



City Council Agenda Bill

SUBJECT:		Agenda Date: March 17, 2015	AB15-028	
A Resolution Authorizing Adoption of Proposed Amendments to the 2015 Comprehensive Plan Pertaining to the Critical Areas Element		Department/Committee/Individual		
		Mayor Ken Hearing		
		City Administrator – Londi Lindell		
		City Attorney - Mike Kenyon		
		City Clerk – Susie Oppedal		
		Finance – Dawn Masko		
		Public Works – Mark Rigos		
		CED Senior Planner – Jamie Burrell		X
		Cost Impact: N/A Fund Source: N/A Timeline: Immediate		
Attachments: Resolution, Exhibit A- Critical Areas Element and Figures				
SUMMARY STATEMENT: The City is required to review and revise, if needed, its Comprehensive Plan and Development Regulations by June 30, 2015 to ensure compliance with the Growth Management Act (GMA) – Chapter 36.70A RCW. After reviewing the adopted Scope of Work staff confirms that GMA requirements have been met for the 2015 Critical Areas Element Update. Updates to any new listed species were reviewed as well as new references to groundwater protection planning. The Element added references to the Salmon Plan and other Basin/Watershed Plans. Figures were updated and revised with the most current information, which included incorporating delineated wetlands and revised conveyance channels.				
COMMITTEE REVIEW AND RECOMMENDATION: CED Committee reviewed the proposed amendments at their February 11, 2015 and March 11, 2015 meetings and recommended approval.				
RECOMMENDED ACTION: Motion to approve AB15-028, a resolution authorizing adoption of proposed amendments to the 2015 Comprehensive Plan pertaining to the Critical Areas Element.				
RECORD OF COUNCIL ACTION				
<i>Meeting Date</i>	<i>Action</i>	<i>Vote</i>		
March 17, 2015	Passed Resolution 1678	6-0		

RESOLUTION 1678

A RESOLUTION OF THE CITY OF NORTH BEND, WASHINGTON, AUTHORIZING ADOPTION OF PROPOSED AMENDMENTS TO THE CRITICAL AREAS ELEMENT OF THE NORTH BEND COMPREHENSIVE PLAN, FOR THE 2015 COMPREHENSIVE PLAN AMENDMENTS

WHEREAS, the City is required to prepare a Comprehensive Plan under the Growth Management Act (GMA) and required to implement the plan with development regulations which are consistent with the plan per RCW 36.70A.040; and

WHEREAS, the City is required to take action to review and, if needed, revise the Comprehensive Plan and development regulations to ensure the Plan and regulations comply with the GMA on a periodic basis per RCW 36.70A.130; and

WHEREAS, on April 15, 2014 the City Council directed staff and the Planning Commission to proceed with certain amendments to the 2015 Comprehensive Plan and public participation plan with passage of Resolution No. 1647; and

WHEREAS, the Planning Commission has implemented the scope of work as directed by Resolution No. 1647 and formulated amendments as necessary to ensure the Comprehensive Plan is in compliance with the current provision of the Growth Management Act and King County Countywide Planning Policies; and

WHEREAS, the Planning Commission held a public hearing on the Critical Areas Element on April 24, 2014, and recommended approval of the Critical Areas Element at its June 26, 2014 meeting; and

WHEREAS, the proposed amendments were submitted to the Washington State Department of Commerce for review on February 24, 2015; and

WHEREAS, a SEPA Determination of Non-Significance will be issued for this element and all other amendments to the Comprehensive Plan prior to approval of the Ordinance adopting the 2015 Comprehensive Plan amendments;

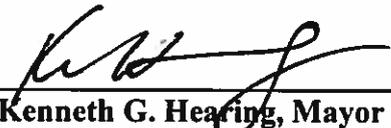
NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF NORTH BEND, WASHINGTON, DOES HEREBY RESOLVE AS FOLLOWS:

Section 1. Approval of Proposed Amendments: The City Council supports approval of the amendments to the North Bend Comprehensive Plan Critical Areas Element and supporting maps as depicted on the attached Exhibit A.

Section 2. Authorization of Comprehensive Plan Amendments: The City Council hereby directs that the amendments described in Section 1 be included as part of a future ordinance in which all of the 2015 Comprehensive Plan amendments will be adopted collectively.

PASSED BY THE CITY COUNCIL OF THE CITY OF NORTH BEND, WASHINGTON, AT A REGULAR MEETING THEREOF, THIS 17TH DAY OF MARCH, 2015.

CITY OF NORTH BEND:



Kenneth G. Hearing, Mayor

APPROVED AS TO FORM:



Michael R. Kenyon, City Attorney

Effective: March 17, 2015
Posted: March 18, 2015

ATTEST/AUTHENTICATED:



Susie Oppedal, City Clerk

CHAPTER 2: CRITICAL AREAS ELEMENT

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CHAPTER 2: CRITICAL AREAS ELEMENT



A. INTRODUCTION

A significant part of the quality of life in North Bend and the Upper Snoqualmie Valley lies in the area's abundance of dominant natural features (see **Figure 2-1 Topography Map**). The geology, hydrology, flora and fauna systems characteristic of the area are intricately connected components of the natural environment. A disturbance in one system can have direct or indirect effects on the others, including the human system.

The quality of life experienced by city residents and visitors is directly associated with the quality of the environment. North Bend has historically been attractive to live in because of the high quality natural environment: clean air and water, lush forest areas, and a beautiful physical setting. Protection of these elements is essential if residents are to maintain their healthy lifestyle. Conversely, the contamination or reduction of these resources where people reside and work negatively impacts the quality of life fundamental to the very reasons that people choose to live here.

King County Countywide Planning Policies (CWPP) adopted November 2012 and amended December 3, 2012 provide local direction to implement the GMA mandate for protection of critical areas. The full list of CWPP's is available at: <http://www.kingcounty.gov/property/permits/codes/growth/GMPC/CPPs.aspx>. The goals and policies of this element were reviewed and found to be consistent with the CWPP: Environment EN-1 through EN-4, Earth and Habitat EN-6 thru EN-9, Flood Hazards EN-10 thru EN-12, and Water Resources EN-13 thru EN-15.

The overarching Environment Goal of the CWPP is to restore and protect the quality of the natural environment in King County for future generations. The vision for King County 2030 is characterized by Protected Critical Areas providing beneficial functions and values for reducing flooding, protecting water quality, supporting biodiversity, and enriching our quality of life for future generations as the region's population continues to grow.

Together, North Bend's Vision Statement and the King County Countywide Planning Policies (CWPP) guide this Critical Areas Element.

Growth Management Detail

The Growth Management Act calls upon local government to protect the environment and enhance the state's high quality of life including air and water quality and the availability of water. To implement this goal the GMA required local governments to protect critical areas and ecosystems. In designating and protecting critical areas cities shall include the best available science when preparing policies and development regulations to protect the functions and values of critical areas. In addition, cities shall give

special consideration to conservation or protection measures necessary to preserve or enhance anadromous fisheries. Pursuant to GMA wetlands regulated under development regulations shall be delineated in accordance with the wetland manual adopted pursuant to RCW 90.58.380.

In addition to the GMA mandate to protect critical areas there are related State mandates to evaluate the impacts of policy decisions or actions that could have a significant impact on the environment under the State Environmental Policy Act (SEPA), to protect the shoreline environment in the Shoreline Management Act (SMA) and various directives to protect surface water and ground water. These state mandates have companion federal mandates to achieve similar goals for federally-funded actions or projects occurring on federal lands. Finally, at the federal level, there is a mandate to protect threatened or endangered species of animals through the Endangered Species Act (ESA). The North Bend area is known as a contributing environment for two threatened species including in the Chinook salmon (water quality and quantity in the Snoqualmie River only) and the Bull Trout, though none have been found in the immediate North Bend area.

The State and Federal environmental protection mandates give clear direction to guide the policy actions the City must take to protect the environment. Natural features which represent limitations to the scope or scale of physical development that can occur within North Bend and its UGA are critical areas which include:

Water and Related Resources:

- River and Stream Corridors
- Frequently Flooded Areas
- Channel Migration areas
- Wetlands
- Aquifer Recharge Areas
- Wellhead Protection Areas

Fish and Wildlife Habitat Areas

Geologically Hazardous Areas:

- Erosion Hazards
- Landslide and Steep Slope Hazards
- Seismic Hazard Areas

While this chapter contains policies intended to protect critical areas in North Bend and influence the protection of areas outside local control, these policies recognize the qualitative differences between various critical areas and the fact that not all areas are constrained for the same reasons. Some are critical because of the hazard they present to public health and safety. Others are critical because of the intrinsic values they represent to the welfare of the North Bend community and/or the region. In some cases, the risk posed to the public, natural system or natural process by the use or development of a critical area can be mitigated or reduced by engineering or site design. In other cases, the risk or impact potential cannot be effectively reduced except by avoiding development within the critical area.

This chapter's intent is to assure long term sustenance of natural features and processes by limiting development in areas where it may interrupt or degrade natural ecological functions and values, subject persons and property to unsafe or hazardous conditions, or affect the perceived quality of life in the North Bend community. Sustainable management of North Bend's environmentally critical areas is considered a high priority action to successfully implement the Comprehensive Plan.

CA Goal 1: Use Best Available Science (BAS) as defined by the Growth Management Act to define and protect Critical Areas

Policies:

- CA 1.1 Collect and evaluate BAS to identify the appropriate level of protection for critical areas.
- CA 1.2 Recognize limitations on critical area function and value created by existing development and design critical area regulations to provide optimal protection to the remaining higher value critical areas, including areas where high value functions can be restored.
- CA 1.3 Utilize the risk assessment method prescribed by the GMA to evaluate the potential impact of not using BAS to protect critical areas where it is determined to be unfeasible to fully protect the functions and values because of existing development patterns.
- CA 1.4 Evaluate state and federal protection mandates when developing local critical area protection and land use development regulations.

B. WATER AND RELATED RESOURCES

Water is a powerful physical and chemical force, whose movement can shape the form and function of the landscape. Heavy rains typical of the Northwest, and North Bend in particular, can scour out river and stream channels, inundate valley floodplains, and flood wetlands. Soil and loose material picked up in one area is often transported by rivers, streams, and floods and deposited to other parts of the Snoqualmie Valley, and ultimately to Puget Sound. Likewise, chemicals dissolved in rainwater are carried to wetlands, over floodplains and downstream. Both surface runoff and groundwater flows of water may combine to create landslides or other earth movement that further alters the physical environment and poses hazards to people and property.

As development occurs, native vegetation and absorbent top soils are removed, land becomes compacted and paved, and existing site topography is changed. Such landscape changes can alter the way water moves, add to existing hazards associated with natural drainage systems and affect the habitat, recreational, and scenic value of water resources.

B.1 Drainage Basin

The South and Middle Forks of the Snoqualmie River and its tributaries are the dominant watercourses in the North Bend area. Originating from the western slopes of the Cascades, the Middle Fork drains 171 square miles and the South Fork drains 85 square miles for a total of 256 square miles.

B.2 Water Quality and Quantity

In addition to contributing significantly to the area's natural beauty and quality of life, the rivers, streams, and wetlands in the Upper Snoqualmie Valley store, purify, and convey surface waters. Stormwater runoff is a significant contributor to water pollution in urbanized areas. Development of homes, farms, and businesses may result in runoff that pollutes these surface waters and groundwater and threatens habitat, recreation value, and/or drinking water supplies. Sedimentation from ground disturbed by grading, construction, farming, and logging can reduce river or stream channel capacity, fill wetlands, and destroy aquatic life and habitat. Surface water runoff from developed areas can carry pollutants such as oils, heavy metals, fertilizers, and pesticides into streams. Changes caused by development can alter or reduce the quantity of water in the ground, streams and rivers. Protection of both water quality and quantity is important to protect fish habitat and provide adequate supplies of potable drinking water. The City has adopted stormwater management regulations and a stormwater utility to implement state and federal

stormwater protection standards. Low impact development approaches for managing stormwater and protecting water quality are a critical component of the stormwater standards.

Regional Groundwater Protection Planning

Guidance for aquifers notes that the City is required to implement the East King County Ground Water Management Plan per WAC 173-100-120 and directs a series of actions to implement the plans. In April 1990, the Department of Ecology designated East King County, including the North Bend planning area, as Groundwater Management Area No. 14, pursuant to RCW 90.44. The designation authorized King County to develop a Groundwater Management Plan (GWMP) for the area. The GWMP process was overseen by a Groundwater Advisory Committee and included representatives of cities, health agencies, state and federal agencies, and public and special interest groups. The City of North Bend participated as a member of the Advisory Committee.

The first phase of the GWMP process included reviewing technical studies of existing groundwater resources in the area. The U.S. Geological Survey had recently completed a comprehensive inventory of 600-800 wells in the area was conducted to identify aquifers and other geologic features. Of those wells, approximately 150 were sampled for a variety of water quality data. The East King County Groundwater Advisory Committee continued the monitoring of the technical studies to develop the Groundwater Management Plan. The East King County Ground Water Management Plan was completed by the East King County Ground Water Advisory Committee in December 1998 then subsequently approved by the King County Council and certified by the Washington Department of Ecology in 2000. In 2001, the King County Council has passed an ordinance establishing a new East King County Ground Water Management Committee for three years. The East King County Groundwater Management Committee monitored progress made under the plan, charted out subsequent groundwater protection efforts and reviewed / revised the plan as necessary. The East King County Groundwater Management Committee did not renew their charter within the county code and became inactive by 2005.

Recharge Areas - Susceptibility and Vulnerability

The Growth Management Act requires cities to classify aquifer recharge areas according to vulnerability. Vulnerability is the combined effect of the (1) hydrogeological susceptibility to contamination and (2) the potential for contamination. A highly vulnerable recharge area would be one where land uses could contribute contamination that might degrade groundwater quality, and hydro geologic conditions (e.g. very porous, well drained soils) that facilitate such contamination. Low vulnerability is indicated by land uses that do not contribute contaminants that will degrade groundwater, and susceptibility conditions that do not facilitate degradation.

The susceptibility of a recharge area to contamination is a function of several physical characteristics including but not limited to: depth to groundwater, aquifer properties such as hydraulic conductivity and gradients and soil structure. Factors relevant to the contaminant loading potential side of the vulnerability equation include general land use, waste disposal sites and practices, and agricultural activities.

The potential for contamination includes a number of factors such as the amount of contaminant present, toxicity, mobility and persistence.

Classification, identification and regulation of critical aquifer recharge areas in the North Bend and the surrounding area will be founded on the available technical studies completed by the City of North Bend and Groundwater Protection Program through the East King County Groundwater Management Committee process. See the policies regarding aquifer recharge areas are general concerns relative to long term protection of groundwater resources below.

B.3 Critical Aquifer Recharge Areas

Under the GMA, the City is required to create a Critical Aquifer Recharge Area (CARA) designation and apply city regulations to protect the aquifer consistent with the East King County Ground Water Management Plan.

Groundwater is an important source of domestic water supply for the North Bend planning area. It is contained in underground aquifers and delivered through such means as springs and wells. Most aquifers are replenished, or recharged, by rainwater. Development can threaten the quantity as well as quality of groundwater by contamination and reducing recharge. Preventing contamination is necessary to avoid potential risks to public health, significant costs, and hardship. The quality of groundwater in an aquifer is directly linked to its recharge area. Intensive development can deplete groundwater or seriously threaten groundwater quality if not properly managed. North Bend's ability to identify the potential impacts to groundwater from new or existing development and recommend mitigating measures depends on the quality of data available on local groundwater resources.

Groundwater management plans have been developed for the county, including the North Bend UGA. The protection of groundwater requires an understanding of (1) the quantity of water replenishing aquifers relative to the quantity being withdrawn from them, and (2) the potential for contamination. These issues are functions of related, but different factors and cannot adequately be addressed by the same designation. The areas highly susceptible to groundwater contamination are shown on **Figure 2-4**. Wellhead protection studies provide additional information about contamination susceptibility and vulnerability of water purveyor's wells. They also increase understanding of where the wells are being recharged. The City of North Bend will update their Wellhead Protection Plan and Critical Aquifer Recharge Areas as required and necessary.

CA Goal 2: *Maintain the long-term quality of groundwater resources in North Bend and its growth area by prevention of contamination.*

Policies:

- CA 2.1 Protect critical groundwater recharge and wellhead protection areas, and develop planning and regulatory measures to ensure that groundwater resources are protected from potential pollution.
- CA 2.2 The City of North Bend shall implement goals and policies outlined in the East King County Groundwater Management Plan as required per WAC 173-100-120.
- CA 2.3 Take corrective action for failing septic systems by requiring failed systems to hook up to the City sewer system consistent with NBMC.
- CA 2.4 Require filing with the City of a hazardous materials emergency plan for industries identified as using, transporting, or storing known hazardous materials.
- CA 2.5 Continue to work with other governmental agencies to identify and control the use of hazardous materials in aquifer recharge areas and wellhead protection areas.
- CA 2.6 Provide education and technical assistance on the use of pesticides and fertilizers to homeowners and businesses in North Bend.

CA 2.7 Implement land use regulations that prohibit uses that pose a significant threat to contamination of a groundwater aquifer in areas defined as high susceptibility wellhead protection and aquifer recharge areas.

CA 2.8 Work cooperatively with State, County and environmental resources to identify and develop strategies to clean up contaminated properties (brownfields) that present a threat to groundwater quality or redevelopment of the contaminated properties.

B.4 River and Stream Corridors

The City of North Bend is located upstream from Snoqualmie Falls, which functions as a barrier to the upstream migration of anadromous fish. However, the Snoqualmie River above Snoqualmie Falls with its three main branches and its many tributaries provide valuable habitat to resident fish species. **Figure 2-6** depicts streams within the North Bend Planning Area.

Natural drainage systems provide important and beneficial functions including storing and regulating stormwater flow, purifying surface water, recharging groundwater, conveying water, providing important aquatic habitat and supporting important biological activities. Alteration of natural drainage systems results in public costs and can disrupt natural processes, leading to environmental degradation including flooding, erosion, sedimentation, and damage to infrastructure, water quality and habitat.

The most effective solution for protecting natural drainage systems and water quality is to control the amount and quality of surface water runoff. New development can be designed to prevent significant runoff and water quality problems, protect the integrity of natural channels, preserve the habitat functions and values of riparian corridors, and maintain the scenic character provided by local watercourses. North Bend Goals and Policies for Regulated Shoreline Environments are contained in the Shoreline Element of the Comprehensive Plan.

CA Goal 3: *Protect the natural hydraulic, hydrologic and habitat functions, scenic as well as recreational values of streams.*

Policies:

CA 3.1 Control the quality and quantity of stormwater runoff to protect natural drainage systems. New development should not increase peak stormwater flows.

CA 3.2 Require mitigation measures on all public improvements and private development which proposes to alter natural drainage systems.

CA 3.3 Insure the implementation of Best Management and Low Impact Development Practices to reduce the impacts of construction and construction-related activities that may affect streams.

CA 3.4 Minimize stream crossings; where authorized, stream crossing should consist of bridges rather than culverts.

CA 3.5 Evaluate state and federal stream habitat protection mandates when developing local critical area protection and land use development regulations.

- CA 3.6 Continue to utilize the Department of Ecology Stream Restoration and Culvert Installation or Replacement Guidelines, or a similar comprehensive standard, for projects in the City of North Bend.
- CA 3.7 Implement best management practices for the treatment of wastewater that removes the river as the primary and secondary discharge point while accommodating target growth.
- CA 3.8 Discharge from the Wastewater Treatment Plant shall meet or exceed Department of Ecology Class A standards.

B.5 Frequently Flooded Areas

Flooding is a natural geologic process which has shaped the Upper Snoqualmie Valley, providing habitat for wildlife, and creating rich agricultural lands. Human development often interferes with the natural processes of floodplains, affecting the distribution and timing of drainage and resulting in inconvenience or catastrophe. Flood problems can increase as human activities encroach upon floodplains.

North Bend is located on the floor of the Upper Snoqualmie Valley, upstream of Snoqualmie Falls and near the confluence of the three forks of the Snoqualmie River. Upstream of North Bend and this confluence is a river basin with an area of approximately 256 square miles. A combination of high annual precipitation and melting snow in the Upper Snoqualmie Basin contribute to the potential for significant winter flooding from November through February. Rivers that carry runoff out of the upper basin are constricted downstream and collect on the flat valley floor where North Bend is located. Although incorporated North Bend with its developed areas occupy a very small percentage of the entire river basin, its location on the valley floor close to the outlet of the basin makes it vulnerable to flooding, which can damage residences or other property.

Flooding of lowland areas by excessive stormwater runoff and snowmelt is one of North Bend's most common and costly natural hazards. The built environment also creates localized flooding problems outside of natural floodplains by altering and confining historic drainage channels, thereby reducing their capacity to contain flows. Flooding has been part of the history of North Bend and the entire Snoqualmie Valley. High flow events occurred in 1932, 1933, 1943, 1947, 1951, 1959, 1964, 1975, 1986, 1989, 1990, 1995, and 1996, 2006, 2009, 2011 and 2015 in the Valley. North Bend flood hazard areas are defined by the Federal Emergency Management Agency (FEMA) as those areas subject to inundation by the 100-year flood (i.e. the 100-year floodplain). The 100-year floodplain is that area that has at least a 1 percent probability of inundation in any given year. Streams, lakes, wetlands, and closed depressions all have floodplains that may also qualify as flood hazard areas. **Figure 2-7** depicts flood hazard areas within the North Bend planning area. The goal and related policies of this plan provide guidance in protecting the public from flood hazard and at the same time protect the environment by discouraging development within flood areas. Primary planning policies and implementation measures to reduce the hazards of flooding in North Bend are provided in the North Bend Floodplain Management Plan.

CA Goal 4: *Protect public safety by discouraging development within the river floodway and its natural systems and by preserving the flood storage function of floodplains.*

Policies:

- CA 4.1 Reserve flood hazard areas for less-intensive activities such as public open space and recreation. Uses permitted in the regulated flood areas shall not change flood elevation or obstruct or divert the natural flow.

- CA 4.2 Support non-structural methods for flood prevention and flood damage reduction measures that do not increase upstream or downstream flooding.
- CA 4.3 Prohibit construction of permanent structures in the floodway (FEMA).
- CA 4.4 Locate roads at grade level and build structures at least one foot above the 100 year flood elevation to maintain existing flood storage capacity where development is allowed in the floodplain.
- CA 4.5 Work with the City of Snoqualmie, King County and the Snoqualmie Watershed Forum to establish criteria for joint review of significant projects which may have flood related issues.
- CA 4.6 Preserve the natural functions of drainage systems, including vegetation and channel corridors, and control runoff from new development in terms of peak flows, total quantity and location of discharge.
- CA 4.7 Review and revise the policies relating to flood protection as necessary for consistency with the North Bend Floodplain Management Plan.

B.6 Channel Migration

The upper Snoqualmie River and its three forks, near the City of North Bend, is one of several rapidly migrating river systems in King County. These rivers have a tendency to move large distances across the floodplain in a short period, sometimes during a single flood. Channel migration hazard areas are not shown on Federal Emergency Management Agency (FEMA) flood insurance maps, which only show areas subject to inundation. The FEMA maps are used by regulatory agencies, landowners, and developers to determine where development can be allowed along rivers. The City of North Bend has approved zoning for potential residential development in accordance with flood insurance maps in areas where a change of river course has been mapped by King County. In many cases, landowners buy the property with little awareness of the potential hazard from bank erosion. An additional complication arises because FEMA maps are based on fixed base hydraulic analyses. Because of channel migration, the floodplain and floodway boundaries shown on the maps are in some cases only reliable for short periods after the maps are completed.

King County's historic approach to bank erosion problems has been to try to control rivers through extensive construction of levees and revetments. However, few new projects of this type have been built since the 1970's, due to lack of funds and the adverse effects of these projects on flooding and aquatic habitat. Projects that have been constructed more recently tend to protect specific small areas such as roads or houses. Levees and revetments are expensive to build and maintain, can aggravate flooding or erosion problems off-site, and are subject to failure due to channel migration upstream or downstream from the project. Traditional rock levees and revetments have degraded in-stream and riparian habitats by eliminating side channels and riparian vegetation and reducing recruitment of gravels and woody debris into rivers.

In order to regulate development in hazardous zones along rapidly migrating rivers, the King County Flood Hazard Reduction Plan recommended conducting channel migration hazard mapping and studies. The 1996 report on Channel Migration in the Three Forks of the Snoqualmie River report is a result of such a study. The study includes a determination of historic limits and rates of channel migration,

estimation of probable future limits of channel migration, and development of maps that show channel migration hazard zones. Hazard maps produced by these studies have been adopted by King County to use in regulating development under the Critical Areas Code.

The Three Forks of the Snoqualmie River report covers the upper Snoqualmie River mainstream from Snoqualmie Falls upstream to the confluence of the three river forks of the Snoqualmie, and each river fork upstream to a stable section of the channel. Within the study area, levees, and revetments (rock-armored banks) are discontinuous and subject to damage by channel migration upstream or downstream of the armored site. On the South Fork Snoqualmie River upstream from the Burlington Northern right-of-way in North Bend, channel migration has been effectively prevented for 30 years by channelization of the river between narrowly spaced levees. Although the levee system requires frequent maintenance due to toe scour (Shannon & Wilson, 1993; King County, 1993), the channel is not expected to migrate outside the levees on this part of the South Fork. Little channel migration occurs on the north Fork upstream from Ernie's Grove or on the Middle Fork upstream from Tanner, where the channels are relatively steep and stable. However, downstream from Tanner on the Middle Fork and north of the Snoqualmie Valley Trail (old Milwaukee railroad) on the South Fork, the river has potential to migrate in conjunction with a flood event placing portions of the Silver Creek Neighborhood at risk for an avulsion channel migration.

CMZs refer to a rivers likely lateral movement, based on evidence of active movement over the past. North Bend's CMZs have been mapped by King County depicting areas of potential, moderate and severe hazard for channel migration. The goal and related policies of this plan provide guidance in protecting the public from flood hazard and at the same time protect the environment by discouraging development within flood prone areas, including channel migration or avulsion areas. **Figure 2-3** in the Comprehensive Plan shows the North Bend UGA River Channel Migration Hazards. .

B.7 Wetlands

Wetlands are defined as those areas that are inundated or saturated by ground or surface water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas. They occur both in association with rivers, streams, lakes or ponds, and as isolated wetlands which exist due to saturated soil conditions. Wetlands are classified into various types. Each type has its own characteristics and related development constraints. Wetlands located in the 100 year floodplain are part of the "shoreline" environment regulated under the State Shoreline Management Act and also receive Federal protection from the US Army Corps of Engineers.

Historical Wetland Detail

Wetlands are a valuable natural resource, which serve many important ecological and social functions. Wetlands are among the most productive biological systems for they provide important habitat for fish and wildlife, including essential nesting, feeding, breeding, and hiding places. Because of the rich biological environment they contain, wetlands provide unique educational and scientific research opportunities. An important quality of wetlands is their value as a scenic resource, providing pleasant visual contrast to manage forest uplands, agricultural lands, and developed areas. In addition, wetlands provide recreational and educational opportunities. Wetlands also improve water quality by filtering out sediments, excess nutrients, and toxic chemicals. They can support agricultural activities and provide a rearing habitat for fish. Wetland vegetation can help stabilize shorelines and effectively reduce stream bank erosion from river

currents. In many cases, wetlands help recharge groundwater supplies and maintain stream flows. Finally, they play an important role in flood reduction by slowing and storing flood waters.

Wetland preservation and protection can significantly reduce public and private costs associated with downstream flooding, poor water quality, and diminishing wildlife habitat. North Bend has recognized the value of natural wetlands. The city has mapped probable wetland areas within the planning area using a 1991 survey of “potential wetlands” using aerial photography and U.S. Soil Conservation Service Soil Survey maps, site specific data from projects on delineated wetlands, and the King County mapped wetlands. **Figure 2-5** depicts wetland resource areas within the North Bend planning area. Since the scale of this map does not allow the depiction of all wetlands, the North Bend Wetlands Inventory Map should be consulted for additional detail.

CA Goal 5: *Preserve, protect, restore and enhance wetlands for their hydraulic, ecological, visual and cultural values.*

Policies:

- CA 5.1 Encourage no net loss of remaining wetlands acreage, functions and values within the North Bend and its UGA.
- CA 5.2 Encourage the creation and restoration of wetlands to increase the quantity and quality of wetlands in North Bend.
- CA 5.3 Protect and buffer wetland functions from significant human impact.
- CA 5.4 Allow for and incorporate public access to wetlands in development plans when the city determines such access will not degrade the resource and is desirable for establishing interpretive facilities and/or providing links to existing or proposed parks, open space or scenic areas.
- CA 5.5 Maintain the natural hydrology to wetlands while identifying methods to remove potentially harmful contaminants from stormwater discharge.
- CA 5.6 Promote the use of property tax reductions, conservation easements and other techniques as incentives to preserve wetlands as a public benefit.
- CA 5.7 Mitigation projects requiring the replacement of wetlands functions and values should, when feasible, contribute to existing wetland system or restore an area that was historically a wetland. Wetland mitigation banking within our watershed may be allowed.
- CA 5.8 Design critical area regulations to recognize limitations on wetland function, value and habitat created by existing development and focus greater protection to the remaining higher value wetland habitat areas.
- CA 5.9 Evaluate the effect of state and federal wetland protection mandates when developing local critical area protection and land use development regulations.

C. FISH AND WILDLIFE HABITAT

The natural environment plays an important role in the health of the entire ecosystem and the overall high quality of life found in North Bend. The preservation of critical areas for habitat use is critical in sustaining wildlife and in retaining the City's rural character. Wildlife habitat areas associated with streams (Figure 2-2), wetlands (Figure 2-5) and their buffers can be protected by regulations and enhanced by innovative and critical site design. The preservation of wildlife habitat and priority species with jurisdictional goals, policies, and regulations is mandated by the Growth Management Act. The development of the Critical Areas plan element for the protection and integration of wildlife habitat in the City of North Bend relates to various issues in regard to wildlife and its recognized importance to the city and its citizens. This plan includes goals and policies to provide guidance for integrating the needs of wildlife and protecting wildlife habitat as well as respecting property owner's rights.

CA Goal 6: *Strive to protect and enhance wildlife habitat areas within the City and its UGA.*

Policies:

- CA 6.1 Work with the state and county to identify, protect, and enhance important wildlife corridors within North Bend and its surrounding area to create a network of wildlife corridors which link habitat areas together to encourage the natural movement of plant and animal species.
- CA 6.2 Encourage community involvement and education in the creation, enhancement, management, interpretation and enjoyment of wildlife habitat areas.
- CA 6.3 Encourage access to sites of wildlife interest when not in conflict with wildlife protection goals.
- CA 6.4 Support and encourage the development of nature conservation programs within the Snoqualmie Valley School District.
- CA 6.5 Work with other agencies to develop a comprehensive fish and wildlife habitat and management plan for North Bend and its UGA.
- CA 6.6 Work with the Snoqualmie Watershed Forum and other stakeholders to develop and implement measures to preserve and restore "threatened" fish populations in the Snoqualmie Watershed including the Chinook salmon via the Near Term Action Agenda for Chinook salmon and the Chinook Salmon Conservation Plan as applicable.
- CA 6.7 Apply for restoration grants to ensure that the quality of the natural environment and its contribution to human health and vitality are sustained now and for future generations.

Regional and National Environmental Compliance

The City of North Bend works closely with federal and state agencies, cities, and other counties to integrate and streamline compliance with federal mandates like the Clean Water Act, Clean Air Act, and Endangered Species Act (ESA). The City will also work with the Snoqualmie Watershed Forum and the Puget Sound Partnership to define and implement measures to protect habitats identified by WDFW. Programmatic actions taken in conjunction with the Watershed Forum to date include, development of the Near Term Action Agenda (NTAA) to protect Chinook Salmon, participation in development of the Long Term Salmon

Conservation Plan for Chinook Salmon completed in 2004 and development of the joint Model Critical Area Protection Ordinance to incorporate the applicable recommendations of the NTAA and “Best Available Science” as defined by the GMA. Capital projects to date include acquisition and restoration of significant critical areas on the Tollgate and Meadowbrook Farms. Storm drainage projects outlined in the Capital Improvement Plan will improve storm drainage, water quality and habitat. The Puget Sound Partnership was created by the Washington State Legislature and Governor in July 2007 to achieve the recovery of the Puget Sound ecosystem by the year 2020. The Partnership's goal is to consolidate and significantly strengthen the federal, state, local, and private efforts undertaken to date to protect and restore the health of Puget Sound and its watersheds.

D. GEOLOGICALLY HAZARDOUS AREAS

Geologically hazardous areas are lands which are susceptible to hazards associated with underlying soils and geology. These include areas characterized by steep slopes, landslides, seismic hazards, and erosion. A number of geologic hazards exist within the vicinity of North Bend. For example, landslide and erosion hazards are common in hillside areas with steep and unstable slopes. In addition, these lands are at great risk in the event of an earthquake. Regulations include, at a minimum, provisions for vegetation retention, seasonal clearing and grading limits, setbacks, and drainage and erosion controls.

To address geologic hazards jurisdictions shall regulate development on lands with:

- a. Slopes with a grade greater than 40 percent;
- b. Severe landslide hazard areas;
- c. Erosion hazard areas;
- d. Mine hazard areas; and
- e. Seismic hazards.

D.1 Erosion Hazards

Erosion is a natural process of the wearing away of land surfaces by water, wind and ice. While erosion and sedimentation are natural processes at work in the landscape, they are frequently accelerated by land use modifications and urban development.

The susceptibility of soil to surface erosion depends on its physical and chemical characteristics, slope, vegetative cover, the intensity of rainfall, and runoff velocity. Eroded material is moved by surface flows and deposited elsewhere as sediment. The negative effects of increased sedimentation are most pronounced where erosion of soils is connected to the surface drainage network. Through sedimentation, soil erosion can result in degradation of surface water quality and/or aquatic habitats.

Figure 2-10, Erosion and Debris Flow, depicts areas of potential landslide hazard within North Bend and its surrounding area. The map shows areas where soils are particularly susceptible to increased erosion as a result of development. It is important to note that while the map does not show any areas within the city which are characterized by erosion hazards, these conditions do exist here on a site specific or local scale. Soils mapped include those which may experience severe to very severe erosion (soil particle movement) according to the USDA Soil Conservation Service. This definition is consistent with erosion hazard areas as designated in the King County Critical Areas Ordinance and meets the minimum guidelines for erosion hazard areas outlined in the Growth Management Act.

CA Goal 7: *Protect people, property, water quality and habitat from the negative effects of accelerated erosion and sedimentation*

Policies:

- CA 7.1 Work with property owners to restore vegetative cover and natural drainage features on identified degraded sites where degradation has led to accelerated erosion and sedimentation.
- CA 7.2 Work with the County to restrict the scope and scale of development in erosion hazard areas which impact the City and its growth area.
- CA 7.3 Seek to retain as open space those areas where the soils have been identified as having severe or very severe erosion potential.
- CA 7.4 Minimize grading and require the restoration of native vegetation on development sites which are known to have a high probability of erosion.
- CA 7.5 Ensure the implementation of Best Management Practices to reduce the impacts of construction and construction-related activities.
- CA 7.6 Ensure usage of proper sedimentation controls and staged clearing and grading to minimize impacts to soil, understory vegetation or downslope conditions through permits and inspections of development sites.

D.2 Landslide and Steep Slopes Hazard Areas

The identification of areas susceptible to landslides is necessary for informed land use planning and to support land development regulations which reduce the risk of property damage, personal injury, and environmental degradation. Landslide hazard areas lie principally outside the existing city limits but are evident in areas surrounding the City. Landslide flow paths however can directly impact the incorporated city. Landslide hazard areas are defined by alternate or co-existing landscape conditions, which are based on well-established geotechnical determinations of slope stability and considerable experience and research in the Puget Sound area. Earthquakes in the past have caused large rocks and boulders to fall from Mt. Si in 1949 and 2008.

The stability of slopes in landslide hazard areas is highly dependent on the water content of the underlying soils. Water readily percolates through sand and gravel, but ponds above less permeable silt, clay and till layers, thus saturating the overlying deposits. Where a less permeable layer (silt or clay) intersects a slope, water often seeps from the layers above. This combination of sedimentary deposits, topography, and local groundwater flow results in a high potential for landslides. An event that increases groundwater levels and flow, such as a rain storm or discharge of surface water above a slope, can saturate sediments near the surface and cause failure of a slope that is stable under dryer conditions. Likewise, erosion along a stream channel can steepen a slope or expose deposits which may become water saturated, increasing the potential for landslides on a previously stable slope.

Most landslide hazard areas outside of the City of North Bend involve a few feet of relatively loose soil on slopes underlain by denser and typically less permeable till or bedrock. All areas with surface soils underlain with relatively impermeable soils on slopes of 15 percent or greater and with drainage from topographically higher areas, and all areas with steep slopes greater than 40 percent (except consolidated rock), are depicted in **Figure 2-10**, Erosion and Debris Flow and **Figure 2-9** Liquefaction Susceptibility. These unstable slopes represent a major hazard to people and structures and have limited development

potential. The plan's goal and policies provide guidance in decreasing the hazards of developing within landslide hazard and steep slope areas.

CA Goal 8: *Protect people and property from the risk and negative effects of unstable slopes and landslide hazards.*

Policies:

- CA 8.1 Encourage use of landslide hazard areas and their alluvial fans as open space and maintain such sites in their natural condition, including preservation of vegetation.
- CA 8.2 Permit developments in landslide hazard areas only if it can be shown that it development not decrease slope stability, or the hazard can be eliminated or mitigated.
- CA 8.3 Seek to retain areas with slopes in excess of 40 percent as open space areas in order to protect against geologic hazards.
- CA 8.4 Work with the County in order to restrict development in landslide hazard areas and their flow paths.

D.3 Seismic Hazards

Seismic hazard areas are defined as those areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction. Loose, water-saturated soils tend to experience the most severe ground shaking during an earthquake. When shaken by an earthquake, such soils lose their ability to support a load; some soils will actually flow like a fluid. Loss of soil strength can result in failure of the ground surface (settlement, surface cracking, and landslides) and damage to structures. Most of the floor of the upper Snoqualmie Valley has been identified as a seismic hazard area (See **Figure 2-8**).

Since the entire valley floor is a seismic hazard area it is unreasonable to restrict remaining undeveloped valley properties to agricultural or open space uses for seismic safety purposes. However, land use planning strategies and building code regulations can be used to reduce the health and safety risk due to seismic hazards in hillside areas where landslides and rock fall are possible. It is essential for the City to include an earthquake disaster response plan as part of the emergency response plan. This plan would designate specific responsibilities to various city officials in the event a significant earthquake occurs and would outline the relationship between the City's disaster preparedness plan and other jurisdictional disaster response plans. The plan is currently being developed by the City and should also identify particularly hazardous buildings so damage response teams know where the most likely locations for structural failure and casualties.

CA Goal 9: *North Bend should seek to diminish the risks to human life and property associated with earthquake activity in the Puget Sound Region.*

Policies:

- CA 9.1 Maintain and enforce the latest seismic standards within the City's building codes.
- CA 9.2 Work with the County to develop informational materials for property owners and occupants about seismic hazards.

CA 9.3 Require additional setbacks for new buildings which lie below steep hillsides critical to earthquake-related subsidence, rockfall hazards or which lie in the path of potential landslides.

CA 9.4 Maintain and update the City of North Bend's disaster emergency response plan.

E. AIR QUALITY AND OTHER ENVIRONMENTAL ISSUES

All people contribute to air pollution problems by using automobiles, burning wood in wood stoves, burning yard waste, or numerous other actions. Commercial and industrial operations can also contribute significantly to air quality problems. As the population continues to grow, the city will face an increasing challenge to maintain its air quality.

Quality of life is affected by environmental issues such as noise or light pollution. The city can work with its citizens and other governmental agencies to solve these issues.

Air quality is addressed by development of policies, methodologies and standards that promote regional air quality, in coordination with the Puget Sound Air Pollution Control Agency and the Puget Sound Regional Council.

CA Goal 10: *Strive for the best available solutions to air quality and other environmental issues.*

Policies:

CA 10.1 Adopt local regulations to require compliance with applicable state and federal standards for installation and operation woodstoves and fireplaces.

CA 10.2 Improve air quality by supporting transportation modes that reduce reliance on Single Occupancy Vehicles (SOVs).

CA 10.3 Work to support and promote public information strategies that focus on air quality issues and identifies measures that each person can take to improve air quality.

CA 10.4 Continue to provide yard waste recycling and collection events as an alternatives to open burning.

CA 10.5 Develop and implement idling measures that reduce or prohibit the idling of vehicles, consistent with Objective O2.1 in the Transportation Element and its underlying policies.

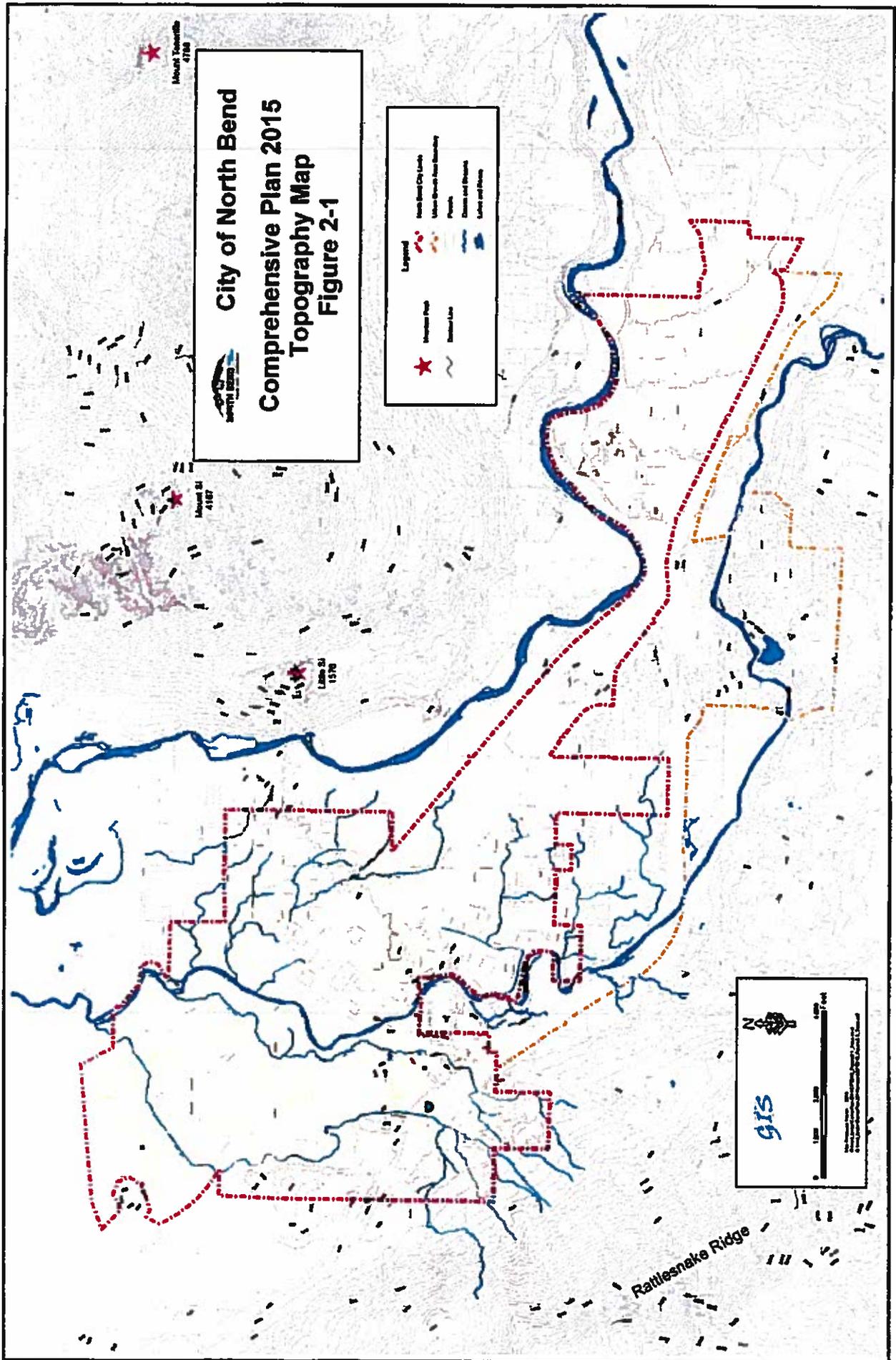
F. CRITICAL AREA MAPPING

The Critical Area mapping found in this element includes those areas within North Bend and its UGA that are defined as: (1) floodways, (2) channel migratory areas, (3) streams and associated buffers, and (4) wetlands and associated buffers. Critical Aquifer Recharge Areas and Seismic Hazards Areas are stand-alone maps because both areas completely encompass North Bend and its UGA. The purpose of these maps is to identify the potential boundaries of the environmentally critical areas that present severe constraints to development.

CA Goal 11: *Maintain Critical Area Base Maps*

Policies:

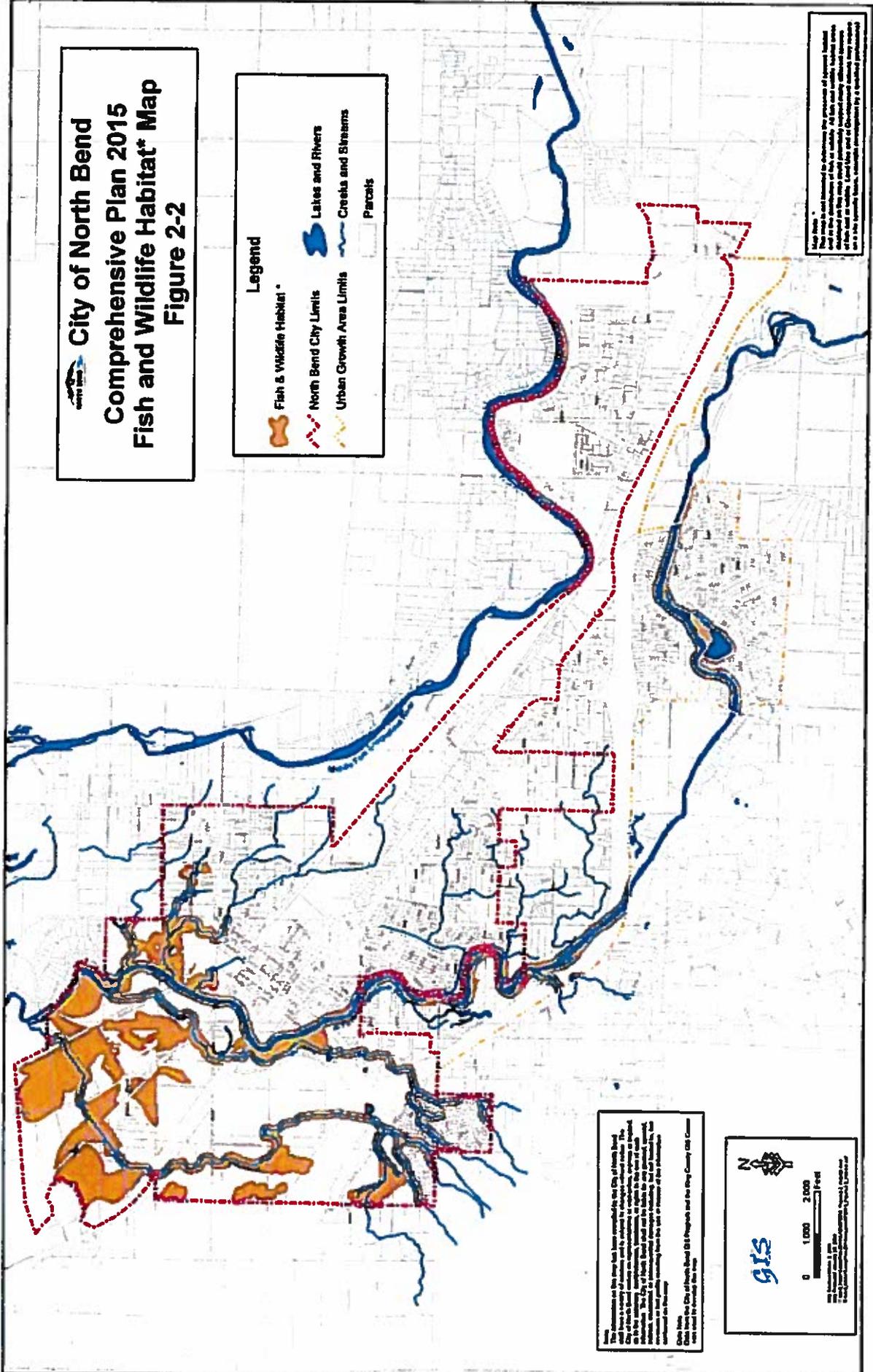
- CA 11.1 Use Best Available Science (BAS) as defined by the Growth Management Act to define and protect Critical Areas
- CA 11.2 Collect and evaluate BAS to identify the appropriate level of protection for critical areas.
- CA 11.3 Recognize limitations on critical area function and value created by existing development and design critical area regulations to provide optimal protection to the remaining higher value critical areas, including areas where high value functions can be restored.
- CA 11.4 Utilize the risk assessment method prescribed by the GMA to evaluate the potential impact of not using BAS to protect critical areas where it is determined to be unfeasible to fully protect the functions and values because of existing development patterns.



**City of North Bend
Comprehensive Plan 2015
Fish and Wildlife Habitat* Map
Figure 2-2**

Legend

- Fish & Wildlife Habitat*
- North Bend City Limits
- Urban Growth Area Limits
- Lakes and Rivers
- Creeks and Streams
- Parcels



Map Note:
This map was prepared for the purpose of general information and should not be used for any specific project. The City of North Bend is not responsible for any errors or omissions on this map. The City of North Bend is not responsible for any errors or omissions on this map. The City of North Bend is not responsible for any errors or omissions on this map.

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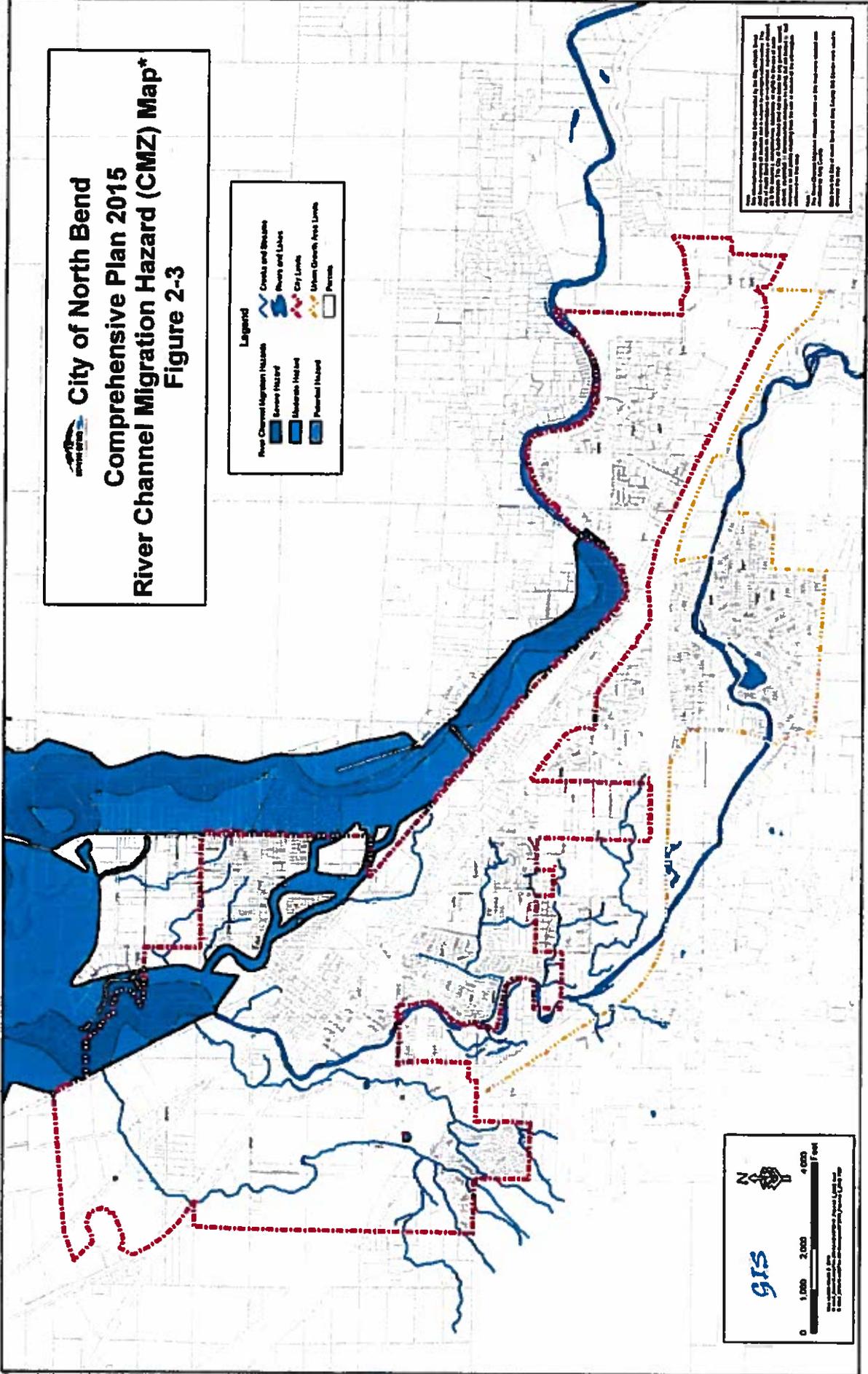
0 1,000 2,000 Feet

Map Scale: 1" = 2,000 Feet

Map Date: 10/2015

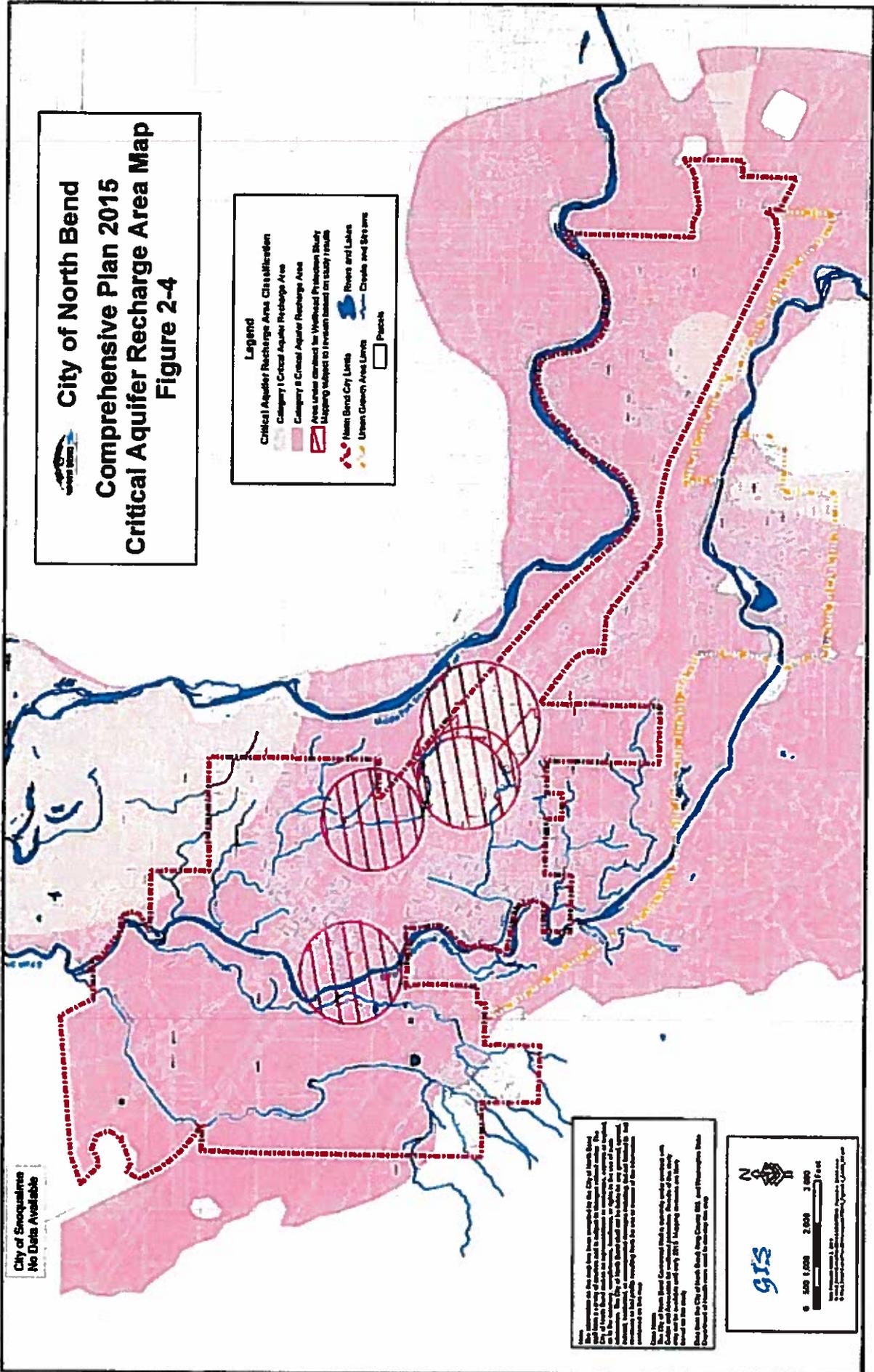
Map Author: GIS Department

**City of North Bend
Comprehensive Plan 2015
River Channel Migration Hazard (CMZ) Map*
Figure 2-3**



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**City of North Bend
Comprehensive Plan 2015
Critical Aquifer Recharge Area Map
Figure 2-4**



Legend

- Critical Aquifer Recharge Area Classification
- City
- Category 1 Critical Aquifer Recharge Area
- Category 2 Critical Aquifer Recharge Area
- Area Under Consideration for Watershed Protection Study (Mapping subject to research based on study results)
- North Bend City Limits
- Urban Growth Area Limits
- Rivers and Lakes
- Creeks and Streams
- Pavement

City of Snoqualmie
No Data Available

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Scale: 1:10,000

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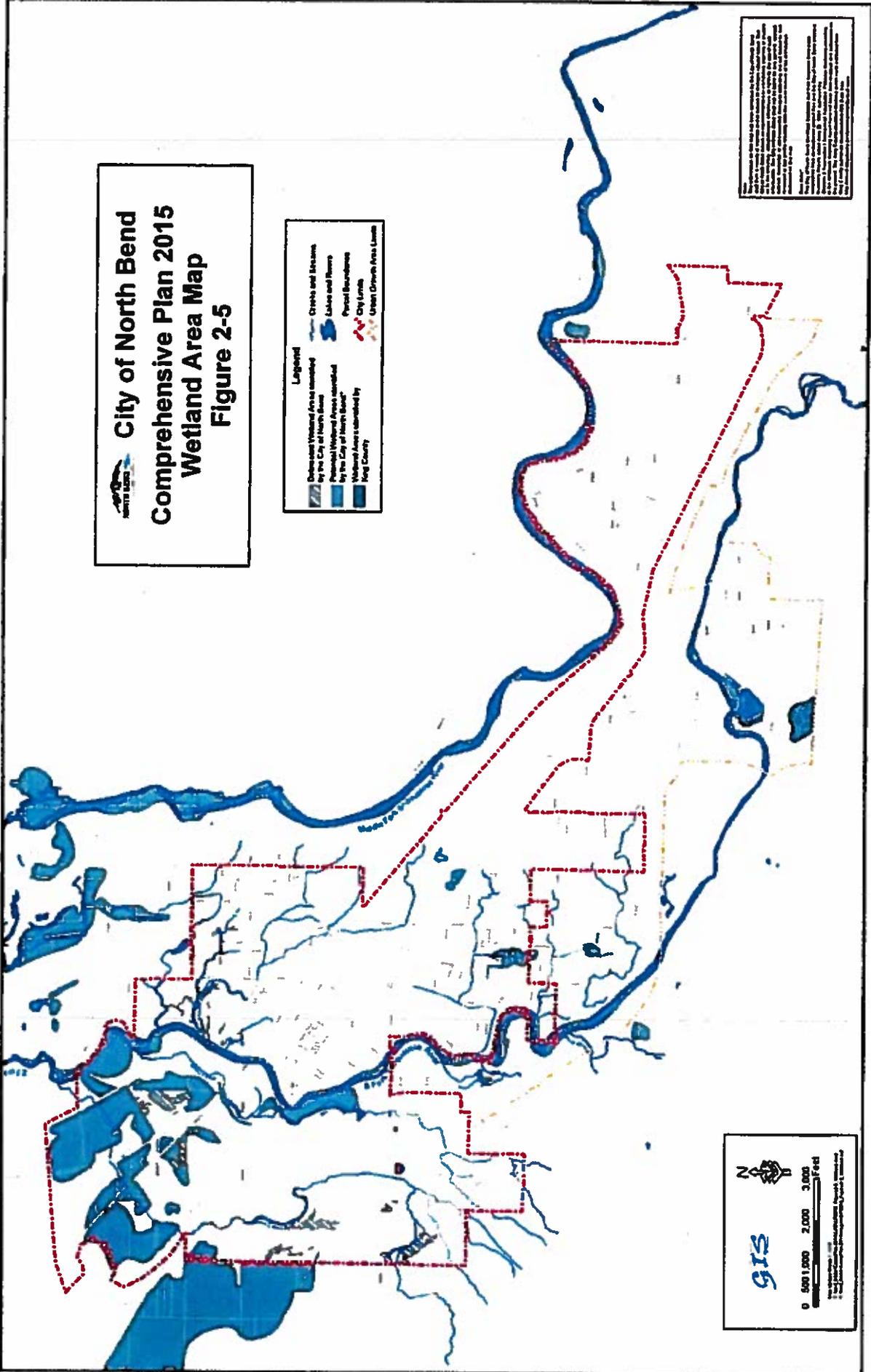
North Arrow

City of North Bend
Department of Health Services

**City of North Bend
Comprehensive Plan 2015
Wetland Area Map
Figure 2-5**

Legend

-  Deleted Wetland Areas identified by the City of North Bend
-  Proposed Wetland Areas identified by the City of North Bend
-  Wetland Areas identified by King County
-  Creeks and Streams
-  Lakes and Rivers
-  Parcel Boundaries
-  City Limits
-  Urban Growth Area Limits



This map was prepared by GIS staff using data from the National Wetlands Inventory (NWI) and other sources. The City of North Bend is not responsible for any errors or omissions in this map. The City of North Bend is not responsible for any errors or omissions in this map. The City of North Bend is not responsible for any errors or omissions in this map.

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City of North Bend Comprehensive Plan 2015 River and Stream Map Figure 2-6

Legend

General

- City of North Bend City Limits
- Stream District City Limits
- Stream District
- Stream
- Stream Bank
- Stream Channel
- Stream Bankline
- Stream Channel Line
- Stream Channel Edge
- Stream Channel Centerline
- Stream Channel Edge Line
- Stream Channel Centerline Line
- Stream Channel Edge Line
- Stream Channel Centerline Line

Stream Bankline

- Type 1 Stream Bankline
- Type 2 Stream Bankline
- Type 3 Stream Bankline
- Type 4 Stream Bankline
- Type 5 Stream Bankline
- Type 6 Stream Bankline
- Type 7 Stream Bankline
- Type 8 Stream Bankline
- Type 9 Stream Bankline
- Type 10 Stream Bankline
- Type 11 Stream Bankline
- Type 12 Stream Bankline
- Type 13 Stream Bankline
- Type 14 Stream Bankline
- Type 15 Stream Bankline
- Type 16 Stream Bankline
- Type 17 Stream Bankline
- Type 18 Stream Bankline
- Type 19 Stream Bankline
- Type 20 Stream Bankline

Stream Channel

- Type 1 Stream Channel
- Type 2 Stream Channel
- Type 3 Stream Channel
- Type 4 Stream Channel
- Type 5 Stream Channel
- Type 6 Stream Channel
- Type 7 Stream Channel
- Type 8 Stream Channel
- Type 9 Stream Channel
- Type 10 Stream Channel
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- Type 20 Stream Channel

Stream Channel Edge

- Type 1 Stream Channel Edge
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Stream Channel Centerline

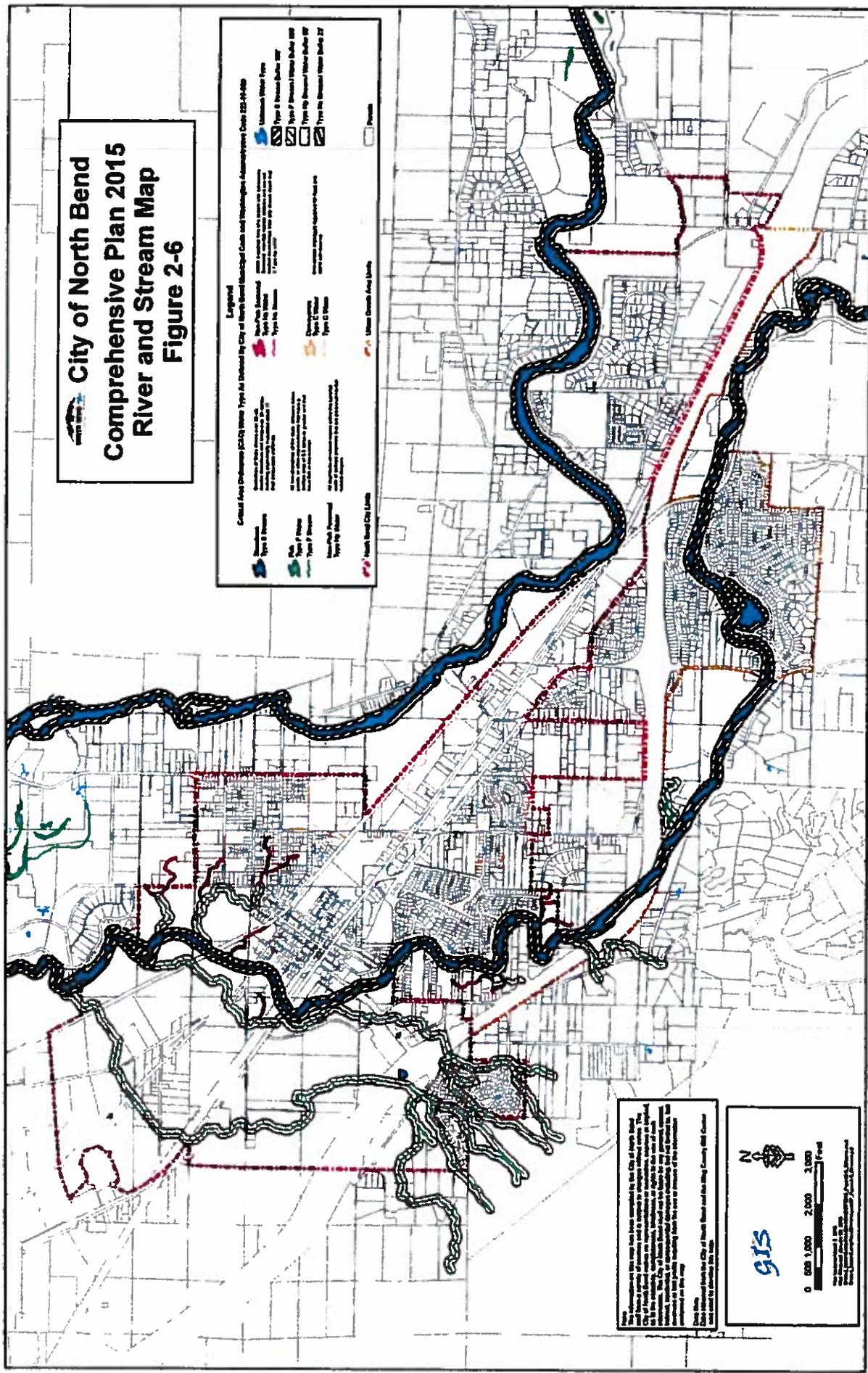
- Type 1 Stream Channel Centerline
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Stream Channel Edge Line

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Stream Channel Centerline Line

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North

City of North Bend, Oregon
2015

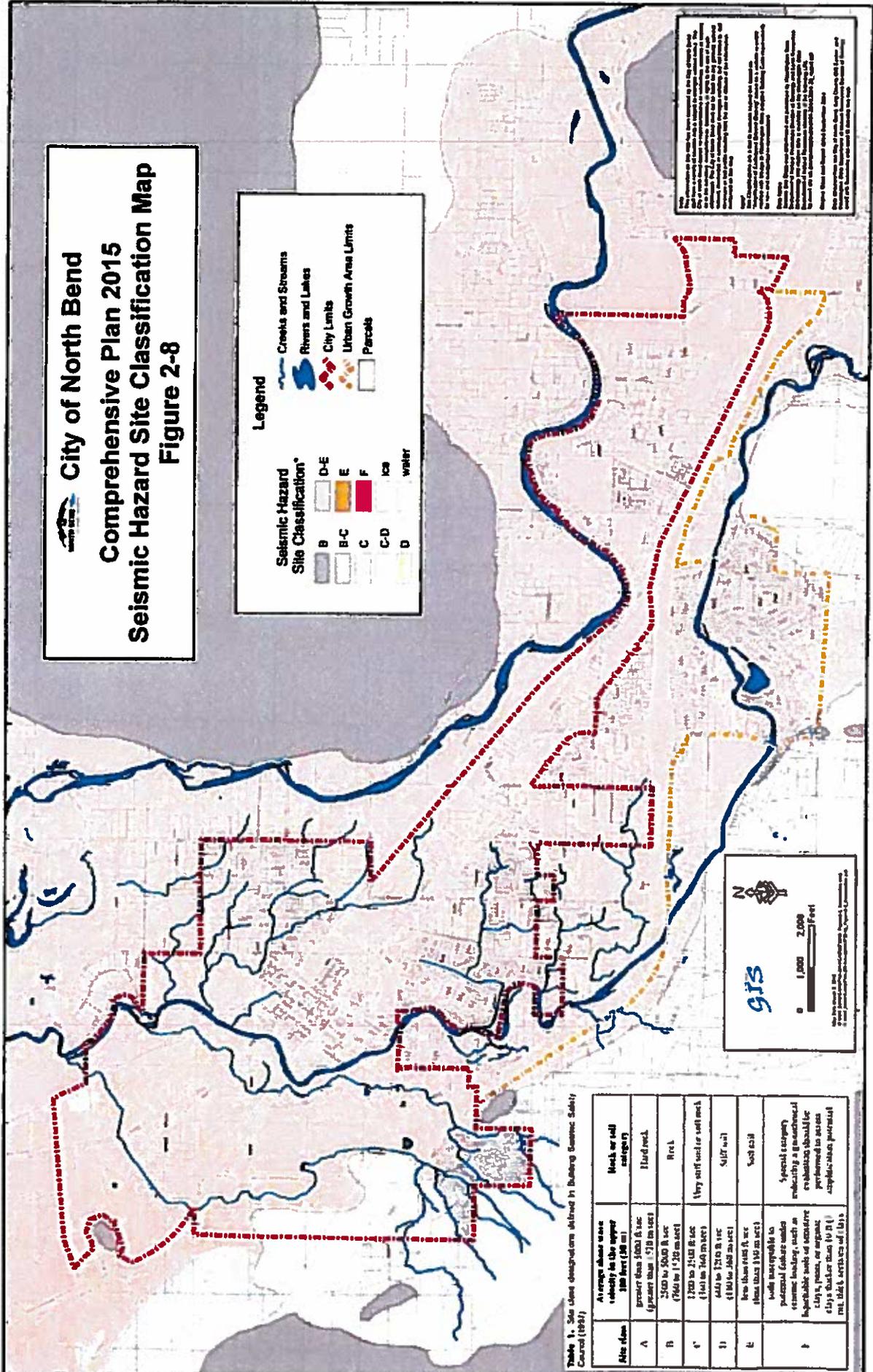
**City of North Bend
Comprehensive Plan 2015
Seismic Hazard Site Classification Map
Figure 2-8**

Legend

Seismic Hazard Site Classification*

B-C D-E
C E
C-D F
D ice
water

Creeks and Streams
Rivers and Lakes
City Limits
Urban Growth Area Limits
Parcels



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Table 1. Site class designations defined in Building Seismic Safety Council (1997)

Site class	Average shear wave velocity in the upper 300 feet (30 m)	Rock or soil category
A	greater than 2,500 ft/sec (762 m/sec)	Hard rock
B	2,500 to 3,500 ft/sec (762 to 1,067 m/sec)	Rock
C	3,500 to 5,000 ft/sec (1,067 to 1,524 m/sec)	Very stiff soil or soft rock
D	5,000 to 7,500 ft/sec (1,524 to 2,286 m/sec)	Stiff soil
E	7,500 to 10,000 ft/sec (2,286 to 3,048 m/sec)	Soft soil
F	less than 7,500 ft/sec (2,286 m/sec) with susceptibility to potential failure under extreme loading, such as liquefaction, or significant clay, peat, or organic clay, silt or sand (U.S. 1997)	Special category: engineering or geotechnical evaluations should be performed to assess appropriate seismic potential

**City of North Bend
Comprehensive Plan 2015
Liquefaction Susceptibility Map
Figure 2-9**

