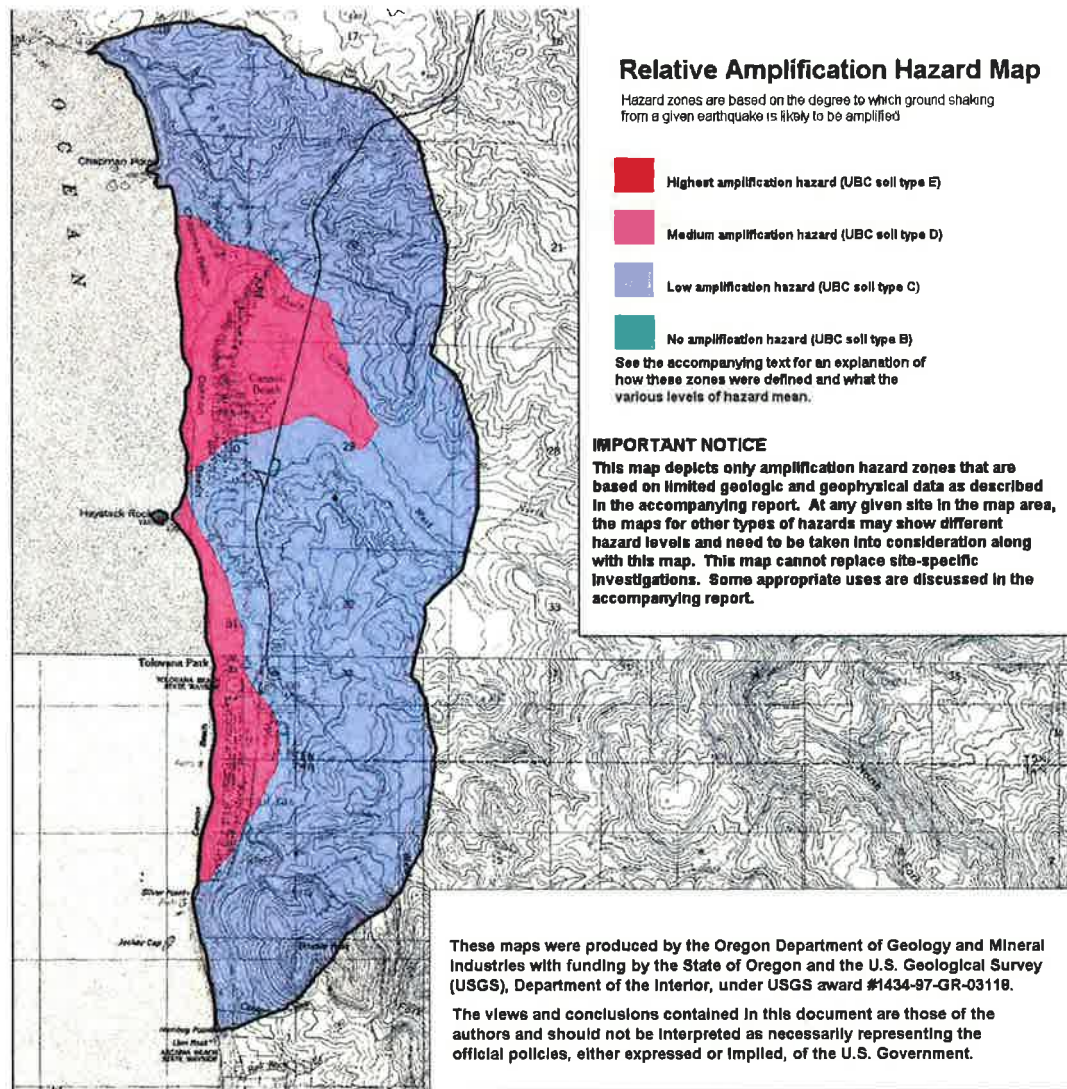


Figure 2.6 Relative Liquefaction Hazard Map

The majority of the City's built lands are located in the highest liquefaction hazard areas. The surrounding areas have a low (or zero) risk of liquefaction.

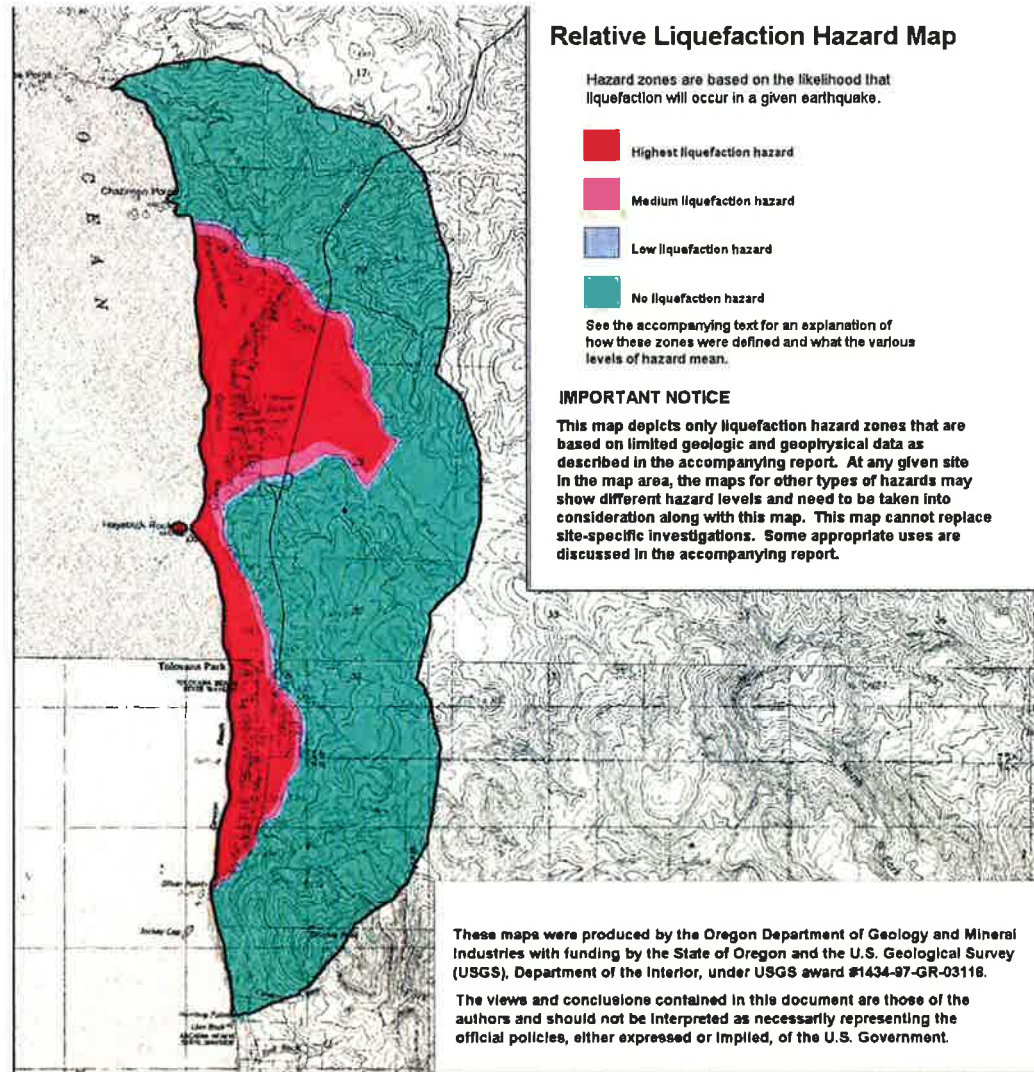


Figure 2.7 Earthquake- Induced Landslides

The majority of the City is located in areas of low landslide hazards. Areas immediately outside the City have medium and high earthquake-induced landslide hazards.

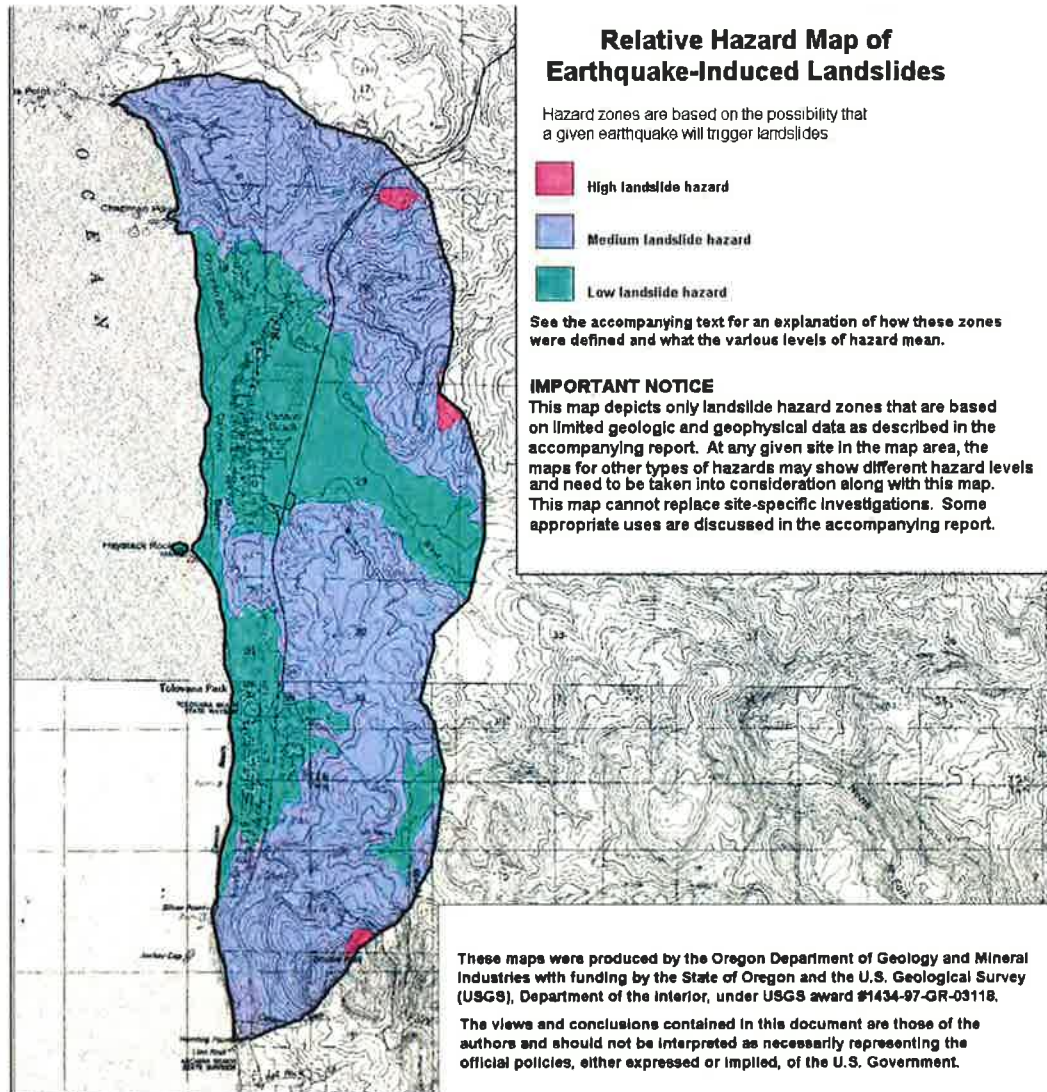
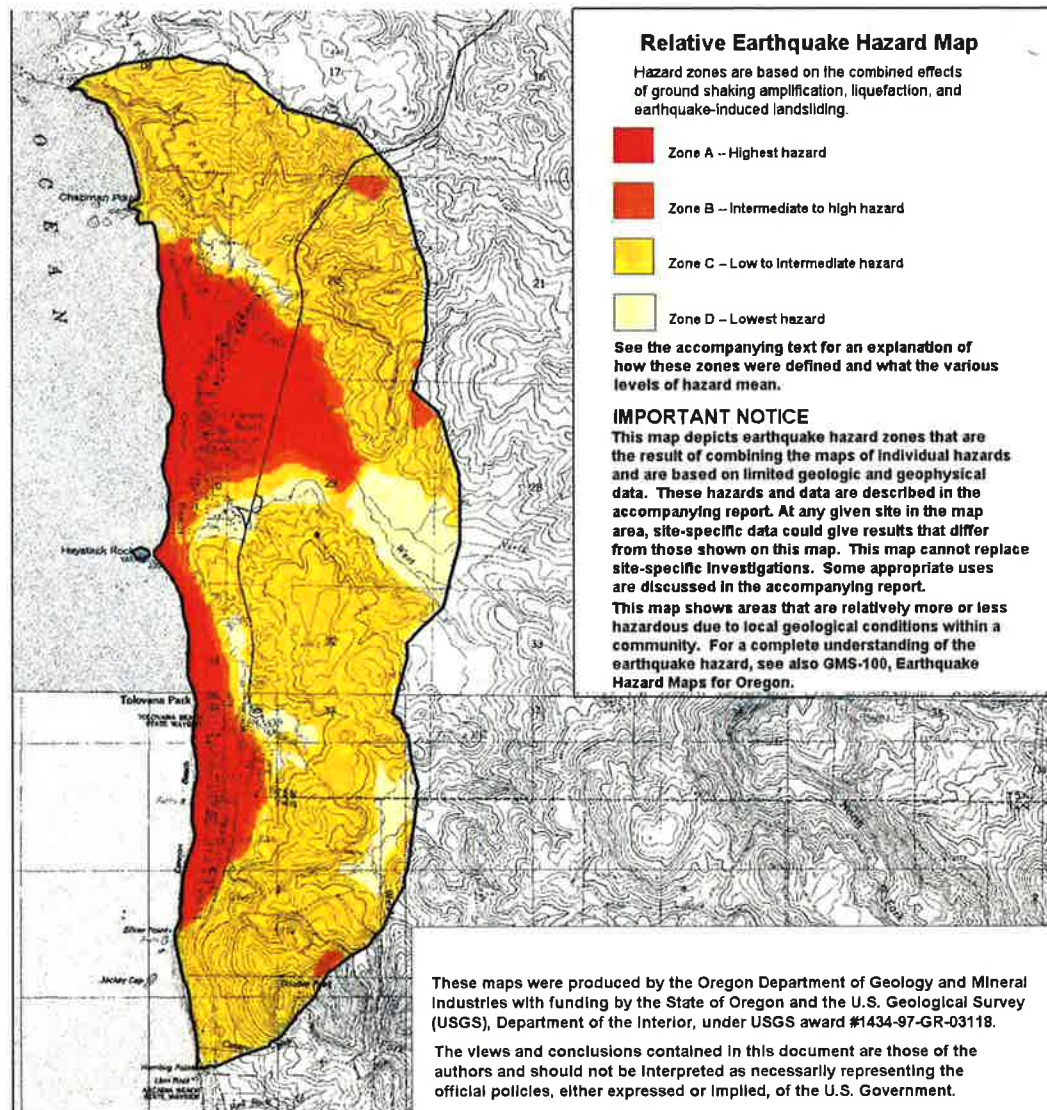


Figure 2.8 Relative Earthquake Hazard

The majority of the City is located in the highest hazard zone. Areas immediately outside the City are in the intermediate and low hazard zones.



Clatsop County estimates a 'high' vulnerability to earthquake hazards, meaning more than 10% of the population or regional assets would be affected by a major emergency or disaster. As shown by the figures above, the City has a moderate risk of amplification, and a very high risk of liquefaction. The majority of the City's developed lands are located in Zone A – the highest hazard area for earthquakes. Additionally, as described above on page 7, about 53% of the City's housing stock was built prior to 1980, before stronger seismic building codes were put into place. The combination of these hazards makes Cannon Beach extremely vulnerable to high magnitude earthquake events.

In 2006, DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse" due to the maximum possible earthquake for any given area. Within Cannon Beach, the following buildings were rated as 'moderate' or 'high.' No buildings in Cannon Beach were assigned the 'very high' rating.

- Cannon Beach Police Department; *moderate*

In addition to the structures listed above, the City's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, and cell towers are vulnerable assets. The City would expect significant damage to roads and bridges following a Cascadia Subduction Zone event, as well as deaths and severe injuries region-wide. Education and outreach regarding earthquakes (and a resultant tsunami) is an ongoing endeavor in Cannon Beach. Additional community impacts are adequately described within the County's Earthquake Hazard Annex.

Flood

Cannon Beach is at risk of flooding from two primary sources: riverine flooding and Ocean flooding. Riverine flooding generally occurs during periods of heavy rainfall that cause the streams that drain the hills east of Cannon Beach to overflow their banks. Ocean flooding results from exceptionally high tides or tsunamis. On some occasions, high tides and riverine flooding can combine to produce flooding in the City.

An additional flooding hazard that impacts the safety and the well being of Cannon Beach residents is the annual riverine flooding of Highway 101 between the south limits of the City of Seaside and the junction of Highways 26 and 101. During periods of heavy rainfall each winter season, the roadway becomes impassable by floodwater from the Necanicum River, often closing the road to passenger vehicles. While the flooding causes little damage to structures, it interrupts commerce along the only North-South roadway on the Oregon Coast and the major transportation route between the North Oregon Coast and the Portland-Vancouver metro area on the Interstate 5 corridor. It also isolates The City of Cannon Beach from Clatsop County's two hospitals, and impairs ambulance, police, and fire services.

The City's Flood Insurance Rate Map highlights the location of the flood hazard in Cannon Beach. The City's current effective date for the Flood Insurance Rate Maps is September 17, 2012.

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan adequately identifies the previous occurrences of floods for the City of Cannon Beach. The

Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the vulnerability of floods as moderate. The County Plan also indicates that the probability of floods is high. These scores would be representative of Cannon Beach's risk as well.

The City of Cannon Beach is a participant in the National Flood Insurance Program. The City has a total of 487 policies under the NFIP, 124 of which are located in A zones. The total coverage for the City under the NFIP is \$120,819,700. There have been 13 claims since 1978, with \$157,247 paid on those claims. As of June 2008, there has been one repetitive loss property in the City of Cannon Beach.

The number and types of structures located in the floodplain are not available at this time.

Absent a tsunami, Cannon Beach has had a low incidence of serious flooding since a dike was constructed along the banks of Ecola Creek in the immediate vicinity of the main commercial areas in the 1960s. Prior to dike construction, the business district in Cannon Beach became flooded routinely during periods of heavy rainfall. Mitigation measures for the Cannon Beach business district should be focused on assessing and maintaining the integrity of the Ecola Creek diking structures. Mitigation measures for the routine flooding of Highway 101 should continue.

Landslide

As previously noted in the Coastal Erosion Hazard, four of the five erosion hazard areas are primary areas of concern to Cannon Beach for landslides. All of the landslide hazard areas are problematic due to a combination of drainage and coastal erosion. The four landslide areas documented under the Coastal Erosion Hazard section are Falcon Cove/Cove Beach, Silver Point, the "S-curves", and Ecola State Park.

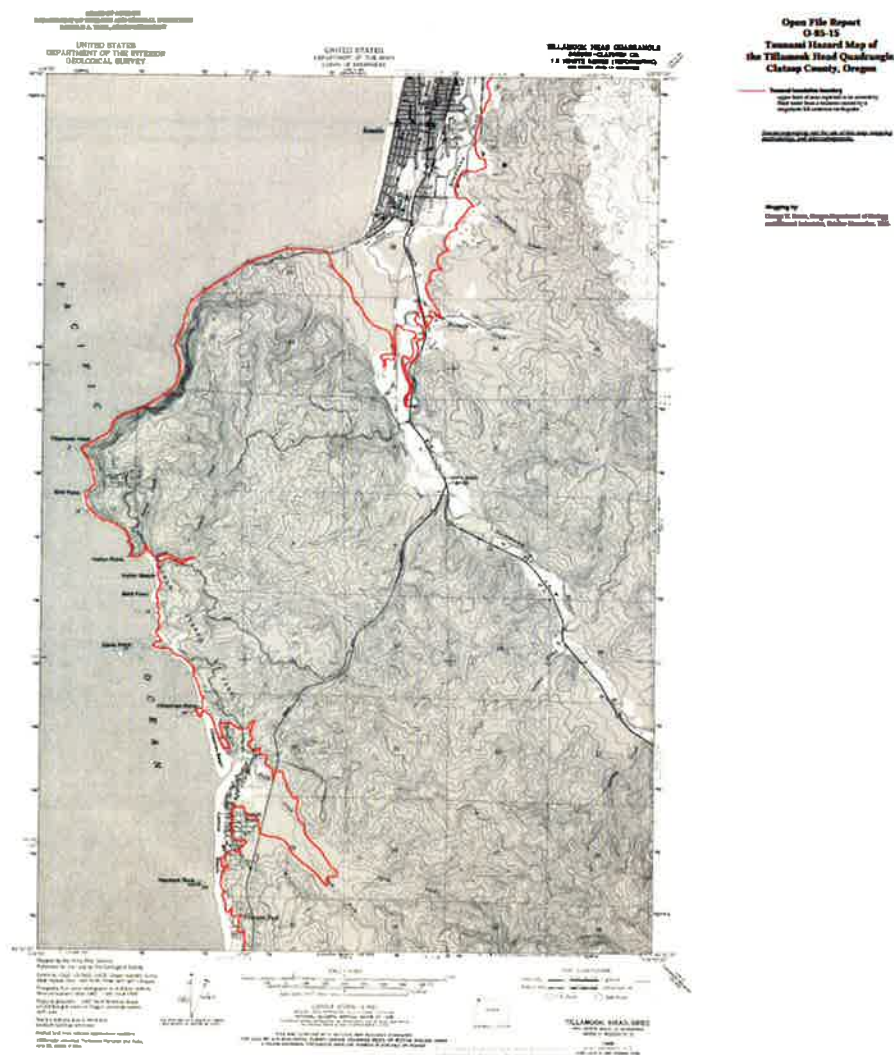
Clatsop County's Plan identifies a number of locations within the County that are at risk of landslides. Due to Cannon Beach's location along the coast, landslides primarily occur during rain and/or coastal erosion events. Beyond this, regional landslides can cause regional commerce and transportation difficulties.

Clatsop County estimates a 'high' probability that landslides will occur in the future; meaning one incident is likely within a 10-35 year period. Cannon Beach estimates a 'moderate' probability due to its more level topography. Clatsop County estimates a 'moderate' vulnerability to landslides, and the same would be true for Cannon Beach as well. Potential community impacts are adequately described in Clatsop County's Landslide Hazard Annex.

Tsunami

Clatsop County's Natural Hazards Mitigation Plan adequately describes the causes and characteristics of tsunami hazards, as well as the previous occurrences of tsunami events within the region. In 1995, The Department of Geology and Mineral Industries (DOGAMI) conducted an analysis resulting in extensive mapping along the Oregon Coast. The maps depict the expected inundation for tsunamis produced by a magnitude 8.8 to 8.9 undersea earthquakes. The tsunami maps were produced to help implement Senate Bill 379 (SB 379), which was passed during the 1995 regular session of the Oregon Legislature. SB 379, implemented as Oregon

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES DONALD A. HULL, STATE GEOLOGIST



Page 30

The extent of a tsunami event in Cannon Beach will depend on where the tsunami originated, and the size of the earthquake that produced the tsunami. Clatsop County appropriately describes the probability of a tsunami event for Cannon Beach. Geologists predict a 10-14% chance that a Cascadia tsunami will be triggered by a shallow, undersea earthquake offshore Oregon in the next 50 years. The forecast comes from evidence for large but infrequent earthquakes and tsunamis that have occurred on the Oregon coast every 500 years, on average.

A Cascadia Subduction Zone event will begin with a magnitude 9.0 near shore earthquake closely followed by a series of devastating coastal Tsunami waves. It can occur at any time and during any season. The challenge for Cannon Beach is how to provide shelter, water and food for up to 4 thousand survivors depending on the season. Through a series of tabletop exercises, Cannon Beach has developed a "Hub and Spoke" emergency management concept. With the Cannon Beach Emergency Operation Center as the "hub" and three-evacuation community support sites as the spokes.

Based on a recently completed innovative pilot project, each evacuation support site will consist of two 20' shipping containers placed on a concrete pad. The pilot project containers are loaded with the following community resilience support items:

- Family Cache Containers
- Medical, administrative, and support equipment containers
- Tourist, Employee and Visitor Kits

Depending on the floor plan, each container can benefit up to a minimum of 700 survivors for at least 96 hours. Once the pilot project is replicated at two more sites, Cannon Beach can provide sustainable support for up to 4,200 survivors.

Cannon Beach has three population demographics influenced by a Cascadia Subduction event. They are:

- a. Residents who live above the inundation line
- b. Residents who live below the inundation line.
- c. Tourists, visitors and employees who work or temporarily reside below the inundation line

Oregon's North Coast climate can present hypothermia as the primary danger long before water or food becomes an issue. Exercise outcomes measured resiliency, in terms of shelter first, water second and food last. Group 1 would most likely shelter in place leaving groups 2 and 3 as those most in need of initial support. Based on exercise outcomes Cannon Beach began an innovative cache container pilot project consisting of the following components:

- a. A support site consisting of two 20' shipping containers.
- b. Family Cache Containers.
- c. Tourist/Employee/Visitor kits.
- d. Medical, administration and equipment support containers.

Each group was provided, at cost, storage containers in the form of 55 gallon drums, 30 gallon barrels or 5 gallon buckets for use as personal cache containers.

Each family determined how many cache containers' they would need and packed them per their family's needs. Because group 3 could make up the largest population segment Cannon Beach has developed an innovative Tourist/Employee/Visitor kit. It consists of a shelter system (poncho, space blanket, tube tent), water and food for 500 survivors.

For more information regarding our project please go to the following link:
http://connectipedia.org/Tsunami_Response_Cannon_Beach

The County estimates a 'high' vulnerability to tsunami hazards, which indicates that at least 10% of the County's population and regional assets are likely to be affected by a tsunami event. This rating appropriately describes Cannon Beach's vulnerability as well. More than 50% of Cannon Beach's developed lands are within the tsunami inundation zone. This includes close to 1,000 residents, and more than 1,000 employees. Additionally, more than 25 overnight-tourist facilities are within the inundation zone.

Cannon Beach recognized the serious nature of the tsunami threat in the middle 1980s and the Fire District began the purchase and installation of warning sirens to mitigate the threat of massive loss of life along the beaches and in low lying areas of the community. The first sirens became operational in 1996 and still function today. The December 2004 quake near Sumatra made the value of these sirens clear to the rest of the world.

Since the siren installations, Cannon Beach has taken additional steps to help insure its survival when a tsunami strikes the area. Past and current activities include:

- Adding satellite phones and a BGAN Internet satellite receiver to the communication tools;
- Purchase of portable water tanks for emergency distribution of potable water;
- Constructing cache sites for storing personal, administrative, support tools and emergency medical supplies throughout the community;
- Establishing an Emergency Preparedness Committee;
- Sponsoring annual Tsunami Education Forums for community members;
- Printing and distributing informational brochures;
- Establishing designated shelters in the community and supplying them with emergency generators;
- Grading and maintaining an emergency helicopter landing pad;
- Wrote, adopted and updated emergency management plans;
- Established committees to address tsunami preparedness.
- Worked with local, state and federal agencies to better understand the tsunami hazard and prepare the community to deal with it;
- Worked with the community elementary school to implement evacuation plans and drills;
- Conducted seismic evaluations of the designated shelter sites;
- Stored County Health Dept. supplies in the Fire Station;
- Purchased a cache of blankets, food, water and shelter supplies for

- use following a tsunami;
- Created a Red Cross trailer that could hold disaster supplies;
- Established tsunami evacuation routes and sites; and
- Met the objectives established by the National Oceanic and Atmospheric Administration's "Tsunami Ready" program.

Some of the mitigation projects still needing to be initiated and/or completed are the seismic upgrades to the two local bridges (to provide safe evacuation routes after a quake and before a tsunami arrives), relocation of the community elementary school to high ground, relocation of both local fire stations to high ground, creating vertical evacuation sites in the community, relocation of City Hall/Police Dept. facilities to high ground, and preparing emergency medical facilities to care for the injured following a tsunami.

Volcano

The Clatsop County Natural Hazard Mitigation Plan adequately describes the City's risk to volcanic events. Generally, an event that affects the County is likely to affect Cannon Beach as well. The causes and characteristics of a volcanic event are appropriately described within the County's Plan, as well as the location and extent of potential hazards. Previous occurrences are well documented within the County's Plan, and the community impacts described by the County would generally be the same for Cannon Beach as well. Cannon Beach is very unlikely to experience anything more than a small amount of volcanic ash during a volcanic event. The County estimates a 'low' probability of future volcanic events and a 'low' vulnerability to future eruptions. The County's probability and vulnerability estimates are accurate of Cannon Beach's as well.

Wildfire

The Clatsop County Natural Hazard Mitigation Plan adequately describes the causes and characteristics of wildfires, as well as the County and City's history of wildfire events. Cannon Beach has no recorded history of wildfire, and County wildfires are mostly related to debris burns. Clatsop (CWPP) will become part of the Clatsop County Hazard Mitigation Plan when it is completed. Cannon Beach is participating in the County's CWPP planning process as well.

Clatsop County estimates a high probability that wildfires will occur in the future. Most wildfires can be linked to human carelessness. This rating is true for Cannon Beach as well.

Clatsop County estimates a moderate vulnerability to wildfire events; meaning 1-10% of the population of regional assets is likely to be affected by a major event. Wildfires are most likely to occur in wild land-urban interface areas, and Cannon Beach is considered to be an 'interface community.^{xxi}' Cannon Beach is particularly vulnerable to catastrophic wildfires. The area is bounded on the east by commercial forestland, and on the north and south by forested state parks (Ecola State Park & Oswald West State Park). Additionally, there are numerous wooded areas throughout the community, making the spread of fire from one area of the City to

another highly likely. The natural mitigation factor is the maritime climate, which reduces the rate at which vegetation dries during the summer months. Potential community impacts are adequately described in Clatsop County's Wildfire Hazard Annex.

Wind and Winter Storms

The Clatsop County Natural Hazard Mitigation Plan adequately describes the causes and characteristics of wind and winter storms, as well as the location and extent of wind and winter storm hazards. The region's (and City's) history of events are adequately described within the County's Plan as well. Because coastal wind storms typically occur during winter months, they are sometimes accompanied by ice, freezing rain, flooding, and very rarely, snow. More than likely, however, the coast's winter will just be windy, cold, and wet.

The County estimates a 'high' probability that wind and winter storms will occur in the future. Windstorms occur yearly, and the more destructive storms occur once or twice per decade. The County additionally estimates a 'high' vulnerability to windstorms; meaning more than 10% of the population or regional assets would be affected by a major windstorm event. Both estimates are true for the City as well.

Cannon Beach's long, narrow configuration on the Pacific shoreline makes it very vulnerable to windstorms blowing in from the ocean. Winter storms with snow and ice that are severe in nature are relatively uncommon along the coastal strip. Because of the infrequent nature, many drivers lack necessary skills and equipment to continue routine travel, and many homes are not constructed to adequately protect their plumbing systems from freezing. Additionally, roughly 65% of the homes in the community are for vacation use and not occupied year-round. During prolonged periods of freezing weather, it is common to find water pipes broken with water running unchecked into homes and onto the ground. When this becomes widespread, the public water reservoirs drain with resultant loss of flow needed for fire protection and public health.

Action Items

The Cannon Beach addendum includes action items that, when implemented, will reduce the City's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the City's existing plans and policies. Implementing the addendum's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the City's resources.

The following action items are detailed recommendations for activities that local departments, citizens, and others could engage in to reduce risk.

1. Provide Seismic Upgrades to the Hwy. 101 Bridge spanning Arch Cape Creek (approx. MP 35.6).

2. Encourage ODOT to upgrade or replace Ecola Creek Bridge on Fir Street.
3. Encourage ODOT to upgrade or replace Ecola Creek Bridge at Highway 101 in Cannon Beach to withstand M9.3 quake.
4. Encourage the State to take appropriate action to avoid annual winter flooding on multiple sections between the City of Seaside and the Junction of Highways 101 and 26. Following on the action being taken in 2013, monitor results of that effort and make appropriate action to mitigate.
5. Stabilize "S-Curves" area to reduce risk of landslide activity so that utility lines in the Hemlock Street right-of-way are protected.
6. Encourage ODOT to seismically upgrade the Hwy 101 overpass at Warren Way in Cannon Beach (approx. MP 30.3).
7. Conduct seismic upgrades of municipal water reservoirs and water treatment facilities.
8. Encourage ODOT to seismically upgrade the Hwy 101 overpass at Sunset Blvd. in Cannon Beach (approx. MP 29.5).
9. Conduct a seismic evaluation of the Cannon Beach Water Treatment Plant and make any necessary upgrades required to ensure continuity of operations following a severe earthquake.
10. Improve emergency helipad to facilitate utilization by large military helicopters. Level and grade the site and install semi- impervious surface.

The City will use the same prioritization process and plan maintenance schedule as outline in the County's Plan [See Section 4: Plan Implementation and Maintenance of the Clatsop County Multi- Jurisdictional Natural Hazard Mitigation Plan and Appendix D: Economic Analysis of Natural Hazard Mitigation Projects].

Proposed Action Item:		Alignment with Plan Goals:	
Provide Seismic Upgrades to the Hwy. 101 Bridge spanning Arch Cape Creek (approx. MP 35.6)		Protect life. Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Arch Cape can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that large Cascadia Subduction Zone earthquakes are accompanied by tsunamis occurring every 500 years, plus or minus 200 years, with the last event occurring 300 years ago. A failure of the Arch Cape Creek Bridge would isolate the Cove Beach/Falcon Cove area from its police and fire protection services as well as less emergent services. Since a strong quake would likely induce rockslides on Hwy. 101 to the south, the second-tier emergency services from Tillamook County would not be available. This bridge is essential for the survival of these residents. The Oswald West State Park is often filled with visitors and campers. It too is dependent upon emergency services provided via the bridge over Arch Cape Creek. A tsunami following a local earthquake will create a significant life safety threat and the bridge would be a vital link to provide for rescue of those in Cove Beach/Falcon Cove and in Oswald West State Park. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Consult with ODOT to obtain engineering data relevant to providing seismic upgrades to the bridge. Obtain estimates for installing the upgrades. Locate and secure funding for the project. Solicit bids for the project. Award contract to the bidder with the best proposal. Complete the project. 			
Coordinating Organization:		Public Works	
Internal Partners:		External Partners:	
Public Safety		ODOT, US Dept. of Transportation, FEMA, OEM, Clatsop County, Tillamook County	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
ST			
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:
Encourage ODOT to upgrade or replace Ecola Creek Bridge on Fir Street		Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.
Rationale for Proposed Action Item:		
<ul style="list-style-type: none"> • Bridge serves as primary tsunami evacuation route to high ground for the entire downtown area. The bridge must remain passable after a major quake (M9.3) in order to accommodate throngs of evacuees. • Alternate routes cannot be accessed within the time frame necessary for survival. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> • Develop an engineering cost-benefit analysis for upgrading or replacing the structure. • Secure funding source for improvements. • Develop plans for best option construction. • Coordinate anticipated construction issues with City of Cannon Beach, County, State, Feds. • Complete project. • Adjust evacuation plans to utilize improved bridge. 		
Coordinating Organization:	Public Works	
Internal Partners:		External Partners:
		ODOT, FEMA, ODFW, Army Corps of Engineers, Dept of State Lands
Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	
	LT	
Form Submitted by:	Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Encourage ODOT to upgrade or replace Ecola Creek Bridge at Highway 101 in Cannon Beach to withstand M9.3 quake.		Protect life. Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Cannon Beach can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that large Cascadia Subduction Zone earthquakes are accompanied by tsunamis occurring every 500 years, plus or minus 200 years, with the last event occurring 300 years ago. • Bridge loss would divide City, making delivery of emergency services impossible following a major earthquake. • Bridge loss during quake would sever vital transportation link on Oregon Coast. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Conduct an engineering study of the bridge structure. • Develop recommendations for upgrading or replacing the bridge. • Develop construction drawings for capital improvement • Seek bids for construction • Contract for work with best proposal. • Make selected improvement 			
Coordinating Organization:		Public Works	
Internal Partners:		External Partners:	
		ODOT, City of Cannon Beach, Clatsop Co., FEMA, ODFW, Army Corps of Engineers, OR Div. of State Lands	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Encourage the State to take appropriate action to avoid annual winter flooding on multiple sections between the City of Seaside and the Junction of Highways 101 and 26. Following on the action being taken in 2013, monitor results of that effort and make appropriate action to mitigate.		Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:			
<p>Routine winter flooding of this section of Highway 101 has several negative effects:</p> <ul style="list-style-type: none"> ○ Disrupts coastal economy from Tillamook to Astoria and beyond ○ Prevents or delays timely ambulance response between Seaside and points south and west. ○ Prevents or delays police and fire mutual support to and from Seaside during emergencies. ○ Prevents or delays routine patrols by Oregon State Police and Clatsop County Sheriffs Office. ○ Damages vehicles attempting to drive through the flooded sections of roadway ○ Causes vehicles to be swept off the roadway while attempting to drive through sections of flooded roadway, posing a threat to life. ○ Consumes many hours of labor for ODOT and other public agencies attempting to control or warn motorists of the hazard ○ Consumes motorist funds for towing and repairs to vehicles disabled by floodwaters. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Gain political consensus for project from ODOT and affected counties, cities, state & federal agencies, and citizens • Conduct engineering studies for raising roadway elevations or utilize existing studies in ODOT files. • Prepare or utilize existing job specifications • Estimate job costs • Obtain funding • Solicit bids for the specified work • Award a contract for the work • Complete the project 			
Coordinating Organization:		Public Works	
Internal Partners:		External Partners:	
Planning		State of Oregon, Dept. of Transportation , FEMA, Clatsop Co. Cities, Oregon Emergency Management, Dept. of State Lands, Dept. of Fish and Wildlife	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:	Alignment with Plan Goals:	
Stabilize “S-Curves” area to reduce risk of landslide activity so that utility lines in the Hemlock Street right-of-way are protected.	Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:		
<ul style="list-style-type: none"> • Cannon Beach can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that large Cascadia Subduction Zone earthquakes are accompanied by tsunamis occurring every 500 years, plus or minus 200 years, with the last event occurring 300 years ago. • “S-Curve” area of South Hemlock Street has a history of sliding, causing disruption to wired and piped utilities and to traffic. Projects should be undertaken to prevent additional sliding and prevent damage. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> • Conduct engineering studies to continue and expand the existing de-watering program. • Obtain cost estimates for implementation of the chosen solutions. • Advertise for bids. • Award contract(s) for the work. • Complete the projects. 		
Coordinating Organization:	City of Cannon Beach, Public Works Dept.	
Internal Partners:		External Partners:
Planning, Building, Parks & Recreation		Engineering firms, Excavation Contractors, FEMA, OEM
Timeline:		If available, estimated cost:
Short Term (0-2 years)	Long Term (2-4 or more years)	
	LT	
Form Submitted by:	Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Encourage ODOT to seismically upgrade the Hwy 101 overpass at Warren Way in Cannon Beach (approx. MP 30.3).		Protect life. Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> The Cannon Beach area is at risk of a major earthquake. Oregon Dept. of Geology and Mineral Industries estimates the current odds of a M9 quake as 1 in 7 in then next 40 years. The Warren Way overpass is a vital transportation link on Highway 101, the sole route into and out of the City of Cannon Beach. If the overpass were to collapse as a result of an earthquake, it would block traffic on Highway 101. The loss of the overpass would create a serious economic loss to the City of Cannon Beach and other communities on the Oregon Coast. Loss of the overpass would significantly hamper the provision of fire protection, law enforcement, and emergency medical services to a large part of the Cannon Beach Area. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Request proposals from engineering firms for determining necessary seismic upgrades establishing project costs. Secure funding for the project Seek construction bids for the project. Award contract to firm with best proposal. Complete the project. 			
Coordinating Organization:		City Manager	
Internal Partners:		External Partners:	
City Council		ODOT, City of Cannon Beach, Clatsop County, US Dept of Transportation, FEMA, OEM	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Conduct seismic upgrades of municipal water reservoirs and water treatment facilities.		Minimize damage to public and private buildings and infrastructure. Decrease disruption of critical services.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> Water is essential for human health, business activities, and fire suppression. Cannon Beach can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that the Cascadia Subduction Zone earthquakes are accompanied by tsunamis, occurring every 500 years, plus or minus 200 years, with the latest event occurring 300 years ago. The City's reservoirs should be inspected for resistance to such a quake and upgrades made to provide stability. Life for residents and visitors in Cannon Beach would return to normal at a much more rapid pace following a large quake if the municipal water supply were to remain intact. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Hire an engineering firm with expertise in reservoir construction and stability, to develop a report on the current status of the reservoirs and make recommendations on adding seismic stability in order to sustain a M9.3 quake without loss of service. Develop specifications for the recommended upgrades. Locate funding sources for the project(s). Advertise for bids. Award a contract for the upgrades. Complete the project(s). 			
Coordinating Organization:		City of Cannon Beach, Public Works	
Internal Partners:		External Partners:	
Building and Planning Departments		Engineering firm(s), FEMA, OEM	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Encourage ODOT to seismically upgrade the Hwy 101 overpass at Sunset Blvd. in Cannon Beach (approx. MP 29.5).		Protect life. Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical services.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> The Cannon Beach area is at risk of a major earthquake. Oregon Dept. of Geology and Mineral Industries estimates the current odds of a M9 quake as 1 in 7 in then next 40 years. The Sunset Blvd. overpass is a vital transportation link on Highway 101, the sole route into and out of the City of Cannon Beach. If the overpass were to collapse as a result of an earthquake, it would block traffic on Highway 101. The loss of the overpass would create a serious economic loss to the City of Cannon Beach and other communities on the Oregon Coast. Loss of the overpass would significantly hamper the provision of fire protection, law enforcement, and emergency medical services to a large part of the Cannon Beach Area. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> Request proposals from engineering firms for determining necessary seismic upgrades establishing project costs. Secure funding for the project Seek construction bids for the project. Award contract to firm with best proposal. Complete the project. 			
Coordinating Organization:		City Manager	
Internal Partners:		External Partners:	
City Council, Public Works		Oregon Dept. of Transportation , City of Cannon Beach, Clatsop County, US Dept of Transportation, FEMA, OEM	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Conduct a seismic evaluation of the Cannon Beach Water Treatment Plant and make any necessary upgrades required to ensure continuity of operations following a severe earthquake.		Minimize damage to public and private buildings and infrastructure. Decrease disruption to critical facilities.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Cannon Beach can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that large Cascadia Subduction Zone earthquakes are accompanied by tsunamis occurring every 500 years, plus or minus 200 years, with the last event occurring 300 years ago. • Water is essential to life. • Life for residents and visitors in Cannon Beach would return to normal at a much more rapid pace following a large quake if the municipal water supply were to remain intact. • The water treatment plant was built prior to current geologic forecast for stronger shaking and may need hardening against such violent quakes. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Hire an engineering firm with expertise in treatment plant construction and seismic stability, to develop a report on the current status of the water treatment facility and make recommendations on adding seismic stability in order to sustain a 9.3 quake without loss of service. • Develop specifications based on recommended upgrades. • Locate funding sources for the project. • Advertise for bids. • Award a contract for the upgrades. • Complete the project. 			
Coordinating Organization:		Cannon Beach Public Works	
Internal Partners:		External Partners:	
Planning, Administration, Parks and Community Services.		ODF, FEMA, Dept. of State Lands, Engineering Firm(s)	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
ST			
Form Submitted by:		Cannon Beach Steering Committee	

Proposed Action Item:		Alignment with Plan Goals:	
Improve emergency helipad to facilitate utilization by large military helicopters. Level and grade the site and install semi-impervious surface.		Protect life.	
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Cannon Beach can anticipate an earthquake associated with the Cascadia Subduction Zone up to a Magnitude 9.3. The geologic record shows that large Cascadia Subduction Zone earthquakes are accompanied by tsunamis occurring every 500 years, plus or minus 200 years, with the last event occurring 300 years ago. • Site near south end of community is the only site at elevation above tsunami inundation, owned by the City, and capable of accommodating large military aircraft. This could be an important method of moving relief supplies into the community and evacuating the sick and injured after a serious disaster. It is anticipated that all major and minor roadways will be impassable due to slides, floods, buckling, and bridge collapse. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • Conduct Civil Engineering study to determine type and amount of fill needed to reduce the slope of existing site to nearly level and provide necessary drainage. • Secure necessary funding. • Explore possible sources for fill material. • Seek bids for required work. • Award contract and complete the project. 			
Coordinating Organization:		Public Works	
Internal Partners:		External Partners:	
Planning		ODOT, County Road Dept.,	
Timeline:		If available, estimated cost:	
Short Term (0-2 years)	Long Term (2-4 or more years)		
	LT		
Form Submitted by:		Cannon Beach Steering Committee	