FINAL

CITY OF BONNEY LAKE
GRANT NO. G1000016

CUMULATIVE IMPACTS ANALYSIS

for City of Bonney Lake Shorelines: Lake Tapps and Fennel Creek

Prepared for:

City of Bonney Lake
Community Development Department
8720 Main Street East
Bonney Lake, WA 98391

Prepared by:

THE WATERSHED COMPANY
750 Sixth Street South
Kirkland . WA 98033
p 425.822.5242
f 425.827.8136
watershedco.com

MAKERS
architecture · planning · urban design
1904 3rd Ave, Suite 725
Seattle, Washington 98101

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The Watershed Company
Reference Number:
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The Watershed Company Contact Person:
Dan Nickel

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CUMULATIVE IMPACTS ANALYSIS

CITY OF BONNEY LAKE SHORELINES: LAKE TAPPS AND FENNEL CREEK

1 INTRODUCTION

1.1 Shoreline Management Act Requirements

The Shoreline Management Act guidelines (Guidelines) require local shoreline master programs (SMPs) to regulate new development to "achieve no net loss of ecological function." The Guidelines (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 Guidelines further elaborate on the concept of net loss as follows:

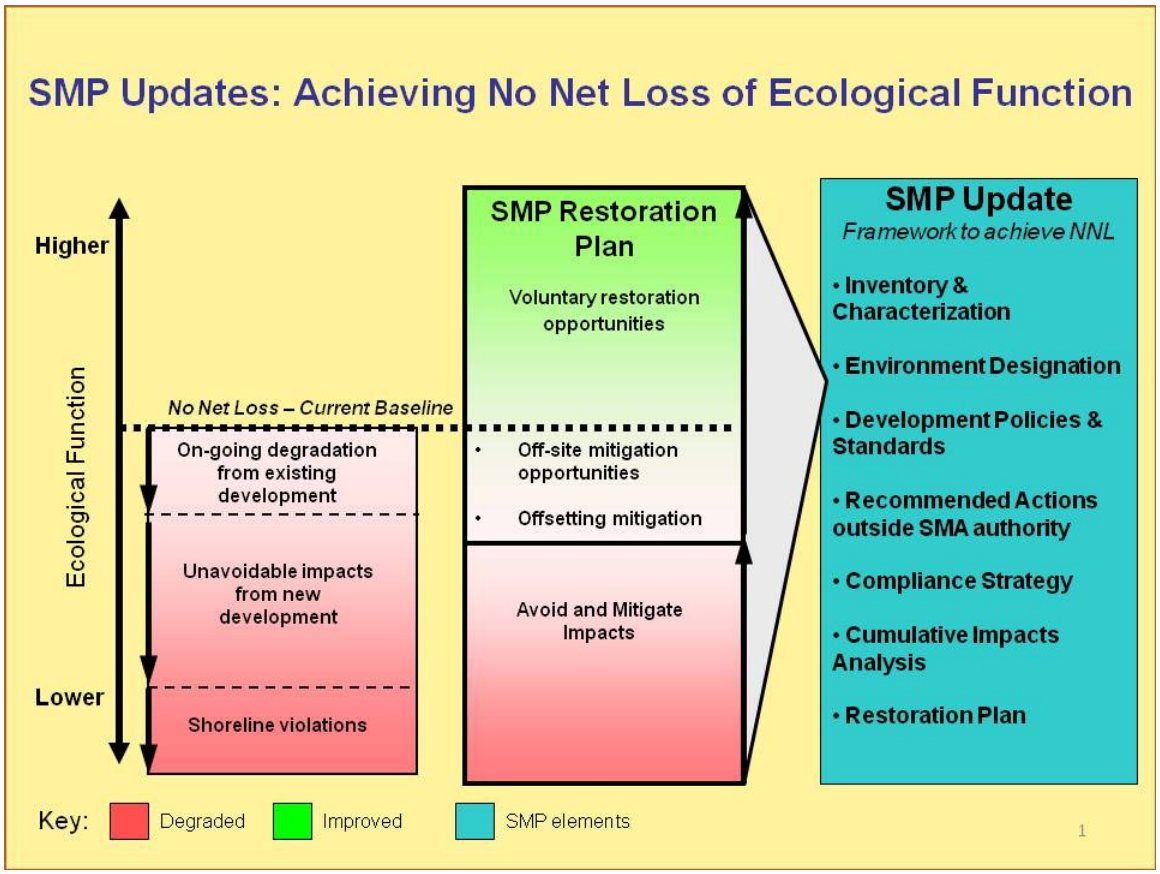
> *"When based on the inventory and analysis requirements and completed consistent with the specific provisions of these guidelines, the master program should ensure that development will be protective of ecological functions necessary to sustain existing shoreline natural resources and meet the standard. The concept of "net" as used herein, recognizes that any development has potential or actual, short-term or long-term impacts and that through application of appropriate development standards and employment of mitigation measures in accordance with the mitigation sequence, those impacts will be addressed in a manner necessary to assure that the end result will not diminish the shoreline resources and values as they currently exist. Where uses or development that impact ecological functions are necessary to achieve other objectives of RCW 90.58.020, master program provisions shall, to the greatest extent feasible, protect existing ecological functions and avoid new impacts to habitat and ecological functions before implementing other measures designed to achieve no net loss of ecological functions." [WAC 173-206-201(2)(c)]*

In short, updated SMPs shall contain goals, policies and regulations that prevent degradation of ecological functions relative to the existing conditions as documented in that jurisdiction's characterization and analysis report. For those projects that result in degradation of ecological functions, the required mitigation

must return the resultant ecological function back to the baseline. This is illustrated in Figure 1 below. The jurisdiction must be able to demonstrate that it has accomplished that goal through an analysis of cumulative impacts that might occur through implementation of the updated SMP. WAC 173-26-186(8)(d) states "[e]valuation 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."

Figure 1. SMP Updates: Achieving No Net Loss of Ecological Function



Source: Department of Ecology

As outlined in the *Shoreline Restoration Plan,* prepared as part of this SMP update, the Shoreline Management Act also seeks to restore ecological functions in degraded shorelines. This cannot be required by the SMP at a project level, but Section 173-26-201(2)(f) of the Guidelines says: "master programs shall include goals and policies that provide for restoration of such impaired ecological

functions." See the *Shoreline Restoration Plan* for additional discussion of programs and activities in the City that contribute to the long-term restoration of ecological functions relative to the baseline condition.

1.2 Methodology

Using the textual, numerical and graphical information developed and presented in the *Shoreline Analysis Report*, this cumulative impacts analysis was prepared consistent with direction provided in the Guidelines as described above. To the extent that existing information was sufficiently detailed and assumptions about possible new or re-development could be made with reasonable certainty, the following analysis is quantitative. However, in many cases information about existing conditions and/or redevelopment potential was not available at a level that could be assessed quantitatively or the analysis would be unnecessarily complex to reach a conclusion that could be derived more simply. Further, ecological function does not have an easy metric. For these reasons, much of the following analysis is more qualitative.

2 EXISTING CONDITIONS

The following summary of existing conditions is based on the *Shoreline Analysis Report*. This discussion has been organized by waterbody and shoreline assessment unit. The *Shoreline Analysis Report* includes an in-depth discussion of the topics below, as well as information about transportation, stormwater and wastewater utilities, impervious surfaces, and historical/archaeological sites, among others.

2.1 Lake Tapps

To facilitate analysis, the City's Lake Tapps shoreline was divided into three assessment units based on variations in land use and shore topography: Lake Tapps – Residential, Lake Tapps – Park Facilities, and Lake Tapps – Printz Basin Flume.

The Lake Tapps – Residential assessment unit is dominated by single-family residences, with a smaller amount of multi-family residences currently present. Much of the Lake Tapps – Residential shoreline is built-out. Wetlands are depicted by a County inventory and the National Wetland Inventory along the majority of Lake Tapps shoreline; however, nearly all of the Lake Tapps – Residential shoreline is developed with lawns, bulkheads and docks, and may no longer contain functional wetland areas. An ecological function summary for this assessment unit is provided below in Table 1. The overall shoreline ecological function is considered LOW.

Table 1. Function Summary of Lake Tapps – Residential

Lake Tapps – Residential	
Shoreline Processes and Functions within Assessment Unit	**Alterations and Assessment of Functions**
Hydrologic	
Storing water and sediment	LOW-MODERATE: The lake provides excellent water and sediment storage functions. However, the uplands surrounding the lake within shoreline jurisdiction have low water and sediment storage functions. Impervious surfaces (39.9% cover) and compact managed lawns interfere with infiltration of precipitation and rapidly send water "downstream." Wetlands and other natural water and sediment storage features are generally lacking.
Attenuating wave energy	LOW-MODERATE: Bulkheading and other shoreline modifications have replaced native vegetation and natural woody debris as the features attenuating wave energy for approximately 90% of the shoreline length. Shoreline erosion is therefore not known to be a serious problem on the lake. Additionally, reduced lake levels during the winter months further reduce the potential for erosion.
Removing excess nutrients and toxic compounds	LOW: The lake is surrounded by intensively landscaped lakefront homes – only 5% of lots remain vacant. The upland shoreline areas are more often a source of nutrients and toxic compounds, via lawn treatment runoff (pesticides, fertilizers, herbicides), pet wastes, road and construction site runoff (hydrocarbons, metals, sediment), and septic systems. The lake is on Ecology's 303d list for invasive exotic species (Category 4). Water quality studies conducted in 2004 and 2005 indicated phosphorous is the primary nutrient limiting algal growth, while nitrate and ammonia concentrations were relatively low (Pierce County 2007).
Recruitment of LWD and other organic material	LOW: Dense residential development and other upland modifications restrict the ability of this lake unit to recruit LWD and organic material. Furthermore, LWD is often removed from the lake out of concern for boater safety since Lake Tapps is a significant regional water-oriented recreational area.
Vegetation	
Temperature regulation	LOW: Lack of dense shoreline vegetation nearly eliminates potential for some shading of the shallow-water nearshore area. Vegetation is less effective at shading west- and south-facing shoreline areas due to afternoon sun from the southwest.
Water quality improvement	LOW: Residential areas surround the lake and are dominated by lawn and landscaping rather than dense areas of native lakeside vegetation. These residential landscapes are sources of water quality contaminants such as fertilizers, herbicides and pesticides. In addition to the typical residential landscaping pollutants, runoff from surrounding urban areas carries hydrocarbons, metals, sediments, and other pollutants to the lake from roads, parking lots, and other developed areas. There are approximately 15 stormwater outfalls to the lake through this shoreline unit.
Attenuating wave energy	LOW: In its pre-buildout condition, the lake was ringed with mature mixed-forest communities. Those communities are now almost entirely absent around the lakeshore, so vegetation does not provide any

Lake Tapps – Residential	
Shoreline Processes and Functions within Assessment Unit	**Alterations and Assessment of Functions**
	significant wave attenuation function. As mentioned above, bulkheading up to 90% and other shoreline modifications have replaced native vegetation and natural woody debris as the features in place to reduce the effects of wave energy on uplands.
Sediment removal and bank stabilization	LOW: Under natural conditions, there would be an ongoing, underlying rate of shoreline erosion, which would contribute to maintaining substrate conditions. This rate would be partially determined and moderated by the presence of shoreline vegetation whose root systems would tend to hold bank material in place. Instead, the lake shore now has little shoreline vegetation and a large proportion of it is armored. While this "stabilizes" the banks, it limits natural recruitment of lakebed materials.
LWD and organic matter recruitment	LOW: Again, the loss of natural, forested shoreline vegetation and its replacement primarily with lawn and other types of landscaping has nearly eliminated LWD and organic matter recruitment potential along the lake shore. Any trees or LWD that enter the lake are likely to be quickly removed out of concern for safety or to reduce the risk of property damage.
Habitat	
Physical space and conditions for life history	LOW: Under natural conditions, the lake bottom would gradually rise in a shallow wedge such that incoming waves would roll up the bottom and onto the shore, losing energy. This reduced energy environment would be more hospitable to emergent vegetation, which further attenuates wave energy and provides a refuge for small fish and amphibians. Shallow nearshore areas in lakes typically provide rearing, foraging and migration habitat for fish. Shoreline armoring, however, generally reduces this low-energy shallow-water environment, creating a deeper, more turbulent nearshore area that is less hospitable to small fish and amphibians, as well as to emergent vegetation. Up to 90% of this shoreline unit is armored. The deeper water may also allow larger fish predators to prey on small fish. The absence of dense shoreline vegetation is a limiting factor in terrestrial species' (birds, mammals, amphibians) use of the shoreline, since cover, food, nesting sites, travel corridors, etc. are limited or largely absent.
Food production and delivery	LOW: Food production from the uplands is limited by the lack of native seed- and fruit-bearing vegetation. This may be made up for, in part, by fruit trees and other non-native vegetation in yards which supplies some food for wildlife. Not only does native upland vegetation provide food directly for terrestrial wildlife, but it is a source of insects and other organic matter that drop into the water to provide food for fish and other aquatic life.
Summary	Accounting for the existing hydrologic, vegetative, and habitat conditions within the shoreline surrounding Lake Tapps (residential properties), the overall shoreline ecological function is considered LOW.

The Lake Tapps – Park Facilities assessment unit includes both public facilities and residential zoning. The Lake Tapps – Park Facilities unit is highly

developed for recreational uses. At present, two of the three parks that make up the unit are in private ownership and City-owned public access is limited to Allan Yorke Park at this time. An ecological function summary for this assessment unit is provided below in Table 2. The overall shoreline ecological function is considered LOW.

Table 2. Function Summary of Lake Tapps – Park Facilities

Lake Tapps – Park Facilities	
Shoreline Processes and Functions within Assessment Unit	**Alterations and Assessment of Functions**
Hydrologic	
Storing water and sediment	LOW-MODERATE: The lake provides excellent water and sediment storage functions. However, the uplands surrounding the lake within Shoreline jurisdiction have low water and sediment storage functions. Impervious surfaces (29%), compact managed lawns, and overall lack of native vegetation interfere with infiltration of precipitation and rapidly send water "downstream." Wetlands and other natural water and sediment storage features are lacking.
Attenuating wave energy	MODERATE: Allan Yorke Park contains an armored shoreline with lawn or impervious surfaces and thus acts very similar to most of the residential areas along the lake. The other two private parks are both unarmored (based on aerial photos) and thus attenuate wave energy through natural gradient shorelines. In all cases, shoreline erosion is not known to be a serious problem on the lake. Additionally, reduced lake levels during the winter months further reduce the potential for erosion. Only 41% of the shoreline in this unit is armored.
Removing excess nutrients and toxic compounds	LOW: Park properties contain large areas of lawn and other landscaping. The upland shoreline areas are more often a source of nutrients and toxic compounds, via lawn treatment runoff (pesticides, fertilizers, herbicides), pet wastes, road and construction site runoff (hydrocarbons, metals, sediment), and septic systems. The lake is on Ecology's 303d list for invasive exotic species (Category 4). Water quality studies conducted in 2004 and 2005 indicated phosphorous is the primary nutrient limiting algal growth, while nitrate and ammonia concentrations were relatively low (Pierce County 2007).
Recruitment of LWD and other organic material	LOW: The loss of natural, forested shoreline vegetation and its replacement primarily with lawn and other types of landscaping has nearly eliminated the ability of the lakeshore to recruit LWD and organic material.
Vegetation	
Temperature regulation	LOW: Lack of dense shoreline vegetation nearly eliminates potential for some shading of the shallow-water nearshore area. Vegetation is less effective at shading west- and south-facing shoreline areas due to afternoon sun from the southwest.
Water quality improvement	LOW: Park properties are dominated by lawn and landscaping rather than dense buffers of native lakeside vegetation. These landscapes can be sources of water quality contaminants such as fertilizers, herbicides and pesticides. In addition to the typical landscaping pollutants, runoff from surrounding urban areas carries hydrocarbons, metals, sediments, and other pollutants to the lake from roads, parking lots, and other

Lake Tapps – Park Facilities	
Shoreline Processes and Functions within Assessment Unit	**Alterations and Assessment of Functions**
	developed areas.
Attenuating wave energy	LOW: Development of these park areas has removed most tree and shrub vegetation along the shoreline. Attenuation of wave energy is either performed by natural beach substrates (Church Lake Park or Inlet Island Park) or bulkhead (in the case of Allan Yorke Park), but not vegetation. Under natural conditions, shoreline vegetation would help attenuate wave energy through fallen woody debris or root structures along the shoreline edge. The absence of these conditions results in a LOW rating for the function even though wave energy might be attenuated by other circumstances.
Sediment removal and bank stabilization	LOW-MODERATE: Under natural conditions, there would be an ongoing, underlying rate of shoreline erosion, which would contribute to maintaining substrate conditions. This rate would be partially determined and moderated by the presence of shoreline vegetation whose root systems would tend to hold bank material in place. Instead, the lake shore now has little shoreline vegetation and a portion of it (Allan Yorke Park) is armored. While this “stabilizes” the banks, it limits natural recruitment of lakebed materials. Both Church Lake Park and Inlet Island Park have unarmored shorelines, but neither have substantial shoreline vegetation which contribute to sediment movement and stabilization.
LWD and organic matter recruitment	LOW: Again, the loss of natural, forested shoreline vegetation and its replacement primarily with lawn and other types of landscaping has nearly eliminated LWD and organic matter recruitment potential along the lake shore. Any trees or LWD that enter the lake are likely to be quickly removed out of concern for safety or to reduce the risk of property damage.
Habitat	
Physical space and conditions for life history	LOW/MODERATE: Under natural conditions, the lake bottom would gradually rise in a shallow wedge such that incoming waves would roll up the bottom and onto the shore, losing energy. This reduced energy environment would be more hospitable to emergent vegetation, which further attenuates wave energy and provides a refuge for small fish and amphibians. Shallow nearshore areas in lakes typically provide rearing, foraging and migration habitat for fish. Shoreline armoring, however, generally reduces this low-energy shallow-water environment, creating a deeper, more turbulent nearshore area that is less hospitable to small fish and amphibians, as well as to emergent vegetation. The deeper water may also allow larger fish predators to prey on small fish. The absence of dense shoreline vegetation is a limiting factor in terrestrial species’ (birds, mammals, amphibians) use of the shoreline, since cover, food, nesting sites, travel corridors, etc. are limited or largely absent.
Food production and delivery	LOW: Food production from the uplands is limited by the lack of native seed- and fruit-bearing vegetation. This may be made up for, in part, by fruit trees and other non-native vegetation which supplies some food for wildlife. Not only does native upland vegetation provide food directly for terrestrial wildlife, but it is a source of insects and other organic matter that drop into the water to provide food for fish and other aquatic life.

Lake Tapps – Park Facilities	
Shoreline Processes and Functions within Assessment Unit	**Alterations and Assessment of Functions**
Summary	Accounting for the existing hydrologic, vegetative, and habitat conditions within the shoreline surrounding Lake Tapps (Park Facilities), the overall shoreline ecological function is considered LOW.

The Lake Tapps – Printz Basin Flume assessment unit is zoned single-family residential, but it is presently undeveloped and nearly entirely vegetated. Additionally, the Printz Basin Flume is not regulated under the SMA or the SMP. The City and the Washington State Department of Ecology (Ecology) have agreed that the portion of the Printz Basin Flume 200 feet upstream of the Flume's terminus to the City's jurisdictional boundary is not regulated under the SMA or the SMP. While the Flume itself is not regulated under the SMA, the first two hundred feet up the flume upstream of the terminus is regulated under the SMA as this portion of the Flume is within 200 feet of the OHWM of Lake Tapps. An ecological function summary for this assessment unit, which includes both the portions regulated under the SMA/SMP and the portions not regulated under the SMA/SMP, is provided below in Table 3. The overall shoreline ecological function is considered MODERATE.

Table 3. Function Summary of Lake Tapps – Printz Basin Flume

Printz Basin Flume	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
Hydrologic	
Storage of water and sediment	LOW - MODERATE: The diversion flume carries water through a man-made channel along much of its length in the City. During high flows, the flume is contained within a bermed bank, and so the channel itself is designed to convey floodwaters. Several parts to the diversion flume (Printz Basin and Wickersham Basin) were designed as open areas for sediment deposition – neither of which is located in the City. Therefore, this portion of the diversion flume is not intended to store water or sediment, but rather convey this to the lake.
Transport of water and sediment	MODERATE: The flume has been formed through this area with the intention of conveying water and sediment into Lake Tapps and acting less like a sink. Although sediment deposition occurs throughout the diversion flume, it occurs more readily at the mouth of the flume into Lake Tapps.
Attenuating flow energy	MODERATE: The flume is designed less to attenuate flow energy as it is to convey water. However, in this area of the flume within the City of Bonney Lake, the channel is lined with vegetation that may act to reduce flow energy during high flow events. Recruitment of woody debris, especially LWD, may occur along the banks and also reduce energy. The Printz Basin, upstream of the City limits, includes a large open

Printz Basin Flume	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
	water area and associated wetland which serve to dampen and moderate stream flow fluctuations. Still, the decrease in channel roughness brought on by a reduction in accumulated woody debris and bank vegetation has reduced the stream channel's ability to absorb and dissipate stream flow energy.
Developing pools, riffles, and gravel bars	LOW/MODERATE: Reduction in roughness elements, via channelization and removal of LWD has resulted in a simpler channel form which is less conducive to the formation and maintenance of the basic habitat elements, including pools, riffles, and gravel point bars.
Removing excess nutrients and toxic compounds	MODERATE: Although the channelized flume is essentially cutoff from any large available floodplain, upland areas still provide a competent biofiltration function. However, the channel itself, due to its minimal length, reduced roughness, and linear flow, offers little ability to remove nutrients and toxic compounds.
Recruitment and transport of LWD and other organic material	MODERATE/HIGH: Streambank forest vegetation remains in-tact along much of the channel in the City, potentially allowing and contributing to recruitment and transport of LWD and organic material. However, a floating boom, located at the mouth of the lake, captures most of this floating debris and thus transport of this material to the lake is diminished.
Vegetation	
Temperature regulation	MODERATE/HIGH: Well-vegetated banks and buffers improve shading conditions, in turn benefiting both temperature and dissolved oxygen. Although this section of the Printz Basin Flume is linear, the forested community along the banks provides shade along the majority of the channel length.
Water quality improvement	MODERATE: The linear channel offers less opportunity to improve water quality than a natural flowing sinuous channel. However, streambank vegetation along the flume, which consists of a mixed forest/shrub community, likely provides good water quality benefits to the aquatic environment.
Slowing riverbank erosion; bank stabilization	MODERATE/HIGH: Although the flume channel is man-made with high berms, the forested vegetation community provides additional stability to the banks, thereby reducing erosion.
Attenuation of flow energy	LOW/MODERATE: (As stated above), the decrease in channel roughness due to a reduction in accumulated woody debris and channel straightening has reduced the channel's ability to absorb and dissipate stream flow energy. In-water or bank vegetation provides more stability rather than flow attenuation.
Sediment removal	LOW/MODERATE: As stated above, the linear channel and lack of a truly active floodplain greatly diminishes the ability of shoreline vegetation to function properly. This includes the lack of sediment removal. Under more natural stream and floodplain conditions, vegetation would act to reduce flow energy and thus allow for sediment to settle out.
Provision of LWD and organic matter	MODERATE/HIGH: Shoreline vegetation along this flume section is dense, consisting of a mix of tree and shrub cover. Opportunities for LWD and organic matter to be introduced into the aquatic environment

Printz Basin Flume	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
	are high. However, the presence of a floating boom at the mouth to Lake Tapps reduces the likelihood that large material would reach the lake.
Hyporheic	
Removing excess nutrients and toxic compounds	MODERATE: The soils in this portion of the stream are generally poorly drained (Buckley loam – tends to be hydric) having been formed from Osceola mudflows. Given that the flume channel was man-made and not historically present to contribute to the development of a hyporheic zone, it is unlikely that the Printz Basin flume hyporheic zone performs any significant removal of excess nutrients or toxic compounds.
Water storage and maintenance of base flows	MODERATE: As above, the existing soils are not likely conducive to significant hyporheic flow, limiting the potential for water storage and base-flow maintenance.
Support of vegetation	MODERATE: Though hyporheic flow is likely limited given the above conditions, the riparian vegetation adjacent to the flume channel likely benefits from the close association with hyporheic water storage.
Habitat	
Physical space and conditions for life history	MODERATE: Habitat in and along the Printz Basin flume varies. Although the vegetative community in the upland shorelands provides extensive habitat for terrestrial species (accumulated downed wood and snags, resulting in places for various wildlife species to find cover or suitable nesting and rearing sites), the aquatic environment provides much less complexity. Within the channel itself, less wood overall similarly results in less available protective cover, and diminishes the creation of pool/riffle sequences as well. The lack of side channels, backwaters and sinuosity has limited the amount of valuable edge habitat available, and further reduced overall complexity.
Food production and delivery	MODERATE/HIGH: Food production from upland areas is fairly good with native seed- and fruit-bearing vegetation. Not only does such vegetation provide food directly for terrestrial wildlife, but it is a source of insects and other organic matter that drops into the water and provide food, either directly or indirectly, for fish and other aquatic life.
Summary	Accounting for the existing hydrologic, vegetative, hyporheic, and habitat conditions within the Printz Basin, the overall shoreline ecological function is considered MODERATE.

Based on the existing and planned land use and existing conditions, the proposed environment designations for the Lake Tapps – Residential, Lake Tapps – Park Facilities, and Lake Tapps – Printz Basin Flume assessment units are Shoreline Residential and Shoreline Multifamily, and Park, respectively. Please see Appendix A for a map of proposed environment designations.

2.2 Fennel Creek

Shoreline jurisdiction in the City of Bonney Lake includes one City-owned parcel on Fennel Creek. The parcel is undeveloped and well vegetated. An ecological

function summary for this assessment unit is provided below in Table 4. The overall shoreline ecological function is considered MODERATE/HIGH.

Table 4. Function Summary of Fennel Creek

Fennel Creek	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
Hydrologic	
Storage of water and sediment	MODERATE/HIGH: Fennel Creek, below Victor Falls and within the City's shoreline jurisdiction, flows through a fairly wide and steep riparian ravine consisting of a mixed forested vegetative community. A narrow adjoining floodplain and riparian wetland areas contribute to this creek's ability to store water and sediment during high flow events. Although narrow at times, the creek is able to spread out across its floodplain during high flows, and so the floodplain is still able to store and attenuate flood flows and trap and store fine sediments. These fine sediments are incorporated into the floodplain topsoil to nourish vegetative growth, in turn supporting wildlife habitat.
Transport of water and sediment	MODERATE: The stream corridor has largely been undisturbed in this reach as it remains in protected City ownership for well water supply. However, increased development in the upper basin has likely altered the flow regime and the sediment transport capacity through this reach. This system may be less sensitive to such alterations, given that it is located just below Victor Falls.
Attenuating flow energy	MODERATE/HIGH: As mentioned above, this reach has largely remained undisturbed, with little floodplain encroachment. Riparian vegetation is well-established and generally abundant, providing energy attenuation during overbank flows.
Developing pools, riffles, and gravel bars	MODERATE/HIGH: Riparian vegetation is generally good, and includes a mix of deciduous and coniferous cover, thus contributing to LWD in the channel and the development of pools and riffles.
Removing excess nutrients and toxic compounds	MODERATE: Dense vegetation in the riparian wetland and floodplain areas provide a competent biofiltration function. These areas buffer the stream channel on this City-owned parcel and remove nutrients and toxics that may come from areas outside of shoreline jurisdiction. However, the soils (Xerochrepts 45 to 70 percent slope) are highly susceptible to slope failure, have high rates of runoff, and generally do not support a long-standing conifer community.
Recruitment and transport of LWD and other organic material	MODERATE/HIGH: Streambank forest vegetation remains in-tact along much of the creek both in and outside of the City's jurisdiction. This allows for potential recruitment and transport of LWD and organic material.
Vegetation	
Temperature regulation	MODERATE/HIGH: Well-vegetated banks and buffers improve shading conditions, in turn benefiting both temperature and dissolved oxygen. The combination of a well-established and maturing forest in the shoreline/buffer areas, steep sloped ravine, and a relatively narrow active channel during low-flow periods results in excellent shade being provided to the stream.
Water quality improvement	MODERATE/HIGH: Riparian and flood plain areas are intact and well-forested, resulting in good biofiltration function. However, for fine

Fennel Creek	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
	sediments and pollutants originating from farther upstream, shoreline vegetation can only be effective at removing pollutants when stream flow is made to come in direct contact with the vegetation, which happens most effectively during flood events. Under low-flow conditions, there is less direct contact between the stream flow and the riparian vegetation, so considerably less biofiltration can occur. Water quality evaluations for Fennel Creek in 2006 by Pierce County rated the creek as Fair on the Benthic Index of Biotic Integrity (BIBI).
Slowing riverbank erosion; bank stabilization	MODERATE/HIGH: The well-forested stream banks provide good bank stabilization with streambank erosion occurring at rates consistent with well-functioning natural processes. However, the upper slopes of the ravine remain relatively unstable with high runoff rates and severe erosion hazards.
Attenuation of flow energy	HIGH: As mentioned above, this reach has largely remained undisturbed, with little floodplain encroachment. Riparian vegetation is well-established and generally abundant, providing energy attenuation during overbank flows. Complex flow patterns through areas of riparian wetlands and accumulated woody debris during flood events provide a rough channel, enhancing the stream's ability to absorb and dissipate flow energy.
Sediment removal	MODERATE/HIGH: Densely-vegetated forest vegetation, along with its associated leaf litter and forest duff, effectively filters and retains fine sediments. However, as mentioned above, the highly erodible soils of the forested ravine may contribute sediment inputs to the channel.
Provision of LWD and organic matter	HIGH: In contrast with most areas in the region, opportunity for the recruitment of large woody debris is good due to the forested condition and sloped ravine, and should improve further as the forest continues to mature. There are also good opportunities for the recruitment of small-to-medium woody debris and leaf litter that contribute to a decomposition-based food chain.
Hyporheic	
Removing excess nutrients and toxic compounds	MODERATE: The soils in this portion the Fennel Creek shoreline are moderately well drained to somewhat excessively drained glacial till. Permeability varies but runoff tends to be very rapid. Given these conditions, the hyporheic zone is expected to be rather narrow, composed of the mapped floodplain area. The coarse substrate tends to be well drained, thus a higher likelihood that the hyporheic zone contributes to the removal of excess nutrients and toxic compounds.
Water storage and maintenance of base flows	MODERATE: Although the soils within this stretch of Fennel Creek likely contribute to water storage in the hyporheic zone, the area of available storage is minimized due to the steep ravine through which Fennel Creek flows.
Support of vegetation	MODERATE: The glacial till that tend to be present in the hyporheic zone can be so well-draining and poor at wicking water upward that plants growing above these gravelly soils can be deprived of water even when an active water table is near the surface. However, the presence of a dense forested community is evidence that vegetation can be readily supported throughout this reach.

Fennel Creek	
Shoreline Processes and Functions Occurring within Assessment Unit	**Alterations and Assessment of Functions**
Habitat	
Physical space and conditions for life history	HIGH: Though second-growth, the forest community provides habitat of good quality and complexity and in good quantity for fish and wildlife. The vegetation is complex and maturing, with accumulating downed wood and snags, resulting in more places for various wildlife species to find cover or suitable nesting and rearing sites. This increase in dense shoreline vegetation increases the quantity and quality of habitat available for use by terrestrial species (birds, mammals, amphibians) since cover, food, nesting sites, travel corridors, etc. are available and functioning. Within the stream channel itself, an increase in logs and overall wood similarly results in more available protective cover, the creation of pool/riffle sequences, and an increase in habitat complexity as described above. Shallow, low-energy aquatic areas provide critical rearing, foraging, and refuge habitat for amphibians and juvenile fish, particularly salmonids. Below Victor Falls, Chinook and coho salmon as well as steelhead, are present.
Food production and delivery	MODERATE/HIGH: The forest community along this portion of Fennel Creek should provide the food production that native wildlife are adapted to, including native seed- and fruit-bearing vegetation from wetland, floodplain, and upland areas. Not only does such vegetation provide food directly for terrestrial wildlife, but it is a source of insects and other organic matter that drops into the water and provide food, either directly or indirectly, for fish and other aquatic life.
Summary	Accounting for the existing hydrologic, vegetative, hyporheic, and habitat conditions within the Fennel Creek shoreline, the overall shoreline ecological function is considered MODERATE/HIGH.

Based on the existing and planned land use and existing conditions, the shoreline environment is designated as Natural. Please see Appendix A of the SMP for a map of proposed environment designations.

3 DEVELOPMENT POTENTIAL

This section provides a summary of the likely future development within the City's shoreline jurisdiction. Existing land uses within the shoreline jurisdiction were mapped and tabulated during the shoreline inventory and are discussed in the *Final Shoreline Analysis Report for City of Bonney Lake's Shoreline: Lake Tapps and Fennel Creek* (June 24, 2010).

GIS mapping data provided the basis for future land use analysis along the shoreline jurisdiction. Existing land use maps and Pierce County parcel maps were used to identify existing land uses acreages, percentage of occupied and vacant lands, and percentage of public and private properties within the shoreline jurisdiction. Then in order to maintain consistency between the growth assumptions in the City Comprehensive Plan, the methodology used to determine future capacity developed as part of the City's Buildable Lands Analysis was used to calculate future potential development within the Shoreline Jurisdiction which is summarized in Table 5. This information can then be used to estimate areas where incremental loss of shoreline ecological function could potentially occur if regulations, including mitigation, are not in place that reflect the goals and policies of the Shoreline Element of the Comprehensive Plan.

Table 5. Likely changes in land use along shorelines of the City of Bonney Lake

Assessment Unit	Likely Changes in Land Use
Lake Tapps: Residential	This Assessment Unit is comprised of two different Shoreline Environmental Designations which are addressed separately below: <u>Shoreline Residential:</u> A majority of this Assessment Unit is designated Single-Family Residential in the Comprehensive Plan and zoned R1 Single-Family, which allows single-family housing at a density of 4-5 net dwelling units per acre. There are a few areas that are designated Medium Density Residential in the Comprehensive Plan and are zoned R2 Medium Density Residential, which allows 5 - 9 dwelling units per acre. When in this shoreline environment designation, there are a total of 25 lots that are considered under-developed based on the Buildable Lands Methodology: lots within this classification are large parcels in residential zones with an existing single family home that could be further subdivided. If all of the 25 lots were further subdivided, up to 29 additional new single-family home lots could be created around Lake Tapps. However, not all of the lots will be further divided due to a number of reasons including personal use, economic investment and sentimental attachment with the surrounding area. Therefore, the Buildable Land Methodology assumes that 30% of the lots that could be redeveloped will actually not do so in the next 20 years. As a result, the City expects that only 17 lots will be redeveloped resulting in additional 20 lots within this shoreline environment designation. In addition to the under-developed lots, there are approximately 19 vacant lots that can be developed, but are not large enough to be further subdivided. For some of the same reasons discussed above, the Buildable Land Methodology assumes that 15% of these lots will not be developed within the next 20 years. Therefore, the City expects that only 17 of the lots will be developed. Finally, there are two vacant lots that are large enough to be further subdivided to create 2 additional lots. For the purposes of this analysis

Assessment Unit	Likely Changes in Land Use
	the City assumes that both lots would be subdivided and 4 new homes constructed on those lots. Therefore, in total, based on the Buildable Lands Methodology, the City expects that 41 new residential structures will be constructed along Lake Tapps within Bonney Lake jurisdiction within the next 20 years. In addition to the vacant, single units and underdeveloped properties, there are 30 mobile/manufactured homes adjacent to Lake Tapps. These are also considered underdeveloped properties and the Buildable Lands Methodology assumes that 30% would not be redeveloped in the next 20 years. Therefore, the City expects that in addition to the 41 new residential structures, 21 existing mobile homes will be replaced with new residential structures in the next 20 years. Some redevelopment and expansion of existing housing stock may also occur, but a majority of the housing stock has been built in the last few decades. <u>Shoreline Multi-family:</u> There is one area in the southwest portion of the lake that is designated High Density Residential and is zoned R3 High Density Residential, which allows 20 dwelling units per acre. Currently, the property that is zoned R-3 and in this shoreline environment designation is all proposed to be developed as part of the Park Place Apartment Project. This project has already been submitted for review under the 1975 SMP and received Ecology approval on June 5, 2013.
Lake Tapps: Park Facilities	The parks and open spaces located within shoreline jurisdiction are designated Conservation/Open Space in the Comprehensive Plan and are generally zoned Public Facilities.
Lake Tapps: Printz Basin Flume	The area of Printz Basin within shoreline jurisdiction is designated Single-Family Residential and is zoned R-1 Single Family residential, but is undeveloped and vegetated. The small portion of the Flume within the jurisdiction of the SMP has been designated Park which does not allowed residential development.
Fennel Creek	The area of Fennel Creek in shoreline jurisdiction is designated Public Facility and is zoned Public Facility. It is undeveloped and vegetated. This location serves as the water supply well for the City of Bonney Lake. The Fennel Creek Trail is proposed through a portion of this area, connecting to Allan Yorke Park and the County's Foothills Trail. Trail construction will include an overlook of Victor Falls.

4 PROTECTIVE SMP PROVISIONS

4.1 Environment Designations

The first line of protection of the City's shorelines is the environment designation assignments (see map in Appendix A). The Natural environment is the City's most restrictive environment. In the Natural environment, only dikes and levees and shoreline enhancement projects are permitted, while trails or walk-ways, utility transmission facilities, fills, and clearing and grading may be allowed through the conditional use permit process. Somewhat less restrictive is the Park environment, which, in general, allows developments related to recreational and boating facilities. The City's most permissive environments are the Shoreline Residential and Shoreline Multifamily environments, which are intended to primarily accommodate single-family residential and multi-family residential developments, respectively. The purpose of the "Aquatic" environment is to protect, restore and manage the unique characteristics and resources of marine waters, including habitat, ecology, navigation and public enjoyment. An "Aquatic" environment designation will be assigned to shoreline areas waterward of the ordinary high-water mark.

Table 6 (from BLMC 16.50.020) below identifies the prohibited and allowed uses and modifications in each of the shoreline environments, and shows a hierarchy of higher-impacting uses and modifications being allowed in the already highly altered shoreline environments, with uses more limited in the less developed areas. This strategy helps to minimize cumulative impacts by concentrating development activity in lower functioning areas that are not likely to experience function degradation with incremental increases in new development.

Table 6. Shoreline Use and Modification Matrix (from BLMC 16.50.020)

Shoreline Uses	**Residential - Low Density**	**Residential - High Density**	**Park**	**Natural**	**Aquatic**
Resource Land Uses					
Agriculture	X	X	X	X	X
Aquaculture	X	X	X	X	X
Forest Practices	X	X	X	X	X
Mining	X	X	X	X	X
Commercial Uses and Development					

Shoreline Uses	Residential - Low Density	Residential - High Density	Park	Natural	Aquatic
Water oriented uses	X	X	X	X	X
Non-water oriented uses	X	X	X	X	X
Industrial Uses and Development					
Water oriented uses	X	X	X	X	X
Non-water oriented uses	X	X	X	X	X
Recreational Uses and Development:					
Docks and Piers	P	P	P	X	P
Parks or Picnic Areas	P	P	P	X	X
Trails or Walk-ways	P	P	P	C	X
High intensity recreational activities	X	X	P	X	X
Transportation and Parking Facilities					
Causeways	P	X	X	X	X
Roadways	P	P	P	X	X
Railroads	X	X	X	X	X
Parking Facilities – primary	X	X	X	X	X
Parking Facilities – accessory	Same as the primary use it supports				X

Shoreline Uses	Residential - Low Density	Residential - High Density	Park	Natural	Aquatic
Residential Uses and Development					
Single Family Dwelling	P	X	X	X	X
Accessory Dwelling Units	P	X	X	X	X
Duplex	P	P	X	X	X
Multifamily Dwelling	X	P	X	X	X
Subdivisions and Short Subdivisions	P	P	~~C~~X	~~C~~X	X
Live-aboard vessels	X	X	X	X	X

Shoreline Uses	Residential - Low Density	Residential - High Density	Park	Natural	Aquatic
Boating Uses and Facilities					
Docks and Piers	P	P	P	X	See adjacent upland SED
Boating Ramps	X	X	P	X	
Covered Moorages	X	X	X	X	
Boat Houses	X	X	X	X	
Temporary Moorage[1]	P	P	P	X	
Marinas	X	X	X	X	
Launching Rails	X	X	X	X	
Utilities					
Water System Treatment Plants	X	X	X	X	X
Sewage Treatment Plants	X	X	X	X	X
Electrical Generation Plants	X	X	X	X	X
Electrical Substations	X	X	X	X	X
Solid Waste Disposal Facilities	X	X	X	X	X
Accessory Utilities	Same as the primary use it supports				
Utility Transmission Facilities	P	P	P	C	X
Personal Wireless Facilities	C	C	C	X	X
Radio towers	X	X	X	X	X

[1]Temporary moorages are only allowed to be used for vessels supporting construction activities

Shoreline Modifications	Residential - Low Density	Residential - High Density	Park	Natural	Aquatic
Structural Shoreline Stabilization	C	C	C	X	See adjacent upland SED
Piers and Docks	P	P	P	X	
In-Stream Structures	X	X	X	X	
Fills	P	P	P	C	C
Clearing and Grading	P	P	P	C	N/A

Dredging	X	X	X	X	C
Dredge Disposal	C	C	C	X	C
Dikes and Levees	X	X	P	P	C
Shoreline Enhancement Projects	P	P	P	P	P

4.2 General Goals, Policies and Regulations

The Shoreline Element adopted as part of the Comprehensive Plan contains numerous general goals and policies, while the Shoreline Code provides supporting regulations, intended to protect the ecological functions of the shoreline and prevent adverse cumulative impacts. Several key provisions are listed below.

- **Goal SL-3: Preserve, protect, and restore critical areas within the shoreline environment.**
- **Goal SL-4: Manage activities in the larger watershed basin that may adversely impact surface and ground water quality or quantity.**
- **Goal SL-5: Preserve, protect, and restore native shoreline vegetation.**
- **Goal SL-7: Maintain and improve ecological functions by locating, designing and managing shoreline uses to prevent significant adverse impacts and, where possible, restore water quality, fish and wildlife habits, and ecological functions.**
- **Goal SL-21: Implement the projects, programs, and plans to restore areas that have been degraded or diminished as a result of past activities.**
- *Policy SL-4.1: Manage storm water quantity to ensure protection of natural hydrology patterns and avoid or minimize impacts to streams.*
- *Policy SL-4.2 Prevent impacts to water quality associated with septic systems.*
- *Policy SL-4.3: Support public education efforts to reduce the use of pesticides and fertilizers in order to protect and improve water quality.*
- *Policy SL-5.1: New developments or substantial redevelopments along Lake Tapps should preserve and restore shoreline vegetation.*
- *Policy SL-5.5: Work with Cascade Water Alliance regarding the management of noxious aquatic vegetation to ensure the use of a mixture of control methods with emphasis the most environmentally sensitive methods.*

- Policy *SL-7.1: The City should periodically review conditions along the shoreline and conduct appropriate analysis to determine whether or not other actions are necessary to ensure a no net loss of ecological functions, protect human health and safety, upgrade the visual qualities, and enhance residential and recreational uses on the City's shorelines.*

- Policy *SL-7.2: The City should establish development regulations that avoid, minimize, and mitigate impacts to the ecological functions association with shoreline uses.*

- *Policy SL-7.3: Provide adequate vegetative conservation areas to protect natural features and improve ecological functions.*

- *Policy SL-16.1: Assure that shoreline modifications individually and cumulatively do not result in a net loss of ecological functions.*

- *Policy SL-21.1: Include provisions for shoreline vegetation restoration, fish and wildlife habitat enhancement, and low impact development techniques in projects located within the shoreline.*

- *Policy SL-21.2: Minimize impacts from publicly initiated aquatic vegetation management efforts.*

- BLMC 16.56.020.A:

  All shoreline development and uses shall occur in a manner that results in no net loss of shoreline ecological functions, through the location and design of all allowed development and uses. Impacts to shoreline ecological functions from allowed development and uses shall be mitigated in the following sequence of steps listed in order of priority:

  1. Avoid the impact altogether by not taking a certain action or parts of an action;

  2. Minimize impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts;

  3. Rectify the impact by repairing, rehabilitating, or restoring the affected environment;

  4. Reduce or eliminating the impact over time by preservation and maintenance operations;

5. Compensate for the impact by replacing, enhancing, or providing substitute resources or environments; and

6. Monitor the impact and the compensation projects and taking appropriate corrective measures.

4.3 Shoreline Restoration Plan

As discussed above, one of the key objectives that the SMP must address is "no net loss of ecological shoreline functions necessary to sustain shoreline natural resources" (Ecology 2004). However, SMP updates seek not only to maintain conditions, but to improve them:

> *"…[shoreline master programs] include planning elements that when implemented, serve to improve the overall condition of habitat and resources within the shoreline area of each city and county (WAC 173-26-201(c))."*

The Guidelines state that "master programs shall include goals, policies and actions for restoration of impaired shoreline ecological functions. These master program provisions should be designed to achieve overall improvements in shoreline ecological functions over time, when compared to the status upon adoption of the master program" (WAC 173-26-201(2)(f)). Pursuant to that direction, the City has prepared a *Shoreline Restoration Plan*, which is a non-regulatory part of the SMP.

Practically, it is not always feasible for shoreline developments and redevelopments to achieve no net loss at the site scale, particularly for those developments on currently undeveloped properties or a new pier or bulkhead. The *Shoreline Restoration Plan*, therefore, can be an important component in making up that difference in ecological function that would otherwise result just from implementation of the SMP. The *Shoreline Restoration Plan* represents a long-term vision for restoration that will be implemented over time, resulting in incremental improvement over the existing conditions.

The *Shoreline Restoration Plan* identifies a number of opportunities for restoration on both public and private properties inside and outside of shoreline jurisdiction, and also identifies ongoing City programs and activities, non-governmental organization programs and activities, and other recommended actions consistent with a variety of watershed-level efforts. Several restoration actions which are identified have the potential to offer significant improvements to overall function. These include the City's Septic System Abatement Program which focuses on water quality improvements, revegetation projects on CWA properties, and incentive based restoration programs promoted by the City.

4.4 General Cumulative Impacts Assessment

The following table (Table 7) summarizes for each environment designation and corresponding waterbody the existing conditions, anticipated development, relevant SMP and other regulatory provisions, and the expected net impact on ecological function. Certain special topics are discussed and analyzed in greater detail in Chapter 5 following the table. The discussion of existing conditions is based on the *Shoreline Analysis Report*, and additional analysis needed to perform this assessment. The *Shoreline Analysis Report* includes a more in-depth discussion of the topics below, as well as information about transportation, stormwater and wastewater utilities, impervious surfaces, and historical/archaeological sites, among others.

In addition to the environment designations discussed in the following table, the Aquatic designation will apply to those applicable areas of shoreline jurisdiction which are located waterward of the ordinary high water mark. The evaluation contained within the following table includes the aquatic are within the adjoining upland designation.

Table 7. General Cumulative Impacts Assessment

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
Shoreline Residential					
Lake Tapps	Land use is primarily single family residential. The average residential setback distance is 61.8 feet. Ecological Function: Function is low because of the built conditions: a high degree of shoreline armoring, numerous overwater structures, high potential for pollutants from lawns and developed areas, and a very low degree of remaining natural vegetation. Little potential for large woody debris and organic matter recruitment exists. The lack of both living and dead vegetation greatly limits many functions, including wave attenuation, nutrient and sediment removal, bank stabilization, temperature regulation, and food production and delivery. Wetlands are depicted by a County inventory and the National Wetland Inventory along the majority of Lake Tapps shoreline; however, much of the Lake Tapps residential shoreline is developed	Future Development: The majority of parcels are built out and not likely to change use. An estimated 25 of approximately 528 parcels within shoreline jurisdiction are vacant and have the potential to develop. Presently, there is subdivision potential to create an additional 10 lots. Some redevelopment of the existing housing stock is likely to occur, but a majority of the housing stock has been built in the last few decades. Together, the expected number of new and redeveloped houses accounts for just over 15% of the total existing residential structures (see Section 5.1 below for more details on the calculation of expected development). Functions/Processes Impacted: Water Quantity: Slight changes to water quantity related to surface runoff may increase with more residential development. However, all future development would adhere to stormwater management requirements. Water Quality: Future development of residential uses may impact water quality increasing the likely application of chemicals, fertilizers and pesticides. Slight improvements in water quality may occur upon development or redevelopment in areas devoid of shoreline vegetation through vegetation standards and incentives. Vegetation and Habitat: Preservation and enhancement of vegetation in this and other areas will ensure protection of existing functions.	Policies: Management policies for the Shoreline Residential environment (Chapter 13: Shoreline Element, 2. Shoreline Environmental Designations) include: • Existing ecological functions should be protected and, where feasible, previously degraded ecological functions should be restored. • During development and redevelopment, all reasonable efforts, should be taken to restore ecological functions. • Standards should be established for buffers, shoreline stabilization measures, vegetation conservation, critical area protection, water quality, and shoreline modifications to ensure that development does not further degrade the shoreline and is consistent with the overall goal of improving ecological functions and habitat. • New residential development should be located and designed so that future shoreline stabilization is not needed. Additional management policies for residential uses (Chapter 13: Shoreline Element, 4.2 Residential) include: • New development should be required to preserve existing shoreline vegetation, control erosion and protect water quality using best management practices. • The City should provide development incentives, including reduced shoreline setbacks, to encourage the restoration of shoreline vegetation. • Adequate provisions should be made for protection of groundwater supplies, erosion control, stormwater drainage systems, aquatic and wildlife habitat, ecosystem-wide processes, and open space. Policies related to shoreline stabilization (Chapter 13: Shoreline Element, 5.2 Shoreline Stabilization) include:	Any in- or over-water proposals would require review not only by the City of Bonney Lake, but also by the Washington Department of Fish and Wildlife (WDFW), the U.S. Army Corps of Engineers (Corps), and the Washington Department of Ecology. Each of these agencies is charged with regulating and/or protecting shorelines and the waters of Lake Tapps, and would impose certain design or mitigation requirements on applicants. In compliance with the terms of the City's Phase 2 National Pollution Discharge Elimination System requirements, the City has developed a Stormwater Management Program. The Stormwater Management Program includes Best Management Practices (BMPs), and the Bonney Lake Municipal Code (Chapter 15.13 BLMC) identifies illicit discharges and avenues for enforcement. As identified in the *Shoreline Restoration Plan*, several opportunities for improvements to shoreline ecological function exist. These include: • Evaluating habitat conditions and current/potential fish use in the lake; • Restoring shoreline vegetation through incentive programs to encourage owners of developed properties to replace existing lawns with native shoreline vegetation; • Enhancing shorelines with LWD and promoting natural LWD recruitment; • Monitoring and improving water quality in the lake (such as through implementation of the Septic System Abatement Master Plan); and • Implementing projects to fill data gaps identified in the 1999 White River Basin Salmonid Habitat Limiting Factors Report.	In general, un-mitigated new development has the potential to degrade the baseline condition. However, the City's SMP provides several mechanisms to ensure the baseline condition is preserved and potential improvements are made where possible. These include requiring re-vegetation of the shoreline upon most re-development or expansion scenarios and adherence to the County's stormwater manual to control pesticide and fertilizer applications. Strict implementation of the SMP should minimize impacts. Without mitigation for potential setback reductions, the regulations should maintain the existing average setback, and vegetation conservation standards should preserve native vegetation that is currently present along the shoreline. Furthermore, if mitigation for potential setback reductions includes supplementation of native shoreline plantings and/or removal of substantial shoreline hardening, ecological function in developed residential areas could improve in the long term. Future restoration actions

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
	with lawns, bulkheads and docks, and may no longer be functioning wetland.		• Policy SL-17.1: Structural shoreline stabilization measures should only be used when a need has been demonstrated and that more natural, flexible, non-structural methods have been determined infeasible. • Policy SL-17.2: Shoreline modifications individually and cumulatively shall not result in a net loss of ecological functions. Policies related to overwater structures (Chapter 13: Shoreline Element, 4.5 Overwater Structures) include: • Policy SL-11.1: Limit and reduce the number of over water structures. • Policy SL-11.3: Design and construct new or renovated over water structures and their accessory components, such as boatlifts and canopies, to minimize impacts on native fish and wildlife and the corresponding habitat. <u>Regulations:</u> For single-family residences, duplexes, and accessory dwelling units, the proposed SMP typically requires setbacks of at least 60 feet from the OHWM (BLMC 16.40.030.D). Reductions of the 60-foot setback can occur only when paired with mitigation elements for restoration and enhancement of functions. The 60-foot building setback required under the SMP is approximately equal to the existing average residential setback of 61.8 feet along Lake Tapps within the City of Bonney Lake. Therefore, standard SMP setback provisions would roughly maintain the existing average setback distance. A detailed discussion of effects of SMP provisions related to residential setbacks is presented in Section 5.1. BLMC 16.56.060.A establishes a vegetation conservation requirement of the 20 feet landward of the OHWM for all uses, activities and developments. Native shoreline vegetation in these areas shall be preserved to the maximum extent feasible. BLMC 16.56.060.B requires that the vegetation conservation area be replanted with native vegetation as part of new residential development, when the gross floor area of an existing residential building is increased by 25% or when the alteration of an existing residential building exceeds 60% of the assessed value of the residential structure.	• Restoration of shoreline areas owned by Cascade Water Alliance completed as mitigation associated with work on the existing dike infrastructure. These actions address the ecological functions assessed in the Restoration Plan, as well as the continuation of ongoing studies, projects and other efforts on the Lake Tapps shoreline.	will likely include promoting the use of the Septic System Abatement Program and encouraging incentive based shoreline re-vegetation, Given the above potential impacts and mitigation measures, no net loss of ecological functions is expected.

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
			BLMC 16.56.070.C requires that all residential developments implement BMPs identified in the Pierce County Stormwater Manual Volume IV Chapter 3 prevent pesticides and fertilizers from entering Lake Tapps. The regulations contained within BLMC 16.54.020 will considerably reduce the potential for new hard shoreline stabilization, and will likely result in conversions of existing hard structural stabilization to soft structural stabilization over time. A detailed discussion of effects of SMP provisions related to new and replacement shoreline stabilization is presented in Section 5.2. The pier and dock regulations in BLMC 16.40.030 contain strict dimensional and materials standards. Additionally, they contain a requirement that single-family residences with multiple docks must remove a dock before one can be repaired or replaced (BLMC 16.40.030.L.5). A detailed discussion of the effects of SMP provisions related to residential overwater structures is presented in Section 5.3.		
Shoreline Multifamily					
Lake Tapps	This area is designated for high-density residential development. The area available for development is located landward of an existing major roadway which was constructed as close as 20 feet of the OHWM. Ecological Function: This area is currently in a highly disturbed condition as it transitions between land uses.	Future Development: Future development of this area is expected to be high-density residential, consistent with zoning (High Density Residential, R-3). The required Shoreline Conditional Use Permit and requested Shoreline Variance for a 92-unit apartment complex on 4.82 acres was approved by the Bonney Lake Hearing Examiner in May of 2013. This proposed development was reviewed under the 1975 SMP and is vested for 5 years from the date that the permits are approved by the Department of Ecology. The proposal also includes construction of a private dock with multiple boat slips for the residents. Functions/Processes Impacted:	Policies: SMP policies for the Shoreline Multifamily environment (Chapter 13: Shoreline Element, 2. Shoreline Environmental Designations) include: • Existing ecological functions should be protected and, where feasible, previously degraded ecological functions should be restored. • During development and redevelopment, all reasonable efforts should be taken to restore ecological functions. • Standards should be established for buffers, shoreline stabilization measures, vegetation conservation, critical area protection, water quality, and shoreline modifications to ensure that development does not further degrade the shoreline and is consistent with the overall goal of improving ecological functions and habitat.	Any in- or over-water proposals would require review not only by the City of Bonney Lake, but also by the Washington Department of Fish and Wildlife (WDFW), the U.S. Army Corps of Engineers (Corps), and the Washington Department of Ecology. Each of these agencies is charged with regulating and/or protecting shorelines and the waters of Lake Tapps, and would impose certain design or mitigation requirements on applicants. In compliance with the terms of the City's Phase 2 National Pollution Discharge Elimination System requirements, the City has developed a Stormwater Management Program. The Stormwater Management Program includes Best Management Practices (BMPs), and the Bonney Lake Municipal Code (BLMC 15.13) identifies illicit discharges and avenues for enforcement. As identified in the *Shoreline Restoration Plan*, several opportunities for improvements to shoreline ecological function exist. These include:	This area is currently highly disturbed. An increased setback for multifamily development of 75 feet, compliance with stormwater management requirements, and the preservation of existing vegetation through the vegetation conservation standards should ensure no net loss of ecological functions.

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
		Water Quantity: Impervious surface area is expected to increase. However, all future development would adhere to stormwater management requirements. Water Quality: New development constructed in accordance with stormwater management should maintain, and perhaps improve, water quality. Vegetation and Habitat: New development is likely to transform much of the existing disturbed areas into impervious surfaces. Preservation of vegetation in the landward 20 feet of the OHWM will ensure protection of existing functions.	• New residential development should be located and designed so that future shoreline stabilization is not needed. <u>Policies related to shoreline stabilization (Chapter 13: Shoreline Element, 5.2 Shoreline Stabilization) include:</u> • <u>Policy SL-17.1: Structural shoreline stabilization measures should only be used when a need has been demonstrated and that more natural, flexible, non-structural methods have been determined infeasible.</u> • <u>Policy SL-17.2: Shoreline modifications individually and cumulatively shall not result in a net loss of ecological functions. Policies related to overwater structures (Chapter 13: Shoreline Element, 4.5 Overwater Structures) include:</u> • <u>Policy SL-11.1: Limit and reduce the number of over water structures.</u> • <u>Policy SL-11.3: Design and construct new or renovated over water structures and their accessory components, such as boatlifts and canopies, to minimize impacts on native fish and wildlife and the corresponding habitat.</u> <u>Regulations:</u> SMP regulations for the Shoreline Multifamily environment include the requirement that structure shall be set back a minimum of 75 feet from the OHWM and garages and pavements for motorized vehicles (driveways and parking areas) shall be set back at least 100 feet (16.42.030(D.)). BLMC 16.56.060.A establishes a vegetation conservation requirement of the 20 feet landward of the OHWM for all uses, activities and developments. Native shoreline vegetation in these areas shall be preserved to the maximum extent feasible. BLMC 16.54.030.C requires In the following circumstances, a use pier or dock shall be require on lots subdivided to create one (1) or more additional lots with waterfront access rights or for new residential development of two (2) or more dwelling units located on the same lot with waterfront access rights.	• Evaluating habitat conditions and current/potential fish use in the lake; • Restoring shoreline vegetation; • Enhancing shorelines with LWD and promoting natural LWD recruitment; • Monitoring and improving water quality in the lake; and • Implementing projects to fill data gaps identified in the 1999 White River Basin Salmonid Habitat Limiting Factors Report. These actions address the ecological functions assessed in the Restoration Plan, as well as the continuation of ongoing studies, projects and other efforts on the Lake Tapps shoreline. These actions address the ecological functions assessed in the Restoration Plan, as well as the continuation of ongoing studies, projects and other efforts on the Lake Tapps shoreline.	

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
			BLMC 16.56.060.B requires that the vegetation conservation area be replanted with native vegetation as part of new residential development, when the gross floor area of an existing residential building is increased by 25% or when the alteration of an existing residential building exceeds 60% of the assessed value of the residential structure.BLMC 16.56.070.B requires that all residential developments implement low impact development techniques identified in the Pierce County Stormwater Manual Volume VI to the extent feasible.		
Park					
Lake Tapps	The Park designation includes the public Allan Yorke Park, the privately owned Church Lake Park and Inlet Island Park, as well as a portion of the Emerald Hills Elementary property. Existing conditions include the following: Allan Yorke Park: The entire shoreline is armored. The park is bisected by a highway. Facilities waterward of the highway include a public boat launch, a fishing pier, and swimming areas. On the landward side of the highway, there are restrooms, ball fields, a skateboard park, tennis courts and a parking lot. Church Lake Park: Facilities include a basketball court, picnic areas, a boat launch, a	Future Development: There is little likelihood of future changes to these shoreline areas. Functions/Processes Impacted: Water Quantity: With little to no expansion of impervious surface coverage planned, no significant change to water quantity is expected. All future development would adhere to stormwater management requirements. Water Quality: Future development of park uses may impact water quality by decreasing vegetative cover and increasing the likely application of chemicals, fertilizers and pesticides. Vegetation and Habitat: Future redevelopment and/or restoration activities at the various parks are likely to result in improved vegetation and habitat conditions through the addition of native plantings.	Policies: SMP policies for the "Park" environment (Chapter 13: Shoreline Element, 2. Shoreline Environmental Designations) include: • During development and redevelopment, all reasonable efforts should be taken to restore ecological functions. • Standards should be established for shoreline stabilization measures, vegetation conservation, water quality, and shoreline modifications within this designation to ensure that new development does not further degrade the shoreline and is consistent with the overall goal of improving ecological functions and habitat. Additional policies for residential uses (Chapter 13: Shoreline Element, 4.3 Recreation) include: • Policy SL-9.5: Ensure that existing and new recreation uses do not adversely impact shoreline ecological functions. Regulations: BLMC 16.40.330 requires that water-enjoyment uses be set back a minimum of 20 feet from the OHWM and that nonwater-oriented uses be set back a minimum of 100 feet. BLMC 16.56.060.A establishes a vegetation conservation requirement of the 20 feet landward of the OHWM for all uses, activities and developments. Native shoreline vegetation in these areas shall be preserved to the maximum extent feasible. BLMC 16.56.060.D stipulates that snags and living	Any in- or over-water proposals would require review not only by the City of Bonney Lake, but also by the Washington Department of Fish and Wildlife (WDFW). A project that includes in-water fill would require review and permitting from the U.S. Army Corps of Engineers (Corps), and the Washington Department of Ecology. Each of these agencies is charged with regulating and/or protecting shorelines and the waters of Lake Tapps, and would impose certain design or mitigation requirements on applicants. In compliance with the terms of the City's Phase 2 National Pollution Discharge Elimination System requirements, the City has developed a Stormwater Management Program. The Stormwater Management Program includes Best management Practices (BMPs), and the Bonney Lake Municipal Code (BLMC 15.13) provides regulations pertaining to stormwater management. As identified in the *Shoreline Restoration Plan*, several opportunities for improvements to shoreline ecological function exist. These include: • Evaluating habitat conditions and current/potential fish use in the lake; • Restoring shoreline vegetation; • Enhancing shorelines with LWD and promoting natural LWD recruitment; • Implementing projects to fill data gaps identified in the 1999 White River Basin Salmonid Habitat	SMP provisions, including setbacks and vegetation conservation standards, ensure that environmental conditions will not be degraded relative to existing baseline over the long term. Given strict adherence to the SMP policies and regulations, no net loss of ecological functions is expected as no detrimental or un-mitigated alterations to the existing conditions are likely to occur along the Park designated shorelines.

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
	dock, and a parking lot. Inlet Island Park: Facilities include a volleyball court, playground, buildings, a boat launch, two docks, an enclosed swimming area, and a parking lot. Emerald Hills Elementary: Facilities include ball fields separated from Lake Tapps by developed roadways. <u>Ecological Function</u>: Function is low, due to high development that includes impervious surface and maintained lawn. Potential for contaminated runoff is high, and little natural vegetation exists to perform water quality improvement, water storage, or habitat functions. A lack of woody debris and organic materials further limits habitat function, as well as the normal functions of vegetation.		trees over 4.5 inch DBH shall not be removed within the vegetative conservation area unless they are hazard or nuisance trees or their removal is part of an approved development that includes mitigation for impacts to ecological functions. Critical areas in shoreline jurisdiction are regulated by the City's Critical Areas Regulations, codified under Title 16 BLMC, and incorporated in the SMP. The City's Critical Areas Regulations (BLMC Title 16) apply wetland buffers ranging from 25 to 300 feet depending on wetland rating and land use. If provisions of the Critical Areas Regulations and other parts of the SMP conflict, the provisions most protective of the ecological resource shall apply	Limiting Factors Report. These actions address the ecological functions assessed in the Restoration Plan, as well as the continuation of ongoing studies, projects and other efforts on the Lake Tapps shoreline.	
Lake Tapps-Printz Basin Flume	The Printz Basin Flume area is owned by the Cascade Water Alliance and Puget Sound Energy. The diversion flume carries water through a man-made channel. Streambank forest vegetation remains intact along much of	<u>Future Development: No future development is anticipated. The only anticipated activity would be restoration.</u> <u>Functions/Processes Impacted: No adverse impacts to function/processes are anticipated in the future. Habitat enhancement may occur at some point in the future.</u>			

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
	the channel in the City. The area of Printz Basin within shoreline jurisdiction is designated Single-Family Residential and is zoned R-1 Single Family residential, but is undeveloped and vegetated. Ecological Function: Function of the unit is moderate. Although function is limited by the channelized nature of the man-made flume itself, vegetation bordering the flume provides large woody debris, shade, living space for wildlife, and food production and delivery support for wildlife, as well as a moderate level of hydrologic and hyporheic function.				
Natural					
Fennel Creek	Parcel is owned by the City. One of the City's four wells is located in this parcel. Vegetation is intact in a mixed forested community with a narrow floodplain and riparian wetland areas. Ecological Function: Overall function is moderate/high. Habitat function is high because of dense native forest in the unit. The stream channel is	Future Development: No major future development is anticipated. Trail development would likely occur within the City-owned parcel to connect Allan Yorke Park to Victor Falls. The only anticipated activity beyond trail creation would be restoration. Functions/Processes Impacted: No adverse impacts to function/processes are anticipated in the future. Habitat enhancement may occur at some point in the future.	Policies: SMP policies for the Natural environment (Chapter 13: Shoreline Element, 2. Shoreline Environmental Designations) include: • Uses that would substantially degrade the ecological functions or be detrimental to the visual quality of the natural character should be prohibited. • Physical alterations should only be considered when they serve to protect or enhance a significant, unique, or highly valued feature that might otherwise be degraded or for public access where no significant ecological impacts would occur. Regulations: Critical areas in shoreline jurisdiction are regulated by the City's Critical Areas Regulations, codified under Title 16 BLMC, and incorporated in the SMP. The City's Critical Areas	While areas designated as Natural shoreline environments typically have properly functioning shoreline conditions that provide a variety of ecological functions, portions of these shoreline areas may also be in need of improvements. While no specific restoration opportunities are identified in the *Shoreline Restoration Plan*, preservation of the shoreline areas in their present state, through the City's SMP and critical areas regulations, should ensure adequate protection.	No net loss of ecological functions is expected as no detrimental alterations to the existing conditions in this environment are likely to occur.

Waterbody	Existing Conditions	Likely Development / Functions or Processes Potentially Impacted	Effect of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
	relatively undisturbed. However, the shoreline soils are susceptible to erosion and development in upper basin has likely altered flow regime. These characteristics temper sediment transport and nutrient/toxin removal function somewhat.		Regulations (BLMC Title 16) apply wetland buffers ranging from 25 to 300 feet depending on wetland rating and land use. If provisions of the Critical Areas Regulations and other parts of the SMP conflict, the provisions most protective of the ecological resource shall apply.		

5 DEVELOPMENT IMPLICATIONS

Sections 5.1 through 5.3 will expand on several key areas of functions and impacts associated with new development and redevelopment within the Shoreline Residential environment designation on Lake Tapps. Section 5.4 will discuss some unique other development activities associated with Lake Tapps.

In order to understand the changes that are likely to occur over the next 20 years, the City examined the changes that have been permitted within its shoreline jurisdiction over nine years (2002 – 2011) in addition to the capacity analysis provided in Table 5. Understanding the permit history allows for some assumptions to be made regarding future potential impacts to shoreline function.

Based on the buildable lands analysis for new development, 41 new residences, not including redevelopment of existing mobile homes, could be expected in the next 20 years. However, only 19 lots are currently vacant within the shoreline area, the balance being created through subdivision. This analysis indicates that demand for new development within the shoreline jurisdiction will outnumber the supply of vacant parcels, suggesting that demand for redeveloped houses might be greater in the future. Over the past nine years, property redevelopment permits were issued at an average rate of 1.5 per year. At that rate, we could anticipate 31 redevelopment projects in the next 20 years (Table 8); total redevelopment will likely increase above that rate as the supply of vacant lots dwindles. Together, the expected number of new and redeveloped houses account for over 15 percent of the total existing residential structures (Table 8).

Table 8. Expected residential development based on annual permit data from 2002-2011 and available lots

	Annual change (based on 2002-2011 permits)	Total expected change[2]	% change in 20 years
New residences	3.3/yr	35	9%
Replacement of residences	1.5/yr	31	6.7%
Residential expansion[1]	5.1/yr	102	22%

[1] *Includes garages and accessory dwelling units.*

[2] *The number of vacant lots limits the number of new shoreline residential developments; previous demand for new development could be transferred*

into a higher rate of redevelopment, but that is not factored into these figures.

5.1 Residential Setbacks on Lake Tapps

Land use in the proposed Shoreline Residential environment will continue to remain predominantly single-family residential over the next 20 years, though some residentially zoned lands may be acquired for public open space.

Typically, the development of vacant lots into residential uses would result in replacement of pervious, vegetated areas with impervious surfaces and a landscape management regime that often includes chemical treatments of lawn and landscaping. These actions can have multiple effects on shoreline ecological functions, including:

- Reduction in the ability of a site to improve the quality of water passing through the untreated vegetation and healthy soils.
- Potential contamination of surface water from chemical and nutrient applications.
- Increase in surface water runoff due to reduced infiltration area and increased impervious surfaces, which can lead to excessive soil erosion and subsequent in-water sediment deposition.
- Elimination of upland habitat occupied by wildlife that use riparian areas.

For single-family residences, duplexes, and accessory dwelling units, the proposed SMP requires setbacks of at least 60 feet from the ordinary high water mark (OHWM) (BLMC 16.40.030.D). Garages and pavement for motorized vehicles must be set back at least 70 feet from the OHWM (BLMC 16.40.030.F). Uncovered patios or decks may extend into the setback a maximum of 10 feet (BLMC 16.56.100.A.5).

The 60-foot building setback required under the SMP is approximately equal to the existing average residential setback of 61.8 feet along Lake Tapps within the City of Bonney Lake (City of Bonney Lake). Therefore, standard SMP setback provisions would roughly maintain the existing average setback distance.

While the amount of space between the shoreline and a structure provides an excellent, quick evaluation of shoreline condition for most urban residential shorelines, the condition of nearshore environments (including the extent of native vegetation, amount of impervious surfaces, and extent of chemical usage on lawns and landscaping) is a more precise indicator of shoreline health. Shoreline setbacks, in conjunction with impervious surface cover restrictions and

revegetation standards, provide a means to minimize potential degradation of shoreline ecological functions in developed areas and mitigate impacts. The proposed SMP includes provisions to require new residential development to adhere to the Pierce County stormwater manual BMPs which limit pesticide and fertilizer applications (BLMC 16.56.070.C).

Impervious surfaces currently cover 39.9 percent of the proposed Shoreline Residential environment (note that while the *Shoreline Analysis Report* previously reported that the Lake Tapps – Residential assessment unit had impervious surface coverage of 33 percent, the new 39.9 percent figure is based on more accurate data from Pierce County's 2008 planimetric data). For residential development, the existing SMP limits the extent of impervious surfaces (including parking areas but excluding driveways) to less than 33-1/3 percent of the total lot area above OHWM. Therefore, the existing impervious surface level of nearly 40 percent likely accounts for the additional impervious surfaces typical of driveways. Future development of vacant parcels (19 parcels) and new parcels created through subdivision (20 parcels) will add impervious surfaces to presently undeveloped or underdeveloped lands, which could affect water quantity through an increase in runoff which would have negligible effects on Lake Tapps and water quality. The water quality of runoff from new development should be managed per State guidelines as all future development would need to adhere to stormwater management requirements. For these reasons, an increase in impervious surface limits up to 40 percent, including driveways, in the Shoreline Residential environment would not likely result in significant impacts to shoreline functions.

The proposed SMP provides an option to reduce structural setback standards by planting native vegetation adjacent to the shoreline. This option allows for a total maximum primary structure setback reduction of 20 feet, with a 5-foot reduction for every 300 square feet of native shoreline vegetation provided.

The proposed SMP also provides an option to construct a small deck near the shoreline if no bulkhead exists or if a bulkhead is removed and additional shoreline vegetation is planted. To do so, the following provisions must also be met:

- The deck covers less than 25 percent of the shoreline, and native vegetation covers a minimum of 75 percent of the shoreline;
- For every 1 square foot of deck , 3 square feet of vegetation is provided;
- The total area of the waterfront deck or patio along the shoreline shall not exceed 150 square feet; and
- The deck is setback at least 5 feet from OHWM.

If any of the above two options are requested, a revegetation plan must be prepared that includes a mix of native trees, shrubs, and groundcover, and limits the use of fertilizers, pesticides, and herbicides. Monitoring and maintenance plans are also required.

The proposed SMP establishes a vegetated conservation requirement of the 20 feet landward of the OHWM for all uses, activities and developments (16.56.060.A). Up to 25 percent of the required vegetation conservation area may be cleared or thinned for view maintenance and waterfront access, provided the remaining 75 percent remains vegetated. Revegetation of the vegetation conservation area is required during new residential development, including replacement of existing structures, increase of gross floor area by greater than 25 percent, and an alteration to the existing building by greater than 60 percent of the assessed value (BLMC 16.56.060.B)Given the present lack of native shoreline vegetation, the two setback options and the vegetation conservation requirement are likely to enhance natural shoreline vegetative functions over time.

Table 8 indicates that demand for new housing development along the shoreline is expected to be higher than the availability of vacant lots; therefore, residential subdivision of existing developed parcels is anticipated to create 20 new parcels. The SMP specifies that the creation of new residential lots is prohibited unless the applicant demonstrates that development in each created lot can meet all of the provisions of the SMP. This provision helps ensure that development on subdivided lots will meet the minimum protective requirements set forth in the SMP.

Relative to the existing conditions in the Shoreline Residential environment along the Lake Tapps shoreline, the implementation of typical 60-foot setbacks with clear vegetation conservation standards and incentives to improve shoreline vegetation is likely to result in an improvement of ecological functions over time. Allowances to reduce the shoreline buffer incrementally based on improvements to shoreline function provided through a series of incentives would be expected to improve the ecological function of the immediate nearshore waterward of the ordinary high water mark. Incentives which emphasize low impact development techniques, planting of native vegetation, and limitations on the use of fertilizer, herbicides, and pesticides all have the effect of cumulative improvement in the water quality of Lake Tapps over time. In summary, structural setbacks, vegetation conservation standards, impervious surface standards, and regulatory incentives to reduce shoreline armoring and enhance native vegetation along the shoreline are expected to result in no net loss of shoreline ecosystem conditions.

5.2 Shoreline Stabilization

New shoreline armoring typically has the following effects on ecological functions:

- Reduction in nearshore habitat quality for both aquatic and terrestrial species. Specifically, shoreline complexity and native emergent vegetation that provide forage and cover may be reduced or eliminated. Elimination of shallow-water habitat may also increase vulnerability of juvenile salmonids to aquatic predators

- Reduction of natural sediment recruitment from the shoreline. This recruitment is necessary to replenish substrate and preserve shallow water conditions.

- Increase in wave energy at the shoreline if shallow water is eliminated, resulting in increased nearshore turbulence that can be disruptive to aquatic resources.

Based on an evaluation of the City's GIS data, approximately 90 percent of the shoreline in the Lake Tapps – Residential assessment unit and 41 percent of the Lake Tapps – Parks Facilities assessment unit along the Lake Tapps shoreline currently contain shoreline armoring. Under the SMP (Chapter 13, Section 5.2; BLMC 16.54.020), new shoreline stabilization is only allowed to protect new or existing primary structures from erosion damage caused by natural processes, as demonstrated through a geotechnical report by a licensed geotechnical engineer or related licensed professional. Furthermore, where feasible, new structures are to be located and designed to eliminate the need for shoreline stabilization. In cases where new or expanded stabilization is required to protect primary structures, applicants must first consider "soft" stabilization alternatives, and in all cases the size of stabilization must be the minimum necessary.

In most cases, replacement or repaired stabilization must be placed no farther waterward of OHWM, although in limited cases repaired or replacement bulkheads may be located immediately waterward of an existing bulkhead.

Independent of regulations by other regulatory agencies, the proposed SMP limits any new or expanded shoreline stabilization and mitigates for likely impacts. Given the present heavily armored state of the shoreline, demand for new stabilization is expected to be relatively low. Over the 9 years of reviewed permit history, the City received bulkhead installation/ replacement/ repair permit applications at a rate of 1.9 per year, leading to an anticipated 38 bulkhead projects (roughly 10 percent of existing parcels with bulkheads) over the next 20 years. The SMP regulations pertaining to new or expanded stabilization will mitigate negative impacts on the shoreline by requiring

landowners to 1) document need for shoreline stabilization, 2) explore the use of soft-armoring techniques first, and 3) potentially develop a vegetation conservation plan. Since new bulkheads are only allowed where they are critical to protect a primary structure, and since bulkheads already cover the vast majority of the residential shoreline, it is expected that most bulkhead projects will be either replacement or repair projects. Generally, repair and replacement of existing bulkheads are likely to result in a small loss of existing shoreline function by continued degradation of shoreline substrates (i.e. lack of sediment recruitment potential from upland areas and reduced shallow water substrates at the immediate nearshore). Utilizing soft-stabilization techniques is one mechanism to off-set continued degradation of shoreline armoring.

The Army Corps of Engineers and WDFW also have jurisdiction over new shoreline stabilization projects, and repairs or modifications to existing shoreline stabilization. As part of their efforts to minimize and compensate for shoreline stabilization-related impacts, both agencies encourage implementation of native shoreline enhancement plantings for new shoreline stabilization projects. Further, they also strongly promote shoreline restoration and additional impact compensation measures for many shoreline armoring modification projects, including placement of gravel at the toe of the armoring to create shallow-water environments, angling the armored face landward to reduce wave turbulence, and shifting the armoring as far landward as feasible.

Over time, the combined effects of the City's existing SMP and permit approvals from the WDFW and the Corps will likely result in little to no change in the total amount of hardened shoreline. Furthermore, SMP regulations require new or expanded stabilization to avoid, minimize, and mitigate potential impacts. Overall, the SMP is expected to limit the impacts of shoreline stabilization to maintain existing shoreline functions.

5.3 Overwater Structures

Overwater structures encompass a variety of uses, from in-water structures, such as fixed-pile piers, floating docks and platforms, to moorage covers, such as canopies and boathouses. Piers and docks can adversely affect ecological functions and habitat in the following ways:

- Reduced vegetation coverage along the shoreline where overwater structures meet the shore.
- Altered patterns of light transmission to the water column, affecting macrophyte growth and altering habitat for and behavior of aquatic organisms.

- Interference with long-shore movement of sediments, altering substrate composition and development.

- Contribution to contamination of surface water from chemical treatments of structural materials.

The *Shoreline Analysis Report* for Bonney Lake (TWC and Makers 2011) identified total of 516 piers, docks, and other structures and 83 boat canopies within the Lake Tapps – Residential assessment unit. Of the 465 existing lots in this assessment unit, only five lots did not have associated overwater structures. Between 2002 and 2009, the City issued an average of 1.9 permits per year for dock addition, replacement, or repair. At that rate, 38 overwater structures would be affected by SMP permitting requirements in the next 20 years.

Provisions for new overwater structures in the SMP (BLMC 16.54.030) set a limit of one dock per single family residence and require joint-use docks for multi-family or subdivided waterfront lots. The SMP also sets a total area standard of 360 square feet for a non-shared dock. Any ells, fingers, or floats must be positioned beyond 30 feet from shore, and all new docks must be fully grated within 30 feet of the OHWM.

The ecological effects of overwater structures generally are most significant in the following two areas:

1. At the immediate shoreline, where shoreline vegetation functions to filter runoff and provide shoreline habitat structure; and

2. In the shallow areas of the lake, where light transmission is sufficient to allow for macrophytic growth and where most sediment movement occurs.

The proposed SMP limits the width of new docks to 6 feet within the first 30 feet from shore; this eliminates the potential for new wide docks, or large overwater decks running parallel to shore. Grated decking is also required within the first 30 feet of new docks to allow for light transmission. When wide structures occur along the shoreline, they tend to degrade shoreline functions since vegetation is generally cleared along the shoreline to accommodate access to overwater structures. In this case, narrow piers or docks extending perpendicular from shore tend to result in less vegetative clearing along the shoreline.

The proposed SMP also establishes standards for replacement and repaired docks. These standards will have several benefits to existing shoreline conditions. All replacement docks and repaired docks with widths greater than 6 feet require the use of grated decking in the area where the work is performed.

Additions to dock area may be made only under specific conditions, one of which is that total over-water coverage is reduced.

Additionally, the City has included an incentive to allow for larger docks, up to an additional 120 square feet, if shoreline vegetation is installed at a rate of 300 square feet of vegetation for every additional 30 square feet of dock coverage (BLMC 16.56.040.D).

Presently, the total number of docks on Lake Tapps outnumbers the number of residential parcels, meaning that many parcels have more than one dock. The proposed SMP specifies that if a property has more than one dock, and one dock requires repair (in which less than 50 percent of pilings are replaced or more than 50 percent of the decking is replaced) or replacement, the other dock must be removed as a condition. This regulation provides a mechanism to reduce total overwater coverage, as well as the length of cleared shoreline frontage to accommodate multiple docks.

Independent of other regulations, the SMP regulations on residential overwater structures are likely to ensure no further loss of shoreline functions. In addition to SMP requirements, the Washington Department of Fish and Wildlife (WDFW) typically requires minimization of dock size, especially in the nearshore area. However, WDFW will, on a case-by-case basis, consider replacement docks at the same size as the original pier if it can be thoroughly shown that the applicant has demonstrated a need for the pier and that proper mitigation sequencing has been followed (avoidance, minimization, and mitigation). Grated decking is a mitigating factor that WDFW encourages. Any new or replacement pier would require a Hydraulic Project Approval (HPA) from WDFW.

Based partially on trends and assumptions within the City of Bonney Lake's portion of the Lake Tapps shoreline, this analysis assumes that the 5 residential lots on Lake Tapps without piers will add piers within the next 20 years, and another 33 overwater structures will be repaired or replaced in that time. The SMP provides regulations specific to new, replacement, expanded, and repaired overwater structures. These standards will minimize the effects of overwater structures, primarily by limiting width along the shoreline and reducing overwater cover through the use of grated decking. In the case of properties with multiple docks where one dock is in need of repair or replacement, the SMP provisions should actually reduce the total number of structures around the lake. Based on overwater structure provisions in the SMP, no net loss of shoreline function is anticipated.

5.4 Other Development Activities

A common activity that will continue to occur in Lake Tapps is milfoil management. Other activities that may occur include those typically associated with dikes, as well as dredging.

Dense growth of milfoil in Lake Tapps limits recreation, navigation, disrupts natural water flow and impacts water quality. In order to address the milfoil, the Cascade Water Alliance (CWA), with support from an Ecology grant, in 2010 developed the *Lake Tapps Integrated Aquatic Vegetation Management Plan,* which calls for a combination of hand-pulling, spot herbicides applications, twice annual monitoring, mapping, and winter drawdown as part of a long-term strategy for the eradication of milfoil.

BLMC 16.56.060G addresses aquatic weed control. It indicates that the control of aquatic weeds by hand pulling, mechanical harvesting, or placement of aqua screens are the preferred methods, and that if large quantities of plant material are generated by control measures that they must be collected and disposed of in an appropriate upland location. Additionally, this regulation states that only Ecology-approved herbicides may be used and that they must be applied by a licensed professional. This regulation along with the implementation of the *Lake Tapps Integrated Aquatic Vegetation Management Plan*, along with the review and conditioning of aquatic vegetation removal permits by agencies with authority, should at a minimum result in no net loss of ecological functions, and potentially result in long-term improvement in ecological functions.

Fifteen dikes were built in the early 1900s to create Lake Tapps. CWA is now responsible for the safe condition of these dikes. CWA owns one dike in the City's shoreline jurisdiction, Dike 13. Cascade Water Alliance and the City of Bonney Lake have complete the construction of a new park area on this Dike. In the event that a new dike or levee was proposed, the proponent would need to demonstrate that impacts on ecological functions and priority species and habitats can be successfully mitigated so as to assure no net loss, among other factors (BLMC 16.54.070B). Any dike or repair must comply with the mitigation sequencing requirement in BLMC 16.56.020.

Regarding dredging, as enunciated in Policy SL-20.1, the SMP discourages dredging operations, including the disposal of dredge materials. BLMC 16.54.060 implements this policy. Under this regulation, dredging may be allowed only when significant ecological impacts are minimized, when mitigation is provided, and when the dredging is proposed for the purpose of establishing, expanding, relocating, or reconfiguring navigation channels and basins where necessary for assuring safe and efficient accommodation of existing navigational uses, or for navigational and recreational access; as part of an approved habitat improvement project; or to clean up contaminated sediments.

When dredging is allowed, the dredging shall be the minimum necessary to accommodate the proposed use and must be carefully scheduled to protect ecological function (e.g., spawning, benthic productivity, etc.).

In summary, the SMP includes provisions to deal with other development activities that are expected to occur or may occur on Lake Tapps. These provisions, along with other regulatory and non-regulatory measures, should ensure no net loss of ecological function will result from these activities.

6 NET EFFECT ON ECOLOGICAL FUNCTION

As described above in Sections 4 and 5, on its own, the proposed SMP, which includes the *Shoreline Restoration Plan*, is expected to protect and improve shorelines within the City of Bonney Lake while accommodating the reasonably foreseeable future shoreline development, resulting in no net loss of shoreline ecological functions. State and federal regulations, acting in concert with this SMP, will provide further assurances of improved shoreline ecological functions over time.

As discussed above, major elements of the SMP that ensure no net loss of ecological functions fall into generally five categories: 1) environment designations (Chapter 13, Section 2; BLMC 16.38-16.48), 2) general provisions (Chapter 13, Section 3; BLMC 16.56), 3) shoreline modification provisions (Chapter 13, Section 5; BLMC 16.50 & 16.54), 4) shoreline use provisions (Chapter 13, Section 4; BLMC 16.50 & 16.52), and
5) the *Shoreline Restoration Plan*.

<u>Environment designations</u>: The *Shoreline Analysis Report* provided the information necessary to assign environment designations for the City's shorelines. Shoreline uses and modifications were then individually determined to be either permitted (as substantial developments or conditional uses) or prohibited in each environment designation. The City's environment designations show a pattern of allowing higher-impacting uses and modifications in the more altered shoreline environments (Shoreline Multifamily and Shoreline Residential), and allowing more limited uses and modifications in the less developed environments (Parks and Natural).

<u>General provisions</u>: The SMP, principally in BLMC 16.56, contains a number of provisions on a variety of topics that contribute to protection and restoration of ecological functions, including a requirement for mitigation sequencing.

Shoreline modification provisions: The BLMC contains a number of regulations on a variety of topics that contribute to protection and restoration of ecological functions, including BLMC 16.54.030 (Piers and Docks), BLMC 16.54.080 (Shoreline Restoration and Ecological Enhancement), and BLMC 16.54.020 (Shoreline Stabilization). All of these shoreline modification regulations emphasize minimization of size of structures and use of designs that do not degrade and may even enhance shoreline functions.

Shoreline use provisions: Regulations in BLMC 16.50 and 16.52 focus on exclusion of uses that are incompatible with the existing land use and ecological conditions, and emphasize appropriate location and design of the various uses. Regulations also emphasize avoidance and minimization of ecological impacts via appropriate setbacks, protection and enhancement of vegetation, reduction of impervious surfaces, and use of innovative designs (such as LID techniques) that do not degrade and may even enhance shoreline functions. These factors are balanced with uses that are essential to the City's waterfront use and development. While allowing water-dependent uses and developments to continue along the shoreline, the proposed SMP emphasizes protection and enhancement of shoreline resources such that no net loss of ecological functions will be achieved over time.

Shoreline Restoration Plan: The City follows a set of restoration goals and policies set forth in the Comprehensive Plan: Natural Environment element. The general goals are to protect all critical areas; providing long-term protection for non-critical-area habitat is also a goal. Both regulatory and non-regulatory approaches are supported in the Comprehensive Plan. A number of restoration projects and programs already in place are outlined in the *Shoreline Restoration Plan*. Specific opportunities and/or implementation strategies for restoration on both public and private properties inside and outside of shoreline jurisdiction are proposed by various groups; these efforts are summarized in the *Shoreline Restoration Plan* and include Pierce County Public Works, Pierce County Conservation District, Puget Sound Partnership, as well as ongoing City programs and activities. All of these programs and organizations share restoration goals of protecting and restoring ecological function and value within the watershed.

Summary: Following are some key features identified in the proposed SMP and this evaluation which protect and enhance shoreline ecological functions.

- Residential development setbacks and impervious surface standards are sufficient to maintain existing conditions.

- Only five new residential piers/docks are anticipated. Repair and reconstruction of existing structures is the most anticipated pier/dock

development activity and the SMP includes mechanisms to reduce overall impacts. The SMP also includes a provision to reduce the occurrence of multiple docks on a single property.

- Clear dimensional standards for overwater structures, combined with shoreline vegetation standards will limit the impact of docks on shoreline vegetation.
- Development incentives encourage the reduction of hard shorelines and revegetation.
- A requirement to investigate soft-armoring techniques prior to the implementation of hard shoreline stabilization.
- Emphasis on achieving no net loss of shoreline ecological functions throughout shoreline jurisdiction, including development of water-dependent uses.

Given the above provisions of the SMP, including the *Shoreline Restoration Plan* and the key features listed above, implementation of the proposed SMP is anticipated to achieve no net loss of ecological functions in the City of Bonney Lake's shorelines.