Washington State Department of Ecology

Grant No. G0800107

City of Snoqualmie Shoreline Master Program Update

Cumulative Impacts Analysis and No Net Loss Report

Main Stem of the Snoqualmie River, Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond)

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REVISED DRAFT

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BMP –	Best Management Practices
CERCLA –	Comprehensive Environmental Response, Compensation, and Liability Act
CAO –	Critical Areas Ordinance (SMC Section 19.08 Article VI)
CIA –	Cumulative Impacts Analysis
CMZ –	Channel Migration Zone
Ecology –	Washington State Department of Ecology
ELJ –	Engineered Logjams
ESA –	Federal Endangered Species Act
FEMA –	Federal Emergency Management Agency
FERC –	Federal Energy Regulatory Commission
GIS –	Geographic Information Systems
OHWM –	Ordinary High Water Mark
RCW –	Revised Code of Washington
SAA –	Shoreline Analysis Area
SEPA –	State Environmental Policy Act (Chapter 43.21C RCW)
SIC –	Shoreline Inventory and Characterization Report
SMA –	Shoreline Management Act (Chapter 90.58 RCW)
SMC –	Snoqualmie Municipal Code
SMP –	Shoreline Master Program
State –	State of Washington
UGA –	Urban Growth Area
USACE –	United States Army Corps of Engineers
WAC –	Washington Administrative Code
WDFW –	Washington State Department of Fish and Wildlife
WRIA –	Watershed Resource Inventory Area

Chapter 1: Introduction

A. Washington State Department of Ecology Direction and Guidance

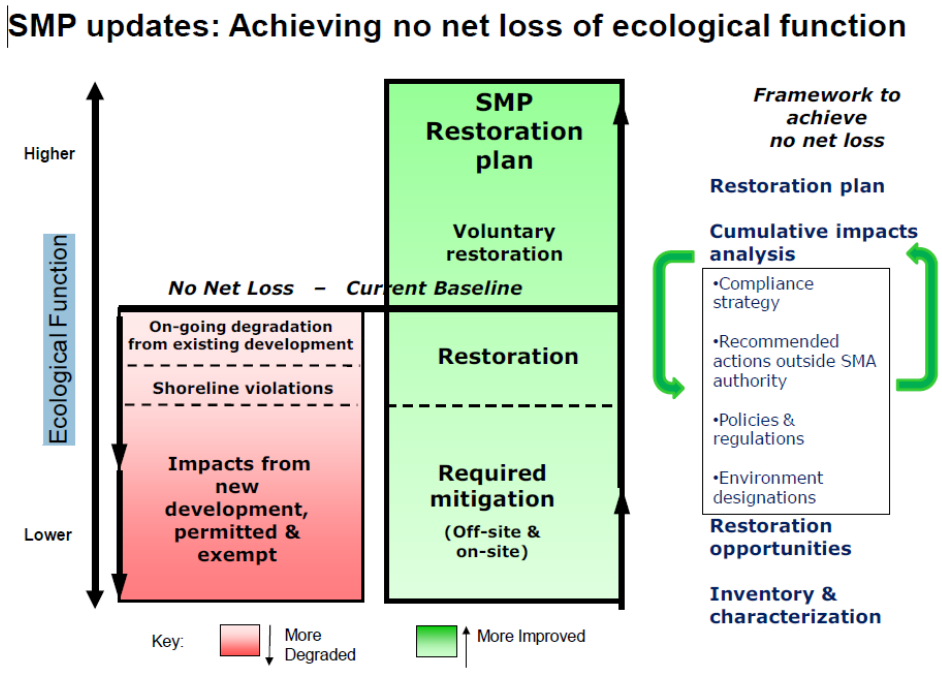
The Shoreline Management Act (SMA) guidelines require local Shoreline Master Programs (SMPs) to regulate new development to "achieve no net loss of ecological function." The SMA Guidelines set forth in Washington Administrative Code (WAC) 173-26-186(8)(d) state that:

> *"To ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts."*

The SMA Guidelines discuss the concept of net loss in more detail in WAC 173-26-201(2)(c).

The city of Snoqualmie's updated SMP will contain goals, policies, and regulations intended to prevent degradation of ecological functions relative to the existing conditions as documented in the *City of Snoqualmie Shoreline Inventory and Characterization Report (SIC)*. When an individual project will result in degradation of ecological functions, mitigation must be provided within the system to return the resultant ecological function back to the baseline, as illustrated in Figure 1.

Figure 1: **SMP Process for Achieving the No-Net Loss Standard. Source: Washington State Department of Ecology (2012)**



Additionally, Figure 1 shows how the *Shoreline Restoration Plan* provides a framework for voluntary restoration efforts and methods to improve the overall ecological function.

The city must be able to demonstrate that it has accomplished the goal of "no net loss" of ecological functions through an analysis of cumulative impacts that might occur through implementation of the updated SMP. Evaluation of such cumulative impacts should consider:

(i) Current circumstances affecting the shorelines and relevant natural processes;

(ii) Reasonably foreseeable future development and use of the shoreline; and

(iii) Beneficial effects of any established regulatory programs under other local, state, and federal laws.

As outlined in the *Shoreline Restoration Plan* that will be prepared as part of the SMP update, the SMA also seeks to restore ecological functions in degraded shorelines. This cannot be required by the SMP at a project level, but WAC 173-26-201(2)(f) of the SMA Guidelines notes that "…master programs shall include goals and policies that provide for restoration of such impaired ecological functions." The *Shoreline Restoration Plan* discusses the SMP policies and other programs and activities in the city that will contribute to the long-term restoration of ecological functions relative to the baseline condition established by the SMP update process.

The shorelines within the city subject to the policies and regulations of the SMP include:

- The Snoqualmie River Main Stem;
- The Snoqualmie River South Fork;
- Kimball Creek (below its confluence with Coal Creek);
- Borst Lake (Snoqualmie Mill Pond);
- Wetlands associated with the Snoqualmie River and Kimball Creek; and
- Upland areas called shorelands, which extend two hundred feet landward from the edge of the floodway and shorelines listed above.

The shorelines of the city are depicted on the map in Appendix 2: CIA Shorelines Analysis Areas Map. The following analysis summarizes the existing conditions, anticipated development, relevant SMP and other regulatory provisions, and the expected net impact on ecological function.

B. Relationship to SEPA

The State Environmental Policy Act (SEPA) requires an assessment of environmental impacts. This cumulative impact analysis supplements the nonproject environmental review done under SEPA and is intended to address cumulative rather than isolated or individual impacts.

The SEPA review process is intended to provide a list of possible environmental impacts that may occur because of a project (SEPA project review) or change in policy (SEPA nonproject review). This helps identify potential impacts that may need to be mitigated, conditioned, or which may result in the denial of a project or proposal. The intent of the Cumulative Impacts Analysis (CIA) is to consider impacts in the shoreline jurisdiction as a whole, based on whether or not multiple smaller projects collectively result in gradual, but significant impacts. While review under SEPA looks at

impacts by topic and the effects they may have as a whole for the project area, the CIA takes a broader approach, examining cumulative impacts that may result from multiple projects over time.

C. Assumptions

This analysis detailed in this report considered foreseeable impacts that could take place over the next eight years. Impacts were examined in the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) shoreline jurisdictions as analyzed in the SIC. It is important to note that while the SIC also analyzed additional areas that were subsequently removed from the shoreline jurisdiction during the review process, but only those areas that were kept as a part of the final proposed shoreline jurisdiction are addressed in the CIA.

In addition, site-specific impacts will be addressed in this report on a case-by-case basis during individual project reviews as guided by the policies, regulations, and review procedures of the SMP. This analysis corresponds with the six proposed shoreline environment designations established in the SMP: Aquatic, Hydropower, Natural, Urban Conservancy, Urban Floodplain, and Urban Riverfront Environments.

D. Document Roadmap

This CIA summarizes existing conditions, as compared to likely future development and related impacts, in the following five shoreline analysis areas (SAAs) within the city:

1. The Snoqualmie River South Fork and adjacent floodway;
2. The Snoqualmie River Main Stem Left Bank and adjacent floodway;
3. The Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) and adjacent floodplain;
4. Kimball Creek and adjacent floodplain; and
5. The Snoqualmie River Main Stem below the SR-202 Bridge (The area south of the SR-202 Bridge includes the area within the Federal Energy Regulatory Commission (FERC) boundary associated with Puget Sound Energy's Snoqualmie Falls hydroelectric facility).

These five SAAs were created for this analysis and they are depicted on Figure 2 shown in Appendix 2. The first four SAAs above also include the adjacent floodway or floodplain areas, though this report shortens the names to exclude the *"and adjacent floodplain"* or *"and adjacent floodway"* designation. The left bank of the Snoqualmie River main stem is the south side of the river, and the right bank is to the north.

The existing conditions that are considered include shoreline characteristics, land use, public access, shoreline modifications, and ecological functions. The CIA summarizes the applicable policies and regulations in the SMP that will act together to ensure that no net loss of ecological function occurs

in the shoreline jurisdiction. It identifies potential upland and in-water development opportunities within each SAA.

Potential development opportunities have been determined based on existing conditions, shoreline environment designations, zoning, and limiting environmental factors such as the presence of wetlands or channel migration zones (CMZs). This report details the potential impacts and risks to shoreline functions and processes, identifies anticipated development in each SAA and how the SMP regulations would address this development, discusses how other local, state and federal regulations would address these potential impacts, and describes the net effect on ecological functions and processes.

Appendix 1 includes tables that contain cumulative impacts summaries for the city's five SAAs. The tables include descriptions of the relationship between ecological function, potential alteration, resources at risk, and proposed SMP regulations and non-regulatory measures designed to assure no net loss, at a minimum.

Chapter 2: Existing Conditions

The following summary of existing conditions in the city's five SAAs and the relevant natural processes is based on the final SIC prepared by Otak, Inc. in June 2013 and additional analysis used to perform that assessment. The full SIC includes a more in-depth of discussion of the following topics.

A. Biological Resources and Sensitive Areas

The mapping and pertinent regulations relative to biological resources and sensitive areas are applicable to all of the SAAs, as follows:

1. Geologically Hazardous Areas

According to Snoqualmie Municipal Code (SMC) 19.12.020, Geologically Hazardous Areas are defined as:

> *"Areas that, because of their susceptibility to erosion, sliding, earthquake, or other geological events, may pose hazards to the siting of commercial, residential, or industrial development consistent with public health or safety concerns, without appropriate mitigation."*

Map Folio Figure 9 – Landslide, Erosion and Seismic Hazard Areas shows the areas mapped as a Steep Slopes, High Seismic Hazard Area, Erosion Hazard Area and Landslide Hazard Area within Shoreline Jurisdiction.

2. Flood Hazard Areas

Floodplains are:

> *"…synonymous with the one hundred-year flood plain and means that land area susceptible to inundation with a one percent chance of being equaled or exceeded in any given year. The limit of this area shall be based upon flood ordinance regulation maps or a reasonable method which meets the objectives of the act." (WAC 173-26-020)*

Floodways are:

> *"…the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot." (WAC 173-158-030)*

The city has mapped floodplains and floodways using data from the Federal Emergency Management Agency (FEMA). For more information, see Map Folio Figure 1– Shoreline Jurisdiction Map.

3. Wetlands

The wetland mapping done by the city, King County, the U.S. Fish and Wildlife Service, (USFWS) National Wetlands Inventory (NWI), and Washington State Department of Fish and Wildlife (WDFW) Priority Habitats and Species (2007) shows that there are extensive wetlands located in

the Snoqualmie River South Fork shoreline jurisdiction area. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries, which were not formally delineated for this project. Wetlands in the shoreline jurisdiction are regulated under the city's Critical Areas Ordinance (CAO).

Soils mapped in and around the SAAs are shown in Map Folio Figure 14 – Soils. Soil types classified as "hydric" may be indicative of wetlands. Additional wetlands may be found when development occurs on currently undeveloped properties. Any undocumented wetlands located within or adjacent to the city, which are associated with the shoreline jurisdiction would also be subject to the city's SMP wetland regulations.

4. Fish and Wildlife Habitat Conservation Areas

According to SMC Section 19.12.190, fish and wildlife habitat conservation areas are designated as follows:

> *"All wetlands and streams and their buffers, together with all publicly owned open spaces of greater than 10 acres, not including land use perimeter buffers, are hereby designated as fish and wildlife habitat conservation areas, including Meadowbrook Farm, the Two Sisters Return Open Space, Snoqualmie Point, Three Forks Natural Area, the Snoqualmie River Open Space and the Kimball Creek Open Space. Other areas shall be designated as fish and wildlife habitat conservation areas based upon a habitat study conducted pursuant to this section."*

Additionally, the city requires habitat studies for all development proposals that the director determines may affect the habitat of a species listed by the federal or state government.

5. Channel Migration Zones

According to definitions in the Washington State Department of Ecology's (Ecology's) SMP Guidelines (WAC 173-26-020):

> *"Channel migration zone (CMZ) means the area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings."*

According to SMC Section 19.12.160, the city's CMZs are designated as follows:

> *"Channel migration zones are hereby designated as shown in the Snoqualmie River Channel Migration Area Map, contained in "Channel Migration in the Three Forks Area of the Snoqualmie River" (King County Department of Natural Resources, Surface Water Management Division, Seattle, WA, 1996), which is hereby incorporated by this reference."*

The referenced map depicts three levels of channel migration that may occur according to the likelihood that channel migration will occur in certain areas. The three levels are "potential," "moderate," and "severe" CMZs, which are all present within the main stem of the Snoqualmie River shoreline jurisdiction. This map included as is Map Folio Figure 12 – Channel Migration Map and a more detailed discussion of the possible effect of channel migration is discussed in SIC Section 4.

6. Critical Aquifer Recharge Areas

King County has not fully studied the critical aquifer recharge areas within the city limits. Therefore, this is a gap of existing information for the city. However, mapping is available for the recently annexed Weyerhaeuser Mill Site and Urban Growth Areas (UGAs) from the County's iMap interactive map site. The majority of the Mill Site and surrounding UGAs are considered critical aquifer recharge areas. The CAO, SMC 19.08.760, provides regulations for critical aquifer recharge areas.

B. Snoqualmie River South Fork and Adjacent Floodway (SAA #1)

1. Shoreline Environment Designations

Table 1 breaks down by percentage each of the proposed shoreline environment designations shown on the Shoreline Designation Map for the Snoqualmie River South Fork SAA.

Table 1: Shoreline Environment Designations for the Snoqualmie River South Fork SAA

Proposed Shoreline Environment Designation	Percentage of SAA #1
Natural Environment	67.06%
Urban Conservancy Environment	32.94%

The three shoreline environment designations, which also includes the Aquatic Environment, though not shown in the table, reflect both the existing conditions and potential future uses along the of the Snoqualmie River South Fork, which are not likely to change greatly in intensity or use from current conditions. The shoreline environment designations for this SAA reflects the city's intent to continue to encourage existing uses in the future while recognizing the existing nature of this area.

2. Land Use

The existing land use pattern in the Snoqualmie River South Fork SAA consists primarily of parks and recreation, open space, and utility uses. Within the upland portion of the Snoqualmie River shoreline jurisdiction, approximately 50% is undeveloped riparian forest, open space, and natural areas, while the remaining 50% is a mixture of residential, developed parks, farm, golf course, and trails.

Table 2 summarizes the breakdown of the future land uses found in the Snoqualmie River South Fork SAA, as indicated by the Comprehensive Plan land use designations shown in Map Folio Figure 2 – Comprehensive Plan Land Use Designations.

Table 2: Comprehensive Plan Land Use Designations for the Snoqualmie River South Fork SAA

Comprehensive Plan Land Use Designations	Percentage of SAA #1
Parks / Open Space	100%

The city's zoning designations follow the land use designations established by the city's Comprehensive Plan. Within this SAA, there are two zoning designations: Open Space 1 and Open Space 2. Table 3 summarizes the breakdown of the two zoning designations for the SAA as shown in Map Folio Figure 3 – Zoning Map.

Table 3: Zoning Designations for the Snoqualmie River South Fork SAA

Current Zoning Designations	Percentage of SAA #1
Open Space 2	66.98%
Open Space 1	33.02%

3. Parks and Open Space / Public Access

This SAA is characterized by a large amount of open and recreational space, including the Mt. Si Golf course. Presently, there are no existing formal public access points to the Snoqualmie River South Fork.

4. Impervious Surfaces

There are very few impervious surfaces within the Snoqualmie River South Fork SAA. Based on April 19, 2012 Geographic Information System (GIS) data, the total coverage of impervious surfaces for this SAA (SAA #1) is 1.22%. The impervious surfaces within the left bank vicinity are limited to concrete or asphalt paving for roads and those associated with the golf course, such as golf cart paths, gravel roads, and packed earth for golf greens.

Additional impervious surfaces within the analysis area may include roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, packed earth (e.g. lawns, etc.), oiled macadam or other surfaces which similarly impede the natural infiltration of surface and storm water runoff.

5. Shoreline Modifications

According to the SIC report, there are no modifications within the Snoqualmie River South Fork. It does not appear that there is armoring or other types of shoreline modification along the south fork of the Snoqualmie River within the city's shoreline jurisdiction. Refer to Map Folio Figure 7 – Shoreline Modifications for more information.

6. Biological Resources and Sensitive Areas

a) *Geologically Hazardous Areas*

The entire Snoqualmie River South Fork SAA is identified as a "high seismic hazard area." In addition, erosion hazard areas are identified only the northernmost segment. Should any additional geologically hazardous areas be determined, those areas shall be subject to the city's regulations set forth in the SMP and the CAO.

b) *Flood Hazard Areas*

With the exception of a very small amount of low ground labeled as floodplain, nearly the entire Snoqualmie River South Fork SAA that is not labeled as a wetland area is within the floodway. For more information, see Map Folio Figure 1– Shoreline Jurisdiction Map.

c) *Wetlands*

Wetland mapping documents prepared by the city, King County, the USFWS NWI, and WDFW's Priority Habitats and Species (2007) show that there are a number of wetlands located in the Snoqualmie River South Fork SAA. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries, which were not formally delineated for this project. Wetlands in the city are regulated under SMC 19.08.730.

The wetland inventory identifies several high functioning Category I wetlands, many of which are located in former oxbows of the Snoqualmie River. None of the wetlands identified in this SAA are classified as "King County Wetlands."

d) *Rivers*

The lower portion of the Snoqualmie River South Fork travels north though the eastern portion of the city to its confluence with the main stem along the northern boundary of the city limits.

e) *Fish and Wildlife Habitat Conservation Areas*

The Snoqualmie River South Fork is designated priority habitat by the WDFW for resident Snohomish Coastal Cutthroat. Priority habitat species, including Elk Range, are found within this SAA along the Snoqualmie River South Fork (see Map Folio Figure 13 – Priority Habitat Species Map).

f) *Channel Migration Zones*

All land within the Snoqualmie River South Fork SAA is identified as moderate or severe CMZs (see Map Folio Figure 12 – Channel Migration Map). A more detailed discussion of the possible effect of channel migration is discussed in SIC Section 4.

g) *Critical Aquifer Recharge Areas*

King County has not studied critical aquifer recharge areas within the city. SMC 19.08.760 provides regulations for critical aquifer recharge areas, should any be identified in the future.

7. Ecological Functions

The SAA exhibits moderate ecological functions due to the presence of the golf course. The golf course contains a very simplistic vegetation community, which reduces food source opportunities and nesting sites for wildlife. The maintained manicured fairways and greens have very little species diversity or physical complexity compared to the surrounding large complex forested woodland habitats or older landscaped residential area.

In terms of hyporheic and hydrologic function, the soils on the golf course were likely completely regraded and reworked and therefore are assumed to allow a reduced infiltration rate as compared to areas with intact, native soils. The use of an array of treatments such as fertilizers, herbicides, and insecticides on the tees, greens, and fairways could be a probable source for excess nutrients and toxics. The presence of the narrow stands of forests in the rough of the golf course allow for the removal of nutrients and toxic compounds, though probably not enough to compensate for the amount of fertilizer, insecticides, herbicides, moss removal, and other potential compounds used to maintain golf course tees, greens, and fairways.

In the remainder of the SAA, outside of the golf course setting, there is a primarily deciduous canopy forest with some mixed conifer / deciduous canopy present with a higher overall ecological function. Trees along the river in the riparian zone can fall directly into the river for food web support. The potential attenuation of flow energy is high, which contributes to a high hydrologic function. Floodwaters moving through this segment have the opportunity to be filtered by standing vegetation. This area is dominated by native species and it provides an excellent array of niches for wildlife; the forested woodlands and vegetated wetlands are excellent examples of upland and wetland habitats.

C. Snoqualmie River Main Stem Left Bank and Adjacent Floodway (SAA #2)

1. Shoreline Environment Designations

Table 4 breaks down by percentage each of the proposed shoreline environment designations shown on the Shoreline Designation Map for the Snoqualmie River Main Stem Left Bank SAA.

Table 4: Shoreline Environment Designations for the Snoqualmie River Main Stem Left Bank SAA

Proposed Shoreline Environment Designation	Percentage of SAA #2
Natural	85.79%
Urban Floodplain	14.21%

The three proposed shoreline environment designations, including the Aquatic Environment not shown in Table 4, reflect both the existing conditions and potential future uses along the main stem of the Snoqualmie River, which are not likely to change greatly in intensity or use from

current conditions. The shoreline environment designations for this SAA reflects the city's intent to continue to encourage existing uses in the future while recognizing the existing nature of this area.

2. Land Use

The existing land use patterns in the Snoqualmie River Main Stem Left Bank SAA are composed primarily of residential, small-scale commercial, parks and recreation, open space, utility, and school uses. Single-family residential and public schools are currently the predominant land uses, encompassing the majority of the shoreline jurisdiction. Parks, open space, and recreational areas are located throughout this SAA, including two small city parks along the riverfront. Single-family residential uses consist of historic platted neighborhoods on relatively small lots, along with low-density residential properties in areas constrained by large wetlands.

Commercial land uses are located in the historic downtown core area, including a one-block segment along the riverfront. School uses include a high school, middle school, and elementary school located east of SR-202 in the floodway, along with a private K-8 school and the public school district administration office east of SR-202 in the floodplain.

Table 5 summarizes the breakdown of the future land uses found in the main stem Snoqualmie River area, as indicated by the Comprehensive Plan land use designations shown in Map Folio Figure 2 – Comprehensive Plan Land Use Designations.

Table 5: Comprehensive Plan Land Use Designations for the Snoqualmie River Main Stem Left Bank SAA

Comprehensive Plan Land Use Designations	Percentage of SAA #2
Parks/Open Space	72.57%
Residential	24.78%
Business/Retail	2.44%
Utility Park	0.21%

The city's zoning designations follow the land use designations established by the city's Comprehensive Plan. Within this SAA, Parks and Open Space and Constrained Residential occupy the largest portion of the SAA. Schools are allowed as conditional uses within residential districts. It is important to note that the Constrained Residential zoning designation comprises a large percentage of this SAA.

This zoning district includes existing platted areas within the floodplain; however, opportunities for future subdivisions are limited due to minimum lot size requirements. Table 6 summarizes the breakdown of the ten zoning designations for the Snoqualmie River Main Stem Left Bank SAA shown in Map Folio Figure 3 – Zoning Map.

Table 6: Zoning Designations for the Snoqualmie River Main Stem Left Bank SAA

Current Zoning Designations	Percentage of SAA #2
Open Space 1	53.57%
Constrained Residential	24.48%
Open Space 2	17.50%
Open Space 3	1.48%
Business Office	0.94%
Business Retail 2	0.56%
Business General	0.50%
Business Retail 1	0.48%
Mixed Use	0.31%
Utility Park	0.19%

3. Parks and Open Space / Public Access

The city created parks, recreation and open space facilities within the city that provide the public both physical and visual access to areas within the shoreline jurisdiction. Providing public access to the SAA is important to the citizens of the city. The city performed a number of strategic planning efforts over the last several years, including the Downtown Vision Plan, the Economic Development Plan, and the Downtown Master Plan. All of these plans present a vision for the future development of a river walk trail along the shoreline of the left bank of the Snoqualmie River's main stem.

The majority of the riverfront property within the Snoqualmie River Main Stem Left Bank SAA is zoned Open Space 1 or Open Space 2. Riverfront properties on the left bank of the Snoqualmie River Main Stem include a number of city-owned parcels, along with properties currently occupied as single-family residential uses or vacant and developed commercial properties within the historic downtown area.

Due to the dangers presented by the main stem of the Snoqualmie River, the majority of public access to the river is in the form of viewing instead of physical access. An informal trail leads to the water's edge in a portion of Sandy Cove Park. Residents use this area for swimming during times of low summer flows. During higher flows, displacement of large boulders, moving wood debris, and the power of a flowing river in proximity to Snoqualmie Falls present extreme dangers to the public. For these reasons, the portion of the left bank of the Snoqualmie River main stem downstream of the Meadowbrook Bridge is not used for boating activities and is not improved for swimming. Non-motorized boats are allowed upstream of the Meadowbrook Bridge.

Presently, there are eleven existing formal public access points in this SAA as shown on Map Folio Figure 8 – Shoreline Access Point Map.

4. Impervious Surfaces

Impervious surfaces within this SAA are those associated with commercial and residential development including roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, and packed earth, such as lawns, athletic fields, etc., or other surfaces which similarly impede the natural infiltration of surface and storm water runoff. Based on April 19, 2012 GIS data, the total coverage of impervious surfaces for this SAA (SAA #2) is 15.65%.

5. Shoreline Modifications

According to the SIC, the majority of known shoreline modifications in the city occur along the main stem of the Snoqualmie River. Modifications within the Main Stem area include the installation of engineered logjams (ELJs), and several bridge crossings: the Meadowbrook Way one-lane bridge crossing, the SR-202 Bridge crossing the Snoqualmie River, and the railroad and highway bridges over Kimball Creek. In addition, riprap and bio-stabilization elements were installed for bank armoring. There is also a revetment / levee along the Snoqualmie River at the Three Forks Natural Area / Meadowbrook Slough. Refer to Map Folio Figure 7 – Shoreline Modifications for more information.

6. Biological Resources and Sensitive Areas

a) *Geologically Hazardous Areas*

Within the Snoqualmie River Main Stem Left Bank SAA, only high seismic and erosion geologic hazard areas are mapped. The entire historic downtown area is classified as a high seismic hazard area. There are several erosion hazard areas within this area; however, they are not as extensive as the mapped seismic area.

Should any additional geologically hazardous areas be determined, those areas shall be subject to the city's regulations set forth in the CAO and the SMP. Refer to Map Folio Figure 9 – Landslide, Erosion, and Seismic Hazard Areas for more information.

b) *Flood Hazard Areas*

The Main Stem Left Bank SAA includes floodway areas. The floodway is generally located north of SR-202 in the northeast portion of this SAA. For more information, see Map Folio Figure 1– Shoreline Jurisdiction Map. A small swath of land that is mapped floodplain runs along the southern edge of this analysis area.

c) *Wetlands*

Wetland mapping documents prepared by the city, King County, the USFWS NWI, and WDFW Priority Habitats and Species (2007) show that there are a number of wetlands located in the Main Stem Left Bank SAA. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries, which were not formally delineated for this project. The city's wetlands are regulated under the COA (SMC 19.08.730).

The majority of the wetlands located in this shoreline jurisdiction are located south and southeast of the city's historic downtown. There are several wetland types including

palustrine forested, scrub-shrub, and emergent. Many of the wetlands are located in former oxbows of the Snoqualmie River Main Stem.

d) *Rivers*

The portion of the Snoqualmie River Main Stem within this SAA travels from east to west toward Snoqualmie Falls. A small portion of Kimball Creek is included in this SAA; the beginning of Kimball Creek runs west from its point of origin in the Snoqualmie River.

e) *Fish and Wildlife Habitat Conservation Areas*

The main stem of the Snoqualmie River is designated priority habitat by the WDFW for resident Snohomish Coastal Cutthroat and rainbow trout. In addition, priority habitat species, including Forest Shrub Marsh, Shrub Marsh, and Elk Range, are included within this SAA (see Map Folio Figure 13 – Priority Habitat Species Map).

f) *Channel Migration Zone*

Moderate and severe CMZs are present within the Snoqualmie River Main Stem Left Bank SAA (see Map Folio Figure 12 – Channel Migration Map). A more detailed discussion of the possible effect of channel migration is discussed in SIC Section 4.

g) *Critical Aquifer Recharge Areas*

King County has not studied critical aquifer recharge areas within the city limits. The CAO (SMC 19.08.760) provides regulations for critical aquifer recharge areas should any be identified in the future.

7. Ecological Functions

This SAA exhibits low-to moderate ecological functions.

The developed area along the Snoqualmie River left bank includes the area of the city with older housing adjacent to the riverbank on a relatively high bank. The bank is undergoing scour and failure, causing the bank to move closer to the older housing. Buildings, parking lots, roads, and sidewalks found in this area all combine to create a relatively high percent of imperviousness, which strong impairs some of the hydrologic functions.

Due to the decades of development in this area, most of the natural vegetation has been removed and replaced with landscape species, most of which is very mature. Residential gardens, orchards, and lawn grass comprise most of the vegetated portions of this segment; the rest of the area is either impervious surfaces or the riverbank itself. The landscaping present would have little potential to remove sediment and nutrients from waters.

The close proximity of the river and topographic conditions results in high rates of flow move through this narrow band with little opportunity for filtration. ELJs have been placed along the left bank as a means to address bank erosion and to deflect erosive flows; erosion rates have been lowered as a result, but cannot be eliminated for the high steep bank. Without extensive armoring or more engineered river features, erosion will continue. In terms of hyporheic flow functions, the area has a high degree of imperviousness, and therefore it is

inhibited regarding the opportunity for groundwater recharge or hyporheic interactions with the river.

D. Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) and Adjacent Floodplain (SAA #3)

1. Shoreline Environment Designations

Table 7 breaks down by percentage the proposed shoreline environment designations shown on the Shoreline Designation Map for the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA.

Table 7: Shoreline Environment Designations for the Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA

Proposed Shoreline Environment Designation	Percentage of SAA #3
Urban Conservancy	67.25%
Natural	25.17%
Urban Floodplain	7.44%
Hydropower	0.14%

The five proposed shoreline environment designations, which also include the Aquatic Environment not shown in the table, reflect both the existing conditions and potential future uses in this SAA. Uses within the Urban Floodplain Environment are likely to change in both nature and intensity from current conditions as new development and redevelopment occur under the Planned Commercial / Industrial zoning.

Future uses within the Urban Conservancy and Natural Environments portions of this SAA should be low intensity, consistent with the Open Space zoning and floodway development restrictions. The designation of SAAs reflects the city's intent to continue to encourage development in the floodplain portion of the old Snoqualmie lumber mill site, while recognizing the existing nature of this area.

2. Land Use

Within the floodplain portion of the Snoqualmie River Main Stem Right Bank / Borst Lake Snoqualmie Mill Pond) SAA, approximately 25% is developed as former industrial uses, while the remaining 75% is undeveloped. Table 8 shows the Comprehensive Plan breakdown and Table 9 shows the Zoning designation distribution for the SAA.

Table 8: Comprehensive Plan Land Use Designations for the Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA

Comprehensive Plan Land Use Designations	Percentage of SAA #3
Open Space	92.34%
Planned Commercial/Industrial	6.77%
Utility Park	0.90%

Table 9: Zoning Designations for the Main Stem Right Bank/Borst Lake (Snoqualmie Mill Pond) SAA

Current Zoning Designations	Percentage of SAA #3
Open Space 2	63.50%
Open Space 1	28.73%
Planned Commercial/Industrial	5.91%
Utility Park	0.95%
Planned Residential	0.91%

3. Parks and Open Space / Public Access

Presently, there are three existing informal public access points to Borst Lake (Snoqualmie Mill Pond) shown on Map Folio Figure 8 – Shoreline Access Point Map. The parcels designed as Urban Conservancy and Natural Environments in this SAA are currently under private ownership and undeveloped, with the exception of Mill Pond Road. The riverfront properties on the right bank (north side, in the UGA) of the Snoqualmie River Main Stem are undeveloped and privately owned.

4. Impervious Surfaces

Impervious surfaces within the Borst Lake (Snoqualmie Mill Pond) / Main Stem Snoqualmie River shoreline jurisdiction area are limited. Based on April 19, 2012 GIS data, the total coverage of impervious surfaces for this SAA (SAA #3) is 3.33%. Such impervious surfaces may include roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, compacted dirt roads, gravel roads, and oiled macadam, or other surfaces which similarly impede the natural infiltration of surface and storm water runoff.

5. Shoreline Modifications

There are very few existing shoreline modifications in the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA. A report by Goldsmith Engineering in October 2012 for the Snoqualmie Mill Site Sensitive Area Study (Job No. 12046) documented that there is an existing weir at the south edge of Borst Lake. Aside from this weir, there does not appear that there any other armoring or other types of shoreline modification along Borst Lake (Snoqualmie Mill Pond) or the right bank of the Snoqualmie River Main Stem within this area. Refer to Map Folio Figure 7 – Shoreline Modifications for more information.

6. Biological Resources and Sensitive Areas

a) *Geologically Hazardous Areas*

Within the main stem portion of the SAA, only high seismic hazard and erosion hazard areas have been mapped.

A sensitive area study is required before any development can be proposed on the privately owned properties within this SAA. Should any geologically hazardous areas be determined, those areas shall be subject to the city's regulations set forth in the CAO and SMP. Refer to Map Folio Figure 9 – Landslide, Erosion and Seismic Hazard Areas for more information.

b) *Flood Hazard Areas*

This SAA includes significant undeveloped areas within the FEMA designated floodway as depicted on the current FIRM map panels, including Borst Lake (Snoqualmie Mill Pond) and the area located between the river and Mill Pond Road. Due to the prior 60-year use of much of the floodplain area and Borst Lake (Snoqualmie Mill Pond) for the former Snoqualmie Valley Lumber mill operations, there are known areas of contamination.

Documentation of these contaminated areas was obtained from the EPA and the property owner. These documents identify the environmental impacts and remediation activities on the old Weyerhaeuser Snoqualmie Mill Site/ Snoqualmie Valley Lumber Mill. Multiple locations on the site could have soil, surface water and groundwater impacts due to the presence of petroleum concentrations, fuels, chemicals and other toxic fluids stored or used onsite.

However, six areas stand out for reported potential impacts and remediation activity: (1) the Former Under- and Above-ground Storage Tanks (UST/ASTs); (2) the Former Plywood Plant; (3) the "Morbark" Area; (4) the Powerhouse & Sawmill; (5) the Lumber Strapping Area; and (6) the Pentachlorophenol (PCP) Dip Tank areas. Remediation of these sites is expected at time of future development. Additional information in located in the city's *Mill Site: Reported Environmental Activity & Remediation, Summary* Report.

c) *Wetlands*

City, King County, NWI, and WDFW Priority Habitats and Species (2007) wetland mapping shows that there are extensive wetlands located in and around the Borst Lake (Snoqualmie Mill Pond) / Main Stem of the Snoqualmie River shoreline jurisdiction area, including palustrine forested, scrub-shrub, and emergent wetlands. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries based on these existing wetland map sources. Soils mapped in and around the SAA are shown in Map Folio Figure 14 – Soils. Soil types classified as "hydric" may be indicative of wetlands. The city's wetlands are regulated under the CAO (SMC 19.08.730). Additional wetlands may be found when development occurs on currently undeveloped properties. Any undocumented wetlands located within or adjacent to the city, which are associated with the shoreline jurisdiction would also be subject to the city's SMP regulations and the CAO.

7. Streams / Lakes

There is a hydraulic connection between the west side of Borst Lake (Snoqualmie Mill Pond) and the main stem of the Snoqualmie River.

a) *Fish and Wildlife Habitat Conservation Areas*

Priority habitat species, including Shrub Marsh and Elk Range, are found within the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA and are mapped in Map Folio Figure 13 – Priority Habitat Species Map.

The area surrounding Borst Lake (Snoqualmie Mill Pond) and the higher ground in the center of Borst Lake (Snoqualmie Mill Pond) is designated for Roosevelt Elk. There are fish and wildlife habitat conservation areas where the boundaries of Borst Lake (Snoqualmie Mill Pond) overlap with the main stem of the Snoqualmie River and its riparian buffer.

b) *Channel Migration Zone*

All of the land within the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA is classified as a CMZ area. Map Folio Figure 12 – Channel Migration Map show the areas classified as potential, moderate, and severe CMZs. The possible effect of channel migration is discussed in SIC Section 4.

c) *Critical Aquifer Recharge Areas*

The northern portion of the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA is mapped by King County as a Category I and II Critical Aquifer Recharge Area.

8. Ecological Functions

This SAA ranks moderately high for functional assessment criteria. The SAA features numerous wetlands along the right bank of the river. Floodwaters can readily inundate the entire area in extreme weather events and sediment can be transported over a large area with deposition rates dependent upon flows and conditions on the surface. The area has the capacity to hold and store large volumes of floodwaters. The majority of the segment is primarily a large vegetated floodplain.

The segment has the opportunity to provide large woody debris and organics into the river for food web support. While much of the area is dominated by native vegetation, the area south and southeast of Borst Lake is heavily dominated by Japanese knotweed, English Ivy, and Himalayan blackberry. In terms of habitat, the vegetation provides good habitat and critical terrestrial linkages between riverine, the lake and expansive upland habitats, and the area rates very high for habitat.

E. Kimball Creek and Adjacent Floodplain (SAA #4)

1. Shoreline Environment Designations

Table 10 breaks down by percentage each of the proposed shoreline environment designations shown on the Shoreline Designation Map for the Kimball Creek SAA.

Table 10: Shoreline Environment Designations for Kimball Creek SAA

Proposed Shoreline Environment Designation	Percentage of SAA #4
Natural	85.79%
Urban Floodplain	14.21%

The two proposed shoreline environment designations reflect both the existing conditions and potential future uses along Kimball Creek, which are not likely to change much in intensity or use from current conditions. The designation of SAAs reflects the city's intent to continue to encourage existing uses in the future while recognizing the existing nature of this area.

2. Land Use

The existing land use patterns in the Kimball Creek shoreline jurisdiction are composed primarily of publicly owned forested open space. A small portion of this area includes city-owned property that houses a sewer lift station.

Table 11 summarizes the breakdown of the two future land uses found in the Kimball Creek SAA, as indicated by the Comprehensive Plan land use designations shown in Map Folio Figure 2 – Comprehensive Plan Land Use Designations.

Table 11: Comprehensive Plan Land Use Designations for Kimball Creek SAA

Comprehensive Plan Land Use Designations	Percentage of SAA #4
Mixed Use	68.88%
Parks / Open Space	31.12%

The city's zoning designations generally follow land use designations established by the city's Comprehensive Plan. Within the SAA, Open Space and Mixed Use are the zoning designations included. However, the portion of this area zoned Mixed Use consists of permanent open space, with the exception of a sewer lift station. Table 12 summarizes the breakdown of the two zoning designations of Kimball Creek SAA, as shown in Map Folio Figure 3 – Zoning Map.

Table 12: Zoning Designations for Kimball Creek SAA

Current Zoning Designations	Percentage of SAA #4
Mixed Use (MU)	95.03%
Open Space 2 (OS-2)	4.93%

3. Parks and Open Space / Public Access

Presently, there are no existing formal public access points to Kimball Creek (see Map Folio Figure 8 – Shoreline Access Point Map). There is undeveloped open space.

4. Impervious Surfaces

Impervious surfaces within the Kimball Creek shoreline jurisdiction are limited. Based on April 19, 2012 GIS data, the total coverage of impervious surfaces for this SAA (SAA #4) is 1.08%. Such impervious surfaces may include single family residential-scale roof tops, walkways, patios, driveways, parking lots, concrete or asphalt paving, gravel roads, lawns, or other similar surfaces which similarly impede the natural infiltration of surface and storm water runoff.

5. Shoreline Modifications

There is very little shoreline modification in the Kimball Creek SAA. Armoring along Kimball Creek includes the road (SR-202) and railroad crossing. Refer to Map Folio Figure 7 – Shoreline Modifications for more information.

6. Biological Resources and Sensitive Areas

a) *Geologically Hazardous Areas*

Within the Kimball Creek shoreline jurisdiction area, only high seismic hazard areas have been mapped. For more information, refer to Map Folio Figure 9 – Landslide, Erosion, and Seismic Hazard Areas. Should any additional geologically hazardous areas be determined, those areas shall be subject to the city's regulations set forth in the CAO and SMP.

b) *Flood Hazard Areas*

None of the Kimball Creek SAA includes FEMA designated floodway areas (see Map Folio Figure 1 – Shoreline Jurisdiction Map). The entire area is within the floodplain.

c) *Wetlands*

City, King County, NWI, and WDFW Priority Habitats and Species (2007) wetland mapping shows that there are extensive wetlands located south of the Kimball Creek SAA. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries, which were not formally delineated for this project. The city's wetlands are regulated under the CAO (SMC 19.08.730).

Soils mapped in and around the SAA are shown in Map Folio Figure 14 – Soils. Soil types classified as "hydric" may be indicative of wetlands. Additional wetlands may be found when development occurs on currently undeveloped properties. Any undocumented wetlands

located within or adjacent to the city, which are associated with the shoreline jurisdiction would be subject to the city's SMP regulations and the CAO.

d) *Streams*

The lower portion of Kimball Creek travels from the west to its mouth at the main fork of the Snoqualmie River, north of the historic downtown and just south of the Snoqualmie Parkway / SR-202 intersection.

e) *Fish and Wildlife Habitat Conservation Areas*

According to SMC 19.12.190, the Kimball Creek Open Space is included as a fish and wildlife habitat conservation area. Additionally, habitat studies are required by the city for all development proposals, which the director determines may affect the habitat of state or federal listed species.

There are large forested areas on the left and right banks of Kimball Creek, all of which are considered fish and wildlife habitat conservation areas. Some portions of the Kimball Creek stream buffer contain non-native invasive species. These areas have been identified for restoration, which will improve the habitat value.

f) *Channel Migration Zone*

There are no areas identified as a CMZ in the Kimball Creek SAA.

g) *Critical Aquifer Recharge Areas*

King County has not studied critical aquifer recharge areas within the city limits. Therefore, this is a gap of existing information for the city. The CAO (SMC 19.08.760) provides regulations for Critical Aquifer Recharge Areas, should any be identified in the future.

7. Ecological Functions

The Kimball Creek and adjacent floodplain SAA ranks moderate for ecological functions. The area includes the riparian zones and floodplain of Kimball Creek. The forested condition of the lower bench of the river's CMZ means it has some potential for entrapping sediment. The river in the reach at the eastern edge of this SAA has flanking gravel bars in late summer low flows; the condition of the meander channel of the river allows those to form and move over time.

In terms of hyporheic functions, the riparian forests along Kimball Creek and the floodplain soils in the lower portion of the area near the river provides the opportunity for storage of shallow groundwater, and movement of hyporheic flows. The area ranks high for water storage, vegetation support, and removal of excess nutrients and toxic compound functions. The habitat functions rank relatively high, as the mixed coniferous / hardwood forest links the margins of the river with the upland habitats to the west of the floodplain, providing good habitat and critical terrestrial linkages between the riverine and expansive upland habitats.

F. Snoqualmie River Main Stem below the SR-202 Bridge (SAA #5)

1. Shoreline Environment Designations

Table 13 breaks down by percentage each of the proposed shoreline environment designations shown on the Shoreline Designation Map for the Snoqualmie Main Stem below the SR-202 Bridge SAA.

Table 13: Shoreline Environment Designations for the Snoqualmie River Main Stem below the SR-202 Bridge SAA

Proposed Shoreline Environment Designation	Percentage of SAA #5
Natural	67.94%
Hydropower	32.06%

The three shoreline environment designations, which also include the Aquatic Environment, which is not shown in the above table, reflect both the existing conditions and potential future in this analysis area, which are not likely to change greatly in intensity or use from current conditions. The shoreline environment designations for this SAA reflects the city's intent to continue to encourage existing uses in the future while recognizing the existing nature of this area.

2. Land Use

The existing land use patterns in the Snoqualmie Main Stem below the SR-202 Bridge SAA are composed primarily of power generation, tourist, and open space uses. Table 14 summarizes the breakdown of the future land uses mapped in the SAA, as indicated by the Comprehensive Plan land use designations shown in Map Folio Figure 2 – Comprehensive Plan Land Use Designations.

Table 14: Comprehensive Plan Land Use Designations for the Snoqualmie River Main Stem below the SR-202 Bridge SAA

Comprehensive Plan Land Use Designations	Percentage of SAA #5
Utility Park	71.19%
Parks / Open Space	20.87%
Residential	6.14%
Business / Retail	1.80%

The city's zoning designations follow the land use designations established by the city's Comprehensive Plan. Within this SAA, Utility Park zoning designation occupies the largest

portion of the SAA. Table 15 provides the breakdown of the seven zoning designations for the SAA as shown in Map Folio Figure 3 – Zoning Map.

Table 15: Zoning Designations for the Snoqualmie River Main Stem below SR-202 SAA

Current Zoning Designations	Percentage of SAA #5
Utility Park	69.08%
Open Space 1	14.68%
Open Space 3	6.16%
Constrained Residential	5.74%
Business Retail 2	2.18%
Planned Commercial/Industrial	1.34%
Mixed Use	0.81%

3. Parks and Open Space / Public Access

The city and Puget Sound Energy have created parks, recreation and open space facilities within the city that provide the public both physical and visual access to areas within the shoreline jurisdiction. Providing public access to the SAA is important to the citizens of the city. The city performed a number of strategic planning efforts over the last several years, including the Downtown Vision Plan, the Economic Development Plan, and the Downtown Master Plan. All of these plans present a vision for the future development of a river walk trail along the shoreline of the Snoqualmie River's main stem.

Three access points are available in this SAA, as identified on Map Folio Figure 8 – Shoreline Access Point Map.

4. Impervious Surfaces

Impervious surfaces within the Snoqualmie River Main Stem below the SR-202 Bridge area include roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, and packed earth, such as lawns, or other surfaces which similarly impede the natural infiltration of surface and storm water runoff. Based on April 19, 2012 GIS data, the total coverage of impervious surfaces for this SAA (SAA #5) is 14.73%.

5. Shoreline Modifications

Between the SR-202 Bridge, which crosses the Snoqualmie River, and downstream to Snoqualmie Falls, there is extensive armoring on both banks that includes boulders and retaining walls. These shoreline structures protect the buildings along the shore that are used for Puget Sound Energy's hydroelectric power production facility at the Snoqualmie Falls. Refer to Map Folio Figure 7 – Shoreline Modifications for more information. The dam is also a major shoreline modification, which is further discussed in the SIC. Federal Energy Regulatory Commission (FERC) typically approves shoreline modifications to SAA #5. FERC has the regulatory authority

to supersede state and local regulations; therefore, future FERC approvals may not comply with the city's SMP.

6. Biological Resources and Sensitive Areas

a) *Geologically Hazardous Areas*

Within the this SAA, there are erosion hazard areas and high seismic hazard areas, as shown on Map Folio Figure 9 – Landslide, Erosion and Seismic Hazard Areas. Should any additional geologically hazardous areas be determined, those areas shall be subject to the city's regulations set forth in the SMP and the CAO.

b) *Flood Hazard Areas*

The Snoqualmie River Main Stem below the SR-202 Bridge SAA includes floodway and floodplain areas. For more information, see Map Folio Figure 1– Shoreline Jurisdiction Map.

c) *Wetlands*

Wetland mapping documents prepared by the city, King County, USFWS NWI, and WDFW Priority Habitats and Species (2007) show that there are a wetlands located in this SAA. According to the SIC, there are wetlands along the riverbank classified as palustrine emergent and palustrine scrub-shrub. See Map Folio Figure 10 – Wetlands and Streams Map for approximate wetland boundaries, which were not formally delineated for this project. The city's wetlands are regulated under the CAO (SMC 19.08.730).

d) *Rivers*

The portion of the Snoqualmie River main stem included within this SAA travels from east to west, and down the 268-foot drop of Snoqualmie Falls.

e) *Fish and Wildlife Habitat Conservation Areas*

The main stem of the Snoqualmie River is designated priority habitat by the WDFW for resident Snohomish Coastal Cutthroat and rainbow trout. In addition, priority habitat species, including Forest Shrub Marsh and Shrub Marsh, are found within this SAA (see Map Folio Figure 13 – Priority Habitat Species Map).

f) *Channel Migration Zone*

There are no areas identified as a CMZ in the Snoqualmie River Main Stem below the SR-202 Bridge SAA.

g) *Critical Aquifer Recharge Areas*

As stated above, King County has not studied critical aquifer recharge areas within the city limits. The CAO (SMC 19.08.760) provides regulations for critical aquifer recharge areas, should any areas be determined in the future.

7. Ecological Functions

SAA #5 includes the riparian fridge adjacent to the river on the left bank, downstream of the Snoqualmie Falls where the shoreline and riparian fringes are generally in a natural condition and characterized by a mature second / third-growth forest. The hydrologic functions are moderate; the mature upland/riparian forest present along the shoreline in this Segment provides opportunity for mature second/third growth conifer and deciduous trees to be recruited into the river.

The high flow rates means that large woody debris that falls into the river is often quickly swept downstream and may not lodge in the channel for long durations. In addition, the material available in the riparian forest is of modest size compared to the ability of the flows within the river to transport it downstream. There is a mature upland forest along this area, likely second or third growth timber. It is predominantly a coniferous forest but has a mixed canopy that includes deciduous as well. The forest is upland, on the steep slopes leading down to the river's edge. This forest does not interact with the river or its flows. Woody debris may be recruited into the channel and small organic debris will certainly fall into the channel; but the vegetation has little other interaction with the river in this Segment.

In terms of hyporheic function, this reach is a high-energy reach below the Snoqualmie Falls where the vegetation does not interface with the river flows. The channel is bedrock and boulders; there is some gravel substrate but very few fines due to the high flow rates. Groundwater is a minor component in this reach: seeps from the upland forests to the west may drain into the river but their volume is inconsequential relative to the river proper.

The right bank area is more actively used by humans and is different from the area discussed above, which is in a more natural condition. This area includes the powerhouse for the hydroelectric generator, and its associated infrastructure. It also includes the Salish Lodge, and all associated infrastructure such as parking lots, trails, driveways, etc. Portions of the area are vegetated in lawn and some forest, although it is a minor component. The reach above and below the falls are different hydrologically because of the flow rate generated by the Falls; it sweeps most small material out of the channel below the Falls leaving a bedrock and boulder condition. The habitat function in this portion of the area is low as there is less appropriate habitat for wildlife in the area. In addition, the physical simplicity of the vegetation communities and species diversity is a limiting factor.

Chapter 3: Ecological Functions and Processes at Risk

The intent of the SMP is to assure, at a minimum, no net loss of ecological functions necessary to sustain shoreline natural resources. The following subsections outline specific ecologic functions of the city's shoreline jurisdiction and related processes that are at risk and must be protected by the SMP.

A. Nutrient Delivery and Removal

Nutrient delivery and removal can result from a variety of processes that take place in the city. This would include runoff and irrigation from agricultural uses, residential landscaping, and land clearing. These processes lead to an excess of nutrients being released into the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond).

B. Groundwater Flow

Groundwater flow within the city's shoreline jurisdiction has been altered by development and infrastructure resulting in disrupted interactions between the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) ecosystems and the hyporheic zone within the city, but especially upstream in King County. Overbank flooding and hyporheic flows in the floodplain areas are important processes in the main basins of the city. These surface and subsurface water flow processes support the hydrology of existing wetlands, rivers, creek, and lake ecosystems.

Development causes greater areas of pollution generating impervious surfaces by paving, creating non-pollution generating surfaces with building construction, and compacted soil. In addition, development removes vegetation that would intercept and treat runoff. All of these factors lead to greater surface runoff and lower infiltration rates, which result in a lower level of aquifer recharge. Wetlands are useful in slowing surface water runoff and storing surface waters in addition to storm water detention facilities that are required in land development.

C. Surface Water Flow

Channelization of rivers and streams and filling of wetlands has intercepted and altered surface water flows, resulting in altered flow and lower infiltration rates. This can be seen in the isolated oxbows throughout the city and the creation of Borst Lake (Snoqualmie Mill Pond). This has resulted in increased storm water runoff and increased peak flow and velocities. Ditching, channelization and clearing vegetation from floodplains and aquatic resources can affect hyporheic flows if not protected; these flows are needed to support existing and potential wetlands as well as the city's water bodies.

D. Sediment Delivery and Removal

Land clearing and urban development has affected sediment delivery and removal in the city. Conversion of forested lands to agriculture, timber harvesting, road construction, and development have all changed the sediment transport processes in the area around the city. Increased impervious surfaces and altered hydrology from new developments in the area could also potentially alter sediment processes.

E. Fish and Wildlife Habitat

Fish and wildlife habitat is affected by urban developments, road construction; culverts, loss of riparian cover, and stream bank alterations. Important habitat elements for fish include riparian cover, large woody debris, passage for migration, clean water, spawning habitat, off-channel habitat, forage habitat, and food sources. There are several areas of spawning habitat in the city SAAs, and rearing habitat has been identified in the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) within the city. Alteration of these habitats, loss of wetlands and riparian areas reduce the habitat areas for many species including small mammals, amphibians, reptiles, birds, and other aquatic and terrestrial species.

Chapter 4: Foreseeable Development in the Shoreline Jurisdiction

A wide range of possible actions may result in cumulative impacts to the shoreline jurisdiction. Consistent with the SMA Guidelines, an evaluation of cumulative impacts on ecological functions considers reasonably foreseeable future development and use of the shoreline that is regulated by the SMP, as well as actions that are caused by unregulated activities and development exempt from permitting.

The focus of foreseeable development is on those actions that have been identified as potential impacts to the shoreline jurisdiction and that are or would be foreseeable based on past development patterns, dependent on shoreline regulations. This section provides a description of how elements of the SMP address the potential impacts of reasonably foreseeable development, including exempt and unpermitted development.

In total, the city has issued 24 shoreline permits for the city's entire shoreline jurisdiction from 2004 to 2015.

A. Snoqualmie River South Fork and Adjacent Floodway (SAA#1)

The Snoqualmie River South Fork contains a modified river corridor. There are no bridge crossings or armoring, but like the main stem of the Snoqualmie River, much of this section of the river has been modified in some manner through fill and rerouting, which has affected some in-stream habitat. There is the potential for unmapped and undelineated wetlands associated with the Snoqualmie River South Fork.

There are three shoreline environment designations along the Snoqualmie River South Fork in this SAA, including the Natural and Urban Conservancy Environments. The Aquatic Environment is the shoreline environment designation for the portion of the river below the ordinary high water mark (OHWM).

1. Patterns of Shoreline Activity

From 2004 to 2015, no shoreline permits were issued for this SAA.

Given the city's zoning, existing land use patterns, and Shoreline Environment Designations, it is not anticipated that future platting or subdividing or property, laying out utilities or mapping streets will establish a future pattern of development beyond that which is discussed below.

2. Residential Development

Under the SMP, in Chapter 4 - Shoreline Regulations, single-family residential development would be allowed in the Urban Conservancy Environment and it would not be allowed in the Natural Environment. However, under current city open space zoning, residential development would not be allowed in this SAA. Given the existing development pattern and the restrictions

imposed by the SMP and zoning, it not expected that residential development would be introduced in the future in this area.

3. Commercial Development

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development is permitted in the Urban Conservancy Environments. Commercial development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

Commercial development is not allowed in the Natural Environment. As a result, water-enjoyment commercial uses would not be permitted in the land surrounding the Snoqualmie River South Fork SAA. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

4. Industrial and Utility Development

Under the SMP, in Chapter 4 - Shoreline Regulations, light industrial development would not be allowed in this SAA, due to the Natural and Urban Conservancy Environments established under the SMP.

Public utilities are permitted outright or as a conditional use in most zones in the city. Under the SMP, in Chapter 4 - Shoreline Regulations, utility development is permitted in the Urban Conservancy and Natural Environments if there is no feasible alternative. Utility development would require a standard 100-foot buffer from the OHWM. It is reasonable to expect that only limited development of utilities would be introduced in the future in this area.

5. Recreational Development

Under the SMP, in Chapter 4 - Shoreline Regulations, parks and open space uses and development are permitted in all shoreline environment designations. Both high and low intensity active recreational facilities are prohibited in the Natural Environment. All active recreational facilities are permitted in the Urban Conservancy Environment. Recreational development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

In all zoning designations, parks and open space facilities are permitted and specific recreational uses such as golf courses, country clubs, swimming pools, and riding stables are allowed in a variety of zoning designations. Given the existing development pattern, it is not expected that the existing area would change much from the existing land uses with respect to recreational development.

6. Overwater Structures

The Snoqualmie River South Fork is not considered navigable. Under the SMP, in Chapter 4 - Shoreline Regulations, boating facilities such as piers, docks, and floats are permitted as a Conditional Use in the Urban Conservancy Environment; however, in-stream structural uses are prohibited. In-stream structural uses are allowed only in the Aquatic Environment. Given the existing development pattern, it not expected that existing conditions would change significantly in the future.

7. Shoreline Stabilization

According to aerial photos and site visits, it does not appear that there is armoring or other types of shoreline modification along the Snoqualmie River South Fork within the city's shoreline jurisdiction.

Structural stabilization methods, including groins, riprap, and bulkheads, are prohibited in the Urban Conservancy, Natural, and Aquatic Environments. Non-structural stabilization measures are permitted in all shoreline environment designations.

B. Snoqualmie River Main Stem Left Bank and Adjacent Floodway (SAA#2)

The Snoqualmie River Main Stem contains a modified river corridor with three bridge crossings. Other modifications along the main stem of the Snoqualmie River include the installation of ELJs and installation of riprap for armoring. There is extensive armoring on both banks that includes boulders and retaining walls between the SR-202 Bridge, that crosses the main stem of the Snoqualmie River, and downstream to Snoqualmie Falls. These shoreline structures protect Puget Sound Energy's hydroelectric power production facility at the Snoqualmie Falls.

In addition, there is a revetment / levee along the Snoqualmie River at the Three Forks Natural Area / Meadowbrook slough. There is the potential for unmapped wetlands associated with the main stem of the Snoqualmie River.

There are six shoreline environment designations along main stem Snoqualmie River in this SAA, including Hydropower, Natural, Urban Conservancy, Urban Floodplain, and Urban Riverfront Environments. Aquatic Environment is the shoreline environment designation for the portion of the river below the OHWM.

1. Patterns of Shoreline Activity

The city has issued 19 shoreline permits for the SAA from 2004 to 2015.

Given the city's zoning, existing land use patterns, and Shoreline Environment Designations, it is not anticipated that future platting or subdividing or property, laying out utilities or mapping streets will establish a future pattern of development different than which is discussed below.

2. Residential Development

Under the SMP, in Chapter 4 - Shoreline Regulations, all residential development is prohibited in the Hydropower and Natural Environments. Single-family residential development in the Urban Floodplain and Urban Conservancy Environments would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

Second story single-family and multi-family dwelling units above nonresidential uses and single-family residential development in the Urban Riverfront Environment from the southerly margins of Southeast Fir Street to northerly margin of Southeast River Street would require a 25-foot standard shoreline setback from the OHWM. Outside this area, a 100-foot standard shoreline setback is required from the OHWM that may be reduced by 25% with buffer averaging.

Under current city zoning, residential zoning comprises 24% of the Snoqualmie River Main Stem Left Bank SAA; 24% of the SAA is zoned Constrained Residential (R-C), while 0.3% is zoned Mixed Use (MU). Given the existing development pattern, it not expected that the intensity or type of residential land use would change.

There is a potential for increased intensity of use of residential lots. That is, older houses could be re-built or remodeled and expanded to become larger houses. Such expansion could result in an increase in impervious surfaces and reduction of native vegetation.

3. Commercial Development

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development is permitted in the Urban Floodplain, Urban Conservancy, Urban Riverfront, and Hydropower Environments. Commercial development is not allowed in the Natural Environment.

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development in the Urban Floodplain Environment would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging. Commercial development in the Urban Riverfront Environment from the southerly margins of Southeast Fir Street to northerly margin of Southeast River Street would require a 25-foot standard shoreline setback from the OHWM. Outside this area, a 100-foot standard shoreline setback from the OHWM is required, that may be reduced by 25% with buffer averaging.

Currently, commercial zoning comprises approximately 2.4% of the SAA. This figure includes the Mixed Use zoning designation, which permits residential and industrial land uses in addition to commercial land use. In the Business General (BG) zoning designation, a broad range of retail and commercial uses, including businesses and services that are of a larger scale or are inappropriate for the historic downtown area could develop on those properties in the main stem of the Snoqualmie River shoreline jurisdiction. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

In the Business Office (BO) zoning designation, smaller-scale office and some retail and service uses could develop on those properties in this SAA. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

In the Business Retail 1 (BR-1) zoning designation, which is located within the downtown historic district retail overlay zone, pedestrian-oriented retail and dining could develop on those properties in this SAA. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

In the Business Retail 2 (BR-2) zoning designation, which includes all properties within the BR district outside of those listed within the BR-1 sub-district, non-auto dependent retail development could develop on those properties in this SAA. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

In the Mixed Use (MU) zoning designation, commercial development could legally develop on those properties in the SAA. However, such development is precluded by a residential plat

approved for the location. Given the limited area zoned MU in the SAA and the existence of a residential plat; it not expected that the intensity or type of land use would change much from the existing land uses.

It is important to note that exempt shoreline permit activities could result from downtown redevelopment projects. However, since most activities that are exempt from substantial development permits must still comply with all development standard, such as setbacks and other regulations in the SMP, and exemptions must be narrowly construed, and conditioned, it is not anticipated that the cumulative impacts of such exempted activities would create extensive impacts beyond that which is discussed in this section, for non-exempted projects.

4. Utility Development

Under the SMP, in Chapter 4 - Shoreline Regulations, light industrial development is permitted as a conditional use in the Urban Riverfront and Urban Floodplain Environments. Industrial development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging. Industrial development is not permitted on lands designated under the Hydropower, Urban Conservancy, or Natural Environments.

In the Utility Park (UP) zoning designation, hydroelectric generation and associated facilities, utility treatment plants and other municipal facilities could develop on those properties in the SAA. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

In the Mixed Use (MU) zoning designation, industrial development could develop on those properties in the main stem of the Snoqualmie River shoreline jurisdiction. However, such development is precluded by a residential plat approved for the location. Given the limited area zoned MU in the shoreline jurisdiction and the residential plat approval; it not expected that the intensity or type of land use would change much from the existing land uses.

Under the SMP, in Chapter 4 - Shoreline Regulations, utility development is permitted in all shoreline environment designations, but is only allowed in the Urban Conservancy and Natural Environments when no feasible alternative exists. Utility development would require a standard 100-foot buffer from the OHWM. Public utility development may occur in the SAA. Public utilities are permitted outright or as a conditional use in most zones in the city.

5. Recreational Development

Under the SMP, in Chapter 4 - Shoreline Regulations, recreational development for parks and open space is permitted in the all shoreline environment designations. High intensity active recreational facilities are permitted in the Urban Riverfront and Urban Conservancy Environments and prohibited in the Hydropower, Urban Floodplain, Natural, and Aquatic Environments. Low intensity active recreational development is permitted in the Urban Riverfront, Urban Floodplain, and Urban Conservancy Environments. Recreational development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

Because of the dangers created by the Snoqualmie Falls, large boulders and wood, and the power of a flowing river, boating facilities such as piers, docks, and floats are not allowed uses

in the main stem of the Snoqualmie River shoreline jurisdiction. However, launches for canoes, kayaks, and other small hand-powered vessels are allowed outright in the Hydropower Environment only below Snoqualmie Falls and as a conditional use in the Urban Conservancy Environment.

In all zoning designations, parks and open space facilities are permitted and specific recreational uses such as golf courses, country clubs, swimming pools, and riding stables are allowed in a variety of zoning designations. Given the existing development pattern, it not expected that the existing area would change much from the existing land uses.

In the Utility Park (UP) zoning designation, public or private parks and open space with appropriate visitor-related commercial services are allowed on those properties in the main stem of the Snoqualmie River shoreline jurisdiction. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

6. Overwater Structures

The main stem of the Snoqualmie River is not considered navigable. Under the SMP, in Chapter 4 - Shoreline Regulations, boating facilities such as piers, docks, and floats are not allowed uses in the Snoqualmie River shoreline jurisdiction. In-stream structural uses are only allowed in the Aquatic Environment. Given the existing development pattern, it not expected that the intensity or type of land use would change much from the existing land uses.

7. Shoreline Stabilization

According to aerial photos and site visits, there is shoreline armoring along the main stem of the Snoqualmie River within the city. Given the existing development pattern, it is not expected that existing conditions would change with respect to shoreline stabilization. Structural stabilization methods, including groins, riprap, and bulkheads, are permitted in the Urban Riverfront, Urban Floodplain, and Hydropower Environments and prohibited in the Urban Conservancy, Natural, and Aquatic Environments. Non-structural stabilization measures are permitted in all shoreline environment designations.

C. Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) and Adjacent Floodplain (SAA #3)

The main stem of the Snoqualmie River contains a modified river corridor with three bridge crossings. Other modifications along the main stem of the Snoqualmie River include the installation of ELJs and installation of riprap for armoring.

There are five shoreline environment designations in the Snoqualmie River Main Stem Right Bank / Borst Lake (Snoqualmie Mill Pond) SAA, including Hydropower, Natural, Urban Conservancy, and Urban Floodplain Environments. The portion of Borst Lake (Snoqualmie Mill Pond) and the Snoqualmie River below the OHWM is designated Aquatic Environment.

Borst Lake (Snoqualmie Mill Pond) has been modified in some manner over the years. It was likely an oxbow of the main stem of the Snoqualmie River isolated for timber mill development. Shoreline

modification has affected in-water habitat. There is the potential for unmapped wetlands surrounding Borst Lake (Snoqualmie Mill Pond).

1. Patterns of Shoreline Activity

Prior to annexation in 2011, the King County Shoreline Master Program regulated 98% of SAA #3. Since annexation, no shoreline permits were issued for this SAA. Given the city's zoning, existing land use patterns, and Shoreline Environment Designations, it is not anticipated that future platting or subdividing of property, laying out utilities, or mapping streets will establish a future pattern of development beyond that which is discussed below.

2. Residential Development

Under the SMP, in Chapter 4 - Shoreline Regulations, single-family residential development would be allowed in the Urban Floodplain and Urban Conservancy Environments and it would not be allowed in the Natural Environment. However, under current city zoning, residential development would not be allowed in this SAA. Given the existing development pattern, it not expected that residential development would be introduced in the future in this area.

3. Commercial Development

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development is permitted in the Urban Floodplain and Urban Conservancy Environments. Commercial development would require a 200-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

In the Planned Commercial / Industrial (PCI) zoning designation, master-planned commercial development containing compatible and complementary uses, including mixed or single retail, wholesale, service and professional businesses, and office uses could develop on those properties in the Borst Lake (Snoqualmie Mill Pond) SAA. Given the existing development pattern, it expected that the intensity or type of land use would represent a change from the existing land uses.

Given the city's intent to guide development in the area according to the Planned Commercial / Industrial zoning, it is reasonable to expect that commercial development would be introduced in the future in this area.

4. Industrial and Utility Development

Under the SMP, in Chapter 4 - Shoreline Regulations, light industrial development is permitted as a Conditional Use in the Urban Floodplain Environment. Industrial development would require a 200-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

In the Planned Commercial / Industrial (PCI) zoning designation, master-planned industrial development containing compatible and complementary uses, including light industrial uses, could develop on those properties in the Snoqualmie River Main Stem Right Bank portion of the SAA. Given the existing development pattern, it expected that the intensity or type of land use would represent a change from the existing land uses.

Public utilities are permitted outright or as a conditional use in most zones in the city. Under the SMP, in Chapter 4 - Shoreline Regulations, utility development is permitted in the Hydropower and Urban Floodplain Environments. Additionally, utility development may be permitted in the Urban Conservancy and Natural Environments if there is no feasible alternative. Utility development would require a standard 100-foot buffer from the OHWM.

Given the city's intent to guide development in the area according to the Planned Commercial / Industrial zoning, it is reasonable to expect that utility development would be introduced in the future in this area.

5. Recreational Development

Under the SMP, in Chapter 4 - Shoreline Regulations, parks and open space uses and development is permitted in all shoreline environment designations. Both high and low intensity active recreational facilities are prohibited in the hydropower and natural environments. High intensity active recreational facilities are also prohibited in the Urban Riverfront Environment. All active recreational facilities are permitted in the Urban Conservancy and Urban Floodplain Environments. A 200 foot standard shoreline setback exists for all recreational development; however, passive recreation and associated development (e.g. trails, overlooks) are allowing the 200 foot setback. Those recreational development not specifically allowed in the setback may reduce the buffer by 25% through buffer averaging.

In all zoning designations, parks and open space facilities are permitted and specific recreational uses such as golf courses, country clubs, swimming pools, and riding stables are allowed in a variety of zoning designations. Given the existing development pattern, it is not expected that the existing area would change much from the existing land uses with respect to recreational development.

6. Overwater Structures

Borst Lake (Snoqualmie Mill Pond) is not considered navigable. Under the SMP, in Chapter 4 - Shoreline Regulations, boating facilities such as piers, docks, and floats are permitted as a Conditional Use in Borst Lake (Snoqualmie Mill Pond); however, in-stream structural uses are prohibited. Given the existing development pattern, it not expected that existing conditions would change significantly in the future.

7. Shoreline Stabilization

According to aerial photos and site visits, it does not appear that armoring or other types of shoreline modification have been installed along Borst Lake (Snoqualmie Mill Pond). Given the existing development pattern, it not expected that this would change. Structural stabilization measures are permitted in the Urban Floodplain Environment and non-structural measures are permitted in all shoreline environment designations.

D. Kimball Creek and Adjacent Floodplain (SAA #4)

Kimball Creek is a modified stream corridor. Much of this section of the creek has been modified in some manner, which has affected some in-stream habitat. There is the potential for unmapped or undelineated wetlands.

There are three shoreline environment designations found in the Kimball Creek SAA, including Natural and Urban Floodplain Environments. Aquatic Environment is the shoreline environment designation for the portion of the creek below the OHWM.

1. Patterns of Shoreline Activity

The city has issued two shoreline permits in the Kimball Creek SAA in the recent past. Given the city's zoning, existing land use patterns, and Shoreline Environment Designations, it is not anticipated that future platting or subdividing or property, laying out utilities or mapping streets will establish a future pattern of development beyond that which is discussed below.

2. Residential Development

Under the SMP, in Chapter 4 - Shoreline Regulations, residential development would be allowed in the Urban Floodplain Environment and it would not be allowed in the Natural Environment.

Under current city zoning, 95% of the Kimball Creek SAA is zoned Mixed Use (MU). Approximately 90% of this analysis area zoned MU would not support residential development as it coincides with a native growth protection area. The remainder of the Kimball Creek SAA, or 5%, is zoned Open Space 1 or Open Space 2 and this zoning would not allow residential development. Given the limited usable area zoned MU, the existing development pattern, and topography, it not expected that the intensity or type of residential land use would change.

Under the SMP, in Chapter 4 - Shoreline Regulations, single-family residential development in the Urban Floodplain Environment would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

3. Commercial Development

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development is permitted in the Urban Floodplain Environment and it is not allowed in the Natural Environment. Commercial development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging. Water-enjoyment commercial uses would not be permitted in along Kimball Creek.

In the Mixed Use (MU) zoning designation, commercial development could legally develop on those properties in the main stem of the SAA. However, in this particular case, the area which is zoned Mixed Use (MU) is part of a residential plat that is covered by sensitive areas and therefore could not be developed with commercial uses. Given the limited area zoned MU in the shoreline jurisdiction; it not expected that the intensity or type of land use would change much from the existing land uses.

4. Industrial and Utility Development

Under the SMP, in Chapter 4 - Shoreline Regulations, light industrial development is permitted as a Conditional Use in the Urban Floodplain Environment. Industrial development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

In the Mixed Use (MU) zoning designation, industrial development could legally develop on those properties in the Kimball Creek shoreline jurisdiction. However, given the residential plat, the existing development pattern, and topography, it not expected that the intensity or type of land use would change from the existing land uses.

Utility development has been limited in this SAA. Public utilities are permitted outright or as a conditional use in most zones in the city. Under the SMP, in Chapter 4 - Shoreline Regulations, utility development is permitted in the Urban Floodplain Environment and utility development may be permitted in the Natural Environment if there is no feasible alternative. Utility development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

5. Recreational Development

Under the SMP, in Chapter 4 - Shoreline Regulations, parks and open space uses and development are permitted in all shoreline environment designations. High- and low-intensity active recreational facilities are prohibited in the Natural Environment. Within the Urban Riverfront Environment, low-intensity active recreational facilities permitted by high-intensity active recreational facilities are prohibited. Recreational development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

In all zoning designations, parks and open space facilities are permitted and specific recreational uses such as golf courses, country clubs, swimming pools, and riding stables are allowed in a variety of zoning designations. Given the existing development pattern, it not expected that the existing area would change much from the existing land uses.

6. Overwater Structures

Kimball Creek is not considered navigable. Under the SMP, in Chapter 4 - Shoreline Regulations, boating facilities such as piers, docks, and floats and in-stream structural uses are not allowed uses in the Kimball Creek shoreline jurisdiction. Given the existing development pattern, it not expected that would change.

7. Shoreline Stabilization

According to aerial photos and site visits, there is very little modification along Kimball Creek within this SAA. Given the existing development pattern, it not expected that this would change. Structural stabilization measures are permitted in the Urban Floodplain Environment and non-structural stabilization measures are permitted in all shoreline environment designations.

E. Snoqualmie River Main Stem below the SR-202 Bridge (SAA #5)

The main stem of the Snoqualmie River contains a modified river corridor with three bridge crossings. Other modifications along the main stem of the Snoqualmie River include the installation of ELJs and installation of riprap for armoring. There is extensive armoring on both banks that includes boulders and retaining walls between the SR-202 Bridge, that crosses the main stem of the Snoqualmie River, and downstream to Snoqualmie Falls. These shoreline structures protect Puget Sound Energy's hydroelectric power production facility at the Snoqualmie Falls.

There are three shoreline environment designations along the Snoqualmie River Main Stem below the SR-202 Bridge. Hydropower and Natural are the shoreline environment designations in addition to Aquatic Environment for the portion of the river below the OHWM.

1. Patterns of Shoreline Activity

The city has issued three shoreline permits in the SAA from 2004 to 2015. Given the city's zoning, existing land use patterns, and Shoreline Environment Designations, it is not anticipated that future platting or subdividing or property, laying out utilities or mapping streets will establish a future pattern of development beyond that which is discussed below.

2. Residential Development.

Under the SMP, in Chapter 4 - Shoreline Regulations, no residential development would be allowed in this SAA, due to the Natural and Hydropower Environments that have been established under the SMP.

In addition, no zoning designations would allow residential development in this SAA. Therefore, no future residential development is expected to occur.

3. Commercial Development

Under the SMP, in Chapter 4 - Shoreline Regulations, commercial development is permitted in the Hydropower Environment and it is not allowed in the Natural Environment. Commercial development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging. It is not expected that the intensity or type of land use would change much from the existing land uses.

4. Industrial and Utility Development

Under the SMP, in Chapter 4 - Shoreline Regulations, no light industrial development would be allowed in this SAA, due to the Natural and Hydropower Environments that have been established under the SMP. Hydropower generation is permitted in the Hydropower Environment.

Utility development has been extensive in this SAA. Public utilities are permitted outright or as a conditional use in most zones in the city. Under the SMP, in Chapter 4 - Shoreline Regulations, utility development is permitted in the Hydropower Environment and utility development may be permitted in the Natural Environment if there is no feasible alternative. Utility development would require a 100-foot standard shoreline setback from the OHWM that may be reduced by 25% with buffer averaging.

With respect to industrial and utility development, it is not expected that the intensity or type of land use would change much from the existing land uses.

5. Recreational Development

Under the SMP, in Chapter 4 - Shoreline Regulations, parks and open space uses and development are permitted in all shoreline environment designations. High- and low-intensity active recreational facilities are prohibited in the Natural and Hydropower Environments.

In all zoning designations, parks and open space facilities are permitted and specific recreational uses such as golf courses, country clubs, swimming pools, and riding stables are allow in a variety of zoning designations.

In the Utility Park (UP) zoning designation, public or private parks and open space with appropriate visitor-related commercial services are allowed on those properties in the main stem of the Snoqualmie River shoreline jurisdiction.

Given the existing development pattern, it is not expected that the existing area would change much from the existing land uses.

6. Overwater Structures

The segment of the Snoqualmie River included in this SAA is not navigable. Under the SMP, in Chapter 4 - Shoreline Regulations, boating facilities such as piers, docks, and floats and in-stream structural uses are not allowed uses in this SAA. However, launches for canoes, kayaks and other small non-motorized vessels could be permitted in the hydropower environment only below Snoqualmie Falls.

Given the existing development pattern, it not expected that the existing conditions with respect to overwater structures would change.

7. Shoreline Stabilization

There is extensive armoring on both banks of the Snoqualmie River in this SAA that includes boulders and retaining walls between the SR-202 Bridge that crosses the main stem of the Snoqualmie River, and downstream to Snoqualmie Falls. These shoreline structures protect Puget Sound Energy's hydroelectric power production facility at Snoqualmie Falls. Structural stabilization measures are permitted in the Hydropower Environment and conditionally permitted in the Natural Environment; non-structural stabilization measures are permitted in all shoreline environment designations.

Given the existing development pattern, it is not expected that existing conditions with respect to shoreline stabilization would change.

Chapter 5: Local, State, and Federal Regulations

A. City of Snoqualmie Shoreline Master Program

As discussed in detail in Chapter 4, this report was assembled after the city considered reasonably foreseeable development and looked at how such development could negatively affect the functions and processes that are potentially at risk, as discussed in Chapter 3. This chapter provides a brief overview of how the SMP addresses the protection of ecological functions and processes from cumulative impacts. It details the SMP regulations within context of the other regulations that apply to the shoreline jurisdiction.

The first level of protection provided by the SMP is the establishment of six shoreline environment designations in the city: Urban Riverfront, Urban Floodplain, Urban Conservancy, Hydropower, Natural, and Aquatic Environments. Shoreline environment designations are geographical divisions of the shoreline jurisdiction within which goals, management policies, and development standards and regulations specific to that environment may apply. These shoreline environment designations were assigned based primarily on existing and proposed land uses, which implicitly encompasses differing levels of ecological functions and different probabilities and potentials for improvements of ecological functions, as well as the location of sensitive areas and their buffers. Each environment designation's designated area is outlined below.

- The **Urban Riverfront Environmen**t includes the first tier of lots along the riverfront between SE Newton Street and Meadowbrook Way. The area generally contains historic town center commercial zoning, including properties within the Downtown Historic and King County Landmark Commercial Districts and within the Meadowbrook Historic District. The environment contains existing and planned "Riverwalk" trail corridor and public parks providing for visual and shoreline access and enjoyment. Finally, the Urban Riverfront Environment also includes lots 200 feet landward of the Snoqualmie River and / or within the floodway, between NE Northern Street and SE Newton Street.

- The **Urban Floodplain Environment** includes the areas within floodway and areas landward two hundred feet from such floodways, inland of the Urban Riverfront Environment. The Urban Floodplain Environment is generally characterized by existing urban development. In addition, the Urban Floodplain Environment includes the associated wetlands located within and between the developed portions of the floodplain.

- The **Urban Conservancy Environment** is assigned to the parts of the shoreline jurisdiction that contain primarily large tracts of public or private ownership that do not contain significant urban development and offers opportunities for ecological restoration. The designation includes open space, floodplain, or other sensitive (critical) areas that should not be more intensively developed. Finally, areas in the Urban Conservancy Environment retain important ecological functions, even though partially developed and have potential for development that is compatible with ecological restoration.

- The **Hydropower Environment** includes areas located within boundaries of an existing FERC hydropower license and containing an operating or planned hydropower facility and related hospitality and tourist uses.
- The **Natural Environment** includes areas determined to be substantially ecologically intact and having high ecological value in the shoreline ecosystem.
- **The Aquatic Environment** includes lands located waterward of the OHWM of the Snoqualmie River Main Stem and South Fork, located waterward of Kimball Creek below its confluence with Coal Creek or located waterward of the OHWM of Borst Lake (Snoqualmie Mill Pond).

The proposed SMP contains numerous goals and policies, with supporting regulations intended to protect the ecological functions of the shoreline and maintain, at a minimum, the current level of function. Major sections of the proposed SMP are referenced and summarized in Table 16 below and in more detail in the Cumulative Impact Analysis Tables in Appendix A.

Table 16: Summary of the City's Shoreline Master Program Policies and Regulations

Purpose of SMP Provision	Key General Ecological Functions Protected
Chapter 1: Introduction to the City of Snoqualmie Shoreline Master Program	
This chapter defines and maps the shoreline jurisdiction in the city. This chapter also references the SIC, which inventoried existing conditions and analyzed ecological processes and functions for different segments of the city's shoreline jurisdiction to establish baseline conditions.	All, with focus on preserving and enhancing shoreline ecological functions.
Chapter 2: Shoreline Environments	
This chapter defines and maps the six designated shoreline environment designations (Urban Riverfront, Urban Floodplain, Urban Conservancy, Hydropower, Natural, and Aquatic Environments) of all the shorelines of the state in the city. Specifically, the environments are the key to providing appropriate and specific regulations to ensure no net loss in both developed and undeveloped areas with high functions.	All, with focus on preserving and enhancing shoreline ecological functions.
Chapter 3: Shoreline Management Goals and Policies	
This chapter sets forth the general goals and policies that apply to all uses, developments, and activities in the city's shoreline jurisdiction. The overall goal of the SMP is to "Ensure shoreline uses, activities and development within the city's shoreline jurisdiction results in minimal adverse impacts to and no net loss of shoreline ecological functions." Specifically the Chapter describes the city's goals and policies for the following elements within its shoreline jurisdiction:	All, with focus on no net loss, critical areas, restoration and mitigation, flood storage, habitat restoration, vegetation and water quality and quantity.

Purpose of SMP Provision	Key General Ecological Functions Protected
• Economic development • Public access • Recreation • Circulation • Shoreline use and shoreline modification • Conservation • Historical, cultural, scientific, and educational • Flood Hazard Management	
Chapter 4: Shoreline Regulations	
Chapter 4 sets forth regulations governing specific categories of uses and activities typically found in the shoreline jurisdiction as well as regulations for those activities that modify the physical configuration or qualities of the shoreline jurisdiction. The policies and regulations cover the following uses and activities: • Agriculture • Aquaculture • Archaeological areas and historic sites • Boating and boating facilities • Channel migration and erosion hazard zones • Commercial development and activities • Critical areas • Dredging • Fill • Forest practices • Frequently flooded areas • Habitat and natural ecosystem restoration and enhancement • Hydropower generation • Industrial development and uses • In-stream structures and uses • Mining • Mitigation • Parks and open space • Public access • Recreational facilities • Recreational uses and development • Residential uses and development • Shoreline modifications and stabilization • Transportation facilities • Utilities • Vegetation Management Corridors • Water Quality Specifically this chapter contains the requirements that all specific shoreline uses meet no net loss.	All, with specific focus on the unique aspects of specific uses that require specific and unique requirements to assure no net loss. All, with focus on protecting habitat, critical areas, vegetation, water quality and water quantity.

B. Beneficial Effects of Other Established Regulatory Programs

1. Other Laws and Programs

In addition to the SMP, a number of established local, state, and federal laws and regulatory programs also protect shorelines. City regulations and programs include the CAO, Comprehensive Plan, zoning regulations, and stormwater regulations. In addition, the Meadowbrook Farm Master Plan and Three Forks Natural Area Master Plan provide goals, objectives, and concepts for protection and restoration of natural systems for wildlife habitat at both of those locations in the city.

The city adopted the 2009 King County Surface Water Design Manual with addendums and falls under the Western Washington Phase II Municipal Storm Water Permit. The new 2012 Phase II Permit requires the use of low impact development (LID) unless infeasible as the first step for storm water management.

There is a current (TetraTech 2010) draft of a new Stormwater Management Comprehensive Plan (SWMCP); with the adoption of the SWMCP, the City will address drainage problems, reduce flood insurance rates, and manage growth within the City limits. Per the stormwater plan, the primary focus for improvements is the City's historic core (all of which is located in the shoreline jurisdiction), where there is minimal storm water conveyance infrastructure and the dominant management issues are storm water runoff (water quality) and overbank flooding of the Snoqualmie River. The City is also preparing a Stormwater System Operations and Maintenance (O&M) Manual, which covers all areas of the city and support future compliance with NPDES.

State regulations and programs include the Growth Management Act (GMA), SEPA, Regulatory Reform (ESHB 1724), Forest Practices Act, Hydraulic Code, the Watershed Planning Act, and the Aquatic Lands Act. In addition, numerous regional programs provide benefits to the city's shoreline jurisdiction, which is within the Snoqualmie / Skykomish Watershed (Watershed Resource Inventory Area (WRIA) 7). These include the *Snoqualmie 2015: Building for Salmon Recovery and Watershed Health* report of 2006, which outlines a 10-year vision for safeguarding the Snoqualmie watershed's remaining natural resources and restore habitat for salmon listed under the federal Endangered Species Act (ESA). The Snohomish River Basin (WRIA 7) Salmon Conservation Plan was prepared in order to "guide protection and restoration actions in the Snohomish River Basin." The plan outlines near-term and long-term recovery actions to improve habitat quantity and quality, minimize habitat loss, and habitat restoration.

Federal regulations and programs include the Clean Water Act, ESA, the Rivers and Harbors Act, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Other relevant federal regulations include the National Environmental Policy Act, the Anadromous Fish Conservation Act, the Clean Air Act, and the Migratory Bird Treaty Act.

Through its planning goals, the GMA encourages economic development that is consistent with the adopted comprehensive plan and that is within the capacities of the state's natural resources. In addition, the GMA requires local governments to maintain and enhance natural-resource-based industries, including anadromous fisheries and agricultural industries. Policies

that give preference to development that is dependent on the economic resources of the shoreline, including anadromous fisheries and agriculture, would be consistent with these GMA goals. Discouraging intense economic development in critical salmon spawning areas would be consistent with other GMA goals for protecting fish and wildlife habitat, and protecting the environment. Encouraging water-enjoyment uses in appropriate locations would further GMA's directive to increase access to natural resource lands and water.

The Comprehensive Plan directs the general development of the city and the SMP guides the character and quality of development relative to shoreline features, especially through critical areas, landscaping, and development regulations.

2. Washington State Department of Fish and Wildlife

The WDFW has jurisdiction of in- and over-water activities up to and including the OHWM, as well as any other activities that could "use, divert, obstruct, or change the bed or flow of state waters." These activities in the city include, but are not limited to, installation or modification of shoreline stabilization measures and accessory structures such as culverts, and bridges and footbridges. These types of projects must obtain a Hydraulic Project Approval (HPA) from the WDFW, which will contain conditions intended to prevent damage to fish and other aquatic life, and their habitats. In some cases, the WDFW may deny the project if significant impacts would occur that could not be adequately mitigated.

3. Washington State Department of Ecology

Ecology may review and condition a variety of project types in the city, including any project that requires a shoreline substantial development permit, a shoreline conditional use permit or a shoreline variance, and any project that disturbs more than one acre of land. Project types that may trigger Ecology's involvement include shoreline modification proposals and wetland or stream modification proposals, among others.

Ecology's three primary goals are to: 1) prevent pollution, 2) clean up pollution, and 3) support sustainable communities and natural resources. Their authority comes from the SMA, Section 401 of the Federal Clean Water Act, the Federal Water Pollution Control Act, the Federal Coastal Zone Management Act of 1972, SEPA, the GMA, and other sections of the Revised Code of Washington (RCW) and the WAC.

4. U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) has jurisdiction of in- and over-water activities up to and including the OHWM, as well as any associated wetlands. These activities in the city include, but are not limited to, installation or modification of shoreline stabilization measures and accessory structures such as culverts, and bridges, footbridges, and restoration activities.

These types of projects must obtain a Section 404 Clean Water Act permit, which will contain conditions intended to prevent damage to waters of the United States including the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond). In some cases, the USACE may deny a project if significant impacts would occur that could not be adequately mitigated. The USACE is a federal agency, and thus any activity within USACE jurisdiction that could affect species listed under the ESA requires

consultation with the National Marine Fisheries Service and the USFWS. These agencies ensure that projects include impact minimization and compensation measures for protection of listed species and their habitats.

Chapter 6: Net Effect on Ecological Functions and Processes

As described in the previous chapters, the proposed SMP provides a substantially increased level of protection to shoreline ecological functions. Implementation of the proposed SMP is expected to protect shorelines within the city, resulting in no net loss of shoreline ecological function. In addition, the application of the SMP may improve ecological functions over time in several areas through restoration efforts and significant enhancement incentives in targeted areas. These areas include along the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) through restoration efforts and significant enhancement incentives in targeted areas. One example would be the left bank Snoqualmie River Main Stem, (referenced in the Shoreline Restoration Plan as Segment 6) where parcels are actively acquired for open space and restoration.

State and federal regulations, implemented in concert with this SMP, will provide further assurances of improved shoreline ecological functions over time. Together with the implementation of the *Shoreline Restoration Plan*, the SMP is expected to begin to address the enhancement and restoration of shoreline functions in those areas where they are currently impaired.

A. Effects of SMP Provisions

Despite a relatively limited potential or likelihood for significant development to occur within the Shoreline jurisdiction over the 20-year planning period, it is an overall goal of the SMP and SMP update process to ensure no net loss, as well as the long-term enhancement, of unique shoreline features, natural resources, and fish and wildlife habitat. The SIC identified four ecologic function categories including:

- Hydrologic: Transport of water and sediment across the natural range of flow variability; attenuating flow energy; developing pools, riffles, gravel bars, nutrient flux, recruitment, and transport of large woody debris and other organic material.
- Shoreline vegetation: Maintaining temperature; removing excessive nutrients and toxic compound, sediment removal and stabilization; attenuation of high stream flow energy; and provision of woody debris and other organic matter.
- Hyporheic functions: Removing excessive nutrients and toxic compound, water storage, support of vegetation, and sediment storage and maintenance of base flows.
- Habitat for native aquatic and shoreline-dependent birds, invertebrates, mammals; amphibians; and anadromous and resident native fish: Habitat functions may include, but are not limited to, space or conditions for reproduction; resting, hiding and migration; and food production and delivery.

In addition, the tables address the following:

1. Nutrient delivery and removal

2. Groundwater flow
3. Surface water flow
4. Sediment delivery and removal
5. Fish and wildlife habitat

Table 17 though Table 20 provides a summary of potential cumulative impacts to shoreline ecological function categories associated with reasonably foreseeable future development, and the elements that are included in the SMP which act as countermeasures toward ensuring no net loss of ecological function. Table 16 provides a summary of the SMP provisions, goals, policies, and regulations that support no net loss of ecological functions in the city's shoreline jurisdiction. It also summarizes the effects of cumulative impacts on shoreline functions.

B. Net Effect

As described above, the proposed SMP provides a substantial level of protection for shoreline ecological functions through strategies such as shoreline buffers, shoreline structural setbacks, and mitigation requirements where impacts are not otherwise avoided, resulting in no net loss of ecological function. Additional protection and potential for enhancement of ecological functions is provided through consistency with other federal, state, and local laws and policies. Together, with implementation of the *Shoreline Restoration Plan*, the proposed SMP has high potential for improving ecological functions in areas of the shoreline jurisdiction where they are currently impaired. Therefore, the cumulative impacts of development in the shoreline jurisdiction are expected to result in no net loss of shoreline ecological functions.

C. Unanticipated Cumulative Impacts

In accordance with WAC 173-26-201(3)(d)(iii), the SMP has been developed to avoid or mitigate unanticipated or uncommon impacts that cannot be reasonably identified at this time. Impact avoidance and mitigation will occur during the city's permit review process for future development in the shoreline jurisdiction. Conditional use permits will be required for development proposals or shoreline uses that are not classified or set forth in the SMP.

Mitigation sequencing will be applied to all development during permit review under SMC 19.08.650(A) to avoid new incremental impacts to shoreline ecological functions. That section of the SMC ensures mitigation sequencing is applied throughout the shoreline jurisdiction. The new section was modified to reflect the requirements of the SMA and included as implementing regulations of the SMP.

Additionally, minimum criteria for review and approval of conditional use permits have been incorporated into the SMP administration provisions pursuant to WAC 173-27-210 and WAC 173-27-160. The criteria include the provision that

"the proposed use will cause no unreasonably adverse effects to the cities shoreline jurisdiction, will not result in a net loss of ecological functions, and will not be incompatible with the environment designation or zoning classification in which it is to be located."

Additionally, it includes the criteria that

"…consideration of cumulative impacts resultant from the proposed use has occurred and has demonstrated that no substantial cumulative impacts are anticipated, consistent with WAC 173-27-160(2)."

D. Conclusion

The reasonably foreseeable future development and associated impacts on shoreline ecological functions were reviewed and compared for the CIA, in conjunction with the SMP provisions, goals, policies, and regulations; the *Shoreline Restoration Plan*; and other existing laws, policies, and regulations beyond the SMP. Together, they provide the basis for evaluating the net effect of both anticipated and unanticipated cumulative impacts of development on shoreline functions. Based on the CIA, the proposed SMP includes policies and regulations that will achieve no net loss of ecological functions as the city implements the SMP over time.

Chapter 7: Conclusions Regarding No Net Loss

The SMP update process has provided the opportunity to identify baseline environmental conditions, anticipate future impacts to shoreline resources, and provide restoration opportunities within the city's shoreline jurisdiction. Changes to the SMP were informed by the best technical information gathered during the update process. The proposed SMP provides a new system of shoreline environment designations that establishes more uniform management of the city's shoreline jurisdiction.

The system of shoreline environment designations and use regulations in the proposed SMP is consistent with current conditions established in the SIC, the existing land use pattern, as well as the land use vision planned for in the city's comprehensive plan, zoning, and other long-range planning documents. Based on this consistency, it is unlikely that substantial changes in the type of shoreline land uses will occur in the future. Furthermore, the use of the Aquatic Environment designation will provide a means for protecting and managing the resources that are unique to the aquatic environment.

The updated development standards and regulation of shoreline modifications provides an increased level of protection for shoreline processes. The updated standards and regulations are more restrictive of activities that would result in adverse impacts to the shoreline jurisdiction. In addition, the *Shoreline Restoration Plan* developed as part of the SMP Update provides the city with descriptions of opportunities to improve or restore ecological functions that have been impaired because of past development activities. Furthermore, the proposed SMP is meant to complement city, state, and federal efforts to protect shoreline functions and values.

The city is required to monitor development under the proposed SMP to ensure no net loss. The *Shoreline Restoration Plan* recommends that city staff tracks all land use and development activity within shoreline jurisdiction, including exemptions, and incorporate actions and programs of individual departments as well. It is suggested that city staff assemble a report to coincide with the eight-year periodic review of the SMP required by RCW 90.58.080. Following the goals and objectives of the proposed SMP, the report could be used to determine whether implementation of the SMP is meeting the basic goal of no net loss of ecological functions relative to the baseline condition established in the SIC.

Based on assessment of these factors, the cumulative actions taken over time in accordance with the provisions outlined in the proposed SMP are not likely to result in a net loss of overall ecological functions from the existing baseline conditions within the city's shoreline jurisdiction. An overall improvement in ecologic functions is expected in the city's shoreline jurisdiction due to restoration efforts proposed along the shoreline with redevelopment and shoreline enhancement.

Appendix 1: Cumulative Impact Analysis Tables

Table 17: Cumulative Impacts to the Shoreline Jurisdiction – Nutrient / Pollutant Delivery and Removal

Shoreline Processes and Functions
Process: Nutrient / Pollutant delivery and removal Functions: Water Quality, Hyporheic, Hydrologic, Vegetation, Habitat
Resources at Risk
The main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) are at risk as well as their associated floodplains, riparian corridors, and potential, undelineated wetlands.
Shoreline Alterations Impacting Processes and Functions
• Existing impervious surfaces increase delivery of nutrients and pollutants to the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond). • Clearing of riparian buffers, and the ditching, draining, and filling of wetlands accelerate nutrient and pollutant delivery and means less ability for this vegetation to provide filtering of runoff. • New development may result in additional impervious surfaces and may exacerbate impacts to existing aquatic resources at risk including associated wetlands and buffers, particularly increasing the delivery of nutrients and pollutants.
Degree of future cumulative impact:
• There is limited potential for new residential, commercial, and industrial development along the main stem of the Snoqualmie River, the Snoqualmie River South Fork, and Kimball Creek and their associated wetlands and floodplain, so impacts in the future should be low. • Commercial development is not allowed along the Snoqualmie River South Fork SAA. • Residential development is not allowed in the Snoqualmie River South Fork and Borst Lake (Snoqualmie Mill Pond) SAA. • Industrial development is not allowed in the Snoqualmie River South Fork SAA. • Commercial and industrial development is likely to increase in the Borst Lake (Snoqualmie Mill Pond) SAA.
Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations
• Proposed overall measures: Encourage use of LID management techniques for new and existing developments (SMP Chapter 3 (G) CON G6-P2), protect existing shoreline resources and associated wetlands, including buffers (SMP Chapter 3 (G) CON G1-P1), and restore riparian areas (SMP Chapter 3 (F) SU G20-P1). Water quality protection through restrictions on clearing native vegetation (SMP Chapter 3 (G) CON G2-P1 and G2-P2). Protect critical areas through adoption of Critical Areas Ordinance (SMP Chapter 3 (G) CON G1-P1 and G1-P3). Conserve vegetation through maintenance and by increasing integrity in altered areas (SMP Chapter 3 CON G2-P3). Shoreline buffers SMC 19.08.590 , SMC Table 19.08.720-1 and SMC Table 19.08.730-1, Shoreline setbacks SMC 19.08.350. • If there is a conflict between the provisions of SMP and CAO, the provisions most consistent with the SMP shall apply, as determined by the city (SMP Chapter 3(G) CON G1-P3). • The CAO, as codified under Chapter 19.08.650 SMC, regulates critical areas such as critical aquifer recharge areas.

Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations (continued)
• All shoreline uses and activities shall utilize best management practices (BMPs) to minimize any increase in surface runoff and to control, treat and release surface water runoff so that receiving water quality is not adversely affected during both construction and operation (SMP Chapter 3(G), CON G6-P1). • The SMP specifically addresses water quality in SMP Chapter 3(G) - Conservation, Goal 6. • The Comprehensive Plan addresses cooperation with King County in ensuring septic systems successfully prevents pollutants from entering groundwater. Drainage from septic systems has contributed to pollution problems in Kimball Creek.
Non-Regulatory Measures
• Restore degraded wetlands. • Restore degraded riparian areas through replanting with native species. • Use LID storm water controls based on the requirements of the new NPDES Phase II Municipal Permit. • Encourage proper gardening practices including the use of environmentally appropriate fertilizers and chemicals. • Public outreach and education on shorelines. • The Shoreline Restoration Plan outlines the non-regulatory measures that are available to the city to help address these issues.

Table 18: Cumulative Impacts to the Shoreline Jurisdiction - Surface and Groundwater Flow

Shoreline Process and Function
Process: Reducing downstream flooding and erosion (surface storage), aquifer recharge and storage Functions: Hydrology and hyporheic
Resources at Risk
The main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) as well as their associated floodplains, riparian corridors, and potential, undelineated wetlands.
Shoreline Alterations Impacting Processes and Functions
• Existing impervious areas and clearing decrease infiltration recharge and subsurface storage, and groundwater discharge to streams, rivers, and wetlands. • Wetland fill, development in floodplain, including shoreline protective structures, reduces surface storage, leads to overbank flooding and increased flooding frequency and duration. • New development will remove forested areas and increase impervious cover. Additional impacts to surface storage functions may occur from shoreline fill and encroachment.
Degree of Future Cumulative Impact
• There is limited potential for new residential, commercial, and industrial development along the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) and its associated wetlands and floodplain, so impacts in the future should be low. • Limited commercial development is allowed along the Snoqualmie River South Fork SAA. • Residential development is not allowed in the Snoqualmie River South Fork and Borst Lake (Snoqualmie Mill Pond) SAA. • Industrial development is not allowed in the Snoqualmie River South Fork SAA. • Commercial and industrial development is likely to increase in the Borst Lake (Snoqualmie Mill Pond) SAA. This may negatively affect surface and groundwater flow.
Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations
• Minimize impacts to surface and groundwater processes by employing nonstructural approaches to reducing downstream flooding and erosion. This would include protecting and restoring wetlands (SMP Chapter 3 (I), FHM G1-P4, and FHM G1-P5). • Protect critical areas through adoption of Critical Areas Ordinance (SMP Chapter 3 (G) CON G1-P1 and G1-P3; SMC Chapter 19 Article VI). Conserve vegetation through maintenance and by increasing integrity in altered areas (SMP Chapter 3 CON G2-P3) and establishment of vegetation management corridors (SMC 19.08.540). Flood hazard management (SMP Chapter 3 SU G1-P2, SU G8-P3, and SU G8-P4) and adoption of Flood Hazard Regulations (SMC Chapter 15.12) via reference in SMC 19.08.010. • If there is a conflict between the provisions of SMP and CAO, the provisions most consistent with the SMP shall apply, as determined by the city (SMP Chapter 3(G) CON G1-P3). • The SMP specifically addresses flood hazard reduction in SMP Chapter 3 (I) Flood Hazard Management.

Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations (continued)
• The CAO, as codified under Chapter 19.08.650 SMC, regulates critical areas such as flood hazard areas. Chapter 15.12 SMC also addresses Flood Hazard Regulations. • Use LID storm water controls based on the requirements of the new NPDES Phase II Municipal Permit.
Non-Regulatory Measures
• Restore degraded wetlands. • Restore degraded riparian areas by replanting native species. • The *Shoreline Restoration Plan* outlines the non-regulatory measures that are available to the city to help address these issues.

Table 19: Cumulative Impacts to the Shoreline Jurisdiction - Sediment Transport

Shoreline Process and Function
Process: Sediment Transport Functions: Sediment delivery and removal from area water systems; Hyporheic
Resources at Risk
The main stem of the Snoqualmie River, the Snoqualmie River South Fork, and Kimball Creek are at risk as well as their associated floodplains, riparian corridors, and potential, undelineated wetlands.
Shoreline Alterations Impacting Processes and Functions
• Sediment delivery and removal processes have been affected by both natural and man-made factors. • Logging and development in the watershed has altered the process of sediment transport. • Converting forest vegetation to agricultural land, harvesting timber, mining, constructing roads, and development have altered or accelerated sediment transport processes within the basin.
Degree of Future Cumulative Impact
• Land clearing and development upstream of the city may increase sediment delivery into water systems if protective vegetation is not present. • This may affect storage of surface waters in wetlands and floodplains in this basin, which in turn could affect flooding, and erosion functions within the shoreline jurisdiction downstream along the Snoqualmie River.
Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations
• Minimize the delivery of sediment from land alterations through retention of natural vegetation, protection of riparian corridors, application of a comprehensive erosion and sedimentation control program and measures, and proper siting of development (SMP Chapter 3 (G) CON G6-P3). • Protect critical areas through adoption of Critical Areas Ordinance (SMP Chapter 3 (G) CON G1-P1 and G1-P3; SMC Chapter 19 Article VI). Protection of: Erosion Hazard Areas (SMC 19.08.660), Landslide Hazard Areas (SMC 19.08.670), Steep Slope Hazard Areas (SMC 19.08.680), Seismic Hazard Areas (SMC 19.08.690) and Channel Migration and Erosion Hazard Zones (SMC 19.08.700). • Conserve vegetation through maintenance and by increasing integrity in altered areas (SMP Chapter 3 CON G2-P3) and establishment of vegetation management corridors (SMC 19.08.540). • Limit and regulate in-stream structures (SMP Chapter 3 SU G17, SU G17-P1 and G17-P2 and SMC 19.08.460). • Dredging, filling, clearing and grading policies and regulations (SMP Chapter 3 CON G4-P6, CON G2-P1, CON G2-P2, CON G6-P3, SMC 19.08.660(A), 19.08.670(F), SMC 19.08.680(A), SMC 19.08.690(A), SMC 19.08.710(B), SMC 19.08.720(B), SMC 19.08.730(F) and (G), SMC 19.08.750(B). • Establishment of Shoreline buffers SMC 19.08.590, SMC Table 19.08.720-1 and SMC Table 19.08.730-1, Establishment of Shoreline setbacks SMC 19.08.350. • Shoreline stabilization measures (SMP Chapter 3 SU G8-P2, G9-P1, G9-P2, G9-P3; SMP Chapter 3 CON G4-P6 and SMC 19.08.510) • The CAO, as codified under Chapter 19.08.650 SMC, regulates geologically hazardous areas.

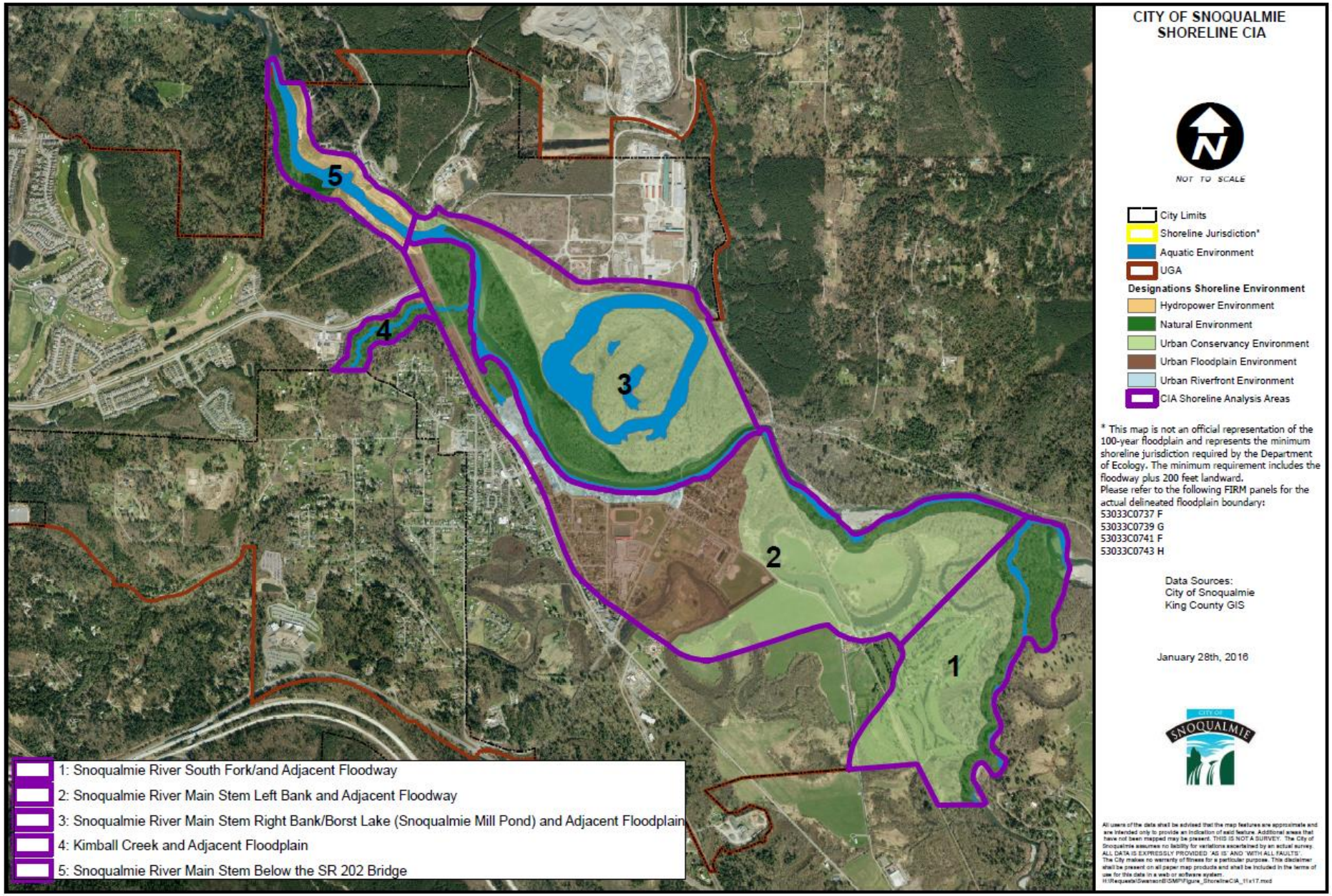
Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations (continued)
• The SMP specifically addresses water quality in SMP Chapter 3 (G) CON G2-P1 and G6-P1 through G6-P4. • SMP Chapter 3 (F) Shoreline Use and Modification SU G1-P2 addresses land clearing, grading, filling, and alteration of natural drainage features and landforms, which must be limited to the minimum necessary for development.
Non-Regulatory Measures
• Create incentive programs to conserve and retain native vegetation and restore native vegetation where none is present. • Programs such as on-site density transfers and conservation easements could help protect these areas. • The *Shoreline Restoration Plan* outlines the non-regulatory measures that are available to the city to help address these issues.

Table 20: Cumulative Impacts to the Shoreline Jurisdiction - Habitat Biodiversity

Shoreline Process and Function
Process: Habitat biodiversity Functions: Habitat - Fish and wildlife habitat, food production and delivery
Resource at Risk
The main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) are at risk as well as their associated floodplains, riparian corridors, and potential, undelineated wetlands.
Shoreline Alterations Impacting Processes and Functions
• Important in-stream and riparian habitat is available in the main stem of the Snoqualmie River, the Snoqualmie River South Fork, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) systems. • Habitat functions are altered with development, logging, road construction, culvert installation, loss of riparian cover, and stream and riverbank modification. • Habitat elements important to fish include riparian cover, large woody debris, passage for migration, clean water, and spawning habitat and forage habitat, and the availability of food sources. • Alteration of forested shrub and herbaceous habitat, loss of wetlands, streams, and rivers reduce the overall habitat for wildlife species, including mammals, amphibians, reptiles, waterfowl, birds and other wildlife species. • Habitat: Connectivity is diminished as riparian cover is removed and culverts, bridges, bulkheads, riprap, filling, and dredging interrupt aquatic systems. Loss of habitat features such as large woody debris, snags, banks with overhanging vegetation and persistent woody vegetation decreases wildlife cover, denning, perching, and nesting habitat.
Degree of Future Cumulative Impact
• There is limited potential for new residential, commercial, and industrial along the main stem of the Snoqualmie River, the south fork of the Snoqualmie River, Kimball Creek, and Borst Lake (Snoqualmie Mill Pond) and its associated wetlands and floodplain, so impacts in the future should be low. • Limited commercial development is allowed along the Snoqualmie River South Fork SAA. • Residential development is not allowed in the Snoqualmie River South Fork and Borst Lake (Snoqualmie Mill Pond) SAAs. • Industrial development is not allowed in the Snoqualmie River South Fork SAA. • Commercial and industrial development is likely to increase in the Borst Lake (Snoqualmie Mill Pond) SAA. This may affect habitat and water quality functions within the city's shoreline jurisdiction.

Proposed Restoration / Protection Measures and Draft SMP Policies and Regulations
• Protect and restore riparian habitat, aquatic habitat, and wetlands (SMP Chapter 3 (G) CON G1-P1). • If there is a conflict between the provisions of SMP and CAO, the provisions most consistent with the SMP shall apply, as determined by the city (SMP Chapter 3(G) CON G1-P3). • The CAO, as codified under Chapter 19.08.750 SMC, regulates fish and wildlife habitat conservation areas. • Under Conservation Goal 2 in Chapter 3 (G), habitat protection is an important objective and the management of shoreline public access sites is addressed in CON G2-P3. • SMP Chapter 3 (G) - Goal 3 emphasizes maintaining shoreline vegetation management corridors to provide wildlife habitat, wildlife migration corridors and shading for temperature control. • SMP Chapter 3 (G) - Conservation calls for all shoreline development to be located, designed, constructed, and managed to avoid disturbance of and minimize adverse impacts to wildlife resources, including spawning, nesting, rearing and habitat areas, and migratory routes. • Protect critical areas through adoption of Critical Areas Ordinance (SMP Chapter 3 (G) CON G1-P1 and G1-P3; SMC Chapter 19 Article VI). Protection of: Erosion Hazard Areas (SMC 19.08.660), Landslide Hazard Areas (SMC 19.08.670), Steep Slope Hazard Areas (SMC 19.08.680), Seismic Hazard Areas (SMC 19.08.690) and Channel Migration and Erosion Hazard Zones (SMC 19.08.700). • Conserve vegetation through maintenance and by increasing integrity in altered areas (SMP Chapter 3 CON G2-P3) and establishment of vegetation management corridors (SMC 19.08.540). • Limit and regulate in-stream structures (SMP Chapter 3 SU G17, SU G17-P1 and G17-P2 and SMC 19.08.460). • Clearing and grading policies and regulations (SMP Chapter 3 CON G4-P6, CON G2-P1, CON G2-P2, CON G6-P3, SMC 19.08.660(A), 19.08.670(F), SMC 19.08.680(A), SMC 19.08.690(A), SMC 19.08.710(B), SMC 19.08.720(B), SMC 19.08.730(F) and (G), SMC 19.08.750(B). • Establishment of Shoreline buffers SMC 19.08.590, SMC Table 19.08.720-1 and SMC Table 19.08.730-1, Establishment of Shoreline setbacks SMC 19.08.350. • Shoreline stabilization measures (SMP Chapter 3 SU G8-P2, G9-P1, G9-P2, G9-P3; SMP Chapter 3 CON G4-P6 and SMC 19.08.510)
Non-Regulatory Measures
• Restore degraded wetlands and aquatic systems. • This includes restoring degraded riparian and aquatic habitat by planting with native species and addition of habitat feature such as large woody debris and snags. • The *Shoreline Restoration Plan* outlines the non-regulatory measures that are available to the City to help address these issues.

Appendix 2: CIA Shoreline Analysis Areas Map


CITY OF SNOQUALMIE
SHORELINE CIA
NOT TO SCALE
City Limits
Shoreline Jurisdiction*
Aquatic Environment
UGA
Designations Shoreline Environment
Hydropower Environment
Natural Environment
Urban Conservancy Environment
Urban Floodplain Environment
Urban Riverfront Environment
CIA Shoreline Analysis Areas
* This map is not an official representation of the 100-year floodplain and represents the minimum shoreline jurisdiction required by the Department of Ecology. The minimum requirement includes the floodway plus 200 feet landward.
Please refer to the following FIRM panels for the actual delineated floodplain boundary:
53033C0737 F
53033C0739 G
53033C0741 F
53033C0743 H
Data Sources:
City of Snoqualmie
King County GIS
January 28th, 2016
1: Snoqualmie River South Fork/and Adjacent Floodway
2: Snoqualmie River Main Stem Left Bank and Adjacent Floodway
3: Snoqualmie River Main Stem Right Bank/Borst Lake (Snoqualmie Mill Pond) and Adjacent Floodplain
4: Kimball Creek and Adjacent Floodplain
5: Snoqualmie River Main Stem Below the SR 202 Bridge
1
2
3
4
5