CITY OF
BAINBRIDGE ISLAND

STUDY SESSION

TUESDAY, MAY 3, 2016

LOCATION: BAINBRIDGE ISLAND CITY HALL
280 MADISON AVENUE N., BAINBRIDGE ISLAND, WASHINGTON

AGENDA
(TIMES LISTED ON THE AGENDA ARE APPROXIMATE)

1. CALL TO ORDER / ROLL CALL

7:00 PM

Mayor:	Val Tollefson	
Deputy Mayor:	Sarah Blossom	
Councilmembers:	Kol Medina	Michael Scott
	Ron Peltier	Roger Townsend
	Wayne Roth	

2. ACCEPTANCE OR MODIFICATION OF AGENDA / CONFLICT OF INTEREST DISCLOSURE

3. PUBLIC COMMENT ON AGENDA ITEMS

7:05 PM

4. CITY COUNCIL DISCUSSION

A. 7:15 PM Water System Plan Presentation (Consultant) and Utility Advisory Committee Recommendations, AB 13-002 - Public Works (Pg. 2)

B. 7:45 PM Comprehensive Plan Update – Review and Status, AB 15-018 - Planning (Pg. 10)

5. FOR THE GOOD OF THE ORDER

6. ADJOURNMENT

9:45 PM

City of Bainbridge Island
City Council Agenda Bill

CITY OF BAINBRIDGE ISLAND

PROCESS INFORMATION	
Subject: 7:15 PM Water System Plan Presentation (Consultant) and Utility Advisory Committee Recommendations, AB 13-002 - Public Works (Pg. 2)	Date: 5/3/2016
Agenda Item: COUNCIL DISCUSSION	Bill No.: 13-002
Proposed By: Public Works Director Barry Loveless	Referrals(s):

BUDGET INFORMATION		
Department: Public Works	Fund:	
Expenditure Req: N/A	Budgeted?	Budget Amend. Req?

REFERRALS/REVIEW		
:	Recommendation:	
City Manager: Yes	Legal: N/A	Finance: N/A

DESCRIPTION/BACKGROUND

Action Item:
Alena Bennett with Carollo Engineering, Inc. and City staff to present to City Council the Water System Plan update and to hear the Utility Advisory Committee (UAC) recommendations.

RECOMMENDED ACTION/MOTION

Information only.

ATTACHMENTS:

Description	Type
UAC Report	Backup Material
Figure ES.1	Backup Material

City of Bainbridge Island
Utility Advisory Committee

Review and Report Regarding November 2015 Draft Water System Plan

April 25, 2016

Background

In November 2015, Carollo Engineers submitted a draft Water System Plan ("Plan") to the City of Bainbridge Island (the "City"). The City operates two separate water systems, Winslow (including portions of Fletcher Bay) with 2387 connections (a 2013 figure) and Rockaway Beach with 71 connections (in 2013).

The Plan is an update of the City's 2005 and 2012 Water System Plans, and was prepared in accordance with Washington State Department of Health requirements in WAC 245-290-100. As such, the Plan covers multiple topics such as: review of the condition of the existing system; projections of future demands; development of a capital improvement plan, and a financial analysis.

In December 2015, the City's Utility Advisory Committee ("UAC) was asked to review the Plan, and to submit comments and recommendations about it. Accordingly, on December 14, 2015, Carollo representatives briefed the UAC about the Plan. Thereafter, the UAC devoted a significant portion of its meetings on January 11 and 25, February 8 and 22, March 14 and 28, and April 11and 25 to considering and analyzing the Plan.

UAC Review and Comments

Initially, the UAC noticed that the Plan was based on data through 2013. As the UAC's review was commencing in 2016, the UAC recommended that the Plan be revised to include data (which is available) from 2014 and 2015. This seemed particularly appropriate as the City's water rates were reduced by 30% in August 2013, and the UAC felt the most recent data should be reviewed before the Plan is finalized.

The City staff agreed, and obtained authorization from the City Council for the Plan to be updated. That work has not happened as of yet. Rather than wait, the UAC continued its review and analysis of the Plan with the assumption that the

updated numbers will not significantly change the UAC's conclusions about the Plan.

The Plan generally concludes as follows:

- the Winslow system has adequate water rights and supply capacity to meet future demands of the designated retail service area within the 20 year planning period, proposes a new pressure zone be developed for high elevation customers , and suggests many pipeline upsizing and installation projects;
- the Rockaway Beach system needs another source of water and additional storage capacity for fire flow;
- both water systems are in compliance with water quality monitoring regulations; and
- the City has adequate revenues from water rates and system facility charges to meet expected operating costs, and has more than sufficient reserves to construct CIP projects through at least 2021.

The UAC agrees with these conclusions. In addition, the UAC has the following comments:

1. Winslow CIP. Planned improvements are either required by a build out of the retail service area or are upgrades to meet fire flow requirements. The Winslow service area includes many residences, primarily in the northeast portion of Winslow, that do not obtain water from the City but rather are currently served by independent wells and small systems. The UAC believes there is little likelihood these residents will abandon their current water systems (and pay costs of connection and the City's system facility charges), and thus the UAC suggests the City not plan for capital projects for that area.

   Further the Winslow water system serves much of the City's major commercial and civic infrastructure (such as shopping, schools, etc.) and approximately half the island's population density. It should be recognized that this places demands on this water system to expend funds for improvements to meet fire flow standards. As such, much of the CIP is dedicated to, and driven by, the need to meet the City's and Fire District's fire code and related Department of Health requirements, as opposed to projects necessary to improve water supply or water quality.

2. Rockaway Beach CIP. The Plan describes alternatives for the City to solve the supply and storage long term deficiency for Rockaway Beach, and includes within the 2016-21 CIP $1,000,000 to connect to the Wyckoff well and within the 2022-25 CIP $3,000,000 for constructing a transmission line to the Winslow water system. The Rockaway Beach system was formed by a Local Improvement District in the mid-1990's, and serves only 71 connections. The UAC feels that there are likely significantly less costly alternatives available to the City, such as constructing an intertie to an adjacent utility. Accordingly, the UAC does not recommend the $3,000,000 expenditure be included in the 2022-25 CIP.

3. Financial Analysis. The City's water utility has no debt and a substantial beginning fund balance in 2016. The Plan is based on a projected beginning fund balance of $5,686,516[1]. This is well beyond the utility's policy reserve amount of $319,000 ($194,000 for operating expenses and $125,000 for capital). Even though the Plan proposes to spend 75% of this fund balance by 2021 on capital projects, the UAC considered refunding a portion of the reserves to the ratepayers as the CIP projects are in the very early stage of development. However, due to the complexity of such a refund program, the UAC agreed to recommend retaining and using the reserves but not charge rates that cause the reserves to grow, despite $12.1 million in long range CIP projects. Also, the UAC considered but does not recommend water rates be reduced below its current low level, fearing lower rates would be a disincentive for water conservation.

4. Up-zoning and Expansion of the Retail Service Area. The Plan indicates there are adequate resources to meet the future needs of the Winslow retail service area under the present zoning. As the City is in the midst of updating its Comprehensive Plan, the UAC points out that either expanding the retail and commercial service area or up-zoning areas within the service area could significantly impact the ability of the water system to provide adequate water without the development of additional sources or other improvements.

[1] The actual fund balance on January 1, 2016, was $6,888,631. The UAC has been advised that this higher than projected balance is primarily due to timing of income and expenditures for construction projects.

5. City Service Areas. The Kitsap County Coordinated Water System Plan assigns the following "Retail Water Service Areas" ("RWSA") to the City: center of the Island, north of the Island, and the Rockaway Beach system. These RWSA's are shown in pink and red on Figure ES.1 of the Plan (a copy of which is attached). Within those three RWSA's, the City's water system presently serves customers in and plans for properties only in the Winslow RWSA and the Rockaway Beach RWSA. The Winslow RWSA is shown in dark pink and the Rockaway Beach RWSA is shown in red on Figure ES.1 and on Figures ES.4 and ES.5. Water service within the City's RWSA's outside the Winslow and Rockaway Beach RWSA's (into areas labeled on ES.1 as Future Winslow RWSA and Future Rockaway Beach RWSA) is provided by other service providers, typically single wells or very small water systems.

   The UAC points out that the Plan does not analyze or discuss the City providing service in the future to any properties inside the Future Winslow and Future Rockaway Beach RWSA's . In other words, the Plan does not anticipate extending service outside the areas currently served by the City, even though they are within RWSA's assigned to the City. That is primarily because there has not been much demand for water service from property owners inside the Future Winslow and Future Rockaway Beach RWSA's, and serving those areas has not been deemed important for economic and efficient operation of water service within the current Winslow and Rockaway Beach RWSA's.

   If, in the future, the City wishes to provide service inside the Future Winslow and Future Rockaway Beach RWSA's, there are procedures in place within the City to analyze and consider that step. The UAC points out that such a future analysis may require additional sources of water, as the highest projections of supply within the current system show capacity being exceeded in 2035.

6. Water Resource Management. While the Plan is not required to, and does not, include a discussion of water resource management on the Island, the subject is a major concern of the citizenry and has been given considerable attention by City, including retaining Aspect Consulting to update the Island hydrological model. As such, the UAC would like to refer to the recommendations made in the 2005 Water System Plan to protect the Fletcher Bay aquifer by shifting

winter loads from the Fletcher Bay and Sands Well fields (also a part of the Fletcher Bay aquifer) to the Head of the Bay well field. The Kitsap Public Utility District has well(s) also accessing the Fletcher Bay aquifer, and is supportive of a collaborative approach to determining if such a practice can serve to recharge the aquifer for more productive use during peak summer demand.

Approved by the Utility Advisory Committee on April 25, 2016, on a 6-0 vote.

Andrew Maron, Chair
Jeff Kanter, Vice Chair
Ted Jones
Steve Johnson, absent
Nancy Nolan
Emily Sato
Jim Thrash

Attachment: Figure ES.1

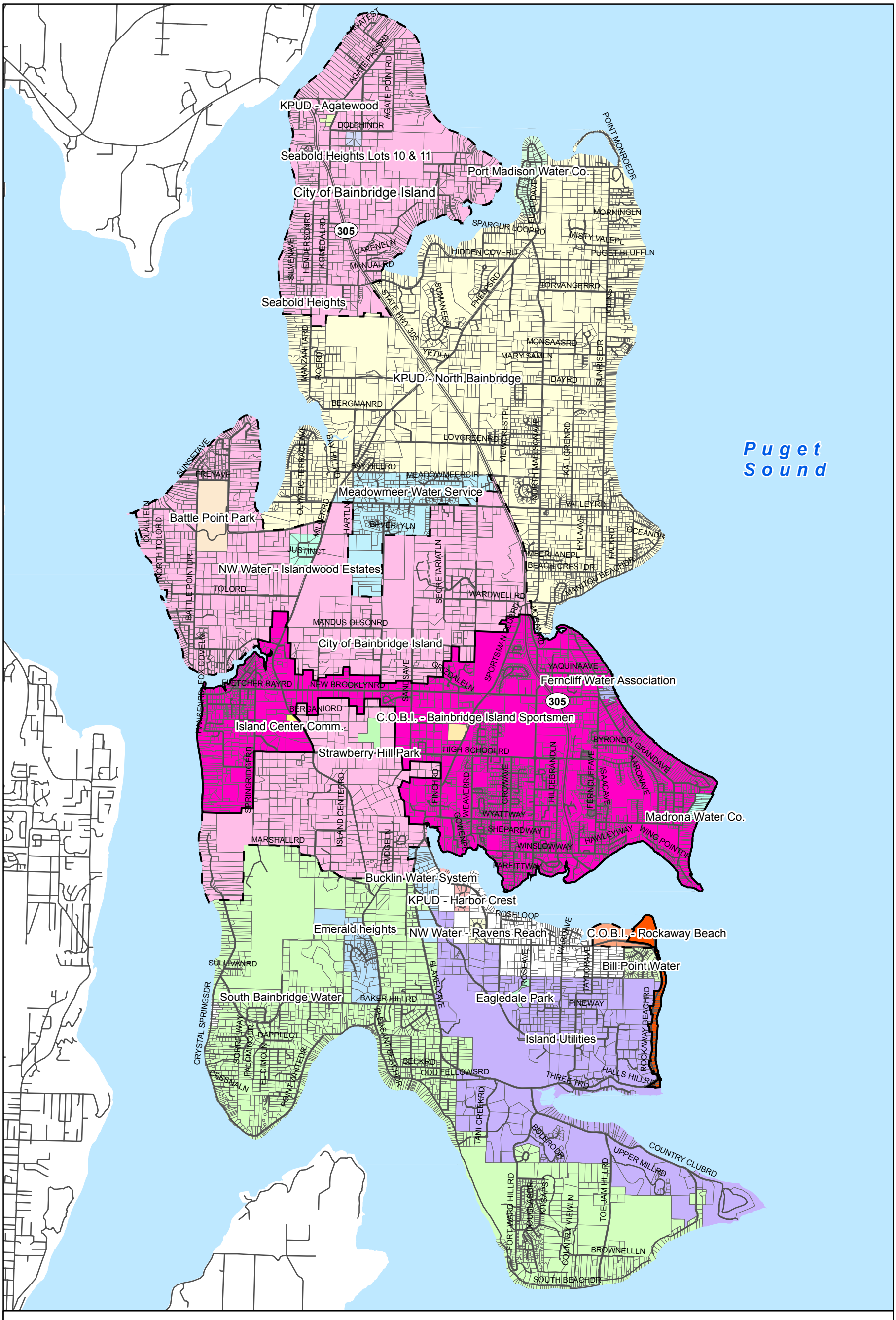


Figure ES. 1
RWSA Boundaries and Adjacent Water Utilities
Water System Plan
City of Bainbridge Island

City of Bainbridge Island
City Council Agenda Bill

CITY OF BAINBRIDGE ISLAND

PROCESS INFORMATION	
Subject: 7:45 PM Comprehensive Plan Update – Review and Status, AB 15-018 - Planning (Pg. 10)	Date: 5/3/2016
Agenda Item: COUNCIL DISCUSSION	Bill No.: AB 15-018
Proposed By: Department of Planning and Community Development	Referrals(s):

BUDGET INFORMATION		
Department: Planning	Fund:	
Expenditure Req:	Budgeted? Yes	Budget Amend. Req? No

REFERRALS/REVIEW		
:	Recommendation:	
City Manager:	Legal: N/A	Finance: N/A

DESCRIPTION/BACKGROUND

City Council review and discussion of the Planning Commission review of the Comprehensive Plan Update to-date. This check-in focuses on Planning Commission review of the Water Resources and Housing Elements.

See attached memo.

RECOMMENDED ACTION/MOTION

Discussion and provide feedback on the Update process to-date.

ATTACHMENTS:

Description	Type
May 3 Council Memo	Memorandum
Planning Commission Schedule	Backup Material
Low Impact Development Handout	Backup Material
Clean DRAFT Water Resources Element	Backup Material
Map of Aquifer System Recharge Areas	Backup Material
Redlined DRAFT Water Resources Element	Backup Material
2015 Bremerton-Silverdale MSA Average Median Income	Backup Material

- Housing Tools Table — Backup Material
- Redlined DRAFT Housing Element — Backup Material
- Comprehensive Plan Glossary — Backup Material

CITY OF
BAINBRIDGE ISLAND

Department of Planning and Community Development

Memorandum

Date: May 3, 2016

To: Planning Commission

From: Jennifer Sutton, AICP
Senior Planner

Subject: Comprehensive Plan Update Process:
Water Resources & Housing Elements

I. Scope and Objectives of Plan Update meeting on May 3

At the May 3, 2016 Council Study Session, the Council will review with staff and planning consultant Joe Tovar the Planning Commission's work to-date on the Water Resources and Housing Elements.

The objective of these Council reviews is to enable an in-depth understanding of the details of the Planning Commission's emerging recommendations. It would also be timely at these sessions for Council to identify any issues or draft recommendations that warrant reconsideration by the Commission before holding public hearings on the entire comprehensive plan proposal at the end of the summer.

II. DRAFT Water Resources & Housing Elements

As discussed with the Council in March, the 2016 DRAFT Elements reflect a number of non-substantive changes that make the Plan easier to navigate, more clear and succinct:

- Grammatical, syntax and formatting improvements;
- Goals and policies have been re-numbered consecutively within each Element;
- Obsolete or redundant text eliminated;
- Terms defined in the Glossary (attached) are *italicized*; and
- Clarifications made about the degree of directiveness of policy statements (e.g., "encourage" vs. "ensure").

During review of the Transportation Element in December and January, the Commission decided add a vision statement to each element, and the DRAFT Water Resources and Housing Elements reflect these new vision statements. The Commission has also recommended added

an “Implementation” section at the end of each Element. The Commission has only begun to review the Housing Element, so that “Implementation” section is currently blank.

Since the Planning Commission has completed the preliminary review of the Water Resources Element, we have provided Council with two versions of this Element. The “clean” version shows a “final” Element, assuming that all of the Planning Commission’s additions and deletions are accepted. We believe that it will be much easier for the Council to follow the organization and flow of the Element in this format. We have highlighted in yellow the portions of the Water Resources Element that address significant new issues or represent significant new policy language. The staff presentation at your meeting will focus primarily on this highlighted text. Since the Commission has only begun to review the Housing Element, it would be presumptive to include a “clean” version of the Housing Element.

The second set of DRAFT Water Resources and Housing Elements is in the “revision format” showing added text with underlining and text to be deleted with ~~strikethroughs~~. This enables the reader to see specifically where and what changes the Planning Commission is recommending relative to the 2004 version of the Plan. When the Council adopts the Ordinance in December updating the Comprehensive Plan, it will be in this revision format, but the “finished product” posted on the MRSC and City websites will be in the “clean” format.

DRAFT Water Resources Element

The review of the Water Resources Element was deeply informed by the work of Aspect Consulting on City groundwater model and monitoring program. In addition to regular Planning Commission meetings, notable changes to *Goal 2- Groundwater Protection and Management* and *Goal 4 Stormwater Protection and Management*. The *Existing Conditions and Future Needs* section was also completely updated with more up-to-date information.

DRAFT Housing Element

The Commission began discussing “Housing” on April 14 with a presentation on affordable “housing tools” by the City’s consultant Joe Tovar- see attached Table. On April 28, the Commission confirmed that the city should consider adding all of the identified “housing tools” to the City’s affordable housing toolbox, recognizing that different tools will be more appropriate in different zoning districts. This recommendation will be integrated into the DRAFT Housing Element for the Planning Commission meeting on May 12.

The DRAFT *Housing Element* attached is amended and reorganized from the 2004 *Element,* and now includes some housing data from the City’s *Housing Needs Assessment*. Previous City affordable housing reports from 2004 and 2007 are available on the City’s website. The 2015 Average Median Income (AMI) Table for the Bremerton-Silverdale Metropolitan Statistical Area (MSA) is attached. These incomes and household size would be used to qualify people for any designated affordable housing units- see the definition of “affordable housing” in the Plan Glossary and at the end of the DRAFT Housing Element.

III. Next Steps

The Planning Commission will continue to review the DRAFT *Housing Element* at the May meetings. In May the Planning Commission will begin a "Consistency Check" on the Comprehensive Plan Elements reviewed to date, and review the "red pin" placeholders in the DRAFT to date. The DRAFT Elements, Introduction and Glossary reviewed to date can be viewed on the City's website. In July, the Council will have a similar check-in to review the Planning Commission work on Utilities and Capital Facilities Elements.

OTHER PLANNING COMMISSION PROJECTS								COMPREHENSIVE PLAN UPDATE PROJECT								
Project Lead	**WYATT SPR (JM)**	**Helm OS Ap (JS)**	**Aquifer Conseration Regs. (JT/CC)**	**Aquaculture Ltd. SMP (CC)**	**General Ltd. SMP (CC)**	**Wintergreen Walk (VA Mason) SPR (JM)**	**Historic Preserv. Ord. (HB)**	**HOUSING**	**MYAC (High School) presentation on CP**	**CONSISTENCY CHECK/REVISIONS**	**UTLITIES**	**CAPITAL FACILITIES**	**6 YEAR C.I.P.**	**HUMAN SERVICES**	**CULTURAL**	**COMPLETE PLAN**
MAY 3	CITY COUNCIL CHECK-IN															
May 12	PM			SS				SS	P							
May 19					SS					SS						
May 26		PH					PH			SS	○	○				
June 9			SS		SS	PM					SS	SS				
June 16																
June 23			SS									SS		○	○	
JULY 5	CITY COUNCIL CHECK-IN															
July 14					SS								B	SS	SS	
July 28																
Aug 11																PH
Aug 25																PH

SS Study Session **PH** Public Hearing ○ Public Workshop **PM** Public Meeting **B** Briefing 4.28.16 **DRAFT**

May 2013

Talking points

Why are we doing Low Impact Development?

1. LID is the preferred method for stormwater management

LID techniques for managing stormwater in new development and redevelopment are coming to many Washington State municipalities, however with a different emphasis for the east and west sides of the state.

The Washington Department of Ecology (Ecology) will require municipalities covered by the Phase I or Phase II municipal stormwater permit in Western Washington to integrate LID requirements into their stormwater and broader development codes in the next two to five years.

Timeline

Western WA municipalities must implement the new permit requirements by:

- June 30, 2015: Phase I cities and counties
- Dec. 31, 2016: Most Phase II Western WA Municipalities
- June 30, 2017: Phase II permit holders in Lewis and Cowlitz Counties
- June 30, 2018: City of Aberdeen

Ecology's Phase II Eastern Washington permit requires cities and counties to introduce LID techniques and begin to identify what works for local conditions. Cities and counties will need to allow LID projects and develop local feasibility criteria for infiltrating stormwater runoff.

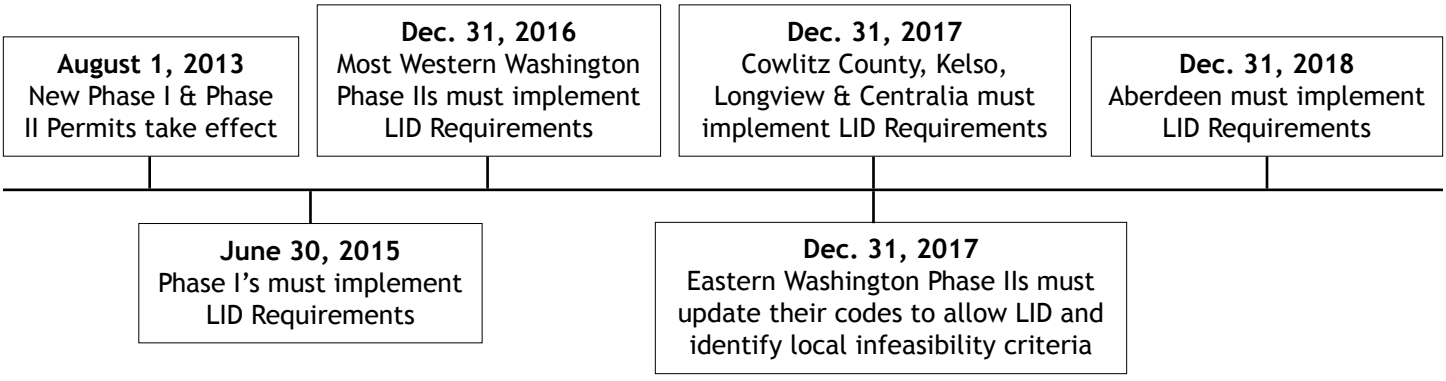
Eastern WA municipalities must implement the new permit requirements by Dec. 31, 2017

2. LID infiltrates and treats stormwater runoff on-site

LID refers to a suite of stormwater management and site design approaches that mimic natural drainage processes to retain vegetation, limit impervious surfaces, and infiltrate and treat runoff on-site. While traditional stormwater practices focus on collecting stormwater in piped networks and transporting it off-site as quickly as possible, LID manages stormwater on-site by using multiple approaches including:

- "Disconnecting" impervious surfaces by directing roof runoff to disperse or infiltrate in a bioretention facility
- Reducing impervious surfaces using techniques like minimizing the length and width of roads
- Conserving and retaining areas of vegetation, such as forested and natural areas as open space
- Amending soils by adding components like compost and mulch
- Installing bioretention facilities or raingardens that capture, infiltrate, and treat stormwater runoff
- Using permeable pavements which are a range of materials that allow stormwater runoff to move into underlying soils
- Rainwater collection and reuse, such as rain barrels and cisterns
- Vegetated roofs that capture and delay stormwater runoff in soils and plants that cover the roof area

Timeline for new LID Requirements in Washington State



3. LID is an effective approach for managing stormwater

LID has been widely demonstrated as an effective approach for managing stormwater. Here's how it works:

- **Slows it down.** LID reduces the quantity and speed of stormwater flowing into water bodies. Seattle's SEA Streets LID project reduced the volume of water flowing to municipal drainage infrastructure by 98% and the Meadow on the Hylebos LID project in Tacoma was able to retain 99% of precipitation falling on that area.
- **Spreads it out.** Because LID approaches, such as permeable pavements, can be installed over larger areas than traditional stormwater drywells or retention ponds, their effectiveness amplifies when implemented at the landscape-level. LID facilities are often small and more dispersed across the development than the traditional facilities.
- **Soaks it in.** LID filters pollutants picked up by stormwater runoff, such as oil, bacteria, sediments, and metals, before the pollutants enter surface water bodies. A six-year study by University of Washington found that permeable pavements were much more effective than traditional pavements at reducing zinc, copper, and motor oil concentrations to in stormwater runoff.

4. LID has multiple economic, environmental, and community benefits

In addition to water quality improvements, LID provides a multitude of economic, environmental, and community benefits that go beyond traditional stormwater infrastructure. Some of these benefits include:

- **Cost effectiveness** through lower operations and maintenance costs as well as reduced infrastructure costs because LID reduces water flow into our stormwater systems
- **Aesthetic benefits** as LID features can be part of attractive landscaping throughout communities and streetscapes
- **Multiple ecological benefits** including: preserved fish and wildlife habitat, improved air quality from retaining vegetation, reduced building water or energy use (where rainwater is collected or vegetated roofs provide insulation), and carbon sequestration by retaining or planting vegetation

Economic benefits

The effectiveness and multiple benefits provided by LID as a stormwater approach can help stretch scarce local government dollars and provide your jurisdiction with the biggest "bang for its buck." Here's how LID may provide economic benefits:

- May lower long-term operations and maintenance costs for LID facilities
- Avoids expensive retrofits of existing infrastructure because there is less runoff from new development
- May provide more usable land area for development because LID reduces the need for stormwater retention ponds and can free up land area for other uses
- Reduces pollution in stormwater runoff from new development resulting in lower clean up costs for rivers and streams
- Leads to fewer costly urban flooding events as LID holds water on-site, reducing the amount of runoff generated during rain events
- Increases property values by creating attractive landscaping and streetscapes
- Contributes toward other regulatory goals, such as comprehensive plans, critical areas ordinances, salmon recovery plans, and watershed plans
- Cleaner water means healthier fisheries and shellfish throughout the state

Environmental and community benefits
LID uses a variety of site design and pollution prevention techniques that create a hydrologically functional and environmentally sensitive landscape. Because LID strategies are, by design, environmentally-focused, their ecological and community benefits are many. Some are shown here:

- All LID strategies help clean our rivers, lakes, streams, and marine waters
- A rain garden or green roof can provide habitat for wildlife
- A green roof can help insulate a building, reducing energy use
- Improve air quality by decreased impervious surfaces and increased vegetation
- Provide communities with landscape enhancements
- Improve walkability and pedestrian safety
- Provide an opportunity for residents and businesses to help manage stormwater through actions
- Provide new small-business opportunities in the green jobs sector

5. LID works on many sites and under many conditions

LID has been successfully implemented on many types of sites, depending on site conditions and with careful planning. LID can be implemented in a wide variety of land uses including:

- Urban redevelopment (rain gardens, green roofs, rainwater harvesting for indoor use)
- Lower density urban development (reducing street width and building bioretention in parking lots)
- Infrastructure projects (integrate into planning of roads, parking areas)
- Rural commercial and residential areas (bioretention in the right-of-way and permeable pavement parking lots)

WATER RESOURCES ELEMENT

TABLE OF CONTENTS

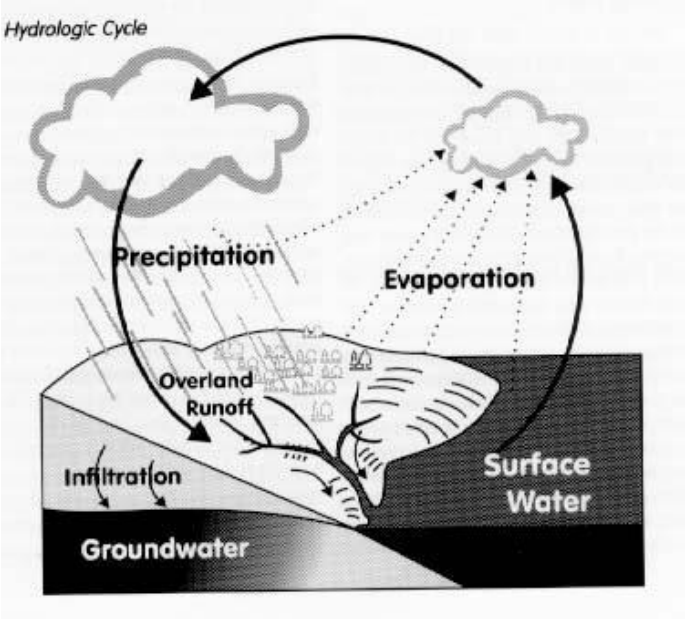
WATER RESOURCES Introduction

Bainbridge Island is a quasi-enclosed environment that requires a holistic perspective to understand the interdependence among the Island's three primary water resources: *groundwater*, surface water, and *stormwater*. Although these waters are typically regulated and managed independently, they are, in nature, intimately connected. In fact, it is all the same water, simply given a different name and managed according to where it resides in the hydrologic cycle at any given time (see Figure 1).

When rain falls, rainwater that is not evaporated or taken up by plants will take one of three paths. It may infiltrate into the ground where it is called *groundwater*. It may drain directly into *streams* and harbors where it is called surface water, or it may be captured by manmade *infrastructure* such as street drains, ditches, or detention/retention ponds where it is called *stormwater*.

Rainwater that infiltrates into the ground (*groundwater*) may be pumped from wells to provide drinking water or irrigation or seep out of the ground into *streams*, springs, and harbors where it is, again, called surface water. Likewise, *stormwater* may discharge into a nearby stream or harbor and become surface water or infiltrate into the ground and become *groundwater*.

Figure 1. The Hydrologic Cycle



In order to successfully protect and manage any one of these waters, one must protect and manage all three. To address these interrelationships, a separate Water Resources Element has been developed as follows:

- General water resources management policies
- *Groundwater* protection and management policies
- Surface water protection and management policies
- *Stormwater* protection and management policies
- Residential on-site sewage system policies
- Contaminated sites policies
- Public education and outreach policies

Land Use Connection

In the development of policies related to the management of our Island water resources, it is important to understand the links between water resources quality and quantity and *land use*. Most water quality and habitat integrity impacts are caused by the way land was or is used. Developed land allows for rapid *runoff* and inundation of natural conveyance systems such as *wetland*s and *streams*. Rapid *runoff* can cause damage through flooding, erosion, and water-borne contamination.

In addition, *household*s create sewage which needs disposal either by a wastewater treatment plant or by residential on-site sewage systems. Wastewater treatment plants are reasonably effective at cleaning wastewater, but do not at present provide complete removal of nitrogen nor treat for contaminants of emerging concern which include, but are not limited to, byproducts of medications, recreational drugs, health and beauty products, and caffeine.

Residential on-site sewage systems can fail and cause contaminants to enter the surface water and/or *groundwater*. Even functioning systems, depending upon *density* and proximity to surface water and *groundwater*, can contribute to accumulations of nitrogen and contaminants of emerging concern in these waters.

Use of fertilizers, pesticides, and other chemicals for cropland, lawns and gardens, and vehicle and *household* cleaning and maintenance as well as improper pet and livestock waste management can add significant contamination to surface water, *stormwater* and *groundwater*.

Commercial and industrial uses, past and present, leave behind pollutants in our soils. In particular, historic *land use*s such as large row crop agriculture, lumber, petroleum, and others have left behind legacy pollutants in sediments both on upland properties and in the sediments along the bottoms of our *streams*, harbors, and nearshore areas.

Without proper coordination of the regulations that will implement policy statements, conflicting signals may be given when dealing with water resources issues. For

example, a surface water problem may be resolved by efficiently collecting and removing all water from the area, whereas a *groundwater recharge* issue may require that the water be kept on-site to allow for infiltration.

Another conflict arises when infiltration of *stormwater* competes for space with on-site sewage system drainfields. There are physical limitations to the rates of infiltration and absorption based on soil types, which may make it impossible to have both of those facilities on the same site. Where development occurs in important *aquifer recharge areas*, special consideration is needed to preserve the volume of *recharge* available to the *aquifer* and to protect the *groundwater* from contamination.

A key component of water resources protection and adaptive management is adequate monitoring in order to assess impacts of current *land use* and effectiveness of applied management actions.

The overriding theme that runs through all of the policies and *goal*s in this element is the preservation and protection of water quality, water quantity, and ecological and hydrologic function.

Climate change

Climate change projections indicate that over the coming decades, sea level may rise up to four feet in the Puget Sound region, the ocean will become more acidic, and climatic conditions are likely to become warmer. This will result in more intense rain events during the wet season with longer, drier summers, though overall annual volume of rainfall will remain approximately the same.

Ocean acidification will likely impact aquatic species survival and assemblages in our marine areas and sea level rise will likely impact habitat and built *infrastructure* in our nearshore areas including homes, businesses, and public facilities such as roads and sewer facilities.

Wetter conditions during the wintertime will increase water availability, but may cause flooding or diminish water quality. More intense and frequent storms or heavier rainfall events can cause *stormwater* inundation and localized flooding, chronic flooding, non-infiltrated run-off, erosion and landslides. Increased intensity of rainfall may also diminish *aquifer recharge* rates as saturated soils are less able to absorb large amounts of water falling over short periods of time.

Warmer, drier conditions in the summertime will increase evaporation rates and water demand by plants, wildlife and people, and may diminish water quality. Dry conditions decrease water availability, resulting in reduced stream flow and diminished *aquifer recharge*. Warmer and drier conditions can also reduce water quality, both by increasing in-stream temperatures and by concentrating contaminants in smaller volumes of water.

VISION

Bainbridge Island's water resources (precipitation, on the surface, and in the ground) are climate resilient and demand and quantity are adequate for all forms of life on the Island. *Aquifers* are continuously monitored and maintained above the early warning level. The water quality for most of the consumed water is monitored to ensure quality fully meets the standards for drinking water. Education on water conservation has resulted in a significant reduction in the average water consumption per *household*. The Bainbridge Island *groundwater* model is regularly updated with new data and results from model runs are used to maintain long-term *sustainability* of the Island's water resources. *Low impact development* techniques are applied to all *land uses* and redevelopment.

GOALS AND POLICIES

GOAL 1 GENERAL WATER RESOURCES

Protection of water resources is of primary importance to the Island. Therefore, the *goal* is to manage the water resources of the Island in ways that restore, enhance, and preserve their ecological and hydrologic function.

- Degradation of water resources is not allowed.
- The long-term *sustainability* of the Island's water resources is maintained, taking into account future climatic conditions and their effects on the water cycle.
- New development and population growth are managed so that water resources remain adequate for the indefinite future.
- *Groundwater*, surface water, and *stormwater* monitoring, data assessment, and reporting are current and available including future projections of availability, quality and need.
- Use current and future technology to maintain and protect water resources.

Policy WR 1.1

The City *shall* study future climate and demand scenarios to accurately understand future water resource conditions.

Policy WR 1.2

Groundwater, surface water, and *stormwater* are resources that *shall* be protected and managed to preserve water quality and quantity, and to retain natural ecological and hydrologic function to the maximum extent practicable.

Policy WR 1.3

To foster sustainable water resources, planning, protection, management, monitoring and on-going education and outreach *should* be provided by the City in coordination with government agencies at all levels, drinking water purveyors, *watershed* management groups, Tribes, non-profit organizations, local integrating organizations for regional recovery and protection, and other stakeholders.

Policy WR 1.4

The policies in this element work in tandem with the protective measures set by the City's Shoreline Management Master Program, *Critical areas* Ordinance, and any other environmental or water resources management ordinance established by the City.

Policy WR 1.5

Identify the areas of the Island that are the most vulnerable to pollution from concentrations of fecal coliforms and nitrates (for example, from septic fields, agricultural activities, or fertilizers), and monitor those areas to determine if and when preventative or restorative measures are warranted.

GOAL WR-2 GROUNDWATER PROTECTION AND MANAGEMENT

Policy WR 2.1

Recognize that the entire Island functions as an *aquifer recharge area*. *Low impact development* techniques are essential for maintaining *aquifer recharge*.

Low impact uses and less intense development are appropriate for areas with high *aquifer recharge*. Low impact uses include development for buildings, roads or parking that has a reduced area of impact on the land. Low impact uses do not depend on regular applications of fertilizers or pesticides. *Low impact development* is an environmentally-friendly approach to site development and *stormwater* management, emphasizing the integration of site design and planning techniques that conserve and protect the natural systems and hydrologic functions of a site.

Policy WR 2.2

Areas of high *aquifer recharge should* be identified and assessed as part of a *land use* application. Care *should* be taken to minimize the effect of development on these areas.

Policy WR 2.3

To promote efficient use of *groundwater* resources, the City *shall* encourage the expansion of public and private water systems, rather than encouraging *shall*ow or individual residential wells.

Policy WR 2.4

The City *shall* assess the impacts of proposed activities and development on the flow of springs and *streams* and levels of *wetland*s that are either sustained by *groundwater*

discharge or contribute *recharge* to *groundwater*, and require an assessment of anticipated hydrologic impacts. Activities or development may be restricted if the report indicates any adverse impacts.

Policy WR 2.5

The City, in cooperation with the appropriate regulatory agencies (e.g., Washington State Department of Health and the Kitsap Public Health District) will institute new wellhead protection procedures.

Policy WR 2.6

The City *shall* encourage the use of integrated pest management techniques and the reduction of pesticide and herbicide use within the City boundaries.

Policy WR 2.7

Establish a stakeholder group to develop an Island-wide *groundwater* management plan.

Policy WR 2.8

Develop a program to strongly encourage exempt well owners to regularly monitor the quality of their well water and identify leaks using tools such as flow meters. Results *should* be self-reported to the Kitsap Public Health District.

Policy WR 2.9

Recognizing that the Island *aquifer* system is a Sole Source *Aquifer* as designated by EPA, institute an added level of development and re-development permit review to prevent or mitigate potential pollutant-generating activities associated with proposed *land use*.

Policy WR 2.10

Develop seawater intrusion prevention regulations.

Policy WR 2.11

The City *shall* develop a water conservation program.

Policy WR 2.12

Water re-use and reclamation will be encouraged to serve as a supplementary source for high-water users such as industry, parks, schools, and golf courses, as approved by the Washington State Department of Health.

Policy WR 2.13

Develop a program that encourages homeowners to explore innovative methods for recapturing and reusing surface water *runoff* and grey water, as approved by the Washington State Department of Health and the Kitsap Public Health District.

Policy WR 2.14

Maintain a comprehensive program of *groundwater* data gathering and analysis. The program *shall* include modeling, hydrogeologic and geologic studies, and monitoring of static water levels, water use, water quality, surface water flows, and acquisition of other data as necessary.

GOAL WR-3 Surface Water Protection and Management

Achieve no net loss of ecological functions and processes necessary to sustain *aquatic resources*[1] including loss that may result from cumulative impacts over time.

Over recent decades, awareness has grown of the importance of preserving and protecting *aquatic resources*. *Aquatic resources* have a number of important ecological functions, processes and values. These functions vary, but include providing water quality protection, flood plain control, shoreline stabilization, contributions to *groundwater* and stream flows and wildlife and fisheries habitat. *Aquatic resources* also have values as natural areas providing aesthetic, recreational and educational opportunities that *should* be preserved for future generations.

Policy WR 3.1

Development *should* not be approved in regulated aquatic *critical areas* or their associated water quality buffer unless the subject property is encumbered to such an extent that application of *development regulation*s would deny all reasonable use of property.

Policy WR 3.2

Require that vegetated buffers be maintained between proposed development and the aquatic resource in order to protect the functions and values of such systems. Degraded buffers *should* be restored to enhance their function. Allow reductions in vegetated buffers only in areas where such reductions, if consistently applied, would not result in significant cumulative impacts to *aquatic resources* and *fish and wildlife habitat*.

Policy WR 3.3

Require that buffers be retained in their natural condition wherever possible, while allowing for appropriate maintenance. Where buffer disturbance has occurred, require revegetation with appropriate species, with a preference for native species, to restore the buffers' protective values.

Vegetated buffers facilitate infiltration and maintenance of stable water temperatures, provide the biological functions of flood storage, water quality protection and

[1] *Aquatic resources* – Marine nearshore, *wetland*s, *streams*, lakes, creeks and associated vegetated areas.

groundwater recharge, reduce amount and velocity of run-off, and provide for wildlife habitat.

Policy WR 3.4

Ensure that development activities are conducted so that *aquatic resources* and natural drainage systems are maintained and water quality is protected.

Policy WR 3.5

Prior to any clearing, grading, or construction on a site, all *wetland*s, *streams*, and buffer areas *should* be specifically identified and accurately located in the field in order to protect these areas during development.

Policy WR 3.6

Herbicides and pesticides *shall* not be used in aquatic resource areas, and buffers, and *should* be discouraged in the areas that drain into them.

Policy WR 3.7

Prohibit access to aquatic *critical areas* by *farm* animals. Agricultural activities within proximity of *aquatic resources should* complete a *farm* management plan addressing water quality and other natural resource protection.

Policy WR 3.8

Mitigation *shall* be required to compensate for unavoidable impacts to aquatic *critical areas*. Mitigation *should* be designed to achieve no net loss in functions and processes of *aquatic resources*.

Policy WR 3.9

Promote *watershed*-based mitigation to meet federal regulations, improve mitigation success and better address the ecological demands of the island's *watershed*s.

Policy WR 3.10

Work with state and local health departments to evaluate the merits of new technologies such as greywater capture, package treatment plants and composting toilets, as alternatives to septic and sewer systems; and determine which of those systems *should* be allowed and/or encouraged to better protect the quality and capacity of the Island's surface water and nearshore environment.

Policy WR 3.11

Consider the impacts of *climate change*~~,~~ and ocean acidification, when developing regulations or approving capital projects related to *aquatic resources*, including marine nearshore, *wetland*s, *streams*, lakes, creeks, associated vegetated areas and *frequently flooded areas*.

Policy WR 3.12

Allow stream relocation only where relocation would result in improved stream habitat or when a property owner would otherwise be denied all reasonable use of the property.

Policy WR 3.13

Degraded channels and banks *should* be rehabilitated by various methods (e.g., culvert replacement, volunteer efforts, public programs or as offsetting mitigation for new development) to restore the natural function of the riparian habitat for fish and wildlife.

Policy WR 3.14

Resident and migratory fish *streams* and adjacent land *should* be preserved and enhanced to ensure a sustainable fishery.

Policy WR 3.15

Require the construction of public facilities to avoid encroachment into and disturbance~~s~~ of *aquatic resources*.

Policy WR 3.16

Maintain a comprehensive program of surface water inventory, data gathering and analysis. The program *shall* include monitoring and assessment of physical, chemical, and biological health of surface water ecosystems to include *streams*, ephemeral *streams*, lakes, *wetland*s, and marine waters. This may include water, flow, sediment, habitat, submerged aquatic vegetation, fish and shellfish tissue, aquatic species diversity and other ecosystem health indicators.

Policy WR 3.17

Support a community-wide program to educate Island residents about alternatives to using and disposing of herbicides, pesticides, and other *household* chemicals, to reduce impacts to marine shoreline areas, *wetland*s, *streams*, and other *environmentally sensitive areas*.

Policy WR 3.18

Promote and support volunteer or community-driven restoration projects.

Policy WR 3.19

The City *should* make every effort to purchase or obtain *conservation easement*s for significant *wetland*s and areas of the shoreline critical to natural habitat.

Policy WR 3.20

Permanent visual markers *should* be placed around the buffer areas of protected *aquatic resources*.

GOAL WR-4 Stormwater Protection and Management

***Stormwater* is a resource that, rather than be captured and carried away as a wastestream, *should* be protected from pollutants and retained on site to replenish *aquifers* and maintain *wetland* and summer stream flows, preserving or mimicking the natural water cycle to the maximum extent practicable.**

Policy WR 4.1

Comply with all requirements of the City's National Pollutant Discharge Elimination System Phase II Municipal *Stormwater* Permit (NPDES Permit).

Policy WR 4.2

Continue to provide ongoing opportunities for the public to participate in the decision-making process involving the development, implementation and update of the City's *Stormwater* Management Program (SWMP) through advisory councils, public hearings, and *watershed* committees.

Policy WR 4.3

Continue to improve and maintain an education and outreach program designed to reduce or eliminate behaviors and practices that cause or contribute to adverse *stormwater* impacts and encourage the public to participate in stewardship activities.

Policy WR 4.4

Continue to identify and eliminate sources of pollutants to the City's *stormwater* drainage system through proactive field screening techniques such as effluent monitoring, system inspections and cleaning, and commercial and industrial business inspection, and through the enforcement of the City's Illicit Discharge Detection and Elimination ordinance.

Policy WR 4.5

Ensure development of, and adherence to, required public and private *stormwater* pollution prevention plans (SWPPPs) for public facilities, construction sites, and commercial and industrial *land use*. Encourage the use of such plans where not specifically required.

Policy WR 4.6

Ensure development of, and adherence to, erosion and sediment control plans on all construction and development sites of any size.

Policy WR 4.7

Develop and actively enforce a strong *Low impact development* (*LID*) ordinance to require any and all methods and practices for new development and redevelopment to the maximum extent practicable and reasonable. *LID* is a *stormwater* and *land use* management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation,

use of on-site natural features, site planning, and distributed *stormwater* management practices that are integrated into a project design.

Policy WR 4.8

Prioritize *LID*-based retrofit of public and private *stormwater* drainage systems and built assets through the inventory, management and fiscal planning process.

Policy WR 4.9

Incentivize *LID* retrofit of current built environment.

Policy WR 4.10

Use *watershed* and basin plans as a means to reduce *stormwater* impacts and *non-point source pollution*.

Policy WR 4.11

Comply with all requirements specifically identified by the City's permit for any Total Maximum Daily Load (TMDL) in which the City is a stakeholder.

Policy WR 4.12

Conduct effectiveness monitoring and assessments to continue to adaptively manage *stormwater* to ensure optimal protection.

GOAL WR-5 RESIDENTIAL ON-SITE SEWAGE SYSTEMS

Ensure that sewage is collected, treated, and disposed of properly to prevent public health hazards and pollution of *groundwater*, Island surface water, and the waters of Puget Sound.

Policy WR 5.1

Regulations and procedures of the Washington State Department of Health and the Kitsap Public Health District apply to all on-site disposal systems. The City *shall* work with these agencies to assure regular inspection, maintenance and repair of all *sanitary sewer* and on-site systems located on the Island.

Policy WR 5.2

The City *shall* request notification of all waivers or variances of Kitsap Public Health District requirements, such as modification of setbacks, vertical separation, minimum lot size, reserve drainfield, etc., prior to issuance and subsequent modifications by the Kitsap Public Health District of an approved Building Site Application.

Policy WR 5.3

Alternative systems, such as sand filters, aerobic treatment, composting toilets, and living-systems *shall* be allowed when approved by the Kitsap Public Health District.

Policy WR 5.4

Regulations *shall* require coordination between the on-site septic and *storm drain*age disposal systems designs to ensure the proper functioning of both systems.

Policy WR 5.5

The City *shall* assist the Kitsap Public Health District in developing a program to require proper maintenance of all on-site waste disposal systems in order to reduce public health hazards and pollution. This program *shall* include periodic system inspection and pumping when necessary.

Policy WR 5.6

The City and the Kitsap Public Health District *should* work together on a collaborative program to fund and pursue grants or low-cost loans for low and moderate-income *household*s to repair failed septic systems. Incentivize maintenance, repair and replacement of systems for any income level.

Policy WR 5.7

On-site waste disposal systems serving more than one *household should* be allowed only with assurance of proper design, operation, management and approval from the Kitsap Public Health District.

Policy WR 5.8

The City may provide the service of operation and maintenance management for approved large on-site *sanitary sewer* systems (LOSS) or community *sanitary sewer* systems in coordination with the Kitsap Public Health District.

Policy WR 5.9

The City *should* support the Kitsap Public Health District in maintaining and improving a public education program to foster proper construction, operation, and maintenance of on-site septic systems.

Policy WR 5.10

The City *should* support the Kitsap Public Health District in developing and maintaining an ongoing inventory of existing on-site disposal systems to provide needed information for future studies.

GOAL WR-6 CONTAMINATED SITES

Incorporate awareness of known contaminated sites such as former lumber treatment facilities, former fueling stations, and other pollutant-generating *land use* into all water resources management, *land use* planning, and *capital facility* management in order to remediate or clean-up sites as effectively as possible, while preventing further impacts to water resources.

Policy WR 6.1

The City will assemble and maintain an inventory of contaminated sites on the Island to track site location, contaminant(s) of concern, cleanup status, and potential to impact nearby surface or *groundwater*.

Policy WR 6.2

The City will collaborate with EPA, Washington State Department of Ecology, and the Kitsap Public Health District to address contaminated site assessment and cleanup efforts within the purview of those agencies to achieve remediation/cleanup as quickly as reasonably possible.

Policy WR 6.3

The City will consult the contaminated site inventory prior to property acquisition and weigh the cost/benefit of acquiring such a property.

Policy WR 6.4

The City will make every reasonable attempt to clean-up/remediate city-owned sites that are known to be or discovered to be contaminated.

Policy WR 6.5

The City will consult the contaminated site inventory as part of development or redevelopment site plan review and take potential impacts into consideration when making *land use* decisions.

Policy WR 6.6

The City will consult the contaminated site inventory as part of capital *infrastructure* construction or maintenance.

Policy WR 6.7

The City will consult the contaminated site inventory as part of emergency management preparedness and response.

GOAL WR-7 PUBLIC EDUCATION AND OUTREACH

The City, in concert with federal, state, and local governments; public water purveyors; watershed councils; non-profits; citizens; and other appropriate entities, will continue to improve and implement a comprehensive public education and outreach program to promote protection and management of all water resources.

Policy WR 7.1

Educate and inform the public about the purpose and importance of aquatic environments, their vulnerabilities, and observed status and trends in ecological health and function.

Policy WR 7.2

Educate and inform the public about expected *climate change* impacts and how these will affect the Island's water resources and their beneficial uses.

Policy WR 7.3

Educate the public about the characteristics of the *aquifer* system, the Island's dependency upon it, and its vulnerability to contamination (including seawater intrusion) and depletion.

Policy WR 7.4

Educate the public about EPA's Sole Source Aquifer Designation Program and what this designation means for the Island's *aquifer* system.

Policy WR 7.5

Educate the public about well head protection and the critical importance of restricted chemical use or storage within the protection area around wells.

Policy WR 7.6

Educate the public about critical *aquifer recharge areas* (or other special conservation areas) and the purpose they serve to the *aquifer* system.

Policy WR 7.7

Inform the public about how to report spills or illicit dumping of hazardous waste or other pollutants and how to access information about location and status of contaminated sites.

Policy WR 7.8

Inform the public about how to find information about their well and how to properly maintain it.

Policy WR 7.9

Educate, and provide technical assistance to the public on methods to identify wasted water indoors and outdoors and practices to conserve water such as native landscaping, xeriscaping, and water use reduction or reuse.

Policy WR 7.10

Provide "how to" or "dos and don'ts" resources for *streams*ide and shoreline landowners.

Policy WR 7.11

Provide information and guidance on water resources protection best management practices for commercial, industrial, residential, agricultural, and other *land use*s to

prevent or reduce pollution. These practices include, but are not limited to, septic system maintenance; pet and livestock waste management; landscaping and gardening; *farm* plans; appropriate methods for use, storage and disposal of hazardous materials and other chemicals; on-site drainage system maintenance, and automotive care.

Policy WR 7.12

Provide and promote opportunities for citizen stewardship and involvement.

Policy WR 7.13

Provide *LID* technical guidance and workshops to businesses and contractors working on the Island.

EXISTING CONDITIONS & FUTURE NEEDS

The following outlines the present conditions and understanding of the water resources of the Island and the future needs for restoration, enhancement, and protection of these resources.

Groundwater

Groundwater is the sole source of drinking water for Island residents, *farms* and industry on Bainbridge Island. It is found in underground reservoirs called *aquifers*. An *aquifer* is defined as a *permeable* sand and/or gravel formation that is capable of yielding a significant amount of water to a well. Wells on Bainbridge Island penetrate several distinct *aquifers* to allow withdrawal of drinking water by individual homeowners and municipal water purveyors. Most individual *household* wells penetrate to depths of less than 300 feet. Some residents are still using hand-dug wells less than 40 feet deep, completed in the *permeable* sediments known as the Vashon Recessional Outwash. *Groundwater* found at this level also feeds the base flow (summer flow) for Island *streams*. High capacity wells have been drilled as deep as 1,200 feet to find adequate marketable quantities of water for public and private water purveyors. While few in number, these wells produce a large portion of the Island's potable water. The Blakely Formation, a sedimentary bedrock formation, dominates the geology on the southern end of the Island and limits *groundwater* production in this area.

Our understanding of the Island's water resources has been enhanced through historical studies such as the *City of Bainbridge Island, Level II Assessment*[4] prepared by Kato & Warren and Robinson Noble in 2000 and monitoring and assessments completed in the last ten years by the City's *Groundwater* Management Program. This work includes the development, improvement, and utilization of a *groundwater* model; the development of a well monitoring network; and the implementation of long-term monitoring.

Bainbridge Island has six principal *aquifers* (Kato & Warren and Robinson & Noble, 2000), the extents of which were refined in the *Conceptual Model and Numerical Simulation of the Groundwater-Flow System of Bainbridge Island, Washington* (USGS, 2011). The six *aquifers* delineated below reflect updated understanding based on the United States Geological Survey (USGS) model. Additional details about the *aquifers*, including detailed maps and discussion regarding the extent, thickness, and other characteristics, can be found in the USGS report.

Perched *Aquifer* (PA)—This *aquifer* is comprised predominantly of Vashon Advance glacial outwash (Qva). The top of the *aquifer* ranges from sea level to more than 300 feet above mean sea level [ft MSL], with a thickness of 20 to 200 feet, and is utilized

predominantly by domestic wells. About 4 percent of wells are reported to be completed in this unit.

Semi-Perched *Aquifer* (SPA)—This semi-perched *aquifer* exists within *permeable* interbeds (QClpi) of the upper confining unit (QC1). The top of the *aquifer* ranges from sea level to more than 200 ft MSL, with a thickness of 10 to 50 feet. About 25 percent of wells are reported to be completed in this unit.

Sea Level *Aquifer* (SLA)—The Sea Level *aquifer* (QA1) is extensive, widely used, and mostly confined by QC1. The top of the *aquifer* ranges from -200 to 200 ft MSL, with a typical thickness of 25 to 200 feet. Fifty-three percent (53%) of wells are completed in the SLA.

Glaciomarine *Aquifer* (*GMA*)—This *aquifer* consists of water-bearing units within a thick sequence of fine-grained glaciomarine drift (QA2). The top of the *aquifer* ranges between more than -500 to -300 ft MSL, with a typical thickness of 20 to 300 feet. Several of the Bainbridge Island's production wells and at least 4 domestic wells are completed in this *aquifer*, representing about 2 percent of wells.

Fletcher Bay *Aquifer* (FBA)—The FBA (QA3) is the deepest identified *aquifer* on Bainbridge Island. Several large production wells are completed in this *aquifer* including the Fletcher Bay Well. The top of the *aquifer* ranges between more than -900 to slightly less than 600 ft MSL, with a typical thickness of 50 to 300 feet. While representing only about 1 percent of wells on Bainbridge Island, the metered KPUD and COBI FBA wells provide approximately 30 percent of the estimated total Island *groundwater* production.

Bedrock *Aquifer*—Less than 1 percent of the wells are completed in the sedimentary Blakely Harbor and Blakeley formations on the south end of Bainbridge Island.

Other wells on Bainbridge Island are either completed in water bearing zones within confining units or have an indeterminate *aquifer* completion zone.

COBI's monitoring well network is distributed across the six Bainbridge Island *aquifers* as follows: 16 in the Perched *Aquifer*, 7 in the Semi-Perched *Aquifer*, 32 in the Sea Level *Aquifer*, 5 in the Glaciomarine *Aquifer*, 9 in the Fletcher Bay *Aquifer*, and 1 in the Bedrock *Aquifer*. Aspect has updated the USGS *groundwater* model to include one new public supply well (KPUD North Bainbridge Well #10), for a total of 1,470 Group A and B public wells and exempt wells estimated to be active on Bainbridge Island.

Aquifer Concerns and Observed Conditions

There are two primary concerns in protecting an *aquifer* system. These are quality and quantity.

Water Quality

Seawater Intrusion

One of the most common *groundwater* quality concerns for Islands or other saltwater shorelines is saltwater intrusion, which is the movement of saltwater into a freshwater *aquifer*. Where the source of saltwater is marine water such as Puget Sound, this process is known as seawater intrusion. Seawater intrusion occurs when the saltwater/freshwater interface moves inland from offshore. Freshwater is less dense than saltwater and so freshwater will float above saltwater. It is the pressure of the

overlying freshwater that keeps the interface offshore. Excessive pumping or overuse of the overlying freshwater will pull the interface toward the shoreline and possibly inland.

Some of our *aquifers* such as the *shall*ow Perched and Semi-Perched *aquifers* are, generally, not in contact with saltwater and, therefore, generally not susceptible to seawater intrusion (an exception being where these *aquifers* are present near the shoreline).

The Sea Level *Aquifer* and our deeper *aquifers* can be susceptible. How susceptible can vary from *aquifer* to *aquifer* and, even within the same *aquifer*, depending upon local conditions.

In order to monitor for potential seawater intrusion, the most common practice is to measure chloride concentration and specific conductivity in *groundwater*. The City's *Groundwater* Management Program conducts annual chloride sampling in *aquifers* or wells susceptible to seawater intrusion. The established Early Warning Level, or EWL, is a chloride concentration >100 mg/L or any 4 consecutive samples showing an increasing trend. To date, no wells in the City's monitoring network (including Kitsap Public Utility District and the City's Water Utility wells) exceeded the EWL, and no trends in chloride results were noted.

Chloride concentrations typically varied between 2 mg/L and 15 mg/L. Results in 2013 and 2014 in the Fletcher Bay *Aquifer* indicate slightly elevated chloride above historic baseline concentration, but not upward trending results. However, these *should* be monitored for continued changes.

Additionally, the City's *groundwater* model was run by USGS in 2010 and updated, recalibrated and run again by Aspect Consulting in 2016 to examine the potential for seawater intrusion under different water production (e.g., growth) scenarios. Model projections indicated no seawater intrusion. It *should* be noted that the model is designed to observe regional scale conditions, but the scale is not fine enough to assess very localized conditions such as one or two wells along the shoreline. Therefore, it is important to continue to monitor in vulnerable areas to catch potentially developing local conditions.

One example is an elevated chloride level measured in one well in the Seabold area in 2006 prior to the development of the City's *Groundwater* Management Program. As there was no established program in place at the time, there was no immediate follow up sampling/study to confirm seawater intrusion rather than a source other than seawater intrusion. Other common sources of chloride in *groundwater* include connate, or very-old, *groundwater*, septic system effluent, very hard *groundwater*, windblown sea spray, and *recharge* from irrigation, agricultural practices, and well disinfection. Chloride from any of these sources can result in elevated levels of chloride in an *aquifer* or well. Erroneously interpreting chloride concentration data without more detailed study may result in what is called a "false positive," where a test identifies a problem that does not in fact exist. That is why follow up investigation using site-specific assessments, is necessary before seawater intrusion can be confirmed. The City, the

Kitsap Public Health District, and the Kitsap Public Utility District have teamed up to scope a localized, focused study in the Seabold area for potential funding in 2017.

Nitrate

According to USGS research, nitrate is the most commonly found pollutant in *groundwater* nationwide, particularly in rural areas. Nitrate levels in drinking water above EPA's Maximum Contaminant Level (or MCL) of 10 mg/L can have serious health effects primarily for infants, but also pregnant women and individuals undergoing treatment with antioxidant medications. Nitrate converts to nitrite in the digestive track which causes a condition call methemoglobinemia which lowers the oxygen in the blood stream. In infants this is called "Blue Baby Syndrome." Brain damage, even death, can occur.

High nitrate levels in *groundwater* can also indicate the possibility that other contaminants may be present in the water such as bacteria or pesticides.

The typical sources of nitrate in *groundwater* include the application of fertilizers and pesticides, mostly from agricultural row crop farming, but commercial and *residential use* can be significant sources as well (such as lawns, parks, golf courses, ballfields, nurseries, and extensive gardens). Other sources include industrial processes and wastewaters, the land application of wastewater treatment plant sludge or biosolids, and on-site septic system returns.

Although the *Groundwater* Management Program does not, at present, routinely monitor nitrate in *groundwater*, the City's consultant examined nitrate data from the Kitsap Public Health District (KPHD) as part of the 2015-2016 assessment. Nitrate data were not found to exceed EPA's MCL of 10 mg/L. Nitrate data for Group A and B public wells and exempt wells did not indicate any trends. Data submitted to KPHD for exempt wells are typically single results and are insufficient to calculate any trends. However, the maximum result during the last 15 years (2000–2014) was 5.17 mg/L in 2007. There are no apparent trends over time or geographically across the island.

Other Water Quality Concerns

Generally, *groundwater* quality on the Island is very good. However, moderate levels of iron and manganese are naturally-occurring and common. Although neither of these minerals normally exceed EPA's standards for drinking water, they can influence odor and taste and stain fixtures. Many *public water system*s and some private systems use filtration devices to remove or reduce these minerals.

Sole Source *Aquifer* Designation

In 2013, the Bainbridge Island *Aquifer* System was designated a Sole Source *Aquifer*. Sole Source *Aquifer* Designation can apply to one *aquifer* or a system of multiple *aquifers* as is the case with Bainbridge Island.

The Sole Source *Aquifer* Designation Program is an EPA program authorized under the Safe Drinking Water Act of 1974. Section 1424(e) defines a sole source *aquifer* as "the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health."

The EPA more specifically defines a sole or principal source *aquifer* as one which supplies at least 50 percent of the drinking water consumed in the area overlying the *aquifer*, and that these areas have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the *aquifer* for drinking water.

The program and designation are specifically designed to protect the quality of drinking water by helping to prevent contamination of the *aquifer* system. It provides this protection by raising the level of awareness of the vulnerability of the *aquifer* system to contamination and our dependence upon the system as a drinking water supply.

Further, it requires additional EPA scrutiny of federally-funded projects. EPA inspects proposed projects for potential to contaminate the underlying *aquifer*, and, where appropriate, requires modifications and mitigations to prevent contamination.

However, this additional scrutiny applies to federally-funded projects only, and some projects such as highways and agriculture may be exempt if they meet criteria laid out in pre-established memorandums of understanding between the EPA, the Department of Transportation, the Department of Agriculture, or other agencies.

Water Quantity

Water Levels

The City's *Groundwater* Management Program currently monitors water levels in public and domestic wells Island-wide and in all six *aquifers*. Water level is an indicator for water quantity, and water level data are assessed against the program's early warning level, or EWL, for safe yield. The EWL for safe yield is a declining water level equal to or greater than ½ foot or more per year over a 10-year period that cannot be attributed to below average rainfall.

Individual well levels were reviewed for trends and compared against the EWL for safe yield. All wells were found to be below the EWL. Water levels in the *aquifers* did not indicate any *aquifer*-wide trends, and only two individual wells were noted for further review.

An exempt well (25N/02E-21P03) in the Sea Level *Aquifer* showed an apparent average decline of approximately 0.56 feet/year over the 8-year period of record. However, further review of the water level measurement method history showed that it changed twice over the period of record from a steel tape to a sonic water level meter and, then, back to steel tape. The results collected via sonic water level meter appeared to be inconsistent compared to the results before and after using the steel tape, a more rudimentary but more reliable measurement method. Therefore, the sonic level readings were removed from the analysis. Once removed, the remaining data were below the EWL. Water-use data were not available for the well. However, the well owner indicated to COBI that no known change in water use occurred over the period of record. Continued long-term monitoring of this well using the steel tape method, as planned by COBI, will determine if there is a significant trend in water level decline over time.

Group A system well 'Island Utility Well #1' (25N/02E-34F07) in the Fletcher Bay *Aquifer* has shown an average decline of approximately 0.49 feet/year from 2004-2014. Although this does not yet exceed the EWL, it is very close to approaching it. Therefore, further monitoring and assessment are warranted. The well is situated next to two other Fletcher Bay *Aquifer* production wells (Island Utility Well #2, Island Utility Well #4) within the same water system. Production data have not been available for these wells, which makes it unclear if declines are related to changes in water use over the period. This system has just transitioned to operation by KPUD in mid-2015, and they are now reviewing available information to understand the current conditions within that water system. Additional data review will continue as the system *infrastructure* is updated to see if additional water use, system loss, or some other factor contributed to the historical decline. No other Fletcher Bay *Aquifer* wells monitored exhibited a similar declining trend, so it appears that this issue is specific to this well and not an *aquifer*-wide concern.

Aquifer* System *Carrying Capacity

The City, as a community, has yet to fully-define or characterize a sustainable *aquifer* system. Some initial characteristics are keeping the saltwater/freshwater interface offshore and saltwater out of the freshwater supply, and maintaining a balanced water budget for the *aquifer* system in order to prevent depletion.

To help provide some baseline information about these initial characteristics and expected impacts to the system due to *climate change*, Aspect Consulting conducted a system *carrying capacity* model assessment. The *aquifer* system *carrying capacity* assessment was based on those safe-yield indicators with EWLs described above using *aquifer* water levels and chloride concentration. The on-Island *groundwater* balance for the entire *aquifer* system (water budget) was also evaluated. The *groundwater* balance components do not have EWLs, but were evaluated to provide additional context on the predicted changes in *groundwater* conditions.

Water Level Changes: The following rates of *groundwater* level change were based on comparing current and predicted *groundwater* levels in 100 years:

- The Perched *Aquifer* system showed an average 0.10 foot per year of water level decrease at 25 locations simulated across the Island;
- The Semi-Perched *Aquifer* system showed an average 0.13 foot per year of water level decrease at 12 locations simulated across the Island;
- The Sea Level *Aquifer* system showed an average 0.09 foot per year of water level decrease at 49 locations simulated across the Island;
- The Glaciomarine *Aquifer* showed an average 0.02 foot per year of water level decrease at 6 locations simulated across the Island; and
- The Fletcher Bay *Aquifer* showed an average 0.15 foot per year of water level decrease at 9 locations simulated across the Island.

The predicted *groundwater* level changes over a 100-year timeframe were less than the COBI EWLs.

Saltwater/freshwater Interface: The predictive model results indicated that, despite these slow declines, *groundwater* from the Bainbridge Island *aquifer* system flows to Puget Sound and keeps the freshwater/seawater interface at a distance from the Bainbridge Island shoreline. All wells within the Bainbridge Island shoreline maintained chloride concentrations less than 100 mg/L, and no trend in concentrations was observed based on predictive model results.

Water Budget: Though the predicted *groundwater* level declines did not appear to induce seawater intrusion, they can have impacts on other components in the system such as discharge to *streams* to help maintain summertime flows. Therefore, it is important to examine the components of the system's water budget.

Similar to a financial budget, a water budget represents a balance of inputs and outputs. If one component goes up or down, some other component(s) must go up or down to compensate. *Groundwater* balance components are typically difficult to measure directly (such as *recharge* and *groundwater* underflow). Thus, this *groundwater* balance assessment relies on modeling results without actual field measurements.

Based on the 2011 USGS Report, the relationship between *groundwater* balance inputs and outputs for the Bainbridge Island *aquifer* system is shown in the following equation:

$R_{ppt} = W_{ppg} + D_{sw} + (GW_{ps} - GW_{kp})$

Where:

Inputs include:

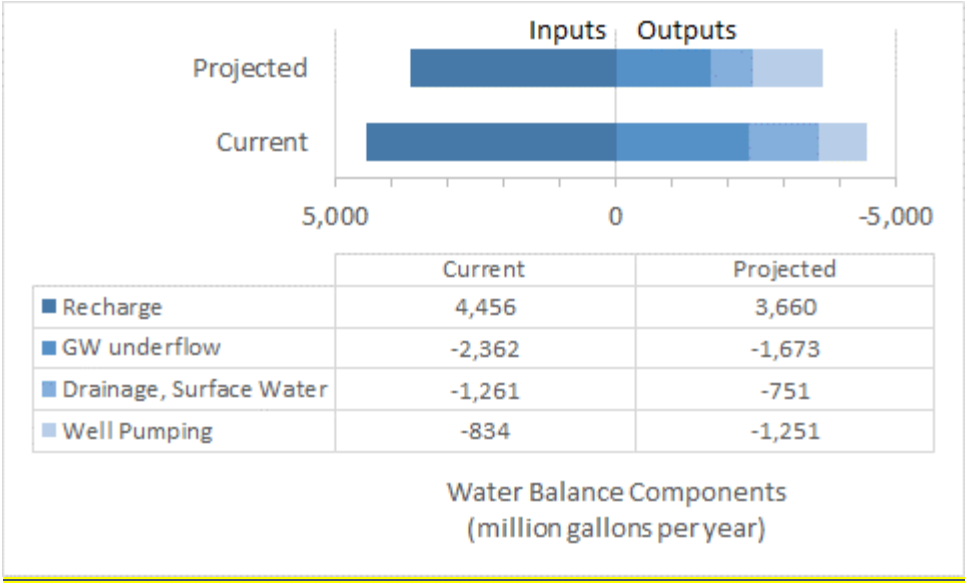
R_{ppt} is precipitation *recharge*.

Outputs include:

W_{ppg} is *groundwater* withdrawals;
D_{sw} is *groundwater* drainage to surface water (such as seeps to bluffs, creeks, *streams*, etc.); and
(GW_{ps} - GW_{kp}) is the net lateral *groundwater* underflow (*groundwater* flow toward Puget Sound submarine seeps (GW_{ps}) and *groundwater* flowing from the Kitsap peninsula in deeper *aquifers* (GW_{kp})).

To balance the modelled 50-percent increase in *groundwater* withdrawals and the 20-percent decrease in *recharge* due to *climate change*, the model showed projected changes in *groundwater* drainage to surface water (approximately 40-percent decrease) and lateral *groundwater* flow (approximately 24-percent decrease). Figure 6, excerpted from Aspect's technical memorandum (*Bainbridge Island Groundwater Model: Aquifer System Carrying capacity Assessment (Task 3 Scenario*), 2016) compares the water balance components under current and projected conditions, based on model results.

The Bainbridge Island *groundwater* model results showed *aquifer* storage will be reduced by approximately 11,000 million gallons between current and projected conditions, reflecting the water level decreases described above. These *groundwater* balance results *should* be carefully interpreted, considering that the limited grid resolution may not be sufficient to accurately simulate *groundwater* discharge to surface water, and that the model has not been calibrated to observed flows.



	Current	Projected
Recharge	4,456	3,660
GW underflow	-2,362	-1,673
Drainage, Surface Water	-1,261	-751
Well Pumping	-834	-1,251

Figure 6. Current and Projected *Groundwater* Balance Components.

In this figure, well pumping (also called production) is the amount of water taken out of the system through wells (water use). The 50% increase in this component represents the expected increase in water use due to population growth.

Drainage to surface water is *groundwater* contribution to surface water features such as *wetland*s, lakes, and *streams*. The 40% reduction shown here may have an impact on maintaining summer baseflows and water temperatures. It is cautioned that the model as it is currently constructed is not specifically designed to provide an estimate as to how much stream flow will be impacted, but it could be modified to answer specific questions around this topic in future model runs.

Groundwater underflow is the amount of *groundwater* that seeps or discharges into Puget Sound at the shoreline. This value is influenced by the water levels in the *aquifers*, and the reduction shown here represents the impact from project water level decreases. The key importance to this component is that there has to be enough underflow to provide the pressure to keep the saltwater/freshwater interface offshore and prevent seawater intrusion.

Recharge is the portion of precipitation or rainfall that infiltrates the ground and reaches the *aquifer*. The estimated 20% reduction shown in the water balance accounts for *climate change* impacts.

The amount of *groundwater* underflow and discharge to *streams* is driven by the geological makeup of the *aquifer* system. Therefore, we have no direct ability to control these budget components. Rather it is the components of well pumping and *recharge* that we have more ability to directly control. We can reduce well pumping by reducing our water use through aggressive water conservation measures.

Though we cannot control precipitation patterns, we can take measures to enhance *recharge* through creative water capture and return measures (from the rain barrel

scale to large scale *infrastructure*) and through protective *land use* measures such as *low impact development* and protection of *aquifer recharge areas* and other *aquifer* conservation areas.

Aquifer Recharge Areas

Understanding the Island's *aquifer recharge* system is important for both *groundwater* quantity and quality. The identification and protection of high *aquifer recharge areas* is important both from the standpoint of *groundwater* quantity and quality. *Aquifer recharge areas* have geologic and soil conditions which allow high rates of surface water infiltration, which also means they are particularly susceptible to contamination. Increasing *impervious surface*s through development reduces the amount of *recharge* available to the Island's *aquifers*. At the same time, *runoff* from *impervious surface*s in developed areas contains increased contaminants. Efforts to protect and preserve the Island's natural water supply are warranted, as the resources that would be required to clean up after contamination or to secure a new source would be prohibitive.

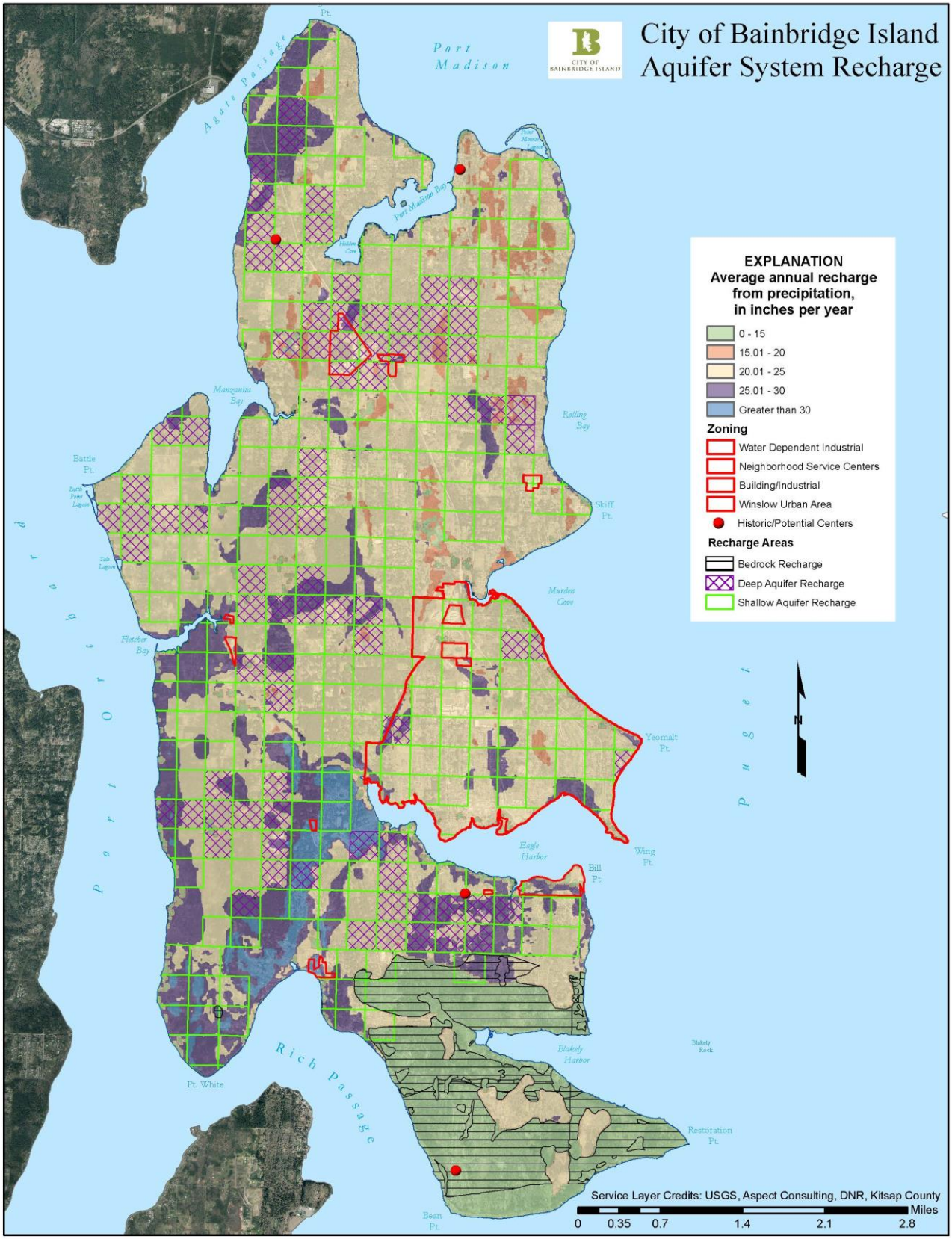
Where development overlays *aquifer recharge areas*, special considerations need to be made to preserve the volume of *recharge* available to the *aquifer* and to protect the *groundwater* from contaminates such as nitrates, biocides and heavy metals found in septic systems and *stormwater runoff*. The most extensively used *aquifer* underlies 85% of the Island and occurs under all zoning classifications.

To help the City assess *recharge* areas for special protection or designation, the model was run to determine *recharge* areas on the Island.

The Bainbridge Island model results indicate that areas across much of the Bainbridge Island area may have a critical recharging effect on *aquifers* that are sources of drinking water. Primary findings include:

- Wells in *shall*ow *aquifers* (including the Sea Level *Aquifer* and above) may withdraw water that originates as *recharge* relatively close to the well head and is younger than 100 years old. See figure below which shows the *recharge* areas for *shall*ow *aquifers* (green squares).
- Wells in deep *aquifers* (including the Glacio-Marine *Aquifer* and the Fletcher Bay *Aquifer*) may withdraw water that originates as *recharge* relatively distant from the wellhead and is greater than 100 years old. See figure below which shows the *recharge* areas for deep *aquifers* (cross-hatched area).
- Not all *groundwater* on Bainbridge Island comes from *recharge* on Bainbridge Island. Model results indicate several wells tapping the deeper *aquifers* withdraw water that originates as *recharge* from areas on the Kitsap Peninsula and is greater than 1,000 years old.

Wells in bedrock were not simulated in the Bainbridge Island model as the method of water particle tracking was not appropriate for fractured bedrock. However, the bedrock is also considered a CARA, because water supply wells have been installed at various depths in bedrock, and potable water supply is from *recharge*. Bedrock *recharge* area is shown at hatched area.


City of Bainbridge Island
Aquifer System Recharge
CITY OF BAINBRIDGE ISLAND
Port Madison
Agate Passage
Port Madison Bay
Manzanita Bay
Rolling Bay
Battle Pt.
Skiff Pt.
Murden Cove
Fletcher Bay
Port Orchard
Puget
Yeomalt Pt.
Eagle Harbor
Wing Pt.
Bill Pt.
Blakely Harbor
Rich Passage
Pt. White
Restoration Pt.
Bean Pt.
EXPLANATION
Average annual recharge from precipitation, in inches per year
0 - 15
15.01 - 20
20.01 - 25
25.01 - 30
Greater than 30
Zoning
Water Dependent Industrial
Neighborhood Service Centers
Building/Industrial
Winslow Urban Area
Historic/Potential Centers
Recharge Areas
Bedrock Recharge
Deep Aquifer Recharge
Shallow Aquifer Recharge
N
Service Layer Credits: USGS, Aspect Consulting, DNR, Kitsap County
Miles
0 0.35 0.7 1.4 2.1 2.8

Surface Water

The surface waters of Bainbridge Island provide aesthetic, recreational, economic, and ecological benefits to Island citizens. Boating, fishing, and shellfish harvest are important recreational and economic activities, and the Island's *streams*, lake, harbors, shorelines, and *wetland*s provide habitat for a diversity of fish and wildlife species.

The harbors and numerous coves around the Island host anchorage, moorage, marinas, boat launches, waterfront access, and swimming beaches. Eagle Harbor, specifically, hosts marinas which provide permanent moorage for live-aboards and an open water mooring and anchoring area for the Island's live-aboard community.

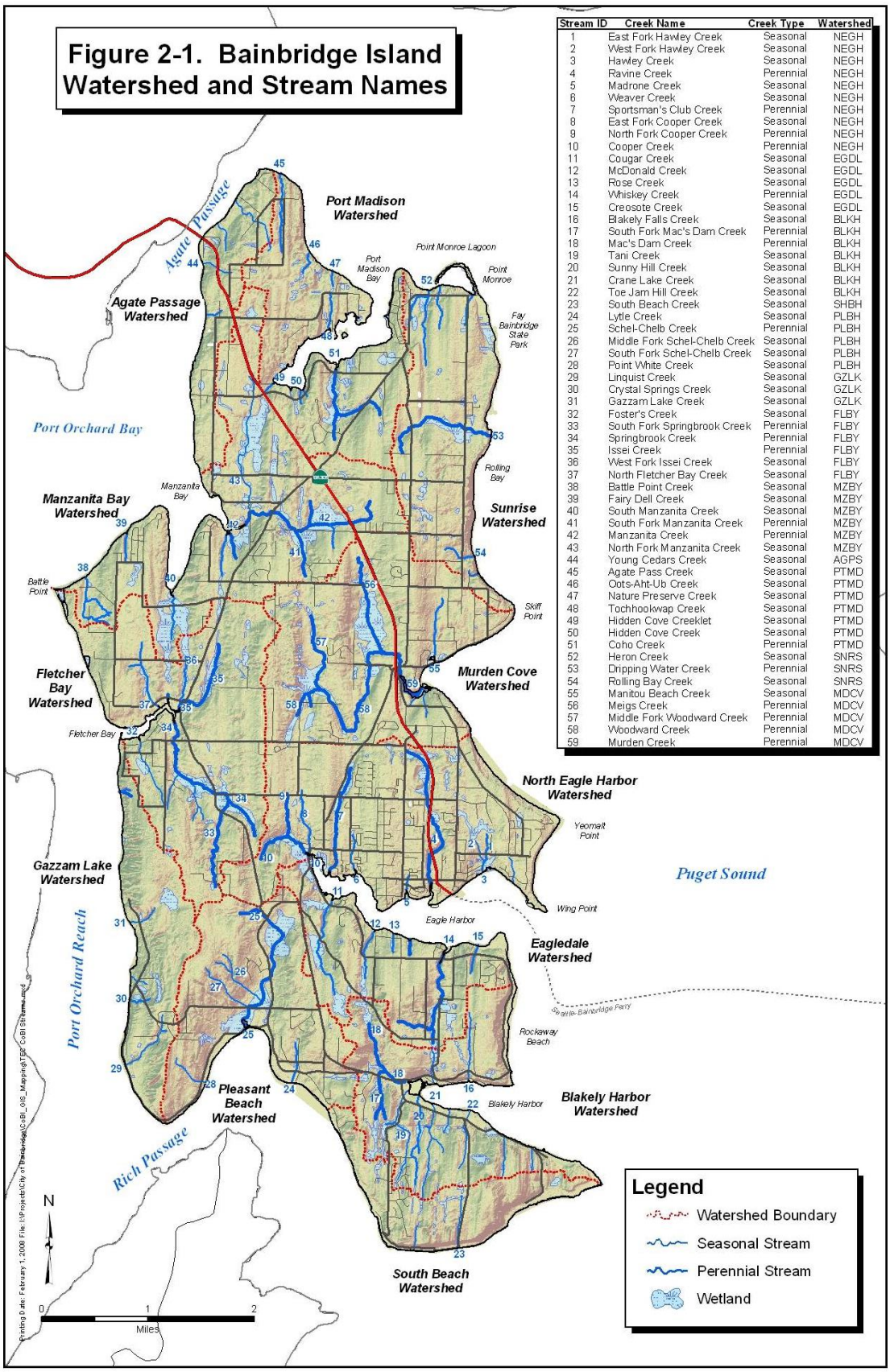
In addition to providing forage and habitat for salmon, otter, sea lions, and waterfowl and swimming, boating, and fishing areas for people, the majority of the Island's shorelines and adjacent nearshore areas are designated commercial shellfish growing and harvest areas by the State Department of Natural Resources. Many shoreline residents recreationally harvest shellfish such as clam and geoduck as well. The Shoreline Master Plan also regulations shellfish harvest activities.

Watersheds

Surface water flows from high geographic points to lower elevations collecting in *streams* and *wetland* systems within the *watershed*s of the Island. *Watershed* boundaries are determined by Island topography where ridgelines define the boundaries.

Bainbridge Island contains twelve distinct *watershed*s with 59 seasonal and perennial *streams* that contribute fresh water to Puget Sound (see Figure 2.1 below excerpted from the Water Quality and Flow Monitoring Program Final Monitoring Plan, 2008). Five harbors, twelve estuarine *wetland*s, one lake, 1,242 acres of *wetland*, 965 acres of tidelands (between mean high and mean low tide), and 53 miles of shoreline comprise the remainder of the surface water system.

Each surface water feature serves a critical function in preserving hydrologic connectivity within the *watershed*. Recent research is finding that even those features that are seasonal such as ephemeral or intermittent *streams* and seasonally-flooded *wetland*s are critical faunal and floral habitat providers, biogeochemical processors, and connectivity corridors.



Stream ID	Creek Name	Creek Type	Watershed
1	East Fork Hawley Creek	Seasonal	NEGH
2	West Fork Hawley Creek	Seasonal	NEGH
3	Hawley Creek	Seasonal	NEGH
4	Ravine Creek	Perennial	NEGH
5	Madrone Creek	Seasonal	NEGH
6	Weaver Creek	Seasonal	NEGH
7	Sportsman's Club Creek	Perennial	NEGH
8	East Fork Cooper Creek	Seasonal	NEGH
9	North Fork Cooper Creek	Perennial	NEGH
10	Cooper Creek	Perennial	NEGH
11	Cougar Creek	Seasonal	EGDL
12	McDonald Creek	Seasonal	EGDL
13	Rose Creek	Seasonal	EGDL
14	Whiskey Creek	Perennial	EGDL
15	Creosote Creek	Seasonal	EGDL
16	Blakely Falls Creek	Seasonal	BLKH
17	South Fork Mac's Dam Creek	Perennial	BLKH
18	Mac's Dam Creek	Perennial	BLKH
19	Tani Creek	Seasonal	BLKH
20	Sunny Hill Creek	Seasonal	BLKH
21	Crane Lake Creek	Seasonal	BLKH
22	Toe Jam Hill Creek	Seasonal	BLKH
23	South Beach Creek	Seasonal	SHBH
24	Lytle Creek	Seasonal	PLBH
25	Schel-Chelb Creek	Perennial	PLBH
26	Middle Fork Schel-Chelb Creek	Seasonal	PLBH
27	South Fork Schel-Chelb Creek	Seasonal	PLBH
28	Point White Creek	Seasonal	PLBH
29	Linquist Creek	Seasonal	GZLK
30	Crystal Springs Creek	Seasonal	GZLK
31	Gazzam Lake Creek	Seasonal	GZLK
32	Foster's Creek	Seasonal	FLBY
33	South Fork Springbrook Creek	Perennial	FLBY
34	Springbrook Creek	Perennial	FLBY
35	Issei Creek	Perennial	FLBY
36	West Fork Issei Creek	Seasonal	FLBY
37	North Fletcher Bay Creek	Seasonal	FLBY
38	Battle Point Creek	Seasonal	MZBY
39	Fairy Dell Creek	Seasonal	MZBY
40	South Manzanita Creek	Seasonal	MZBY
41	South Fork Manzanita Creek	Perennial	MZBY
42	Manzanita Creek	Perennial	MZBY
43	North Fork Manzanita Creek	Seasonal	MZBY
44	Young Cedars Creek	Seasonal	AGPS
45	Agate Pass Creek	Seasonal	PTMD
46	Oots-Aht-Ub Creek	Seasonal	PTMD
47	Nature Preserve Creek	Seasonal	PTMD
48	Tochhookwap Creek	Seasonal	PTMD
49	Hidden Cove Creeklet	Seasonal	PTMD
50	Hidden Cove Creek	Seasonal	PTMD
51	Coho Creek	Perennial	PTMD
52	Heron Creek	Seasonal	SNRS
53	Dripping Water Creek	Perennial	SNRS
54	Rolling Bay Creek	Seasonal	SNRS
55	Manitou Beach Creek	Seasonal	MDCV
56	Meigs Creek	Perennial	MDCV
57	Middle Fork Woodward Creek	Perennial	MDCV
58	Woodward Creek	Perennial	MDCV
59	Murden Creek	Perennial	MDCV

Stormwater

Stormwater is generated when the ground becomes saturated and rainwater drains overland to the nearest surface water body or rainfall encounters hard or *impervious surface*s and drains into manmade drainage ditches, catch basins, and pipes.

There is no question that *stormwater runoff* is the leading transport pathway of pollution into Puget Sound and its associated *wetland*s, creeks, *streams* and rivers. Not only does it carry pollutants such as trash; gas, oil, and metal-laden sediment from road surfaces and parking lots; pesticides, fertilizers, and other chemicals used in lawn care; pet waste and animal waste in agricultural areas, but the volume of *stormwater* generated by *impervious surface*s has tremendous force and can cause erosion and damage to in-stream and *wetland* habitat.

Peak flows that follow immediately after a storm can be much greater than existed when the land was in a natural state with vegetative cover, causing *streams* to expand and overflow and creating flooding conditions on adjacent lands.

Therefore, *stormwater* has long been considered, at best, a nuisance and flooding hazard to be collected and delivered downstream as quickly and efficiently as possible and, at worst, a waste stream to be collected and removed from the *watershed*. Existing land development methods and *stormwater* drainage system *infrastructure* are designed to do just that.

However, as early as the year 2000, water-starved areas of the country started to view *stormwater* as a vital resource rather than a waste stream, first by limiting its generation by reducing *impervious surface*; then, retaining and infiltrating it on site where feasible; and, lastly, protecting it from pollution, capturing it, and reusing it to the maximum extent possible. On June 16, 2015, the California State Water Resources Control Board adopted an order that provides a framework to promote integrated *stormwater* capture and reuse to improve water quality, protect local beaches, and supplement water supplies. The new [*stormwater* discharge] permit focuses on using *stormwater* as a resource and encourages *green infrastructure* and *groundwater recharge* (*Stormwater Report, Water Environment Federation, June 2015*).

The Pacific Northwest is not considered water-starved and local conditions are not nearly so dire as in California. However, *climate change* predictions suggest that local water supplies likely will see some reduction in *recharge*; rainfall patterns will further tax existing, ailing, and undersized drainage *infrastructure* and possibly diminish summertime stream flows and water quality; and warming temperatures will increase summertime stream temperatures. Therefore, local municipalities are, also, rethinking their view of *stormwater* and many have already started evaluating and planning for *climate change*, especially in *stormwater* drainage system maintenance and retrofit. In 2009, Kitsap County adopted resolution 109-2009, *Creating Kitsap County "Water as a Resource" Policy*, in which the county resolved to treat all of its waters, including *stormwater*, as a vital resource, incorporating *low impact development* and water capture and reuse into all of its *land use* and utility management planning.

Observed Surface and Stormwater Conditions

Department of Ecology Surface Water Quality Assessment

Every two years the State Department of Ecology (Ecology) identifies polluted water bodies and submits a list of impaired water bodies, called a 303(d) list, to the Environmental Protection Agency (EPA) for approval in accordance with the federal Clean Water Act. This assessment is based on the assumption that each water body *should* support certain designated uses. Some of these uses are swimming and boating, fish and shellfish rearing and harvest, and wildlife habitat.

Ecology designates water bodies that frequently or consistently fail to meet standards or criteria as *Impaired*. Water bodies that only infrequently fail to meet standards are classified as *Waters of Concern* or *Sediments of Concern* if the sampled matrix was sediment. These assessments use water, fish/shellfish tissue, habitat, and sediment data.

Ecology's *2012 Water Quality Assessment* determined that one stream, one harbor, two coves, one lagoon, and three Island-adjacent nearshore marine areas on Bainbridge Island were *Impaired* by one or more pollutants and were not able to provide the full recreational, habitat, and aesthetic benefits they once offered. An additional one bay, one harbor, and 28 other Island-adjacent nearshore marine areas were identified as *Waters of Concern* and/or *Sediments of Concern* for periodic excursions beyond the allowable standard or criteria for one or more pollutants.

Ecology's proposed *2014 Water Quality Assessment* (under review by the EPA at the time of this printing), designated an additional two *streams* as *Impaired* by at least one pollutant. Tables 2-5 on the following pages detail those water bodies classified as *Impaired* or *of Concern* according to the analyzed matrix (water, tissue, habitat, and sediment, respectively).

It *should* be noted that much of the sediment data were collected prior to 2003, some as early as the 1990's. These may not be representative of current conditions. Further, many of the identified pollutants are legacy pollutants resulting from historic *land use* such as large-scale, row-crop *farm*ing and the active lumber industry at the turn of twentieth century. The City's sediment sampling data collected in 2008 and 2013 may be more representative of current inputs to these water bodies. These data are summarized in the next section, *City Surface Water Quality Assessment*.

One example of legacy pollution is the former Wyckoff Creosote Facility located at the mouth of Eagle Harbor. Sites where sediments are contaminated by hazardous waste are regulated and managed through the Model Toxics Control Act (MTCA). Sites such as the former Wyckoff Creosote Facility, due to the complexity and size, are normally addressed through EPA's Superfund program.

However, water bodies listed on the 303(d) list require TMDLs (Total Maximum Daily Loads) where identified sources of the pollutant of concern are allocated a pollutant load reduction in order for that water body to meet criteria. Currently, the City is a stakeholder in the *Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load (TMDL)*. Four of the Island's *watersheds* are captured within the TMDL drainage basin boundaries (Fletcher Bay, Gazzam Lake, Pleasant Beach, and South Beach *Watersheds*).

Table 2. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Water

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Middle)	Bacteria	Impaired	Impaired
	Copper	Waters of Concern	Waters of Concern
Eagle Harbor (Inner)	Dissolved Oxygen	Waters of Concern	Waters of Concern
	Temperature		
Agate Passage - Bridge	Dissolved Oxygen	Waters of Concern	Waters of Concern
Agate Passage - Agate Point	Dissolved Oxygen	Waters of Concern	Waters of Concern
	Temperature		
Rich Passage - Pleasant Beach Cove/Pleasant Beach	Bacteria	Impaired	Impaired
	Dissolved Oxygen		
	pH	Waters of Concern	Waters of Concern
Rich Passage - Point White	Dissolved Oxygen	Waters of Concern	Waters of Concern
Rich Passage - Fort Ward	Bacteria	Waters of Concern	Waters of Concern
	Dissolved Oxygen		
	pH		
Port Orchard Passage - Lower Crystal Springs	Dissolved Oxygen	Impaired	Impaired
	Bacteria		
	Temperature	Waters of Concern	Waters of Concern
Port Orchard Passage - Upper Crystal Springs	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - Fletcher Bay	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - Battle Point	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - South of Rolston	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Mouth)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Middle)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Inner)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Murden Cove	Bacteria	Impaired	Impaired
Puget Sound (Central) - Rolling Bay	Bacteria	Waters of Concern	Waters of Concern
Port Madison Bay - Point Monroe	Bacteria	Waters of Concern	Waters of Concern
Port Madison Bay - Mouth	Bacteria	Waters of Concern	Waters of Concern
Springbrook Creek	Bacteria	Impaired	Impaired
Ravine Creek	Bacteria	---	Impaired
Murden Creek	Bacteria	---	Impaired

Table 3. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Tissue

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Outer)	Benzo(a)pyrene	Impaired	Impaired
	Benzo(a)anthracene		
	Benzo[b]fluoranthene		
	Benzo[k]fluoranthene		
	Chrysene		
	Dibenzo[a,h]anthracene		
	Indeno(1,2,3-cd)pyrene		
	PCB		
Puget Sound (Central) - Rockaway	Chrysene	Impaired	Impaired

Table 4. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Habitat

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Puget Sound (Central) - Murden Cove	Habitat	Impaired	Impaired
Port Madison - Point Monroe Lagoon	Habitat	Impaired	Impaired

Table 5. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Sediment

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Outer)	1,2,4-Trichlorobenzene	Impaired	Impaired
	1,2-Dichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	2-Methylnaphthalene		
	2-Methylphenol		
	4-Methylphenol		
	Acenaphthene		
	Acenaphthylene		
	Anthracene		
	Arsenic		
	Benzo(a)anthracene		
	Benzo(a)pyrene		
	Benzo(g,h,i)perylene		
	Benzofluoranthenes (b+k+j), Total		
	Benzoic Acid		
	Benzyl Alcohol		
	Bis (2-Ethylhexyl) Phthalate		
	Bioassay		
	Butyl Benzl Phthalate		
	Cadmium		
	Chromium		
	Chrysene		
	Copper		
	Dibenzo(a,h)anthracene		
	Dibenzofuran		
	Diethyl Phthalate		
	Dimethyl Phthalate		
	Di-n-butyl Phthalate		
	Di-n-octyl Phthalate		
	Fluoranthene		
	Fluorene		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	HPAH		
	Indeno(1,2,3-c,d) Pyrene		
	Lead		
	LPAH		
	Mercury		
	Naphthalene		
	N-Nitrosodiphenylamine		
	PCB		
	Pentachlorophenol		
	Phenanthrene		
	Phenol		
	Pyrene		
	Silver		
	Zinc		
Rich Passage - Pleasant Beach	Benzoic Acid	Sediments of Concern	Sediments of Concern
Rich Passage - Pleasant Beach Cove	Benzoic Acid	Sediments of Concern	Sediments of Concern
Port Orchard Passage - Upper Crystal Springs	Benzoic Acid	Sediments of Concern	Sediments of Concern
Port Orchard Passage - South of Rolston	1,2,4-Trichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2-Dichlorobenzene		
	Benzyl Alcohol		
Port Orchard Passage - Manzanita Bay	1,2,4-Trichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2-Dichlorobenzene		
Puget Sound (Central) - Wing Point	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Hexachlorobenzene		
	Pentachlorophenol		
Puget Sound (Central) - Rockaway	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	Naphthalene		
	N-Nitrosodiphenylamine		
Puget Sound (Central) - Blakely Harbor (Middle)	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Dibenzo(a,h) anthracene		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	N-Nitrosodiphenylamine		
	Pentachlorophenol		

Commercial Shellfish Growing Area and Recreational Harvest Area Assessment

Department of Health (DOH) routine bacterial and biotoxin assessments of recreational shellfish harvest areas and commercial shellfish growing and harvest areas demonstrate a significant loss of designated uses. The entire east, north, and west shorelines are closed to recreational butter and varnish clam harvest, and the southern shoreline is closed to recreational varnish clam harvest. Only one small area around Point White is open to recreational harvest.

Most commercial shellfish growing area around the Island is open to harvest. However, two segments of commercial shellfish growing areas along Agate Passage and Crystal Springs are currently closed due to bacterial contamination in shoreline drainages to include private drains, *stormwater* outfalls, and *streams*. Point Monroe Lagoon is restricted for commercial harvest, requiring that shellfish be transplanted to approved growing area waters for a specified amount of time in order to naturally cleanse themselves of contaminates before they are harvested for market. Commercial Geoduck Tract 07850 at Restoration Point was closed four times in 2012-2013 for biotoxin. Commercial Geoduck Tract 07000 at the mouth of Manzanita Bay has been closed 14 times in the last five years for biotoxin, and is currently closed at the time of this printing.

In addition to annual commercial growing area reports, DOH publishes an annual threatened areas report to bring attention to monitoring sites where bacteria concentrations are close to exceeding the criteria. The 2015 report (based upon 2014 data) identified one monitoring site (#457) immediate outside of the north side of the mouth of Fletcher Bay as a threatened site and one site (#418) along the southern shore of Blakely Harbor as a site of concern.

Swimming Beach Assessment

The Departments of Ecology and Health's BEACH Program conducts swimming beach monitoring for bacteria during the swimming season (Memorial Day through Labor Day). Typically, bacteria levels in marine waters tends to be fairly low in the summertime. In fact, most beach closures on the Island have been associated with *sanitary sewer* spills such as the Kitsap Sewer District #7 Fort Ward spill in 2012, and the City's sewer main breaks along the north side of Eagle Harbor in 2014.

In 2015, three of the Island's swimming beaches (Fay Bainbridge Park, Joel Pritchard Park, and Eagle Harbor Waterfront Park) were monitored. Bacterial concentrations in 2015 were acceptable, and there were no beach closures in 2015.

City Surface Water Quality Assessment

In 2007, the City received a Centennial Clean Water Fund Grant from Ecology to design and implement a long-term monitoring program to assess the ecological health of the Island's freshwater (*streams* and lakes), marine water (harbors, bays, and nearshore areas), and *stormwater* discharge.

The Water Quality and Flow Monitoring Program (WQFMP) was pilot-tested in 2007-2008 and expanded to Island wide long-term status and trends monitoring in 2010. The program currently conducts routine monitoring for stream and *stormwater* chemistry, stream and nearshore sediment chemistry, rainfall, stream and *stormwater* flow, and stream biodiversity (benthic macroinvertebrates). Every five years, the program also conducts targeted storm event monitoring to assess *stormwater runoff* impacts in *streams* and nearshore marine waters.

Although the program's Final Monitoring Plan is comprehensive, staffing and funding are limited. Current monitoring gaps are *stormwater* best management practice effectiveness monitoring, lake monitoring, marine biological assessments (fish, aquatic macrophytes, phytoplankton, and benthic invertebrates), routine marine water chemistry, and freshwater and marine habitat assessments.

The program released its first edition *State of the Island's Waters* report in 2012 which summarized findings from data collected through Water Year 2011 (September 2011). Program staff are currently assessing data collected through Water Year 2015 (September 2015) and working on a second edition of the report. The following summary reflects assessments completed at the time of this printing.

Bacteria

All of the seven nearshore marine waters monitored during WY2014 targeted storm event monitoring failed to meet the state criteria for fecal coliform bacteria, while 13 (86%) of the 15 *streams* monitored on a monthly basis failed to meet the state criteria in WY2015. Given these results and the number of state listings for bacterial impairment (see Table 2 above), bacteria has proven to be the most prevalent pollutant in freshwater and marine water resources Island wide.

As described above in *Commercial Shellfish Growing Area and Recreational Shellfish Harvest Area Assessment*, commercial shellfish harvest areas along approximately twelve miles of shoreline are currently closed due to elevated bacteria in shoreline drainages, and nearly the entire Island is closed to recreational harvest of varnish and butter clams due to the biotoxins usually associated with bacteria.

Bacterial contamination is common to every season and every *watershed*, urban or rural, and its sources are as varied as the landscape itself. In rural *watershed*s, the most common sources of bacteria are failing septic systems, improperly-managed pet and livestock wastes, and wildlife. In urban *watershed*s, the most common sources are improperly-managed pet waste, improper food handling, poorly-maintained food waste receptacles, failing septic systems, poorly-maintained or failing *stormwater* drainage *infrastructure* (private and public), failing *sanitary sewer infrastructure*, and illicit cross-connections between the *sanitary sewer* and the *stormwater* drainage systems.

In marine environments, common sources of bacteria aside from discharges from upland sources are improper boat waste disposal, failing *sanitary sewer infrastructure*, and wildlife.

Nutrients

Although they are essential to all plant, human, and aquatic life, phosphorus and nitrogen concentrations, if excessive, can overstimulate growth of aquatic vegetation and algal blooms. Applying Ecology's Water Quality Index using the ratio of total nitrogen to total phosphorus, Island *streams* generally rate of low to moderate concern during the wet season and moderate to high concern during the dry season relative to other Puget Lowland *streams*. In 2013, a year of below average rainfall, most *streams* rated of moderate concern even in the wet season, and 3 *streams* reached a high level of concern. During the extreme dry period in the summer of 2015, 7 *streams* climbed to a level of high concern.

Nuisance algal blooms have increased along eastern shorelines and harbors (see Ecology's Eyes Over Puget Sound). These blooms are not only aesthetically unpleasant, but dying and decomposing algae use up aquatic life-sustaining oxygen and render aquatic habitat unusable such as in Murden Cove and Point Monroe Lagoon which are covered year-round with ulvoid macroalgae (see Table 4 above).

Though more study is needed to establish natural background levels for Island *streams* and it is well-understood that a significant amount of nitrogen-loading in Puget Sound comes from the ocean through the Strait of Juan de Fuca via tidal action, ecosystems with naturally high background levels are particularly sensitive to any additional loading from human sources.

Aside from the natural sources of nutrients from forests and *wetland*s, human inputs include agricultural and residential fertilizers, phosphate-based laundry detergents and commercial washing agents, yard waste such as grass clippings and other vegetation dumped along shorelines and *streams*, failing residential septic systems (in some cases even functioning systems), failing municipal sewer *infrastructure*, and improperly handled pet and livestock waste.

Ammonia

Ammonia is considered a priority pollutant by the EPA, since it is toxic to both humans and aquatic life. Therefore, there are established acute and chronic criteria for ammonia in surface waters. Acute criterion is the concentration of a substance at which injury or death to an organism can occur as a result of short-term exposure. Chronic criterion is the concentration of a substance at which injury or death to an organism can occur as a result of repeated or constant exposure.

Out of the 11 fish-bearing *streams* monitored on a routine basis, 8 (73%) consistently exceeded the chronic criteria, while the remaining 3 had seasonal exceedances only.

During WY2014 targeted storm event monitoring, all 7 *streams* and corresponding nearshore areas monitored exceeded the chronic criteria. Murden Cove frequently exceeded the acute criteria. The cove exceeded acute criteria 14 times during the 3-year Murden Cove *Watershed* Nutrient and Bacteria Reduction Project (2013-2015).

Sediment and Metals

During rain events, sediment-laden *stormwater runoff* is a prominent pollutant on the Island. Not only does sediment cause excessive scouring and erosion, de-stabilizing *slope*s and stream banks and threatening property, but subsequent downstream deposition clogs stream bottoms, smothers fish eggs, and increases siltation rates in the Island's harbors and bays. Sediment also reduces fish's ability to find food and damages their gills as well.

Sediment-intolerant macroinvertebrate species (an important food source for fish) have diminished, some entirely, from half of the Island *streams* monitored, especially Ravine and Murden Creeks.

Equally concerning are the pollutants that sediment carries with it such as heavy metals. Though ambient or background levels of suspended sediment in *streams* and nearshore areas are generally quite low, monitoring results have shown significant increases in suspended sediment and concentrations of metals in *streams*, nearshore marine waters, and *stormwater* outfall discharge during intense rain events.

Anywhere soil is exposed to rain there is a risk of sediment-laden *runoff*. Construction sites, croplands, sand and gravel pits or accumulations, and any other cleared or grubbed land surfaces are all potential sources of sediment. Likewise, poorly-maintained parking lots, *stormwater* drainage systems, and roadways become significant sources of sediment, particularly sediment laden with heavy metals.

Metals are also carried to *streams* from uncontrolled discharges from auto washing wash-water and industrial discharges.

Climate change may lead to an increase in landslide risk, erosion and sediment transport in the fall, winter, and spring seasons, while reducing the rates of these processes in the summer. Quantitative projections are limited, because of the challenge in distinguishing *climate change* impacts from factors such as development patterns and forest management.

The City collects sediment samples from select stream and nearshore sites every five years for contaminant chemistry and grain size analysis.

In-situ Physical Chemistry

Several Island *streams* and nearshore areas experience periodic excursions in pH, temperature, and dissolved oxygen. Excursions in pH are fairly rare. However, Hawley

(East and West Forks), Murden, Schel Chelb, Manzanita, Springbrook, Issei, and Mac's Dam Creeks and Murden Cove suffer chronically low levels of dissolved oxygen. While most only exceed standards in the summertime, Murden and Schel Chelb Creeks exceed standards year-round.

Several *streams* that had historically maintained acceptable water temperatures year-round, have started to exceed temperature criteria during the summertime since 2012 with excursions occurring more frequently over time. These *streams* are Hawley (East and West Forks) Sprinbrook, Schel Chelb, Linquist, Gazzam Lake, and Mac's Dam Creeks. Two nearshore areas (Eagle Harbor at Ravine Creek, and Murden Cove) frequently exceed temperature criteria as well.

Continuous temperature and dissolved oxygen sensors were deployed in three separate reaches of Murden Creek as part of the 2013-2015 Murden Cove *Watershed* Nutrient and Bacteria Reduction Project. Summertime daily maximum temperatures at all three locations exceeded the criteria with temperatures increasing and exceeding criteria more often in the downstream reach. Similarly, summertime daily minimum dissolved oxygen levels exceeded criteria at all three sites. However, upstream reaches only infrequently exceeded criteria during the summertime, while oxygen levels were significantly lower in the downstream reach and exceeded criteria year-round.

Despite observed improvements in some water quality parameters such as phosphorus and bacteria over the project period, in-stream chemistry stayed the same or worsened. This indicates that the impact is most likely habitat driven (lack of canopy cover, reduced or absent buffers, lower summertime stream flows) rather than an illicit discharge of polluted water.

These excursions in physical chemistry, especially temperature and dissolved oxygen, significantly impair these waters' ability to support aquatic life.

Flow and Land use Impacts on the Biological Community

Hydrology is perhaps the most fundamental driver of physical, chemical, and biological processes in streams and is often considered a "master variable" controlling geomorphology, substrate stability, faunal and floral habitat suitability, thermal regulation, metabolism, biogeochemical cycling, and the downstream flux of energy, matter, and biota [Power et al. 1988; Resh et al. 1988; Poff and Ward 1989; Poff 1996; Poff et al. 1997; Dodds et al. 2004](McDonough, Hosen and Palmer, 2011).

In 2015, the City contracted with King County Department of Natural Resources and Parks, Water and Land Resources Di*Vision* to conduct a stream benthos and hydrologic evaluation of the City's stream benthic macroinvertebrate data and continuous flow gauging data.

Flow data analysis showed that stream flows increase more quickly following rain events and generally have higher peaks than would be expected under forested conditions. These results were generally consistent with increasing levels of urbanization upstream of each gauge and consistent with other data collected in other Puget Sound *watershed*s.

The average Benthic Index of Biotic Integrity (B-IBI) scores spanning all years of data were very poor for Ravine Creek; poor for Issei, Murden, and Whiskey Creeks; and fair for Cooper, Manzanita, Springbrook, and Woodward Creeks. None of the eight sites investigated had average scores that showed good or excellent stream benthic communities, although two sites (Cooper and Springbrook) did have individual sampling years that had good scores. Again, these data were generally consistent with the level of development in the study *watershed*s and with data collected in other Puget Sound *watershed*s.

Five statistically significant upward or downward B-IBI component metric trends were identified at four creek sites. Two Murden Creek site metrics showed a worsening trend in species diversity and percentage of pollution tolerant species versus intolerant species. Manzanita Creek showed an improving trend in species richness and both Cooper and Issei Creek showed an improving trend in percentage of pollution intolerant species versus tolerant species.

King County also examined three additional benthic macroinvertebrate diagnostic metrics for organic pollution (i.e., animal waste including human waste), fine sediment, and metals. The Fine Sediment Sensitivity Index was generally lower at all Bainbridge sites relative to reference sites, suggesting that fine sediment inputs may be a factor in benthic impairment in these *streams*. If confirmed through evaluation of sediment conditions at these sites, the cause is unlikely related exclusively to development as some of the stream basins are relatively undeveloped. It is possible that at least in some instances, past *land use* (e.g., historical logging and *farm*ing activities) is a factor in causing excess sediment to be (or to have been) delivered to these *streams*. Any development within these basins may also be a contributing factor as well; potentially delivering fine sediment through construction and land clearing activities and through stream bank erosion resulting from increased peak flows.

All three diagnostic metrics and the flashiness hydrologic metrics indicate that Ravine Creek is suffering from multiple stressors that potentially include organic and metal pollution, geomorphic alteration, and flashier flows, all typical of an urban stream.

There was only one statistically significant upward or downward trend in these three additional metrics – an improving trend in metals-intolerant species in Issei Creek.

Habitat

As stated above in *City Surface Water Quality Assessment*, limited resources prevent the City's monitoring program from actively monitoring for freshwater and marine water habitat assessment aside from limited sediment sampling in select stream and adjacent nearshore areas (addressed above in Water and Sediment). Most of what we know about our nearshore marine habitat and freshwater habitat is based upon work by non-profit entities such as the Bainbridge Island Land Trust, the Puget Sound Restoration Fund and the Bainbridge Island *Watershed* Council and outside agencies such as Washington State Department of Fish and Wildlife (WDFW), Washington State Department of Natural Resources (DNR), Ecology, Wild Fish Conservancy, and the Suquamish Tribe. Limited *land use*/land cover information is available through aerial photography and light detection and radar (*LID*AR) technology, as well.

Land cover

Bainbridge Island encompasses an area of 17,471 acres, or approximately 28 square miles. The primary land cover is tree-cover at 73%, or 12,760 acres. Grass/scrub lands, developed areas with *impervious surface*s and other coverages comprise 15%, 11% and 1%, respectively, with combined coverage of 4,712 acres (Table 1 next page).

Land use type does not vary widely by any great degree across the island due to a low percentage of industrial or commercial land development and the lack of available or developed *farm*/range land. The island's *land use* is consequently dominated by *residential use*s (75%). Other *land use*s such as recreation land (7%), agricultural (6%), transportation corridors (6%), commercial/light manufacturing (2%), *forest land*-use (2%) and public facilities (2%), make up the remainder of the *land use* as a percentage of the total acreage on the island. With a total overall population of 23,630 the greatest population *density* occurs at the towns of Winslow, Island Center, Lynwood Center and around the coastline of the island. Outside of urbanized areas, the Island is generally characterized by scattered, small communities, homes on acreage, and large parcels of undeveloped land.

Stream type

In 2014, the Wild Fish Conservancy (WFC) completed stream typing for Bainbridge Island as part of the West Sound *Watershed*s, Kitsap Peninsula (WRIA 15) Stream Typing Project.

WFC's website states, "Water typing is the state-sanctioned process of mapping the distribution of fish and fish habitat. Regulatory water type maps are used to regulate *land use* decisions adjacent to *streams*, ponds, and *wetland*s. Because existing (modeled) regulatory maps often significantly misrepresent the presence, location, and extent of fish habitat, the effectiveness of state and local government fish habitat protection regulations is compromised. More information about the water typing process and its significance is available at: http://wildfishconservancy.org/resources/maps/what-is-water-typing."

WFC classified fish and fish habitat in Island *streams* and ground-truthed regulatory maps of stream presence and location, identifying an additional 25 previously unknown/unmapped miles of stream with 698 acres of previously unprotected habitat buffer on Bainbridge Island. The City is currently using WFC's updated stream data.

Table 1. CoBI *Watershed* Land Cover Statistics

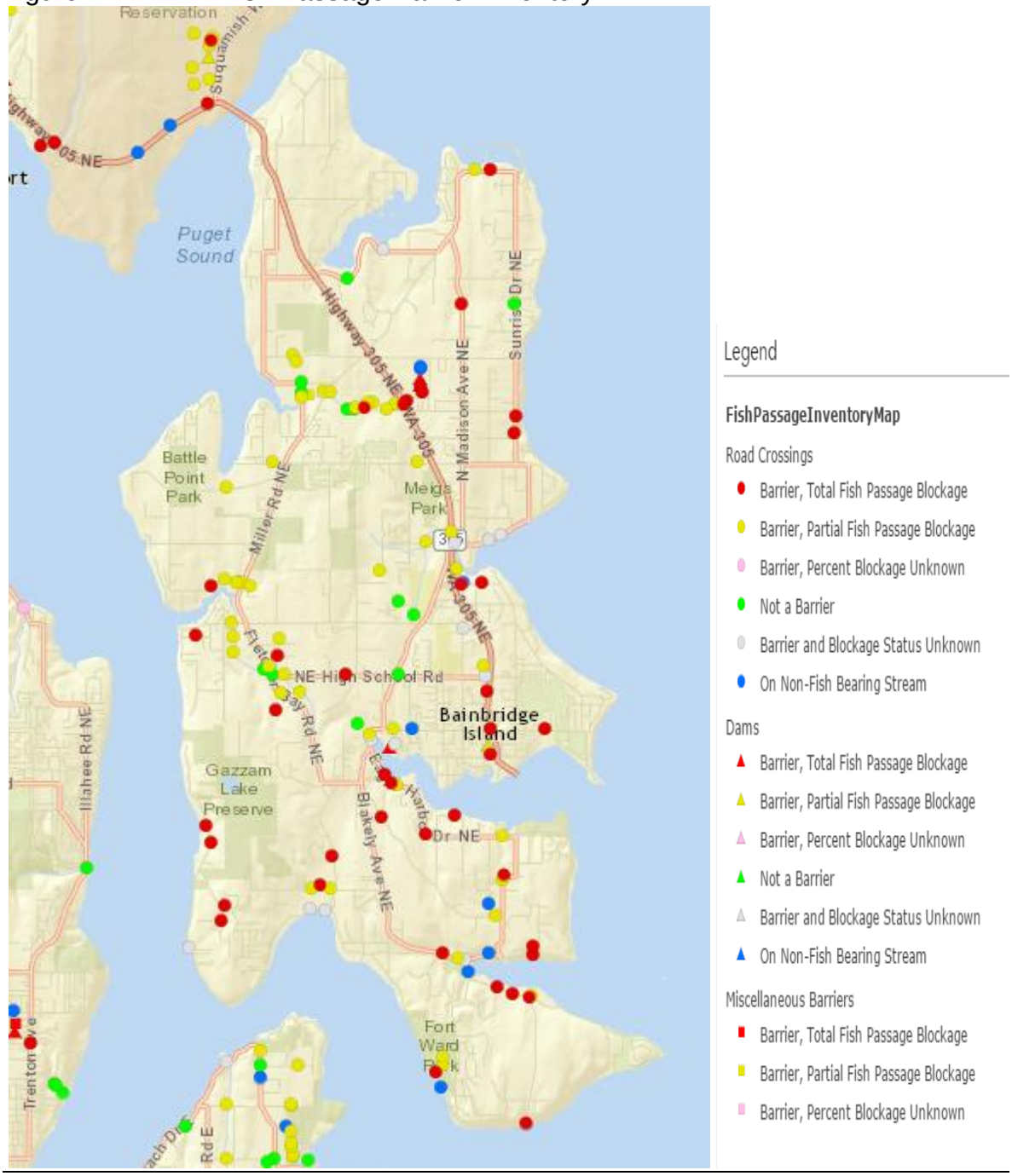
Watershed Name /Code	*Watershed* Area (Acres)	*Watershed* Size Ranking	Breakdown of Total *Watershed* Landcover (% of Total Area)								
			Forest	*Wetlands*	**Natural**	Grass & Turf	Bare Ground	% Total Impervious Area	**Developed**	**Surface Water**	**Other**
Agate Passage / AGPS	599.96	12	79.52	2.75	**82.28**	4.25	3.08	9.17	**16.51**	**0.17**	1.04
Blakely Harbor / BLKH	1,369.73	7	87.04	1.08	**88.13**	2.25	3.62	5.75	**11.62**	**0.22**	0.04
Eagledale / EGDL	1,094.12	9	65.10	2.95	**68.04**	8.83	4.36	18.45	**31.63**	**0.33**	0.00
Fletcher Bay / FLBY	2,114.01	3	75.83	1.09	**76.92**	8.60	6.04	7.89	**22.52**	**0.56**	0.00
Gazzam Lake / GZLK	886.45	10	83.96	0.79	**84.74**	3.96	1.86	7.82	**13.64**	**1.62**	0.00
Manzanita Bay / MZBY	2,296.34	1	72.25	1.92	**74.18**	9.76	6.76	8.85	**25.37**	**0.46**	0.00
Murden Cove / MDCV	2,046.36	4	73.65	2.34	**75.99**	7.65	6.46	9.48	**23.58**	**0.43**	0.00
North Eagle Harbor / NEGH	2,184.91	2	50.64	2.46	**53.11**	8.30	10.57	26.95	**45.82**	**0.44**	0.63
Pleasant Beach / PLBH	1,437.63	5	70.66	3.00	**73.66**	6.01	6.64	13.56	**26.21**	**0.13**	0.00
Port Madison / PTMD	1,388.31	6	81.85	1.18	**83.03**	6.26	3.75	6.36	**16.37**	**0.30**	0.31
South Beach / SHBH	711.89	11	76.59	1.20	**77.79**	4.16	10.88	6.54	**21.58**	**0.63**	0.00
Sunrise / SNRS	1,342.24	8	79.08	1.92	**81.00**	4.49	6.41	7.97	**18.87**	**0.13**	0.00
TOTAL ACREAGE	**17,471.95**	-	12,760.44	333.49	**13,093.92**	1,194.76	1,089.27	1,994.28	**4,278.31**	**74.84**	**24.88**

Notes:
** Statistical sources include: Battelle GIS database, CoBI GIS data, and CoBI Level II Assessment (Kato & Warren, 2000)
(Water Quality and Flow Monitoring Program – Final Monitoring Plan, COBI, 2008)

Fish Passage Barrier Inventory

In 2014 the Washington Department of Fish and Wildlife (WDFW) completed fish passage assessments on Bainbridge Island *streams*. As part of this assessment, WDFW identified 43 total passage barriers (40 road crossings and 3 dams) and 45 partial passage barriers (43 road crossings, 1 dam, and 1 miscellaneous) (see Figure 2).

Figure 2. WDFW Fish Passage Barrier Inventory



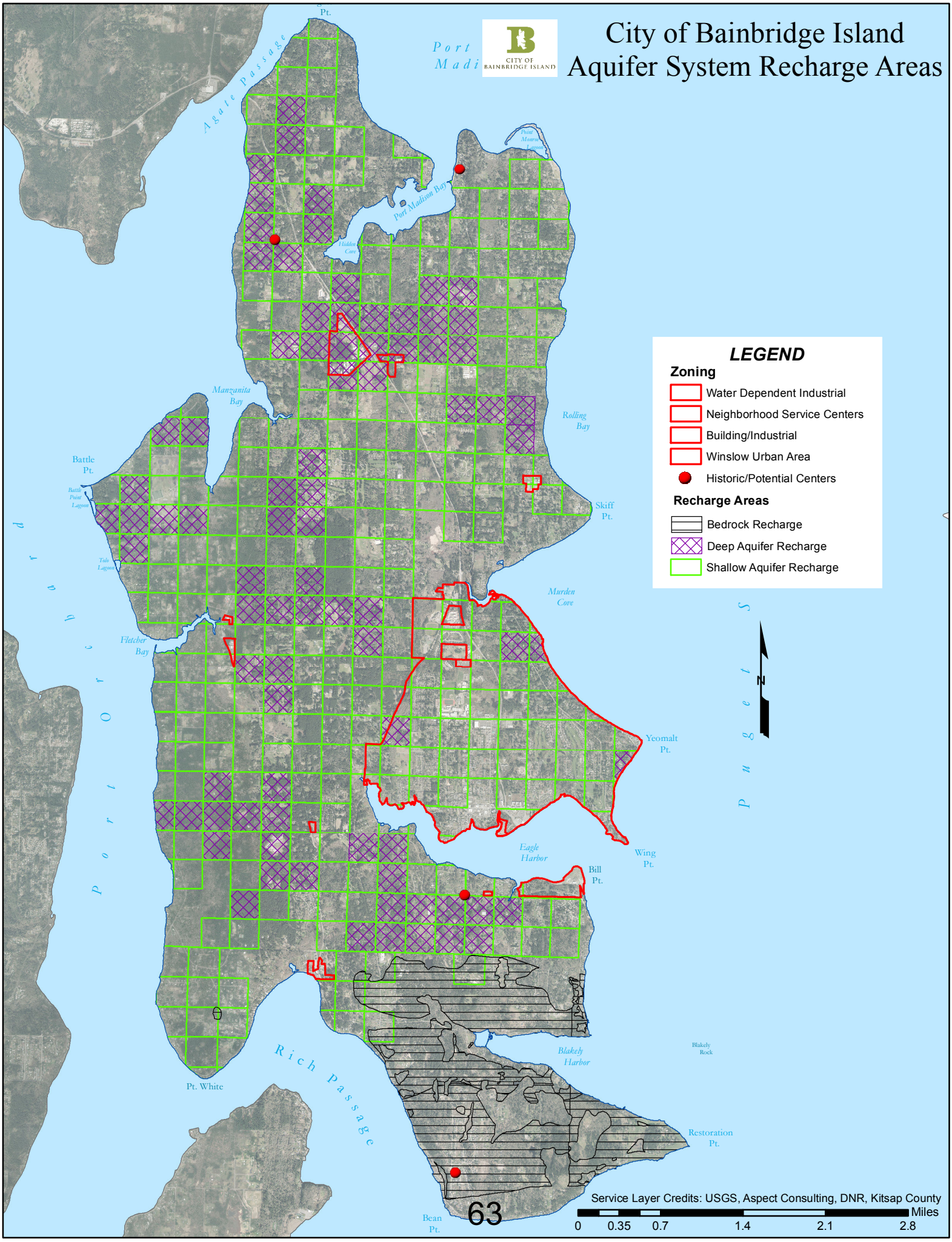
(http://wdfw.maps.arcgis.com/home/webmap/viewer.html)

WATER RESOURCES ELEMENT IMPLEMENTATION

To implement this Element, the City must take action in several ways, including regulations, program creation, and budgeting.

- Modify Aquifer Recharge Area regulations in the City's Critical Areas Ordinance, BIMC Chapter 16.20.
- Adopt stringent Low Impact Development (LID) regulations to comply with the City's NPDES permit requirements, and ensure continued aquifer recharge when development creates new impervious surfaces.
- Create a program to promote LID retrofits for existing private development and consider retrofit for public facilities.
- Develop and Island-wide Groundwater Management Plan.
- Continue data gathering, monitoring, and analysis for all City water resources.
- Continue and improve outreach programs to educate the public about water conservation and protecting water quality, including outreach to owners of exempt wells.
- Coordinate with state and local health departments to evaluate and promote new technologies that conserve and protect water resources (e.g. greywater capture, composting toilets).
- Improve coordination with the EPA, Washington Department of Ecology, and the Kitsap Public Health District to address clean-up of contaminated sites.
- The City must continue to respond to climate change scenarios in order to protect and manage its water resources.

City of Bainbridge Island Aquifer System Recharge Areas



WATER RESOURCES ELEMENT

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NOTE: HIGHLIGHTED GOALS ARE RECOMMENDED TO BE MOVED TO UTILITIES ELEMENT

WATER RESOURCES ELEMENT

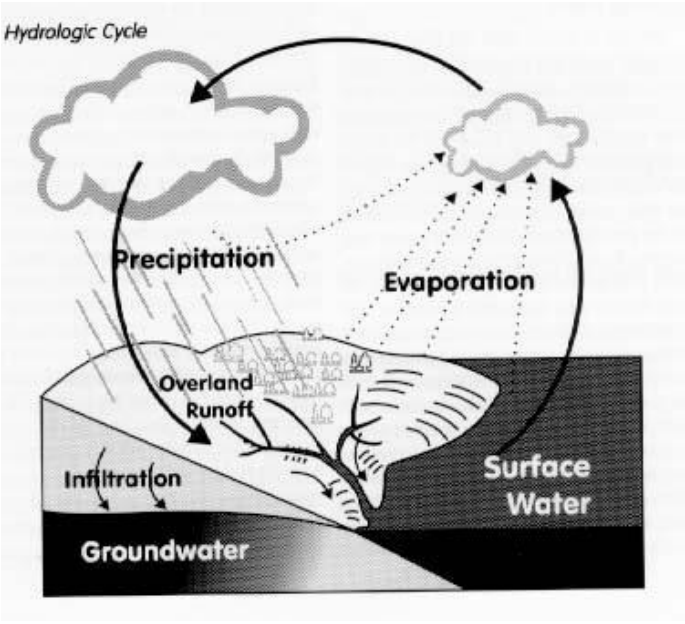
INTRODUCTION

Bainbridge Island is a quasi-enclosed environment that requires a holistic perspective to understand the interdependence among the Island's three primary water resources: *groundwater*, surface water, and *stormwater*. Although these waters are typically regulated and managed independently, they are, in nature, intimately connected. In fact, it is all the same water, simply given a different name and managed according to where it resides in the hydrologic cycle at any given time (see Figure 1).

When rain falls, rainwater that is not evaporated or taken up by plants will take one of three paths. It may infiltrate into the ground where it is called *groundwater*. It may drain directly into *streams* and harbors where it is called surface water, or it may be captured by manmade *infrastructure* such as street drains, ditches, or detention/retention ponds where it is called *stormwater*.

Rainwater that infiltrates into the ground (*groundwater*) may be pumped from wells to provide drinking water or irrigation or seep out of the ground into *streams*, springs, and harbors where it is, again, called surface water. Likewise, *stormwater* may discharge into a nearby stream or harbor and become surface water or infiltrate into the ground and become *groundwater*.

Figure 1. The Hydrologic Cycle



In order to successfully protect and manage any one of these waters, one must protect and manage all three. To address these interrelationships, a separate Water Resources Element has been developed as follows:

- General water resources management policies
- *Groundwater* protection and management ~~and protection~~ policies
- Surface water protection and management ~~and protection~~ policies
- *Stormwater* protection and management ~~and protection~~ policies
- Residential on-site sewage system policies
- Contaminated sites policies
- Public education and outreach policies

Land use Connection

In the development of policies related to the management of our Island water resources, it is important to understand the links between water resources quality and quantity and *land use*. Most water quality and habitat integrity impacts are caused by the way land was or is used. Developed land allows for rapid *runoff* and inundation of natural conveyance systems such as *wetland*s and *streams*. Rapid *runoff* can cause damage through flooding, erosion, and water-borne contamination.

In addition, *household*s create sewage which needs disposal either by a wastewater treatment plant or by residential on-site sewage systems. Wastewater treatment plants are reasonably effective at cleaning wastewater, but do not at present provide complete removal of nitrogen nor treat for contaminants of emerging concern which include, but are not limited to, byproducts of medications, recreational drugs, health and beauty products, and caffeine.

Residential on-site sewage systems can fail and cause contaminants to enter the surface water and/or *groundwater*. Even functioning systems, depending upon *density* and proximity to surface water and *groundwater*, can contribute to accumulations of nitrogen and contaminants of emerging concern in these waters.

Use of fertilizers, pesticides, and other chemicals for cropland, lawns and gardens, and vehicle and *household* cleaning and maintenance as well as improper pet and livestock waste management can add significant contamination to surface water, *stormwater* and *groundwater*.

Commercial and industrial uses, past and present, leave behind pollutants in our soils. In particular, historic *land use*s such as large row crop agriculture, lumber, petroleum, and others have left behind legacy pollutants in sediments both on upland properties and in the sediments along the bottoms of our *streams*, harbors, and nearshore areas.

Without proper coordination of the regulations that will implement policy statements, conflicting signals may be given when dealing with water resources issues. For example, a surface water problem may be resolved by efficiently collecting and removing all water

from the area, whereas a *groundwater recharge* issue may require that the water be kept on-site to allow for infiltration.

Another conflict arises when infiltration of *stormwater* competes for space with on-site sewage system drainfields. There are physical limitations to the rates of infiltration and absorption based on soil types, which may make it impossible to have both of those facilities on the same site. Where development occurs in important *aquifer recharge areas*, special consideration is needed to preserve the volume of *recharge* available to the *aquifer* and to protect the *groundwater* from contamination.

A key component of ~~the~~ water resources protection and adaptive management ~~strategy~~ is adequate monitoring ~~and assessment~~ in order to assess impacts of current *land use* and effectiveness of applied management actions.

The overriding theme that runs through all of the policies and *goal*s in this element is the preservation and protection of water quality, water quantity, and ecological and hydrologic function.

Climate change

Climate change projections indicate that over the coming decades, sea level may rise up to four feet in the Puget Sound region, the ocean will become more acidic, and climatic conditions are likely to become warmer. This will result in more intense rain events during the wet season with longer, drier summers, though overall annual volume of rainfall will remain approximately the same.

Ocean acidification will likely impact aquatic species survival and assemblages in our marine areas and sea level rise will likely impact habitat and built *infrastructure* in our nearshore areas including homes, businesses, and public facilities such as roads and sewer facilities.

Wetter conditions during the wintertime will increase water availability, but may cause flooding or diminish water quality. More intense and frequent storms or heavier rainfall events can cause *stormwater* inundation and localized flooding, chronic flooding, non-infiltrated run-off, erosion and lands*LID*es. Increased intensity of rainfall may also diminish *aquifer recharge* rates as saturated soils are less able to absorb large amounts of water falling over short periods of time.

Warmer, drier conditions in the summertime will increase evaporation rates and water demand by plants, wildlife and people, and may diminish water quality. Dry conditions decrease water availability, resulting in reduced stream flow and diminished *aquifer recharge*. Warmer and drier conditions can also reduce water quality, both by increasing in-stream temperatures and by concentrating contaminants in smaller volumes of water.

[2] ~~*City of Bainbridge Island Level II Assessment: An Element of the Water Resources Study*, 2000, Kato & Warren, Inc., Robinson & Noble, Inc~~

VISION

Bainbridge Island's water resources (precipitation, on the surface, and in the ground) are climate resilient and demand and quantity are adequate for all forms of life on the Island. *Aquifers* are continuously monitored and maintained above the early warning level. The water quality for most of the consumed water is monitored to ensure quality fully meets the standards for drinking water. Education on water conservation has resulted in a significant reduction in the average water consumption per *household*. The Bainbridge Island *groundwater* model is regularly updated with new data and results from model runs are used to maintain long-term *sustainability* of the Island's water resources. *Low impact development* techniques are applied to all *land use*s and redevelopment.

GOALS AND POLICIES

GOAL 1 General Water Resources

Protection of water resources is of primary importance to the Island. Therefore, the *goal* is to manage the water resources of the Island in ways that restore, enhance, and preserve their ecological and hydrologic function. ~~for present and projected *land use*s, recognizing that they are are the sole water supply and that:~~

- **Degradation of ~~*groundwater* quality and quantity~~ water resources is not allowed.**
- ~~**Water supplies and systems are efficiently utilized.**~~
- **The long-term *sustainability* of the Island's water resources is maintained, taking into account future climatic conditions and their effects on the water cycle.**
- ~~**The water needs of N**~~**new development and population growth are managed so that water resources remain adequate for the indefinite future ~~approved under the *Comprehensive Plan* are adequately met by the existing resources~~.**
- ***Groundwater*, surface water, and *stormwater* monitoring, data assessment, and reporting ~~Adequate data of the water resource~~ are current and available including future projections of availability, quality and need.**
- **Use current and future technology to maintain and protect water resources.**

General Water Resources Policies

Policy WR 1.1

The City *shall* study future climate and demand scenarios to accurately understand future water resource conditions.

Policy WR 1.2 ~~1.1~~

~~The City *shall* coordinate with other major private water purveyors, government agencies and citizens to ensure protection and preservation of water resources and to provide efficient high quality Island-wide water service.~~ *Groundwater*, surface water, and *stormwater* are resources that *shall* be protected and managed to preserve water quality and quantity, and to retain natural ecological and hydrologic function to the maximum extent practicable.

Policy WR 1.3 ~~1.2~~

~~To foster sustainable water resources, planning, protection, management, monitoring and on-going education outreach that is based on *watersheds* and natural systems *should* be provided by the City in coordination with appropriate agencies.~~ To foster sustainable water resources, planning, protection, management, monitoring and on-going education and outreach *should* be provided by the City in coordination with government agencies at all levels, drinking water purveyors, *watershed* management groups, Tribes, non-profit organizations, local integrating organizations for regional recovery and protection, and other stakeholders.

Policy WR 1.4 ~~1.3~~

The policies in this element work in tandem with the protective measures set by the City's Shoreline Management Master Program, *Critical areas* Ordinance, and any other environmental or water resources management ordinance established by the City.

Policy WR 1.5

Identify the areas of the Island that are the most vulnerable to pollution from concentrations of fecal coliforms and nitrates (for example, from septic fields, agricultural activities, or fertilizers), and monitor those areas to determine if and when preventative or restorative measures are warranted.

GOAL WR-2 *Groundwater* Protection and Management ~~Protection Policies~~

Policy WR 2.1

Recognize that the entire Island functions ~~To protect *groundwater* resources, areas identified~~ as an ~~high~~ *aquifer recharge area*. *Low impact development* techniques are essential for maintaining *aquifer recharge*.~~*should* be maintained in low impact uses~~.

~~**Discussion:**~~ Low impact uses and ~~low impact~~ less intense development are appropriate for areas with high *aquifer recharge*. Low impact uses include development for buildings, roads or parking that has a reduced area of impact on the land. Low impact uses do not depend on regular applications of fertilizers or pesticides. *Low impact development* is an environmentally-friendly approach to site development and *stormwater* management, emphasizing the integration of site design and planning techniques that conserve and protect the natural systems and hydrologic functions of a site.

Policy WR 2.2

Areas of high *aquifer recharge should* be identified and assessed as part of a *land use* application. Care *should* be taken to minimize the effect of development on these areas.

Policy WR 2.3

To ~~protect Island~~ promote efficient use of *groundwater* resources, the City *shall* encourage the ~~development and~~ expansion of public and private water systems, rather than encouraging *shall*ow or individual residential wells.

Policy WR 2.4

The City *shall* assess the impacts of proposed activities and development on the flow of springs and *streams* and levels of *wetland*s that are either sustained by *groundwater* discharge or contribute *recharge* to *groundwater*, and require an assessment of anticipated ~~by requiring a~~ hydrologic impacts ~~assessment report,~~. Activities or development may be restricted ~~and restricting the activities or development based on~~ if the report indicates any adverse impacts~~, and/or mitigating impacts~~.

Policy WR 2.5

The City, in cooperation with the appropriate regulatory agencies (e.g., Washington State Department of Health and the Kitsap ~~County~~ Public Health District) ~~*should*~~ will institute new wellhead protection procedures.

~~**Policy WR 2.5**~~

~~For the purpose of protecting surface and *groundwater* quality, the City Parks Department and School District *shall* develop plans to eliminate the use of biocides on their properties through the use of integrated pest management techniques. (~~

Policy WR 2.6

The City *shall* ~~promote the use of develop~~ encourage the use of integrated pest management techniques and the reduction of pesticide and herbicide use within the City boundaries.

Policy WR 2.7

Establish a stakeholder group to develop an Island-wide ~~G~~*groundwater* ~~M~~management ~~P~~plan.

Policy WR 2.8

Develop a program to strongly encourage exempt well owners to regularly monitor the quality of their well water and identify leaks using tools such as flow meters. Results *should* be self-reported to the Kitsap Public Health District.

Policy WR 2.9

Recognizing that the Island *aquifer* system is a Sole Source *Aquifer* as designated by EPA, institute an added level of development and re-development permit review to prevent or mitigate potential pollutant-generating activities associated with proposed *land use*.

Policy WR 2.10

Develop ~~an Island-wide~~ seawater intrusion prevention regulations ~~policy~~.

Policy WR 2.11

The City *shall* develop a water conservation program. ~~*should* be aggressively pursued by the City to promote the efficient use of water and to protect the resource. Water conservation programs *should* encourage the use of vegetation that prevents soil erosion, protects habitat for wildlife, retains surface water for *recharge*, and which does not require additional water during normally dry months.~~

Policy WR 2.12

Water re-use and reclamation will be encouraged to serve as a supplementary source for high-water users such as industry, parks, schools, and golf courses, as approved by the Washington State Department of Health.

Policy WR 2.13

Develop a program that encourages homeowners to explore innovative methods for recapturing and reusing surface water *runoff* and grey water, as approved by the Washington State Department of Health and the Kitsap Public Health District.

Policy WR 2.14

Maintain a comprehensive program of *groundwater* data gathering and analysis. The program *shall* include modeling, hydrogeologic and geologic studies, and monitoring of static water levels, water use, water quality, surface water flows, and acquisition of other data as necessary.

NOTE: *GOAL* 3 HAS BEEN BROUGHT OVER FROM THE ENVIRONMENTAL ELEMENT WHERE THEY WERE LABELED "*AQUATIC RESOURCES* (*GOALS* 6 & 7)"

~~Aquatic resources~~ **GOAL ~~1~~ WR-3 Surface Water Protection and Management**

~~Preserve and protect the Island's remaining *aquatic resources*.~~ Achieve no net loss of ecological functions and processes necessary to sustain *aquatic resources*[1] including loss that may result from cumulative impacts over time.

~~Discussion~~: ~~*Aquatic resources* include marine nearshore, *wetlands*, *streams*, lakes, creeks, and associated vegetated areas.~~

Over ~~the past~~ recent decades, awareness has grown of the importance of preserving and protecting *aquatic resources* ~~particularly *wetlands*, in our natural and built environment~~. *Aquatic resources* have a number of important ecological functions, processes and values. These functions vary ~~from *wetland* to *wetland*, stream to stream~~, but include providing water quality protection, flood plain control, shoreline stabilization, contributions to *groundwater* and stream flows and wildlife and fisheries habitat. ~~*Wetlands* and *streams*~~ *Aquatic resources* also have values as natural areas providing aesthetic, recreational and educational opportunities that ~~need to~~ *should* be preserved for future generations.

~~AQ 1.1~~

~~Achieve no overall net loss of the City's remaining, regulated, *aquatic resources.*~~

~~AQ 1.2~~ Policy WR 3.1

~~Development *shall* not be approved in regulated *wetlands*, *streams*, or buffer areas, unless a property owner would be denied all reasonable use of property.~~

[1] *Aquatic resources* – Marine nearshore, *wetlands*, *streams*, lakes, creeks and associated vegetated areas.

Development *should* not be approved in regulated aquatic *critical areas* or their associated water quality buffer unless the subject property is encumbered to such an extent that application of *development regulation*s would deny all reasonable use of property.

~~**Discussion**: In some cases, buffer configurations and widths can be modified to allow normal usage of legally established lots. In other cases, the development and implementation of a habitat management plan may provide resource protection to allow development. A variance process *should* be available to accommodate development in buffer areas. Reasonable use exception *should* be reserved for development in the critical area if no other process will allow for a reasonable use of the property. A Reasonable Use Exception (RUE) is a form of variance from regulations that allows some use of a legally established lot. A reasonable use must minimize the impact to *critical areas*. The RUE process is included in the *critical areas* regulations of the Bainbridge Island Municipal Code, which implements policies of this document.~~

~~AQ 1.3~~ Policy WR 3.2

Require that vegetated buffers be maintained between proposed development and the aquatic resource in order to protect the functions and values of such systems. Degraded buffers *should* be restored to enhance their function. Allow ~~R~~reductions in vegetated buffers ~~*shall* be allowed~~ only in areas where such reductions, if consistently applied, would not result in significant cumulative impacts to *aquatic resources* and *fish and wildlife habitat*.

~~AQ 1.4~~ Policy WR 3.3

Require that buffers be retained in their natural condition wherever possible, while allowing for appropriate maintenance. Where buffer disturbance has occurred, require revegetation with appropriate species, with a preference for native species, to restore the buffers' protective values.

~~**Discussion**:~~ Vegetated buffers facilitate infiltration and maintenance of stable water temperatures, provide the biological functions of flood storage, water quality protection and *groundwater recharge*, reduce amount and velocity of run-off, and provide for wildlife habitat.

~~AQ 1.5~~ Policy WR 3.4

Ensure that development activities are conducted so that *aquatic resources* and natural drainage systems are maintained and water quality is protected.

~~AQ 1.6~~ Policy WR 3.5

Prior to any clearing, grading, or construction on a site, all *wetland*s, *streams*, and buffer areas *should* be specifically identified and accurately located in the field in order to protect these areas during development. ~~After construction, permanent visual markers *should* be placed around the buffer areas.~~

~~**Discussion**: The purpose of this policy is to educate future home owners and users of *aquatic resources* (i.e., trail users) of the boundary of the *aquatic resources*.~~

~~AQ 1.7~~

~~New development using flexible lot design *should* include any *wetlands*, *streams*, or required buffers in separate tracts or easements to remain in common ownership.~~

~~AQ 1.8~~ Policy WR 3.6

Herbicides and pesticides ~~*should*~~ *shall* not be used in aquatic resource areas ~~*wetlands*, *streams*~~, and buffers ~~areas~~, and *should* be discouraged in the areas that drain into them.

~~**Discussion**: Encourage alternatives to the use of herbicide and pesticide in areas adjacent to buffer areas by providing technical information and educational programs including the use of *native vegetation*.~~

~~AQ 1.9~~ MOVE TO *GOAL* 4

~~Develop a community-wide program to educate Island residents about alternatives to using and disposing of herbicides, pesticides, and other *household* chemicals to reduce impacts to marine shoreline areas, *wetlands*, *streams*, and other *environmentally sensitive areas*.~~

~~AQ 1.10~~ Policy WR 3.7

Prohibit ~~A~~access to ~~regulated *wetlands*~~ aquatic *critical areas* by *farm* animals ~~*should* be discouraged~~. Agricultural activities within proximity of *aquatic resources should* complete a *farm* management plan addressing water quality and other natural resource protection ~~must be in conformance with Best Management Practices~~.

~~AQ 1.11~~ Policy WR 3.8

Mitigation *shall* be required to compensate for unavoidable impacts to aquatic *critical areas*. Mitigation *should* be designed to achieve no net loss in functions and processes of *aquatic resources*. ~~Restoration, creation or enhancement of *wetlands*, *streams*, and their buffers *shall* be required in order to offset the impacts of alteration of a *wetland*/stream or buffer area. Compensation for loss of *aquatic resources should* be determined according to function, acreage, type, location, time factors, and an ability to be self-sustaining.~~

Policy WR 3.9

Promote *watershed*-based mitigation to meet federal regulations, improve mitigation success and better address the ecological ~~priorities~~ demands of the island's *watershed*s.

~~Policy WR 3.10~~ MOVE TO GOAL 1

~~Identify the areas of the Island that are the most vulnerable to pollution from concentrations of fecal coliforms and nitrates (for example, from septic fields, agricultural activities, or fertilizers), and monitor those areas to determine if and when preventative or restorative measures are warranted.~~

Policy WR 3.10

Work with state and local health departments to evaluate the merits of new technologies such as greywater capture, package treatment plants and composting toilets, as alternatives to septic and sewer systems; and determine which of those systems *should* be allowed and/or

encouraged to better protect the quality and capacity of the Island's ~~*groundwater*~~ surface water and nearshore environment.

Policy WR 3.11

~~The City will c~~Consider the ~~implications~~ impacts of *climate change*~~,~~ and ocean acidification, ~~and their impacts~~ when developing regulations or approving capital projects related to *aquatic resources*, including marine nearshore, *wetland*s, *streams*, lakes, creeks, associated vegetated areas and *frequently flooded areas*.

~~***Wetlands***~~

~~AQ 1.12~~

~~Maintain the Island's *wetlands* in their natural state by:~~

- ~~Preservation of *native vegetation* in and next to the *wetlands*.~~
- ~~Restoration of areas that have already been degraded.~~
- ~~Protection of areas that have not been disturbed.~~

~~AQ 1.13~~ MOVED TO GOAL 4

~~The City *should* make every effort to purchase or obtain *conservation easements* for significant *wetlands* and areas of the shoreline critical to natural habitat.~~

~~***Streams***~~

~~AQ 1.14~~

~~Maintain the Island's *streams* and creeks in their natural state by:~~

- ~~Preservation of their courses, their banks, and the vegetation next to them.~~
- ~~Restoration of areas that have already been degraded.~~
- ~~Protection of areas that have not been disturbed.~~

~~AQ 1.15~~ Policy WR 3.12

Allow stream relocation only where relocation would result in improved stream habitat ~~and~~ or when a property owner would otherwise be denied all reasonable use of the property.

~~AQ 1.16~~ Policy WR 3.13

Degraded channels and banks *should* be rehabilitated by various methods (e.g., culvert replacement, volunteer efforts, public programs or as offsetting mitigation for new development) to restore the natural function of the riparian habitat for fish and wildlife.

~~AQ 1.17~~ Policy WR 3.14

Resident and migratory ~~Anadromous~~ fish *streams* and adjacent land *should* be preserved and enhanced to ensure a sustainable fishery ~~the propagation of salmonid fish~~.

~~AQ 1.18~~ Policy WR 3.15

Require the construction of public facilities ~~necessary roads and utility corridors~~ to avoid ~~*wetland* and stream crossings and~~ encroachment into and disturbance~~s~~ of *aquatic resources*.

Policy WR 3.16

Maintain a comprehensive program of surface water inventory,data gathering and analysis. The program *shall* include monitoring and assessment of physical, chemical, and biological health of surface water ecosystems to include *streams*, ephemeral *streams*, lakes, *wetland*s, and marine waters. This may include water, flow, sediment, habitat, submerged aquatic vegetation, fish and shellfish tissue, aquatic species diversity and other ecosystem health indicators.

~~**GOAL WR-4**~~

~~**Promote the maintenance, restoration and enhancement of *aquatic resources*.**~~

~~AQ 1.9~~ Policy WR 3.17

~~Develop a~~ Support acommunity-wide program to educate Island residents about alternatives to using and disposing of herbicides, pesticides, and other *household* chemicals, to reduce impacts to marine shoreline areas, *wetland*s, *streams*, and other *environmentally sensitive areas*.

Policy WR 3.18

Promote and support volunteer or community-driven restoration projects.

~~AQ 1.13~~ Policy WR 3.19

The City *should* make every effort to purchase or obtain *conservation easement*s for significant *wetland*s and areas of the shoreline critical to natural habitat.

Policy WR 3.20

Permanent visual markers *should* be placed around the buffer areas of protected *aquatic resources*.

THIS GOAL MOVED TO UTILITIES ELEMENT

~~**Drinking Water Service Policies**~~

GOAL WR-4 *Stormwater* Protection and Management

***Stormwater* is a resource that, rather than be captured and carried away as a wastestream, *should* be protected from pollutants and retained on site to replenish *aquifers* and maintain *wetland* and summer stream flows, preserving or mimicking the natural water cycle to the maximum extent practicable.**

Policy WR 4.1

Comply with all requirements of the City's National Pollutant Discharge Elimination System Phase II Municipal *Stormwater* Permit (NPDES Permit).

Policy WR 4.2

Continue to provide ongoing opportunities for the public to participate in the decision-making process involving the development, implementation and update of the City's *Stormwater*

Management Program (SWMP) through advisory councils, public hearings, and *watershed* committees.

Policy WR 4.3

Continue to improve and maintain an education and outreach program designed to reduce or eliminate behaviors and practices that cause or contribute to adverse *stormwater* impacts and encourage the public to participate in stewardship activities.

Policy WR 4.4

Continue to identify and eliminate sources of pollutants to the City's *stormwater* drainage system through proactive field screening techniques such as effluent monitoring, system inspections and cleaning, and commercial and industrial business inspection, and through the enforcement of the City's Illicit Discharge Detection and Elimination ordinance.

Policy WR 4.5

Ensure development of, and adherence to, required public and private *stormwater* pollution prevention plans (SWPPPs) for public facilities, construction sites, and commercial and industrial landuse. Encourage the use of such plans where not specifically required.

Policy WR 4.6

Ensure development of, and adherence to, erosion and sediment control plans on all construction and development sites of any size.

Policy WR 4.7

Develop and actively enforce a strong *Low impact development* (*LID*) ordinance to require any and all methods and practices for new development and redevelopment to the maximum extent practicable and reasonable. *LID* is a *stormwater* and *land use* management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed *stormwater* management practices that are integrated into a project design.

Policy WR 4.8

Prioritize *LID*-based retrofit of public and private *stormwater* drainage systems and built assets through the inventory, management and fiscal planning process.

Policy WR 4.9

Incentivize *LID* retrofit of current built environment.

Policy WR 4.10

Use *watershed* and basin plans as a means to reduce *stormwater* impacts and *non-point source pollution*.

Policy WR 4.11

Comply with all requirements specifically identified by the City's permit for any Total Maximum Daily Load (TMDL) in which the City is a stakeholder.

Policy WR 4.12

Conduct effectiveness monitoring and assessments to continue to adaptively manage *stormwater* to ensure optimal protection.

GOAL WR-5 ~~*Sanitary sewer*~~ Residential On-Site Sewage Systems

Ensure that sewage is collected, treated, and disposed of properly to prevent public health hazards and pollution of *groundwater*, Island surface water, ~~including~~ and the waters of ~~the~~ Puget Sound~~, and to promote *recharge* of the waters of Puget Sound~~.

~~*Sanitary sewer* On-Site Systems Policies~~

Policy ~~SSP 1.1~~

~~Properly designed and maintained on-site wastewater disposal systems that are approved by the Kitsap County Health District or the State Department of Health are a long-range solution to sewage disposal in most areas of the Island. However, there may be areas of the Island determined by the Kitsap County Health District to be unsuitable for on-site wastewater disposal systems due to site conditions (such as steep *slopes*, geological or soil conditions, lot size, or proximity to sensitive bodies of water).~~

Policy WR 5.1 ~~SSP 1.2~~

Regulations and procedures of the Washington State Department of Health and the Kitsap ~~County~~ Public Health District ~~*shall*~~ apply to all on-site disposal systems. The City *shall* work with these agencies to assure regular inspection, maintenance and repair of all *sanitary sewer* and on-site systems located on the Island.

Policy ~~SSP 1.3~~

~~Certification of adequate design and proper operation of septic systems *shall* be required prior to issuance of permits for remodeling of existing buildings.~~

Policy ~~SSP 1.4~~

~~Prior to issuance of a building permit, on-site drainfield and reserve areas *should* be identified and marked, and a protection plan *should* be approved for any building lot.~~

Policy WR 5.2 ~~SSP 1.5~~

The City *shall* request notification of all waivers or variances of Kitsap ~~County~~ Public Health ~~Department~~ District requirements, such as modification of setbacks, vertical separation, minimum lot size, reserve drainfield, etc., prior to issuance and subsequent modifications by the Kitsap Public Health District of an approved Building Site Application.

Policy WR 5.3 ~~SSP 1.6~~

~~Kitsap County Health District approved~~ A~~a~~lternative systems, such as sand filters, aerobic treatment, composting toilets, and living systems ~~etc.,~~ *shall* be allowed when approved by the Kitsap Public Health District. ~~*should* be encouraged for sites where conventional on-site systems are not suitable or feasible.~~

Policy WR 5.4 ~~SSP 1.7~~

Regulations *shall* require coordination between the on-site septic and *storm drain*age disposal systems designs to ensure the proper functioning of both systems.

Policy WR 5.5 ~~SSP 1.8~~

The City *shall* assist the Kitsap ~~County~~ Public Health District in developing a program to require proper maintenance of all on-site waste disposal systems in order to reduce public health hazards and pollution. This program *shall* include periodic system inspection and pumping when necessary.

Policy WR 5.6 ~~SSP 1.9~~

The City and the Kitsap ~~County~~ Public Health District *should* work together on a collaborative program to fund and pursue grants or low-cost loans for low and moderate-income *household*s to repair failed septic systems. Incentivize maintenance, repair and replacement of systems for any income level.

Policy WR 5.7~~SSP 1.10~~

On-site waste disposal systems serving more than one *household should* be allowed only with assurance of proper design, operation, management and approval from the Kitsap Public Health District.

Policy WR 5.8 ~~SSP 1.11~~

The City may provide the service of operation and maintenance management for approved large on-site *sanitary sewer* systems (LOSS) or community *sanitary sewer* systems in coordination with the Kitsap ~~County~~ Public Health District.

Policy WR 5.9 ~~SSP 1.12~~

The City *should* support the Kitsap ~~County~~ Public Health District in ~~establishing~~ maintaining and improving a public education program to foster proper construction, operation, and maintenance of on-site septic systems.

Policy WR 5.10 ~~SSP 1.13~~

The City *should* support the Kitsap ~~County~~ Public Health District in developing and maintaining an ongoing inventory of existing on-site disposal systems to provide needed information for future studies.

THIS GOAL MOVED TO UTILITIES ELEMENT
~~Public *Sanitary sewer* Policies~~

THIS GOAL MOVED TO UTILITIES ELEMENT
***~~Stormwater~~* ~~Management and Protection~~**

~~GOAL WR-7~~ ~~Monitoring Policies~~(Incorporated these in each of the sections above)

~~Policy WR 6.1~~ ~~M 1.1~~

~~The City *should* Maintain institute a comprehensive program of water resource data gathering and analysis. The Such a program *shall* include geologic studies and monitoring of static water levels, water use, water quality, surface water flows, and acquisition of other data as necessary.~~

~~Policy WR 6.2~~ ~~M 1.2~~

~~Periodic monitoring and reporting of water quality and quantity of *public water systems* is required by the Kitsap County Health District. Single units *shall* be encouraged by the City to provide well data to the Kitsap Public Utility District and the Department of Health regarding water level recordings, quality degradation, etc.~~

~~Policy WR 7.3~~ ~~M 1.3~~ ~~DELETE: SAME AS POLICY 5.5~~

~~The City *should* Ssupport the Kitsap County Health District in developing a program for proper maintenance of on-site waste disposal systems in order to reduce public health hazards and pollution. This program *should* include periodic system inspection and pumping when necessary.~~

~~Policy WR 7.3~~ ~~M 1.4~~ ~~DELETE: SAME AS POLICY 5.10~~

~~The City *should* Ssupport the Kitsap County Health District in developing and maintaining an ongoing inventory of existing on-site disposal systems to provide needed information for future studies.~~

GOAL WR-6 Contaminated Sites

Incorporate awareness of known contaminated sites such as former lumber treatment facilities, former fueling stations, and other pollutant-generating *land use* into all water resources management, *land use* planning, and *capital facility* management in order to remediate or clean up sites as effectively as possible, while preventing further impacts to water resources.

Policy WR 6.1

The City will assemble and maintain an inventory of contaminated sites on the Island to track site location, contaminant(s) of concern, cleanup status, and potential to impact nearby surface or *groundwater*.

Policy WR 6.2

The City will collaborate with EPA, Washington State Department of Ecology, and the Kitsap Public Health District to address contaminated site assessment and cleanup efforts within the purview of those agencies to achieve remediation/cleanup as quickly as reasonably possible.

Policy WR 6.3

The City will consult the contaminated site inventory prior to property acquisition and weigh the cost/benefit of acquiring such a property.

Policy WR 6.4

The City will make every reasonable attempt to clean-up/remediate city-owned sites that are known to be or discovered to be contaminated.

Policy WR 6.5

The City will consult the contaminated site inventory as part of development or redevelopment site plan review and take potential impacts into consideration when making *land use* decisions.

Policy WR 6.6

The City will consult the contaminated site inventory as part of capital *infrastructure* construction or maintenance.

Policy WR 6.7

The City will consult the contaminated site inventory as part of emergency management preparedness and response.

GOAL WR-~~8~~7 Public Education and Outreach

The City, in concert with federal, state, and local governments; public water purveyors; *watershed* councils; non-profits; citizens; and other appropriate entities, will continue to improve and implement a comprehensive public education and outreach program in the protection and management of all water resources.

Policy WR 7.1

Educate and inform the public about the purpose and importance of aquatic environments, their vulnerabilities, and observed status and trends in ecological health and function.

Policy WR 7.2

Educate and inform the public about expected *climate change* impacts and how these will affect the Island's water resources and their beneficial uses.

Policy WR 7.3~~PE 1.1~~

~~The City, special districts, and water purveyors will develop and implement a comprehensive public education program in water resource management and protection. The program *should* address all aspects of water conservation and *groundwater* protection, including septic system maintenance, spill management and non-point pollution impacts from *farm* animal/agricultural activities, and homeowner maintenance practices.~~

Educate the public about the characteristics of the *aquifer* system, the Island's dependency upon it, and its vulnerability to contamination (including seawater intrusion) and depletion.

Policy WR 7.4~~PE 1.2~~

~~Water conservation *should* be aggressively pursued by the City to promote the efficient use of water and to protect the resource. Water conservation programs *should* encourage the use of vegetation that prevents soil erosion, protects habitat for wildlife, retains surface water for *recharge*, and which does not require additional water during normally dry months.~~ (**Moved to *Groundwater* Protection and Management, 2.10.**)

Educate the public about EPA's Sole Source *Aquifer* Designation Program and what this designation means for the Island's *aquifer* system.

Policy WR 7.5~~PE 1.3~~

~~*Water re-use* and reclamation will be encouraged to serve as a supplementary source for high-water users such as industry, parks, schools, and golf courses, as approved by the Washington State Department of Health.~~ (**Moved to *Groundwater* Protection and Management, 2.12.**)
Educate the public about well head protection and the critical importance of restricted chemical use or storage within the protection area around wells.

Policy WR 7.6 ~~PE 1.4~~

~~The City *should* Ddevelop a program that encourages homeowners to reduce *impervious surface* area and explore innovative methods for recapturing and reusing surface water *runoff* and grey water, as approved by the Washington State Department of Health and the Kitsap County Public Health District.~~ (**Moved to *Groundwater* Protection and Management, 2.12.**)
Educate the public about Critical *Aquifer recharge areas* (or other special conservation areas) and the purpose they serve to the *aquifer* system.

Policy WR 7.7 ~~PE 1.5~~

~~The City *should* S~~support the Kitsap County Health District in ~~maintaining~~ establishing a public education program to foster proper construction, operation, and maintenance of on-site septic systems.
Inform the public about how to report spills or illicit dumpings of hazardous waste or other pollutants and how to access information about location and status of contaminated sites.

Policy WR 7.8

Inform the public about how to find information about their well and how to properly maintain it.

Policy WR 7.9

Educate, and provide technical assistance to the public on methods to identify wasted water indoors and outdoors and practices to conserve water such as native landscaping (xeriscaping) and water use reduction or reuse.

Policy WR 7.10

Provide "how to" or "dos and don'ts" resources for streamside and shoreline landowners.

Policy WR 7.11

Provide information and guidance on water resources protection best management practices for commercial, industrial, residential, agricultural, and other *land use*s to prevent or reduce pollution. These practices include, but are not limited to, septic system maintenance; pet and livestock waste management; landscaping and gardening; *farm* plans; appropriate methods for use, storage and disposal of hazardous materials and other chemicals; on-site drainage system maintenance, and automotive care.

Policy WR 7.12

Provide and promote opportunities for citizen stewardship and involvement.

Policy WR 7.13

Provide *LID* technical guidance and workshops to businesses and contractors working on the Island.

WATER RESOURCES ELEMENT
EXISTING CONDITIONS AND FUTURE NEEDS

The following outlines the present conditions and understanding of the water resources of the Island and the future needs for restoration, enhancement, and protection of these resources.

Groundwater

Groundwater is the sole source of drinking water for Island residents, *farms* and industry on Bainbridge Island. It is found in underground reservoirs called *aquifers*. An *aquifer* is defined as a *permeable* sand and/or gravel formation that is capable of yielding a significant amount of water to a well. Wells on Bainbridge Island penetrate several distinct *aquifers* to allow withdrawal of drinking water by individual homeowners and municipal water purveyors. Most individual *household* wells penetrate to depths of less than 300 feet. Some residents are still using hand-dug wells less than 40 feet deep, completed in the *permeable* sediments known as the Vashon Recessional Outwash. *Groundwater* found at this level also feeds the base flow (summer flow) for Island *streams*. High capacity wells have been drilled as deep as 1,200 feet to find adequate marketable quantities of water for public and private water purveyors. While few in number, these wells produce a large portion of the Island's potable water. The Blakely Formation, a sedimentary bedrock formation, dominates the geology on the southern end of the Island and limits *groundwater* production in this area.

~~*Aquifer* systems on the Island have been mapped where there is sufficient geologic and hydrologic data available to define them.~~ Our understanding of the Island's water resources has been enhanced through historical studies such as the *City of Bainbridge Island, Level II Assessment*[4] prepared by Kato & Warren and Robinson Noble in 2000 and monitoring and assessments completed in the last ten years by the City's *Groundwater* Management Program. This work includes the development, improvement, and utilization of a *groundwater* model; the development of a well monitoring network; and the implementation of long-term monitoring. ~~The following information on existing conditions was drawn from the Level II Assessment by Hydrogeologists and Bainbridge Island residents Doug Dow, Russ Prior, and Mark Shaffer and is subject to change with further study. These *aquifers* are described in detail in the *Kitsap County Groundwater Management Plan*, Volumes I II, dated April 1991, and more recently in the Level II Assessment. Brief descriptions of each *aquifer* system identified are as follows:~~

Bainbridge Island has six principal *aquifers* (Kato & Warren and Robinson & Noble, 2000), the extents of which were refined in the *Conceptual Model and Numerical Simulation of the Groundwater-Flow System of Bainbridge Island, Washington* (USGS, 2011). The six *aquifers* delineated below reflect updated understanding based on the United States Geological Survey (USGS) model. Additional details about the *aquifers*, including detailed maps and discussion regarding the extent, thickness, and other characteristics, can be found in the USGS report.

Perched *Aquifer* (PA)—This *aquifer* is comprised predominantly of Vashon Advance glacial outwash (Qva). The top of the *aquifer* ranges from sea level to more than 300 feet above mean sea level [ft MSL], with a thickness of 20 to 200 feet, and is utilized predominantly by domestic wells. About 4 percent of wells are reported to be completed in this unit.

Semi-Perched *Aquifer* (SPA)—This semi-perched *aquifer* exists within *permeable* interbeds (QClpi) of the upper confining unit (QC1). The top of the *aquifer* ranges from sea level to more than 200 ft MSL, with a thickness of 10 to 50 feet. About 25 percent of wells are reported to be completed in this unit.

Sea Level *Aquifer* (SLA)—The Sea Level *aquifer* (QA1) is extensive, widely used, and mostly confined by QC1. The top of the *aquifer* ranges from -200 to 200 ft MSL, with a typical thickness of 25 to 200 feet. Fifty-three percent (53%) of wells are completed in the SLA.

Glaciomarine *Aquifer* (*GMA*)—This *aquifer* consists of water-bearing units within a thick sequence of fine-grained glaciomarine drift (QA2). The top of the *aquifer* ranges between more than -500 to -300 ft MSL, with a typical thickness of 20 to 300 feet. Several of the Bainbridge Island's production wells and at least 4 domestic wells are completed in this *aquifer*, representing about 2 percent of wells.

Fletcher Bay *Aquifer* (FBA)—The FBA (QA3) is the deepest identified *aquifer* on Bainbridge Island. Several large production wells are completed in this *aquifer* including the Fletcher Bay Well. The top of the *aquifer* ranges between more than -900 to slightly less than 600 ft MSL, with a typical thickness of 50 to 300 feet. While representing only about 1 percent of wells on Bainbridge Island, the metered KPUD and COBI FBA wells provide approximately 30 percent of the estimated total Island *groundwater* production.

Bedrock *Aquifer*—Less than 1 percent of the wells are completed in the sedimentary Blakely Harbor and Blakeley formations on the south end of Bainbridge Island.

Other wells on Bainbridge Island are either completed in water bearing zones within confining units or have an indeterminate *aquifer* completion zone.

COBI's monitoring well network is distributed across the six Bainbridge Island *aquifers* as follows: 16 in the Perched *Aquifer*, 7 in the Semi-Perched *Aquifer*, 32 in the Sea Level *Aquifer*, 5 in the Glaciomarine *Aquifer*, 9 in the Fletcher Bay *Aquifer*, and 1 in the Bedrock *Aquifer*. Aspect has updated the USGS *groundwater* model to include one new public supply well (KPUD North Bainbridge Well #10), for a total of 1,470 Group A and B public wells and exempt wells estimated to be active on Bainbridge Island.

Aquifer Concerns and Observed Conditions

There are two primary concerns in protecting an *aquifer* system. These are quality and quantity.

Quality

Seawater Intrusion

One of the most common *groundwater* quality concerns for Islands or other saltwater shorelines is saltwater intrusion, which is the movement of saltwater into a freshwater *aquifer*. Where the source of saltwater is marine water such as Puget Sound, this process is known as seawater intrusion. Seawater intrusion occurs when the saltwater/freshwater interface moves inland from offshore. Freshwater is less dense than saltwater and so freshwater will float above saltwater. It is the pressure of the overlying freshwater that keeps the interface offshore. Excessive pumping

or overuse of the overlying freshwater will pull the interface toward the shoreline and possibly inland.

Some of our *aquifers* such as the *shall*ow Perched and Semi-Perched *aquifers* are, generally, not in contact with saltwater and, therefore, generally not susceptible to seawater intrusion (an exception being where these *aquifers* are present near the shoreline).

The Sea Level *Aquifer* and our deeper *aquifers* can be susceptible. How susceptible can vary from *aquifer* to *aquifer* and, even within the same *aquifer*, depending upon local conditions.

In order to monitor for potential seawater intrusion, the most common practice is to measure chloride concentration and specific conductivity in *groundwater*. The City's *Groundwater* Management Program conducts annual chloride sampling in *aquifers* or wells susceptible to seawater intrusion. The established Early Warning Level, or EWL, is a chloride concentration >100 mg/L or any 4 consecutive samples showing an increasing trend. To date, no wells in the City's monitoring network (including Kitsap Public Utility District and the City's Water Utility wells) exceeded the EWL, and no trends in chloride results were noted.

Chloride concentrations typically varied between 2 mg/L and 15 mg/L. Results in 2013 and 2014 in the Fletcher Bay *Aquifer* indicate slightly elevated chloride above historic baseline concentration, but not upward trending results. However, these *should* be monitored for continued changes.

Additionally, the City's *groundwater* model was run by USGS in 2010 and updated, recalibrated and run again by Aspect Consulting in 2016 to examine the potential for seawater intrusion under different water production (e.g., growth) scenarios. Model projections indicated no seawater intrusion. It *should* be noted that the model is designed to observe regional scale conditions, but the scale is not fine enough to assess very localized conditions such as one or two wells along the shoreline. Therefore, it is important to continue to monitor in vulnerable areas to catch potentially developing local conditions.

One example is an elevated chloride level measured in one well in the Seabold area in 2006 prior to the development of the City's *Groundwater* Management Program. As there was no established program in place at the time, there was no immediate follow up sampling/study to confirm seawater intrusion rather than a source other than seawater intrusion. Other common sources of chloride in *groundwater* include connate, or very-old, *groundwater*, septic system effluent, very hard *groundwater*, windblown sea spray, and *recharge* from irrigation, agricultural practices, and well disinfection. Chloride from any of these sources can result in elevated levels of chloride in an *aquifer* or well. Erroneously interpreting chloride concentration data without more detailed study may result in what is called a "false positive," where a test identifies a problem that does not in fact exist. That is why follow up investigation using site-specific assessments, is necessary before seawater intrusion can be confirmed. The City, the Kitsap Public Health District, and the Kitsap Public Utility District have teamed up to scope a localized, focused study in the Seabold area for potential funding in 2017.

Nitrate

According to USGS research, nitrate is the most commonly found pollutant in *groundwater* nationwide, particularly in rural areas. Nitrate levels in drinking water above EPA's Maximum

Contaminant Level (or MCL) of 10 mg/L can have serious health effects primarily for infants, but also pregnant women and individuals undergoing treatment with antioxidant medications. Nitrate converts to nitrite in the digestive track which causes a condition call methemoglobinemia which lowers the oxygen in the blood stream. In infants this is called "Blue Baby Syndrome." Brain damage, even death, can occur.

High nitrate levels in *groundwater* can also indicate the possibility that other contaminants may be present in the water such as bacteria or pesticides.

The typical sources of nitrate in *groundwater* include the application of fertilizers and pesticides, mostly from agricultural row crop *farm*ing, but commercial and *residential use* can be significant sources as well (such as lawns, parks, golf courses, ballfields, nursaries, and extensive gardens). Other sources include industrial processes and wastewaters, the land application of wastewater treatment plant sludge or bioso*LID*s, and on site septic system returns.

Although the *Groundwater* Management Program does not, at present, routinely monitor nitrate in *groundwater*, the City's consultant examined nitrate data from the Kitsap Public Health District (KPHD) as part of the 2015-2016 assessment. Nitrate data were not found to exceed EPA's MCL of 10 mg/L. Nitrate data for Group A and B public wells and exempt wells did not indicate any trends. Data submitted to KPHD for exempt wells are typically single results and are insufficient to calculate any trends. However, the maximum result during the last 15 years (2000–2014) was 5.17 mg/L in 2007. There are no apparent trends over time or geographically across the island.

Other Water Quality Concerns

Generally, *groundwater* quality on the Island is very good. However, moderate levels of iron and manganese are naturally-occurring and common. Although neither of these minerals normally exceed EPA's standards for drinking water, they can influence odor and taste and stain fixtures. Many *public water system*s and some private systems use filtration devices to remove or reduce these minerals.

Sole Source *Aquifer* Designation

In 2013, the Bainbridge Island *Aquifer* System was designated a Sole Source *Aquifer*. Sole Source *Aquifer* Designation can apply to one *aquifer* or a system of multiple *aquifers* as is the case with Bainbridge Island.

The Sole Source *Aquifer* Designation Program is an EPA program authorized under the Safe Drinking Water Act of 1974. Section 1424(e) defines a sole source *aquifer* as "the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health."

The EPA more specifically defines a sole or principal source *aquifer* as one which supplies at least
50 percent of the drinking water consumed in the area overlying the *aquifer*, and that these areas have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the *aquifer* for drinking water.

The program and designation are specifically designed to protect the quality of drinking water by helping to prevent contamination of the *aquifer* system. It provides this protection by raising the level of awareness of the vulnerability of the *aquifer* system to contamination and our dependence upon the system as a drinking water supply.

Further, it requires additional EPA scrutiny of federally-funded projects. EPA inspects proposed projects for potential to contaminate the underlying *aquifer*, and, where appropriate, requires modifications and mitigations to prevent contamination.

However, this additional scrutiny applies to federally-funded projects only, and some projects such as highways and agriculture may be exempt if they meet criteria laid out in pre-established memorandums of understanding between the EPA, the Department of Transportation, the Department of Agriculture, or other agencies.

Quantity

Water Levels

The City's *Groundwater* Management Program currently monitors water levels in public and domestic wells Island-wide and in all six *aquifers*. Water level is an indicator for water quantity, and water level data are assessed against the program's early warning level, or EWL, for safe yield. The EWL for safe yield is a declining water level equal to or greater than ½ foot or more per year over a 10-year period that cannot be attributed to below average rainfall.

Individual well levels were reviewed for trends and compared against the EWL for safe yield. All wells were found to be below the EWL. Water levels in the *aquifers* did not indicate any *aquifer*-wide trends, and only two individual wells were noted for further review.

An exempt well (25N/02E-21P03) in the Sea Level *Aquifer* showed an apparent average decline of approximately 0.56 feet/year over the 8-year period of record. However, further review of the water level measurement method history showed that it changed twice over the period of record from a steel tape to a sonic water level meter and, then, back to steel tape. The results collected via sonic water level meter appeared to be inconsistent compared to the results before and after using the steel tape, a more rudimentary but more reliable measurement method. Therefore, the sonic level readings were removed from the analysis. Once removed, the remaining data were below the EWL. Water-use data were not available for the well. However, the well owner indicated to COBI that no known change in water use occurred over the period of record. Continued long-term monitoring of this well using the steel tape method, as planned by COBI, will determine if there is a significant trend in water level decline over time.

Group A system well 'Island Utility Well #1' (25N/02E-34F07) in the Fletcher Bay *Aquifer* has shown an average decline of approximately 0.49 feet/year from 2004-2014. Although this does not yet exceed the EWL, it is very close to approaching it. Therefore, further monitoring and assessment are warranted. The well is situated next to two other Fletcher Bay *Aquifer* production wells (Island Utility Well #2, Island Utility Well #4) within the same water system. Production data have not been available for these wells, which makes it unclear if declines are related to changes in water use over the period. This system has just transitioned to operation by KPUD in mid-2015, and they are now reviewing available information to understand the current conditions within that water system. Additional data review will continue as the system *infrastructure* is updated to see if additional water use, system loss, or some other factor contributed to the historical decline. No other

Fletcher Bay *Aquifer* wells monitored exhibited a similar declining trend, so it appears that this issue is specific to this well and not an *aquifer*-wide concern.

Aquifer* System *Carrying capacity

The City, as a community, has yet to fully-define or characterize a sustainable *aquifer* system. Some initial characteristics are keeping the saltwater/freshwater interface offshore and saltwater out of the freshwater supply, and maintaining a balanced water budget for the *aquifer* system in order to prevent depletion.

To help provide some baseline information about these initial characteristics and expected impacts to the system due to *climate change*, Aspect Consulting conducted a system *carrying capacity* model assessment. The *aquifer* system *carrying capacity* assessment was based on those safe-yield indicators with EWLs described above using *aquifer* water levels and chloride concentration. The on-Island *groundwater* balance for the entire *aquifer* system (water budget) was also evaluated. The *groundwater* balance components do not have EWLs, but were evaluated to provide additional context on the predicted changes in *groundwater* conditions.

Water Level Changes: The following rates of *groundwater* level change were based on comparing current and predicted *groundwater* levels in 100 years:

- The Perched *Aquifer* system showed an average 0.10 foot per year of water level decrease at 25 locations simulated across the Island;
- The Semi-Perched *Aquifer* system showed an average 0.13 foot per year of water level decrease at 12 locations simulated across the Island;
- The Sea Level *Aquifer* system showed an average 0.09 foot per year of water level decrease at 49 locations simulated across the Island;
- The Glaciomarine *Aquifer* showed an average 0.02 foot per year of water level decrease at 6 locations simulated across the Island; and
- The Fletcher Bay *Aquifer* showed an average 0.15 foot per year of water level decrease at 9 locations simulated across the Island.

The predicted *groundwater* level changes over a 100-year timeframe were less than the COBI EWLs.

Saltwater/freshwater Interface: The predictive model results indicated that, despite these slow declines, *groundwater* from the Bainbridge Island *aquifer* system flows to Puget Sound and keeps the freshwater/seawater interface at a distance from the Bainbridge Island shoreline. All wells within the Bainbridge Island shoreline maintained chloride concentrations less than 100 mg/L, and no trend in concentrations was observed based on predictive model results.

Water Budget: Though the predicted *groundwater* level declines did not appear to induce seawater intrusion, they can have impacts on other components in the system such as discharge to *streams* to help maintain summertime flows. Therefore, it is important to examine the components of the system's water budget.

Similar to a financial budget, a water budget represents a balance of inputs and outputs. If one component goes up or down, some other component(s) must go up or down to compensate.

Groundwater balance components are typically difficult to measure directly (such as *recharge* and *groundwater* underflow). Thus, this *groundwater* balance assessment relies on modeling results without actual field measurements.

Based on the 2011 USGS Report, the relationship between *groundwater* balance inputs and outputs for the Bainbridge Island *aquifer* system is shown in the following equation:

$R_{ppt} = W_{ppg} + D_{sw} + (GW_{ps} - GW_{kp})$

Where:

Inputs include:

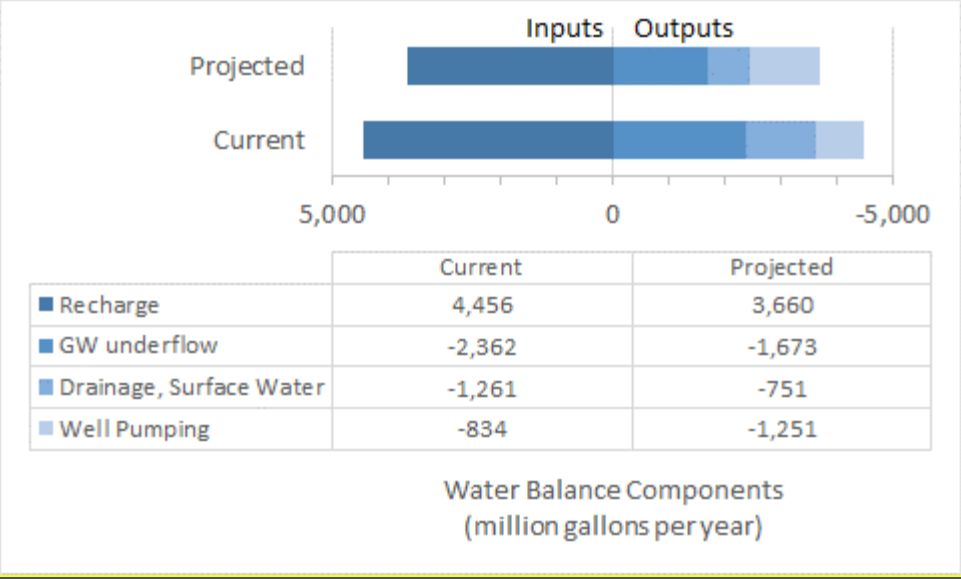
R_{ppt} is precipitation *recharge*.

Outputs include:

W_{ppg} is *groundwater* withdrawals;
D_{sw} is *groundwater* drainage to surface water (such as seeps to bluffs, creeks, *streams*, etc.); and
$(GW_{ps} - GW_{kp})$ is the net lateral *groundwater* underflow (*groundwater* flow toward Puget Sound submarine seeps (GW_{ps}) and *groundwater* flowing from the Kitsap peninsula in deeper *aquifers* (GW_{kp})).

To balance the modelled 50-percent increase in *groundwater* withdrawals and the 20-percent decrease in *recharge* due to *climate change*, the model showed projected changes in *groundwater* drainage to surface water (approximately 40-percent decrease) and lateral *groundwater* flow (approximately 24-percent decrease). Figure 6, excerpted from Aspect's technical memorandum (*Bainbridge Island Groundwater Model: Aquifer System Carrying capacity Assessment (Task 3 Scenario*), 2016) compares the water balance components under current and projected conditions, based on model results.

The Bainbridge Island *groundwater* model results showed *aquifer* storage will be reduced by approximately 11,000 million gallons between current and projected conditions, reflecting the water level decreases described above. These *groundwater* balance results *should* be carefully interpreted, considering that the limited grid resolution may not be sufficient to accurately simulate *groundwater* discharge to surface water, and that the model has not been calibrated to observed flows.



	Current	Projected
Recharge	4,456	3,660
GW underflow	-2,362	-1,673
Drainage, Surface Water	-1,261	-751
Well Pumping	-834	-1,251

Water Balance Components
(million gallons per year)

Figure 6. Current and Projected *Groundwater* Balance Components.

In this figure, well pumping (also called production) is the amount of water taken out of the system through wells (water use). The 50% increase in this component represents the expected increase in water use due to population growth.

Drainage to surface water is *groundwater* contribution to surface water features such as *wetlands*, lakes, and *streams*. The 40% reduction shown here may have an impact on maintaining summer baseflows and water temperatures. It is cautioned that the model as it is currently constructed is not specifically designed to provide an estimate as to how much stream flow will be impacted, but it could be modified to answer specific questions around this topic in future model runs.

Groundwater underflow is the amount of *groundwater* that seeps or discharges into Puget Sound at the shoreline. This value is influenced by the water levels in the *aquifers*, and the reduction shown here represents the impact from project water level decreases. The key importance to this component is that there has to be enough underflow to provide the pressure to keep the saltwater/freshwater interface offshore and prevent seawater intrusion.

Recharge is the portion of precipitation or rainfall that infiltrates the ground and reaches the *aquifer*. The estimated 20% reduction shown in the water balance accounts for *climate change* impacts.

The amount of *groundwater* underflow and discharge to *streams* is driven by the geological makeup of the *aquifer* system. Therefore, we have no direct ability to control these budget components. Rather it is the components of well pumping and *recharge* that we have more ability to directly control. We can reduce well pumping by reducing our water use through aggressive water conservation measures.

Though we cannot control precipitation patterns, we can take measures to enhance *recharge* through creative water capture and return measures (from the rain barrel scale to large scale *infrastructure*) and through protective *land use* measures such as *low impact development* and

protection of *aquifer recharge areas* and other *aquifer* conservation areas.

Aquifer recharge areas

Understanding the Island's *aquifer recharge* system is important for both *groundwater* quantity and quality. *Aquifer recharge areas* have geologic and soil conditions which allow surface water infiltration, which also means they are particularly susceptible to contamination. Increasing *impervious surface*s through development reduces the amount of *recharge* available to the Island's *aquifers*. At the same time, *runoff* from *impervious surface*s in developed areas contains increased contaminants. Efforts to protect and preserve the Island's natural water supply are warranted, as the resources that would be required to clean up after contamination or to secure a new source would be prohibitive.

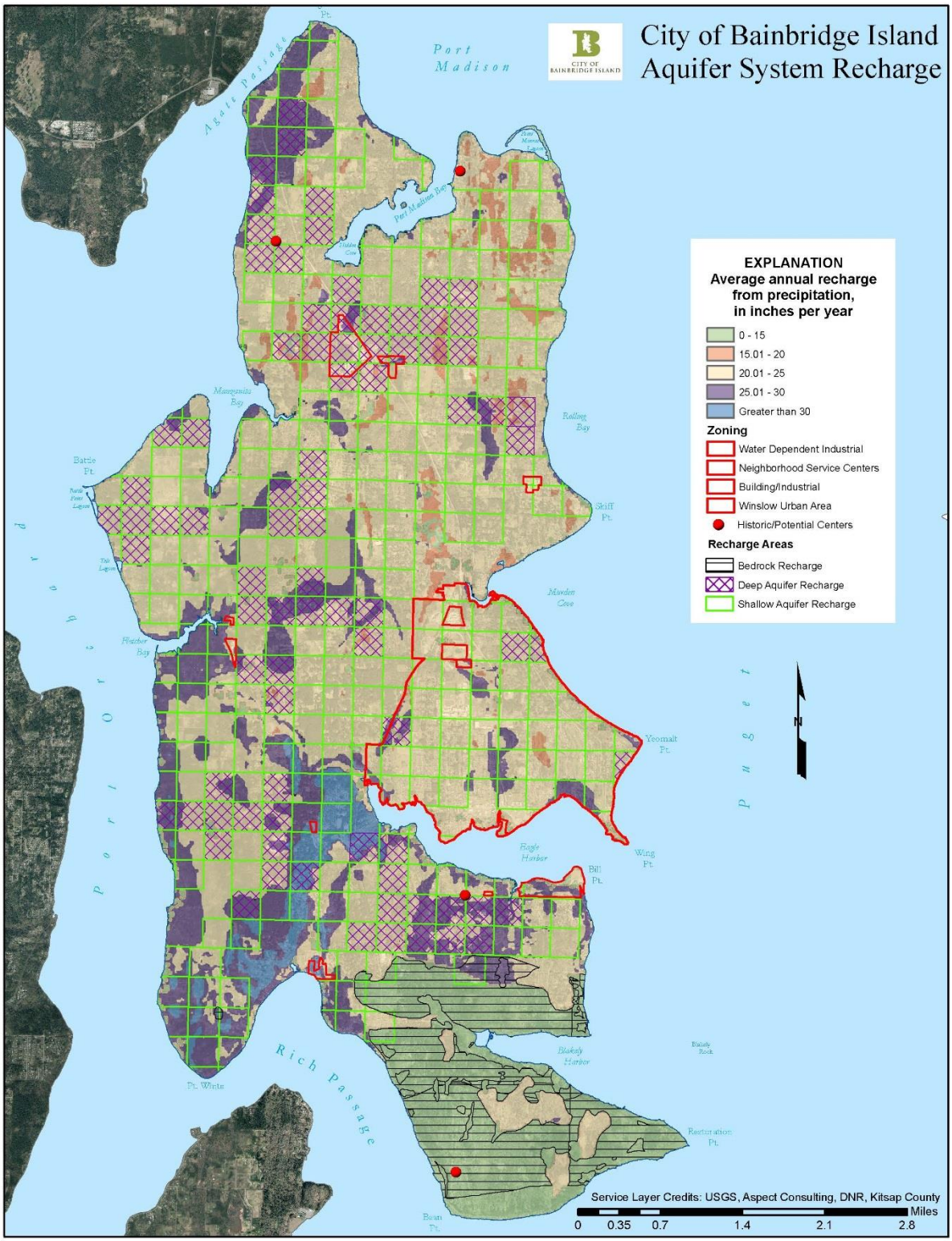
Where development overlays *aquifer recharge areas*, special considerations need to be made to preserve the volume of *recharge* available to the *aquifer* and to protect the *groundwater* from contaminates such as nitrates, biocides and heavy metals found in septic systems and *stormwater runoff*. The most extensively used *aquifer* underlies 85% of the Island and occurs under all zoning classifications.

To help the City assess *recharge* areas for special protection or designation, the model was run to determine *recharge* areas on the Island.

The Bainbridge Island model results indicate that areas across much of the Bainbridge Island area may have a critical recharging effect on *aquifers* that are sources of drinking water. Primary findings include:

- Wells in *shall*ow *aquifers* (including the Sea Level *Aquifer* and above) may withdraw water that originates as *recharge* relatively close to the well head and is younger than 100 years old. See figure below which shows the *recharge* areas for *shall*ow *aquifers* (green squares).
- Wells in deep *aquifers* (including the Glacio-Marine *Aquifer* and the Fletcher Bay *Aquifer*) may withdraw water that originates as *recharge* relatively distant from the wellhead and is greater than 100 years old. See figure below which shows the *recharge* areas for deep *aquifers* (cross-hatched area).
- Not all *groundwater* on Bainbridge Island comes from *recharge* on Bainbridge Island. Model results indicate several wells tapping the deeper *aquifers* withdraw water that originates as *recharge* from areas on the Kitsap Peninsula and is greater than 1,000 years old.

Wells in bedrock were not simulated in the Bainbridge Island model as the method of water particle tracking was not appropriate for fractured bedrock. However, the bedrock is also considered a CARA, because water supply wells have been installed at various depths in bedrock, and potable water supply is from *recharge*. Bedrock *recharge* area is shown as hatched area.


City of Bainbridge Island
Aquifer System Recharge
CITY OF BAINBRIDGE ISLAND
Port Madison
Agate Passage
Port Orchard
Puget Sound
Rich Passage
Manzanita Bay
Rolling Bay
Battle Pt.
Skiff Pt.
Murden Cove
Fletcher Bay
Yeomalt Pt.
Eagle Harbor
Wing Pt.
Bill Pt.
Blakely Harbor
Pt. White
Restoration Pt.
Bean Pt.
EXPLANATION
Average annual recharge from precipitation, in inches per year
0 - 15
15.01 - 20
20.01 - 25
25.01 - 30
Greater than 30
Zoning
Water Dependent Industrial
Neighborhood Service Centers
Building/Industrial
Winslow Urban Area
Historic/Potential Centers
Recharge Areas
Bedrock Recharge
Deep Aquifer Recharge
Shallow Aquifer Recharge
N
Service Layer Credits: USGS, Aspect Consulting, DNR, Kitsap County
Miles
0 0.35 0.7 1.4 2.1 2.8

~~Perched *Aquifer* (PA)~~

~~The Perched *Aquifer* is a sand and gravel *aquifer* system under the major upland areas. It is found above 200 feet elevation and averages 90 feet in thickness. This *aquifer* underlies nine square miles (33%) of the Island's land surface and serves a number of domestic wells, with yields averaging 16 gpm. It is *recharge*d from leakage through overlying sediments and discharges through underlying sediments into deeper *aquifers* or through springs where the *aquifer* intercepts land surface.~~

[4] ~~Subtitled *An Element of the Water Resource Study, dated December 2000*.~~

~~Semi-Perched *Aquifer* (SPA)~~

~~The Semi-Perched *Aquifer* is found under approximately 20 square miles (73%) of the land surface and averages about 30 feet in thickness. Where identified, it is found between 20 feet below and 100 feet above sea level. Approximately 25% of the domestic wells on the Island obtain an average of 19 gpm from this *aquifer*. However, uncharacteristically high yields from wells completed for Meadowmeer provide local yields over 300 gpm. The *aquifer* is *recharge*d from leakage through overlying sediments and discharges into deep cut stream valleys, deeper *aquifers*, or to Puget Sound.~~

~~Sea Level *Aquifer* (SLA)~~

~~The Sea Level *Aquifer* underlies 85% (23.5 square miles) of the Island's land surface but is noticeably absent south of Blakely Harbor where bedrock is found above sea level. The *aquifer*'s average thickness is 110 feet. It is found from 40 feet above to 230 feet below sea level. The Sea Level *Aquifer* is the Island's primary *aquifer* system, supplying water to approximately 53% of Island wells. Several of the Island's larger water purveyors obtain yields of more than 300 gpm from this *aquifer*. The average yield to the majority of (domestic) wells is 20 gpm. The *aquifer* accepts *recharge* from leakage through overlying sediment with natural discharge into Puget Sound. The City's wells at the head of Eagle Harbor are completed in the SLA.~~

~~Glaciomarine *Aquifer* (*GMA*)~~

~~The Glaciomarine *Aquifer* is the *shallo*wer of the two deep *aquifer* systems present below Bainbridge Island. The data available confirms estimates of a depth of 400 to 760 feet below sea level under approximately 9.5 square miles (35%) of the Island and an average thickness of 120 feet. This *aquifer* may exist under a greater portion of the Island but lack of exploration precludes a definitive analysis. Only 2% of Island wells penetrate this fine-grained *aquifer* which yields an average of 18 gpm. Notable wells completed in the *GMA* are the City's Taylor Avenue well and the old and new wells completed at the former creosote plant site at Bill Point. *Recharge* to the *aquifer* is obtained through leakage from overlying sediments. Discharge is likely to deeper areas in Puget Sound.~~

~~Fletcher Bay *Aquifer* (FBA)~~

~~The Fletcher Bay *Aquifer* is named for a pair of wells drilled into the deep *aquifer* system near Fletcher Bay. Several other wells are also completed in this *permeable* sand and gravel formation found from 690 to 1,280 feet below sea level. Because very few wells penetrate to this depth, the extent of the *aquifer* is not well defined. The *aquifer* is believed to underlie 55% (15 square miles) of the Island, mainly in the north central area. The City obtains the majority of the drinking water for the Winslow water system from the FBA through its~~

Fletcher Bay and Sands Road wells. Yields from this *aquifer* average 330 gpm. Because of the depth of this *aquifer*, it has been theorized that it is connected to a similar *aquifer* identified at this depth on the Kitsap Peninsula. However, this connection has not been proven and *recharge* to the FBA can only have been assumed to originate on the Island through leakage from overlying sediments.

Hydrologic Cycle and the Water Budget

Understanding the Island's water budget requires a look at the components of the water system. These components are defined as:

- Precipitation (rain or snow);
- Evapotranspiration: the combined amount of water that evaporates directly from the surface plus the amount that is taken up by vegetation and transpired back into the air;
- *Runoff*: the amount of water that flows directly off the Island via *streams*;
- *Recharge*: the amount of water that infiltrates into the *aquifer*; and
- Discharge: well pumpage, springs, *streams* and direct discharge into Puget Sound.

Although the variability of the natural system is great, educated assessments of the individual components are commonly used to predict sustainable use of the *groundwater*.

All water entering the Island's natural water system originates as precipitation. Only a portion of the precipitation is available for *recharge* because some of it exits the system before it percolates into the ground. Water exits the system through evapotranspiration, surface *runoff* and discharge. The quantity of *groundwater* available for use is a function of the water balance: water entering the system is equal to water flowing out of the system, plus or minus the change in storage of water within the *aquifer*.

Precipitation on Bainbridge Island averages about 35 inches per year. In the absence of more precise water budget data it is generally thought that one-half to one-third of all precipitation is lost through evaporation from surface water and evapotranspiration from trees, plants and grass. It is estimated that approximately one-quarter to one-third of the precipitation is discharged to springs and stream flow or directly to Puget Sound.

The remaining precipitation infiltrates the surface sediments through direct absorption, supplemented to some extent through on-site *stormwater* infiltration, to *recharge* the Island *aquifers*. An unknown quantity of *recharge* is discharged from the Perched and Semi-Perched *Aquifer*, and to a lesser extent the Sea Level *Aquifer* providing (base) stream flow for fish and other wildlife. However, only a portion of the remaining *recharge* that reaches the major *aquifers* is available for use without serious disruption of the hydrologic system. Withdrawing too much water will cause *aquifer* water levels to decline and may cause seawater intrusion into the Sea Level *Aquifer* and deeper *aquifers*.

Hypothetical *groundwater* (*aquifer*) yield

A simplistic approach for determining the "hypothetical *groundwater* yield" is the product of the general *recharge* rate times the *recharge* area (27.5 square miles or 17,600 acres) producing a volume of water in acre feet per year. The Level II study provided a hypothetical *groundwater recharge* of 19,000 acre feet per year (afy). However, it is recognized that the sustainable yield of an *aquifer* can be more accurately determined by monitoring *aquifer*

water levels for many years. Such monitoring would include: flow metering of typical wells for water use or measurement of surface water diversions; well water monitoring; and stream flow monitoring. Management of the *groundwater* resources of Bainbridge Island will require balancing withdrawals from specific *aquifers* to sustainable water levels. Actual sustainable withdrawal rates are unknown.

Aquifer recharge areas

Springs and *streams* reflect a natural system of discharge for Island *groundwater*. All of the remaining land surface (except for portions of the southern end of the Island) serves as *aquifer recharge area*. Soil type, *slopes*, vegetative cover and *impervious surfaces* significantly affect the distribution of *recharge*. The identification of *aquifer recharge areas* is important both from the standpoint of *groundwater* quantity and quality. *Aquifer recharge areas* have geologic and soil conditions which allow high rates of surface water infiltration, which also means they are particularly susceptible to contamination. Increasing *impervious surfaces* through development reduces the amount of *recharge* available to the Island's *aquifers*. At the same time, *runoff* from *impervious surfaces* in developed areas contains increased contaminants. Efforts to protect and preserve the Island's natural water supply are warranted, as the resources that would be required to clean up after contamination or to secure a new source would be prohibitive.

Where development overlays *aquifer recharge areas*, special considerations need to be made to preserve the volume of *recharge* available to the *aquifer* and to protect the *groundwater* from contaminates such as nitrates, biocides and heavy metals found in septic systems and *stormwater runoff*. The most extensively used *aquifer* underlies 85% of the Island and occurs under all zoning classifications.

The *Recharge* Areas Map (Figure 5) was developed by Russ Prior with assistance from Mark Shaffer, Doug Dow and Kitsap County PUD. This *recharge* map is based on a spreadsheet model produced by Robinson and Noble for the Level II Assessment (December 2000). Figure 5 identifies high, moderate and low *aquifer recharge areas* on Bainbridge Island. Generally *recharge* depends on the ease with which precipitation can move from the land surface to the *aquifer* based on the types of conditions in the area. The elements used in the Level II spreadsheet model include: amount of rainfall, surficial soil types (based on USDA Soil Survey of Kitsap County), *slope*, ground cover and water holding capacity.

Aquifer recharge areas have been mapped for the Island using available assessment information described in the Level II Assessment. The mapping identifies high, moderate, and low *aquifer recharge areas* in accordance with the following definitions:

Susceptibility	Characteristics
High	Greater than 20 inches of infiltration into the *groundwater* system per year – generally areas with high *recharge* have *permeable* surficial soils and *shallow slopes.*
Moderate	Between 10 and 20 inches per year of infiltration into the *groundwater* system – includes many areas underlain by Vashon till which allows significant quantities of infiltration.
Low	Less than 10 inches per year of infiltration into the *groundwater* system – generally areas with low *recharge* have surficial soils of low *permeability* and steep *slopes.*

Source: 2000 Bainbridge Island Level II Assessment

Aquifer Concerns

The Island has many *shallow* and deep *aquifers*, some of which may be connected vertically as well as horizontally. No data has been developed to date to determine how much water can be withdrawn from any of the Island *aquifers* without causing over-drafting. Monitoring is important to further our understanding of the Island's *aquifer* systems.

based on current water quality data, the 2000 *Bainbridge Island Level II Assessment* concluded there was no evidence of extensive seawater intrusion on the Island nor was there evidence of increasing salinity

Surface Water

The surface waters of Bainbridge Island provide aesthetic, recreational, economic, and ecological benefits to Island citizens. Boating, fishing, and shellfish harvest are important recreational and economic activities, and the Island's *streams*, lake, harbors, shorelines, and *wetland*s provide habitat for a diversity of fish and wildlife species.

The harbors and numerous coves around the Island host anchorage, moorage, marinas, boat launches, waterfront access, and swimming beaches. Eagle Harbor, specifically, hosts marinas which provide permanent moorage for live-aboards and an open water mooring and anchoring area for the Island's live-aboard community.

In addition to providing forage and habitat for salmon, otter, sea lions, and waterfowl and swimming, boating, and fishing areas for people, the majority of the Island's shorelines and adjacent nearshore areas are designated commercial shellfish growing and harvest areas by the State Department of Natural Resources. Many shoreline residents recreationally harvest shellfish such as clam and geoduck as well. The Shoreline Master Plan also regulations shellfish harvest activities.

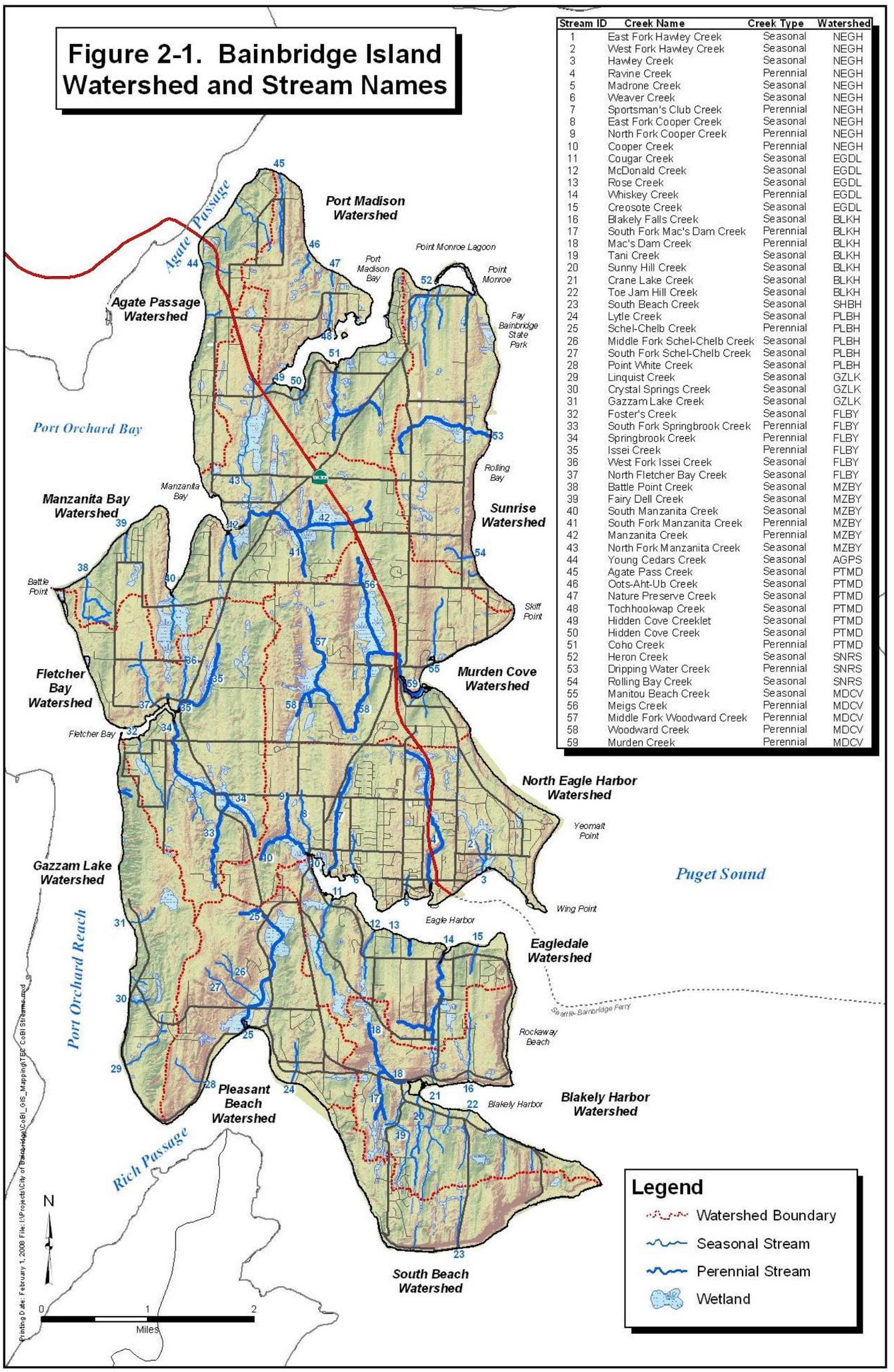
Watersheds

Surface water flows from high geographic points to lower elevations collecting in *streams* and *wetland* systems within the *watershed*s of the Island. *Watershed* boundaries are determined by Island topography where ridgelines define the boundaries.

Bainbridge Island contains twelve distinct *watershed*s with 59 seasonal and perennial *streams* that contribute fresh water to Puget Sound (see Figure 2.1 below excerpted from the Water Quality and Flow Monitoring Program Final Monitoring Plan, 2008). Five harbors, twelve estuarine *wetland*s, one lake, 1,242 acres of *wetland*, 965 acres of tidelands (between mean high and mean low tide), and 53 miles of shoreline comprise the remainder of the surface water system.

Each surface water feature serves a critical function in preserving hydrologic connectivity within the *watershed*. Recent research is finding that even those features that are seasonal such as ephemeral or intermittent *streams* and seasonally-flooded *wetland*s are critical faunal and floral habitat providers, biogeochemical processors, and connectivity corridors.

Figure 2-1. Bainbridge Island Watershed and Stream Names



Stream ID	Creek Name	Creek Type	Watershed
1	East Fork Hawley Creek	Seasonal	NEGH
2	West Fork Hawley Creek	Seasonal	NEGH
3	Hawley Creek	Seasonal	NEGH
4	Ravine Creek	Perennial	NEGH
5	Madrone Creek	Seasonal	NEGH
6	Weaver Creek	Seasonal	NEGH
7	Sportsman's Club Creek	Perennial	NEGH
8	East Fork Cooper Creek	Seasonal	NEGH
9	North Fork Cooper Creek	Perennial	NEGH
10	Cooper Creek	Perennial	NEGH
11	Cougar Creek	Seasonal	EGDL
12	McDonald Creek	Seasonal	EGDL
13	Rose Creek	Seasonal	EGDL
14	Whiskey Creek	Perennial	EGDL
15	Creosote Creek	Seasonal	EGDL
16	Blakely Falls Creek	Seasonal	BLKH
17	South Fork Mac's Dam Creek	Perennial	BLKH
18	Mac's Dam Creek	Perennial	BLKH
19	Tani Creek	Seasonal	BLKH
20	Sunny Hill Creek	Seasonal	BLKH
21	Crane Lake Creek	Seasonal	BLKH
22	Toe Jam Hill Creek	Seasonal	BLKH
23	South Beach Creek	Seasonal	SHBH
24	Lytle Creek	Seasonal	PLBH
25	Schel-Chelb Creek	Perennial	PLBH
26	Middle Fork Schel-Chelb Creek	Seasonal	PLBH
27	South Fork Schel-Chelb Creek	Seasonal	PLBH
28	Point White Creek	Seasonal	PLBH
29	Linquist Creek	Seasonal	GZLK
30	Crystal Springs Creek	Seasonal	GZLK
31	Gazzam Lake Creek	Seasonal	GZLK
32	Foster's Creek	Seasonal	FLBY
33	South Fork Springbrook Creek	Perennial	FLBY
34	Springbrook Creek	Perennial	FLBY
35	Issei Creek	Perennial	FLBY
36	West Fork Issei Creek	Seasonal	FLBY
37	North Fletcher Bay Creek	Seasonal	FLBY
38	Battle Point Creek	Seasonal	MZBY
39	Fairy Dell Creek	Seasonal	MZBY
40	South Manzanita Creek	Seasonal	MZBY
41	South Fork Manzanita Creek	Perennial	MZBY
42	Manzanita Creek	Perennial	MZBY
43	North Fork Manzanita Creek	Seasonal	MZBY
44	Young Cedars Creek	Seasonal	AGPS
45	Agate Pass Creek	Seasonal	PTMD
46	Oots-Aht-Ub Creek	Seasonal	PTMD
47	Nature Preserve Creek	Seasonal	PTMD
48	Tochhookwap Creek	Seasonal	PTMD
49	Hidden Cove Creeklet	Seasonal	PTMD
50	Hidden Cove Creek	Seasonal	PTMD
51	Coho Creek	Perennial	PTMD
52	Heron Creek	Seasonal	SNRS
53	Dripping Water Creek	Perennial	SNRS
54	Rolling Bay Creek	Seasonal	SNRS
55	Manitou Beach Creek	Seasonal	MDCV
56	Meigs Creek	Perennial	MDCV
57	Middle Fork Woodward Creek	Perennial	MDCV
58	Woodward Creek	Perennial	MDCV
59	Murden Creek	Perennial	MDCV

~~*Land cover*~~ MOVED TO HABITAT BELOW.

~~Bainbridge Island encompasses an area of 17,471 acres, or approximately 28 square miles. The primary land cover is tree cover at 73%, or 12,760 acres. Grass/scrub lands, developed areas with *impervious surface*s and other coverages comprise 15%, 11% and 1%, respectively, with combined coverage of 4,712 acres (Table 1 next page).~~

~~*Land use* type does not vary widely by any great degree across the island due to a low percentage of industrial or commercial land development and the lack of available or developed *farm*/range land. The island's *land use* is consequently dominated by *residential use*s (75%). Other *land use*s such as recreation land (7%), agricultural (6%), transportation corridors (6%), commercial/light manufacturing (2%), *forest land* use (2%) and public facilities (2%), make up the remainder of the *land use* as a percentage of the total acreage on the island. With a total overall population of 23,630 the greatest population *density* occurs at the towns of Winslow, Island Center, Lynwood Center and around the coastline of the island. Outside of urbanized areas, the Island is generally characterized by scattered, small communities, homes on acreage, and large parcels of undeveloped land.~~

~~*Stream type*~~

~~In 2014, the Wild Fish Conservancy (WFC) completed stream typing for Bainbridge Island as part of the West Sound *Watershed*s, Kitsap Peninsula (WRIA 15) Stream Typing Project.~~

~~WFC's website states, "Water typing is the state-sanctioned process of mapping the distribution of fish and fish habitat. Regulatory water type maps are used to regulate *land use* decisions adjacent to *streams*, ponds, and *wetland*s. Because existing (modeled) regulatory maps often significantly misrepresent the presence, location, and extent of fish habitat, the effectiveness of state and local government fish habitat protection regulations is compromised. More information about the water typing process and its significance is available at: http://wildfishconservancy.org/resources/maps/what-is-water-typing."~~

~~WFC classified fish and fish habitat in Island *streams* and ground-truthed regulatory maps of stream presence and location, identifying an additional # previously unknown/unmapped miles of stream on Bainbridge Island. The City is currently using WFC's updated stream data.~~

Stormwater

Stormwater is generated when the ground becomes saturated and rainwater drains overland to the nearest surface water body or rainfall encounters hard or *impervious surface*s and drains into manmade drainage ditches, catch basins, and pipes.

There is no question that *stormwater runoff* is the leading transport pathway of pollution into Puget Sound and its associated *wetland*s, creeks, *streams* and rivers. Not only does it carry ~~transports~~ pollutants such as trash; gas, ~~and~~ oil, and metal-laden sediment from road surfaces and parking lots~~,~~; ~~as well as residues from~~ pesticides, fertilizers, and other chemicals used in lawn care;~~,~~ ~~as well as~~ pet waste and animal waste in agricultural areas, but ~~The amount of *stormwater runoff* generated from road, roof, parking lot, and other *impervious surface*s created by urban developments can be of a higher volume than what existed in the natural state.~~ the volume of *stormwater* generated by *impervious surface*s has tremendous force and can cause erosion ~~if allowed to flow into natural drainage systems provided by~~ and damage to in-stream and *wetland* habitat.

Peak flows that follow immediately after a storm can be much greater than existed when the land was in a natural state with vegetative cover~~.~~. ~~Excessive *stormwater runoff* may~~ cause*ing* *streams* to expand and overflow~~,~~ and creating flooding conditions on adjacent lands.

Therefore, *stormwater* has long been considered, at best, a nuisance and flooding hazard to be collected and delivered downstream as quickly and efficiently as possible and, at worst, a waste stream to be collected and removed from the *watershed*. Existing land development methods and *stormwater* drainage system *infrastructure* are designed to do just that.

However, as early as the year 2000, water-starved areas of the country started to view *stormwater* as a vital resource rather than a waste stream, first by limiting its generation by reducing *impervious surface*; then, retaining and infiltrating it on site where feasible; and, lastly, protecting it from pollution, capturing it, and reusing it to the maximum extent possible. On June 16, 2015, the California State Water Resources Control Board adopted an order that provides a framework to promote integrated *stormwater* capture and reuse to improve water quality, protect local beaches, and supplement water supplies. The new [*stormwater* discharge] permit focuses on using *stormwater* as a resource and encourages *green infrastructure* and *groundwater recharge* (*Stormwater Report*, *Water Environment Federation*, *June 2015*).

The Pacific Northwest is not considered water-starved and local conditions are not nearly so dire as in California. However, *climate change* predictions suggest that local water supplies likely will see some reduction in *recharge*; rainfall patterns will further tax existing, ailing, and undersized drainage *infrastructure* and possibly diminish summertime stream flows and water quality; and warming temperatures will increase summertime stream temperatures. Therefore, local municipalities are, also, rethinking their view of *stormwater* and many have already started evaluating and planning for *climate change*, especially in *stormwater* drainage system maintenance and retrofit. In 2009, Kitsap County adopted resolution 109-2009, *Creating Kitsap County "Water as a Resource" Policy*, in which the county resolved to treat all of its waters, including *stormwater*, as a vital resource, incorporating *low impact development* and water capture and reuse into all of its landuse and utility management planning.

~~The volume of *stormwater* generated by *impervious surfaces* has tremendous force and can cause erosion if allowed to flow into natural drainage systems provided by *streams* and *wetlands*. *Stormwater* can loosen soil and stream banks in the natural drainage way causing suspended particulates to flow into other bodies of water.~~

~~Excessive *stormwater runoff* may also cause *streams* to expand and overflow, creating flooding conditions on adjacent lands. Any sedimentation will eventually drop as the water slows down and loses its force, causing siltation and the degradation of *wetlands*, particularly of salmon spawning habitat.~~

~~*Stormwater runoff* from driveways and parking lots also transports pollutants such as gas and oil as well as residues from pesticides, fertilizers, and other chemicals used in lawn care, as well as animal waste in agricultural areas. *Non-point source pollution* accumulates as water runs over hard surfaces and is carried to the nearest body of water.~~

Observed Surface and Stormwater Conditions

Department of Ecology Surface Water Quality Assessment

Every two years the State Department of Ecology (Ecology) identifies polluted water bodies and submits a list of impaired water bodies, called a 303(d) list, to the Environmental Protection Agency (EPA) for approval in accordance with the federal Clean Water Act. This assessment is based on the assumption that each water body *should* support certain designated uses. Some of these uses are swimming and boating, fish and shellfish rearing and harvest, and wildlife habitat.

Ecology designates water bodies that frequently or consistently fail to meet standards or criteria as *Impaired*. Water bodies that only infrequently fail to meet standards are classified as *Waters of Concern* or *Sediments of Concern* if the sampled matrix was sediment. These assessments use water, fish/shellfish tissue, habitat, and sediment data.

Ecology's *2012 Water Quality Assessment* determined that one stream, one harbor, two coves, one lagoon, and three Island-adjacent nearshore marine areas on Bainbridge Island were *Impaired* by one or more pollutants and were not able to provide the full recreational, habitat, and aesthetic benefits they once offered.

An additional one bay, one harbor, and 28 other Island-adjacent nearshore marine areas were identified as *Waters of Concern* and/or *Sediments of Concern* for periodic excursions beyond the allowable standard or criteria for one or more pollutants.

Ecology's proposed *2014 Water Quality Assessment* (under review by the EPA at the time of this printing), designated an additional two *streams* as *Impaired* by at least one pollutant.

Tables 2-5 on the following pages detail those water bodies classified as *Impaired* or *of Concern* according to the analyzed matrix (water, tissue, habitat, and sediment, respectively).

It *should* be noted that much of the sediment data were collected prior to 2003, some as early as the 1990's. These may not be representative of current conditions. Further, many of the identified pollutants are legacy pollutants resulting from historic *land use* such as large-scale, row-crop *farm*ing and the active lumber industry at the turn of twentieth century. The City's sediment sampling data collected in 2008 and 2013 may be more representative of current inputs to these water bodies. These data are summarized in the next section, *City Surface Water Quality Assessment*.

One example of legacy pollution is the former Wyckoff Creosote Facility located at the mouth of Eagle Harbor. Sites where sediments are contaminated by hazardous waste are regulated and managed through the Model Toxics Control Act (MTCA). Sites such as the former Wyckoff Creosote Facility, due to the complexity and size, are normally addressed through EPA's Superfund program.

However, water bodies listed on the 303(d) list require TMDLs (Total Maximum Daily Loads) where identified sources of the pollutant of concern are allocated a pollutant load reduction in order for that water body to meet criteria. Currently, the City is a stakeholder in the *Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load (TMDL)*. Four of the Island's *watershed*s are captured within the TMDL drainage basin boundaries (Fletcher Bay, Gazzam Lake, Pleasant Beach, and South Beach *Watershed*s).

Table 2. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Water

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Middle)	Bacteria	Impaired	Impaired
	Copper	Waters of Concern	Waters of Concern
Eagle Harbor (Inner)	Dissolved Oxygen	Waters of Concern	Waters of Concern
	Temperature		
Agate Passage - Bridge	Dissolved Oxygen	Waters of Concern	Waters of Concern
Agate Passage - Agate Point	Dissolved Oxygen	Waters of Concern	Waters of Concern
	Temperature		
Rich Passage - Pleasant Beach Cove/Pleasant Beach	Bacteria	Impaired	Impaired
	Dissolved Oxygen		
	pH	Waters of Concern	Waters of Concern
Rich Passage - Point White	Dissolved Oxygen	Waters of Concern	Waters of Concern
Rich Passage - Fort Ward	Bacteria	Waters of Concern	Waters of Concern
	Dissolved Oxygen		
	pH		
Port Orchard Passage - Lower Crystal Springs	Dissolved Oxygen	Impaired	Impaired
	Bacteria		
	Temperature	Waters of Concern	Waters of Concern
Port Orchard Passage - Upper Crystal Springs	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - Fletcher Bay	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - Battle Point	Bacteria	Waters of Concern	Waters of Concern
Port Orchard Passage - South of Rolston	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Mouth)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Middle)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Blakely Harbor (Inner)	Bacteria	Waters of Concern	Waters of Concern
Puget Sound (Central) - Murden Cove	Bacteria	Impaired	Impaired
Puget Sound (Central) - Rolling Bay	Bacteria	Waters of Concern	Waters of Concern
Port Madison Bay - Point Monroe	Bacteria	Waters of Concern	Waters of Concern
Port Madison Bay - Mouth	Bacteria	Waters of Concern	Waters of Concern
Springbrook Creek	Bacteria	Impaired	Impaired
Ravine Creek	Bacteria	---	Impaired
Murden Creek	Bacteria	---	Impaired

Table 3. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Tissue

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Outer)	Benzo(a)pyrene	Impaired	Impaired
	Benzo(a)anthracene		
	Benzo[b]fluoranthene		
	Benzo[k]fluoranthene		
	Chrysene		
	Dibenzo[a,h]anthracene		
	Indeno(1,2,3-cd)pyrene		
	PCB		
Puget Sound (Central) - Rockaway	Chrysene	Impaired	Impaired

Table 4. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Habitat

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Puget Sound (Central) - Murden Cove	Habitat	Impaired	Impaired
Port Madison - Point Monroe Lagoon	Habitat	Impaired	Impaired

Table 5. Ecology Approved 2012 and Proposed 2014 Water Quality Assessment - Sediment

Waterbody	Parameter or Pollutant	2012	2014 (Proposed)
Eagle Harbor (Outer)	1,2,4-Trichlorobenzene	Impaired	Impaired
	1,2-Dichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	2-Methylnaphthalene		
	2-Methylphenol		
	4-Methylphenol		
	Acenaphthene		
	Acenaphthylene		
	Anthracene		
	Arsenic		
	Benzo(a)anthracene		
	Benzo(a)pyrene		
	Benzo(g,h,i)perylene		
	Benzofluoranthenes (b+k+j), Total		
	Benzoic Acid		
	Benzyl Alcohol		
	Bis (2-Ethylhexyl) Phthalate		
	Bioassay		
	Butyl Benzl Phthalate		
	Cadmium		
	Chromium		
	Chrysene		
	Copper		
	Dibenzo(a,h)anthracene		
	Dibenzofuran		
	Diethyl Phthalate		
	Dimethyl Phthalate		
	Di-n-butyl Phthalate		
	Di-n-octyl Phthalate		
	Fluoranthene		
	Fluorene		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	HPAH		
	Indeno(1,2,3-c,d) Pyrene		
	Lead		
	LPAH		
	Mercury		
	Naphthalene		
	N-Nitrosodiphenylamine		
	PCB		
	Pentachlorophenol		
	Phenanthrene		
	Phenol		
	Pyrene		
	Silver		
	Zinc		
Rich Passage - Pleasant Beach	Benzoic Acid	Sediments of Concern	Sediments of Concern
Rich Passage - Pleasant Beach Cove	Benzoic Acid	Sediments of Concern	Sediments of Concern
Port Orchard Passage - Upper Crystal Springs	Benzoic Acid	Sediments of Concern	Sediments of Concern
Port Orchard Passage - South of Rolston	1,2,4-Trichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2-Dichlorobenzene		
	Benzyl Alcohol		
Port Orchard Passage - Manzanita Bay	1,2,4-Trichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2-Dichlorobenzene		
Puget Sound (Central) - Wing Point	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Hexachlorobenzene		
	Pentachlorophenol		
Puget Sound (Central) - Rockaway	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	Naphthalene		
	N-Nitrosodiphenylamine		
Puget Sound (Central) - Blakely Harbor (Middle)	1,2-Dichlorobenzene	Sediments of Concern	Sediments of Concern
	1,2,4-Trichlorobenzene		
	1,4-Dichlorobenzene		
	2,4-Dimethylphenol		
	Dibenzo(a,h) anthracene		
	Hexachlorobenzene		
	Hexachlorobutadiene		
	N-Nitrosodiphenylamine		
	Pentachlorophenol		

Commercial Shellfish Growing Area and Recreational Harvest Area Assessment

Department of Health (DOH) routine bacterial and biotoxin assessments of recreational shellfish harvest areas and commercial shellfish growing and harvest areas demonstrate a significant loss of designated uses. The entire east, north, and west shorelines are closed to recreational butter and varnish clam harvest, and the southern shoreline is closed to recreational varnish clam harvest. Only one small area around Point White is open to recreational harvest.

Most commercial shellfish growing area around the Island is open to harvest. However, two segments of commercial shellfish growing areas along Agate Passage and Crystal Springs are currently closed due to bacterial contamination in shoreline drainages to include private drains, *stormwater* outfalls, and *streams*. Point Monroe Lagoon is restricted for commercial harvest, requiring that shellfish be transplanted to approved growing area waters for a specified amount of time in order to naturally cleanse themselves of contaminates before they are harvested for market. Commercial Geoduck Tract 07850 at Restoration Point was closed four times in 2012-2013 for biotoxin. Commercial Geoduck Tract 07000 at the mouth of Manzanita Bay has been closed 14 times in the last five years for biotoxin, and is currently closed at the time of this printing.

In addition to annual commercial growing area reports, DOH publishes an annual threatened areas report to bring attention to monitoring sites where bacteria concentrations are close to exceeding the criteria. The 2015 report (based upon 2014 data) identified one monitoring site (#457) immediate outside of the north side of the mouth of Fletcher Bay as a threatened site and one site (#418) along the southern shore of Blakely Harbor as a site of concern.

Swimming Beach Assessment

The Departments of Ecology and Health's BEACH Program conducts swimming beach monitoring for bacteria during the swimming season (Memorial Day through Labor Day). Typically, bacteria levels in marine waters tends to be fairly low in the summertime. In fact, most beach closures on the Island have been associated with *sanitary sewer* spills such as the Kitsap Sewer District #7 Fort Ward spill in 2012, and the City's sewer main breaks along the north side of Eagle Harbor in 2014.

In 2015, three of the Island's swimming beaches (Fay Bainbridge Park, Joel Pritchard Park, and Eagle Harbor Waterfront Park) were monitored. Bacterial concentrations in 2015 were acceptable, and there were no beach closures in 2015.

City Surface Water Quality Assessment

In 2007, the City received a Centennial Clean Water Fund Grant from Ecology to design and implement a long-term monitoring program to assess the ecological health of the Island's freshwater (*streams* and lakes), marine water (harbors, bays, and nearshore areas), and *stormwater* discharge.

The Water Quality and Flow Monitoring Program (WQFMP) was pilot-tested in 2007-2008 and expanded to Island wide long-term status and trends monitoring in 2010. The program

currently conducts routine monitoring for stream and *stormwater* chemistry, stream and nearshore sediment chemistry, rainfall, stream and *stormwater* flow, and stream biodiversity (benthic macroinvertebrates). Every five years, the program also conducts targeted storm event monitoring to assess *stormwater runoff* impacts in *streams* and nearshore marine waters.

Although the program's Final Monitoring Plan is comprehensive, staffing and funding are limited. Current monitoring gaps are *stormwater* best management practice effectiveness monitoring, lake monitoring, marine biological assessments (fish, aquatic macrophytes, phytoplankton, and benthic invertebrates), routine marine water chemistry, and freshwater and marine habitat assessments.

The program released its first edition *State of the Island's Waters* report in 2012 which summarized findings from data collected through Water Year 2011 (September 2011). Program staff are currently assessing data collected through Water Year 2015 (September 2015) and working on a second edition of the report. The following summary reflects assessments completed at the time of this printing.

Bacteria

All of the seven nearshore marine waters monitored during WY2014 targeted storm event monitoring failed to meet the state criteria for fecal coliform bacteria, while 13 (86%) of the 15 *streams* monitored on a monthly basis failed to meet the state criteria in WY2015. Given these results and the number of state listings for bacterial impairment (see Table 2 above), bacteria has proven to be the most prevalent pollutant in freshwater and marine water resources Island wide.

As described above in *Commercial Shellfish Growing Area and Recreational Shellfish Harvest Area Assessment*, commercial shellfish harvest areas along approximately twelve miles of shoreline are currently closed due to elevated bacteria in shoreline drainages, and nearly the entire Island is closed to recreational harvest of varnish and butter clams due to the biotoxins usually associated with bacteria.

Bacterial contamination is common to every season and every *watershed*, urban or rural, and its sources are as varied as the landscape itself. In rural *watershed*s, the most common sources of bacteria are failing septic systems, improperly-managed pet and livestock wastes, and wildlife. In urban *watershed*s, the most common sources are improperly-managed pet waste, improper food handling, poorly-maintained food waste receptacles, failing septic systems, poorly-maintained or failing *stormwater* drainage *infrastructure* (private and public), failing *sanitary sewer infrastructure*, and illicit cross-connections between the *sanitary sewer* and the *stormwater* drainage systems.

In marine environments, common sources of bacteria aside from discharges from upland sources are improper boat waste disposal, failing *sanitary sewer infrastructure*, and wildlife.

Nutrients

Although they are essential to all plant, human, and aquatic life, phosphorus and nitrogen concentrations, if excessive, can overstimulate growth of aquatic vegetation and algal blooms. Applying Ecology's Water Quality Index using the ratio of total nitrogen to total phosphorus, Island *streams* generally rate of low to moderate concern during the wet season and moderate to high concern during the dry season relative to other Puget Lowland *streams*. In 2013, a year of below average rainfall, most *streams* rated of moderate concern even in the wet season, and 3 *streams* reached a high level of concern. During the extreme dry period in the summer of 2015, 7 *streams* climbed to a level of high concern.

Nuisance algal blooms have increased along eastern shorelines and harbors (see Ecology's Eyes Over Puget Sound). These blooms are not only aesthetically unpleasant, but dying and decomposing algae use up aquatic life-sustaining oxygen and render aquatic habitat unusable such as in Murden Cove and Point Monroe Lagoon which are covered year-round with ulvoid macroalgae (see Table 4 above).

Though more study is needed to establish natural background levels for Island *streams* and it is well-understood that a significant amount of nitrogen-loading in Puget Sound comes from the ocean through the Strait of Juan de Fuca via tidal action, ecosystems with naturally high background levels are particularly sensitive to any additional loading from human sources.

Aside from the natural sources of nutrients from forests and *wetland*s, human inputs include agricultural and residential fertilizers, phosphate-based laundry detergents and commercial washing agents, yard waste such as grass clippings and other vegetation dumped along shorelines and *streams*, failing residential septic systems (in some cases even functioning systems), failing municipal sewer *infrastructure*, and improperly handled pet and livestock waste.

Ammonia

Ammonia is considered a priority pollutant by the EPA, since it is toxic to both humans and aquatic life. Therefore, there are established acute and chronic criteria for ammonia in surface waters. Acute criterion is the concentration of a substance at which injury or death to an organism can occur as a result of short-term exposure. Chronic criterion is the concentration of a substance at which injury or death to an organism can occur as a result of repeated or constant exposure.

Out of the 11 fish-bearing *streams* monitored on a routine basis, 8 (73%) consistently exceeded the chronic criteria, while the remaining 3 had seasonal exceedances only. During WY2014 targeted storm event monitoring, all 7 *streams* and corresponding nearshore areas monitored exceeded the chronic criteria. Murden Cove frequently exceeded the acute criteria. The cove exceeded acute criteria 14 times during the 3-year Murden Cove *Watershed* Nutrient and Bacteria Reduction Project (2013-2015).

Sediment and Metals

During rain events, sediment-laden *stormwater runoff* is a prominent pollutant on the Island. Not only does sediment cause excessive scouring and erosion, de-stabilizing *slope*s and stream banks and threatening property, but subsequent downstream deposition clogs stream bottoms, smothers fish eggs, and increases siltation rates in the Island's harbors and bays. Sediment also reduces fish's ability to find food and damages their gills as well.

Sediment-intolerant macroinvertebrate species (an important food source for fish) have diminished, some entirely, from half of the Island *streams* monitored, especially Ravine and Murden Creeks.

Equally concerning are the pollutants that sediment carries with it such as heavy metals. Though ambient or background levels of suspended sediment in *streams* and nearshore areas are generally quite low, monitoring results have shown significant increases in suspended sediment and concentrations of metals in *streams*, nearshore marine waters, and *stormwater* outfall discharge during intense rain events.

Anywhere soil is exposed to rain there is a risk of sediment-laden *runoff*. Construction sites, croplands, sand and gravel pits or accumulations, and any other cleared or grubbed land surfaces are all potential sources of sediment. Likewise, poorly-maintained parking lots, *stormwater* drainage systems, and roadways become significant sources of sediment, particularly sediment laden with heavy metals.

Metals are also carried to *streams* from uncontrolled discharges from auto washing washwater and industrial discharges.

Climate change may lead to an increase in lands*LID*e risk, erosion and sediment transport in the fall, winter, and spring seasons, while reducing the rates of these processes in the summer. Quantitative projections are limited, because of the challenge in distinguishing *climate change* impacts from factors such as development patterns and forest management.

The City collects sediment samples from select stream and nearshore sites every five years for contaminant chemistry and grain size analysis.

In-situ Physical Chemistry

Several Island *streams* and nearshore areas experience periodic excursions in pH, temperature, and dissolved oxygen. Excursions in pH are fairly rare. However, Hawley (East and West Forks), Murden, Schel Chelb, Manzanita, Springbrook, Issei, and Mac's Dam Creeks and Murden Cove suffer chronically low levels of dissolved oxygen. While most only exceed standards in the summertime, Murden and Schel Chelb Creeks exceed standards year-round.

Several *streams* that had historically maintained acceptable water temperatures year-round, have started to exceed temperature criteria during the summertime since 2012 with excursions occurring more frequently over time. These *streams* are Hawley (East and West Forks)

Sprinbrook, Schel Chelb, Linquist, Gazzam Lake, and Mac's Dam Creeks. Two nearshore areas (Eagle Harbor at Ravine Creek, and Murden Cove) frequently exceed temperature criteria as well.

Continuous temperature and dissolved oxygen sensors were deployed in three separate reaches of Murden Creek as part of the 2013-2015 Murden Cove *Watershed* Nutrient and Bacteria Reduction Project. Summertime daily maximum temperatures at all three locations exceeded the criteria with temperatures increasing and exceeding criteria more often in the downstream reach. Similarly, summertime daily minimum dissolved oxygen levels exceeded criteria at all three sites. However, upstream reaches only infrequently exceeded criteria during the summertime, while oxygen levels were significantly lower in the downstream reach and exceeded criteria year-round.

Despite observed improvements in some water quality parameters such as phosphorus and bacteria over the project period, in-stream chemistry stayed the same or worsened. This indicates that the impact is most likely habitat driven (lack of canopy cover, reduced or absent buffers, lower summertime stream flows) rather than an illicit discharge of polluted water.

These excursions in physical chemistry, especially temperature and dissolved oxygen, significantly impair these waters' ability to support aquatic life.

Flow and Land use Impacts on the Biological Community

Hydrology is perhaps the most fundamental driver of physical, chemical, and biological processes in streams and is often considered a "master variable" controlling geomorphology, substrate stability, faunal and floral habitat suitability, thermal regulation, metabolism, biogeochemical cycling, and the downstream flux of energy, matter, and biota [Power et al. 1988; Resh et al. 1988; Poff and Ward 1989; Poff 1996; Poff et al. 1997; Dodds et al. 2004](McDonough, Hosen and Palmer, 2011).

In 2015, the City contracted with King County Department of Natural Resources and Parks, Water and Land Resources Di*Vision* to conduct a stream benthos and hydrologic evaluation of the City's stream benthic macroinvertebrate data and continuous flow gauging data.

Flow data analysis showed that stream flows increase more quickly following rain events and generally have higher peaks than would be expected under forested conditions. These results were generally consistent with increasing levels of urbanization upstream of each gauge and consistent with other data collected in other Puget Sound *watersheds*.

The average Benthic Index of Biotic Integrity (B-IBI) scores spanning all years of data were very poor for Ravine Creek; poor for Issei, Murden, and Whiskey Creeks; and fair for Cooper, Manzanita, Springbrook, and Woodward Creeks. None of the eight sites investigated had average scores that showed good or excellent stream benthic communities, although two sites (Cooper and Springbrook) did have individual sampling years that had good scores. Again,

these data were generally consistent with the level of development in the study *watersheds* and with data collected in other Puget Sound *watersheds*.

Five statistically significant upward or downward B-IBI component metric trends were identified at four creek sites. Two Murden Creek site metrics showed a worsening trend in species diversity and percentage of pollution tolerant species versus intolerant species. Manzanita Creek showed an improving trend in species richness and both Cooper and Issei Creek showed an improving trend in percentage of pollution intolerant species versus tolerant species.

King County also examined three additional benthic macroinvertebrate diagnostic metrics for organic pollution (i.e., animal waste including human waste), fine sediment, and metals. The Fine Sediment Sensitivity Index was generally lower at all Bainbridge sites relative to reference sites, suggesting that fine sediment inputs may be a factor in benthic impairment in these *streams*. If confirmed through evaluation of sediment conditions at these sites, the cause is unlikely related exclusively to development as some of the stream basins are relatively undeveloped. It is possible that at least in some instances, past *land use* (e.g., historical logging and *farm*ing activities) is a factor in causing excess sediment to be (or to have been) delivered to these *streams*. Any development within these basins may also be a contributing factor as well; potentially delivering fine sediment through construction and land clearing activities and through stream bank erosion resulting from increased peak flows.

All three diagnostic metrics and the flashiness hydrologic metrics indicate that Ravine Creek is suffering from multiple stressors that potentially include organic and metal pollution, geomorphic alteration, and flashier flows, all typical of an urban stream.

There was only one statistically significant upward or downward trend in these three additional metrics – an improving trend in metals-intolerant species in Issei Creek.

Habitat

As stated above in *City Surface Water Quality Assessment*, limited resources prevent the City's monitoring program from actively monitoring for freshwater and marine water habitat assessment aside from limited sediment sampling in select stream and adjacent nearshore areas (addressed above in Water and Sediment). Most of what we know about our nearshore marine habitat and freshwater habitat is based upon work by non-profit entities such as the Bainbridge Island Land Trust, the Puget Sound Restoration Fund and the Bainbridge Island *Watershed* Council and outside agencies such as Washington State Department of Fish and Wildlife (WDFW), Washington State Department of Natural Resources (DNR), Ecology, Wild Fish Conservancy, and the Suquamish Tribe. Limited *land use*/land cover information is available through aerial photography and light detection and radar (*LID*AR) technology, as well.

Land cover

Bainbridge Island encompasses an area of 17,471 acres, or approximately 28 square miles. The primary land cover is tree-cover at 73%, or 12,760 acres. Grass/scrub lands, developed areas

with *impervious surface*s and other coverages comprise 15%, 11% and 1%, respectively, with combined coverage of 4,712 acres (Table 1 next page).

Land use type does not vary widely by any great degree across the island due to a low percentage of industrial or commercial land development and the lack of available or developed *farm*/range land. The island's *land use* is consequently dominated by *residential use*s (75%). Other *land use*s such as recreation land (7%), agricultural (6%), transportation corridors (6%), commercial/light manufacturing (2%), *forest land*-use (2%) and public facilities (2%), make up the remainder of the *land use* as a percentage of the total acreage on the island. With a total overall population of 23,630 the greatest population *density* occurs at the towns of Winslow, Island Center, Lynwood Center and around the coastline of the island. Outside of urbanized areas, the Island is generally characterized by scattered, small communities, homes on acreage, and large parcels of undeveloped land.

Stream type

In 2014, the Wild Fish Conservancy (WFC) completed stream typing for Bainbridge Island as part of the West Sound *Watershed*s, Kitsap Peninsula (WRIA 15) Stream Typing Project.

WFC's website states, "Water typing is the state-sanctioned process of mapping the distribution of fish and fish habitat. Regulatory water type maps are used to regulate *land use* decisions adjacent to *streams*, ponds, and *wetland*s. Because existing (modeled) regulatory maps often significantly misrepresent the presence, location, and extent of fish habitat, the effectiveness of state and local government fish habitat protection regulations is compromised. More information about the water typing process and its significance is available at: http://wildfishconservancy.org/resources/maps/what-is-water-typing."

WFC classified fish and fish habitat in Island *streams* and ground-truthed regulatory maps of stream presence and location, identifying an additional 25 previously unknown/unmapped miles of stream with 698 acres of previously unprotected habitat buffer on Bainbridge Island. The City is currently using WFC's updated stream data.

Table 1. CoBI *Watershed* Land Cover Statistics

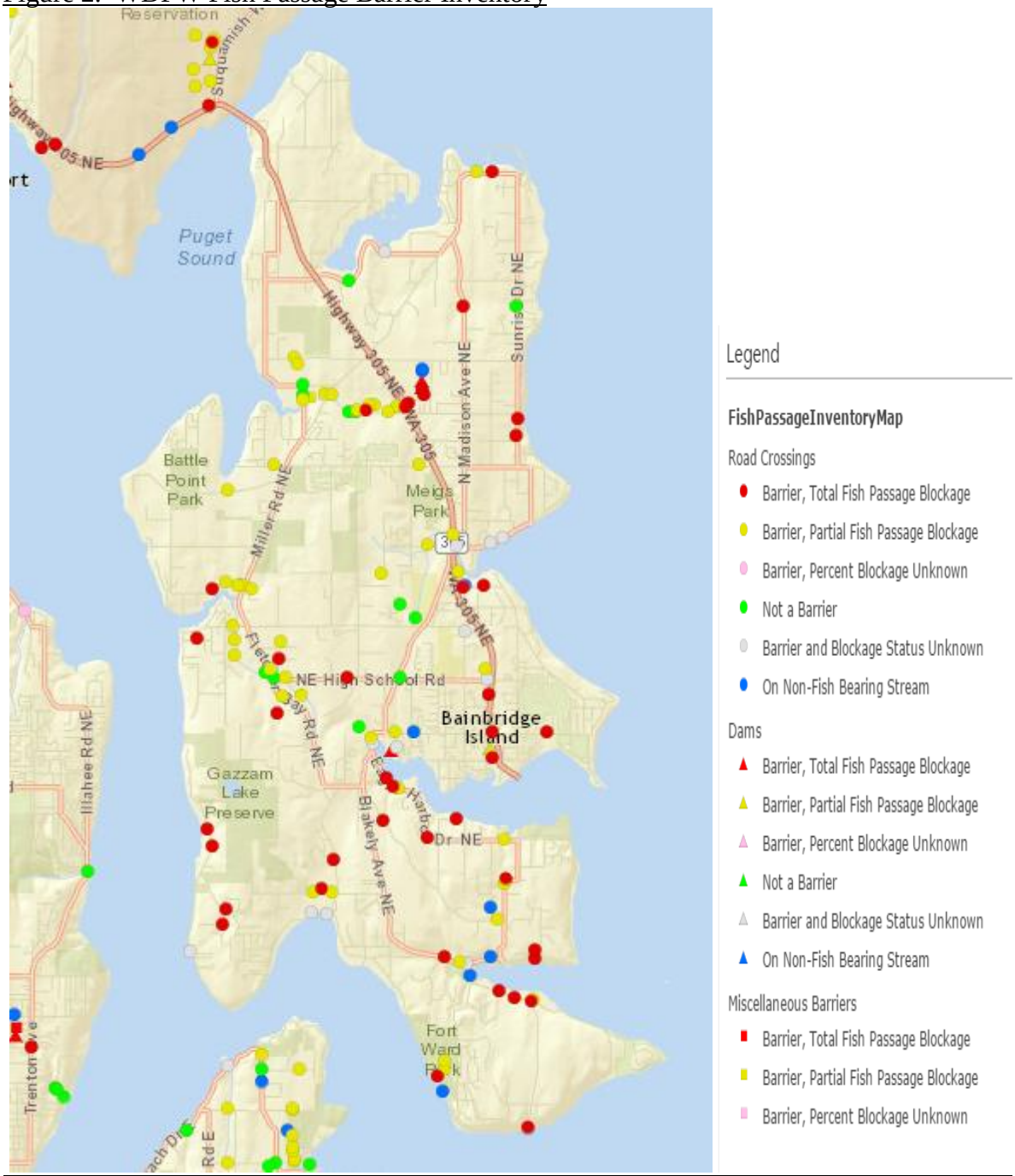
Watershed Name /Code	*Watershed* Area (Acres)	*Watershed* Size Ranking	Breakdown of Total *Watershed* Landcover (% of Total Area)								
			Forest	*Wetlands*	**Natural**	Grass & Turf	Bare Ground	% Total Impervious Area	**Developed**	**Surface Water**	**Other**
Agate Passage / AGPS	599.96	12	79.52	2.75	**82.28**	4.25	3.08	9.17	**16.51**	**0.17**	1.04
Blakely Harbor / BLKH	1,369.73	7	87.04	1.08	**88.13**	2.25	3.62	5.75	**11.62**	**0.22**	0.04
Eagledale / EGDL	1,094.12	9	65.10	2.95	**68.04**	8.83	4.36	18.45	**31.63**	**0.33**	0.00
Fletcher Bay / FLBY	2,114.01	3	75.83	1.09	**76.92**	8.60	6.04	7.89	**22.52**	**0.56**	0.00
Gazzam Lake / GZLK	886.45	10	83.96	0.79	**84.74**	3.96	1.86	7.82	**13.64**	**1.62**	0.00
Manzanita Bay / MZBY	2,296.34	1	72.25	1.92	**74.18**	9.76	6.76	8.85	**25.37**	**0.46**	0.00
Murden Cove / MDCV	2,046.36	4	73.65	2.34	**75.99**	7.65	6.46	9.48	**23.58**	**0.43**	0.00
North Eagle Harbor / NEGH	2,184.91	2	50.64	2.46	**53.11**	8.30	10.57	26.95	**45.82**	**0.44**	0.63
Pleasant Beach / PLBH	1,437.63	5	70.66	3.00	**73.66**	6.01	6.64	13.56	**26.21**	**0.13**	0.00
Port Madison / PTMD	1,388.31	6	81.85	1.18	**83.03**	6.26	3.75	6.36	**16.37**	**0.30**	0.31
South Beach / SHBH	711.89	11	76.59	1.20	**77.79**	4.16	10.88	6.54	**21.58**	**0.63**	0.00
Sunrise / SNRS	1,342.24	8	79.08	1.92	**81.00**	4.49	6.41	7.97	**18.87**	**0.13**	0.00
TOTAL ACREAGE	**17,471.95**	-	12,760.44	333.49	**13,093.92**	1,194.76	1,089.27	1,994.28	**4,278.31**	**74.84**	**24.88**

Notes:
** Statistical sources include: Battelle GIS database, CoBI GIS data, and CoBI Level II Assessment (Kato & Warren, 2000)
(Water Quality and Flow Monitoring Program – Final Monitoring Plan, COBI, 2008)

Fish Passage Barrier Inventory

In 2014 the Washington Department of Fish and Wildlife (WDFW) completed fish passage assessments on Bainbridge Island *streams*. As part of this assessment, WDFW identified 43 total passage barriers (40 road crossings and 3 dams) and 45 partial passage barriers (43 road crossings, 1 dam, and 1 miscellaneous) (see Figure 2).

Figure 2. WDFW Fish Passage Barrier Inventory



(http://wdfw.maps.arcgis.com/home/webmap/viewer.html)

WATER RESOURCES ELEMENT IMPLEMENTATION

To implement this Element, the City must take action in several ways, including regulations, program creation, and budgeting.

- Modify Aquifer Recharge Area regulations in the City's Critical Areas Ordinance, BIMC Chapter 16.20.
- Adopt stringent Low Impact Development (LID) regulations to comply with the City's NPDES permit requirements, and ensure continued aquifer recharge when development creates new impervious surfaces.
- Create a program to promote LID retrofits for existing private development and consider retrofit for public facilities.
- Develop and Island-wide Groundwater Management Plan.
- Continue data gathering, monitoring, and analysis for all City water resources.
- Continue and improve outreach programs to educate the public about water conservation and protecting water quality, including outreach to owners of exempt wells.
- Coordinate with state and local health departments to evaluate and promote new technologies that conserve and protect water resources (e.g. greywater capture, composting toilets).
- Improve coordination with the EPA, Washington Department of Ecology, and the Kitsap Public Health District to address clean-up of contaminated sites.
- The City must continue to respond to climate change scenarios in order to protect and manage its water resources.

2015 - AMI Bremerton Silverdale - effective 6/1/2015 - HOME

	1 Person	2 person	3 person	4 person	5 person	6 person	7 person	8 person
30% AMI	$15,700	$17,950	$20,200	$22,400	$24,200	$26,000	$27,800	$29,600
50% AMI	$26,150	$29,850	$33,600	$37,300	$40,300	$43,300	$46,300	$49,250
60% AMI	$31,380	$35,820	$40,320	$44,760	$48,360	$51,960	$55,560	$59,100
80% AMI	$41,800	$47,800	$53,750	$59,700	$64,500	$69,300	$74,050	$78,850
100% AMI	$52,220	$59,680	$67,140	$74,600	$80,568	$86,536	$92,504	$98,472
120% AMI	$62,664	$71,616	$80,568	$89,520	$96,682	$103,843	$111,005	$118,166

Attachment A - Potential Tools to increase supply of diverse housing types and affordable housing

#	TOOL	WHERE	POLICY OBJECTIVES	WHAT	POTENTIAL SCALE OF IMPACT ON SUPPLY OF HOUSING (MORE / LESS)
1	Surplus public land to write down the cost of development in partnership with affordable housing providers	Winslow	• Increase the affordable housing supply	• The City Council's recent decision regarding the Suzuki property is an example of using surplus city owned property to achieve affordable housing objectives. The details of the project are yet to be negotiated, but they will result in 50+ units of housing with an affordable housing component, on a 13+ acre property in Winslow. • There may be other opportunities to include affordable housing in the airspace over future public facilities such as a police headquarters, post office or municipal parking garage. **See Attachment A1. ACTION: adopt criteria and process**	
2	Explore interest of Island churches regarding potential for affordable housing on church property	Winslow and NSCs if allowed by Subarea Plan	• Increase the affordable housing supply	• Churches in a number of cities have dedicated a portion of their properties for use as affordable housing or other social services. Those churches see such purposes as consistent with their religious mission. • There are a number of churches within Winslow who may have some interest in such a possibility. **See Attachment A1.** • One example, from the City of Shoreline, the Ronald Methodist Church has partnered with non-profit housing providers to build "Ronald Commons" a 60 unit affordable housing project in the Town Center. **See Attachment A2. ACTION: outreach to churches**	
3	Multifamily Property Tax Exemption (MFPTE)	Winslow and NSCs if allowed by Subarea Plan	• Increase # of housing types • Increase the affordable housing supply	• Many cities, including Everett, Covington, Shoreline, Seattle and Tacoma, have effectively used the MFPTE tool to incent the building of 100s of units of affordable housing. • State law permits cities to exempt new projects for up to 12 years from paying property taxes on the value of improvements, provided that a percentage of the units are set aside as affordable housing. • The Puget Sound Regional Council has highlighted the MFPTE tool as an effective way to incentivize affordable housing. **See Attachment A3 ACTION: draft ordinance to adopt program**	

4	Cottage Housing Ordinance	Island-wide	• Increase # of housing types • Increase # of smaller units	• The 2007 Community Housing Coalition Final Report included and recommended adoption of a draft cottage housing ordinance. • Cottage housing, at a typical density of 11 units to the acre, addresses a specific niche in the market for empty-nesters and young singles. • The Ericksen Ave Cottages are an example of this type in Winslow. **See Attachment A4. ACTION: craft and adopt new regulation**	
5	Conservation Villages Ordinance	Outside Centers	• Increase # of housing types • Increase # of smaller units • Conserve lands outside centers	• The City's regulations for cluster subdivisions have produced controversial and unsatisfactory results. • A new approach could be explored to better achieve the City's conservation objectives, while also creating the opportunity for small houses (900 to 1500 square feet) and/or on small lots (3,000 to 5,000 square feet). • A "Conservation Villages" ordinance could be drafted to avoid the flaws in present subdivision regulations and build upon the principles in the "Growing Greener" movement in other states. **See Attachment A5 ACTION: craft and adopt new regulation**	
6	Extend and clarify Housing Design Demonstration Projects (HDDP) Process	Winslow and NSCs if allowed by Subarea Plan	• Increase # of housing types • Increase # of smaller units • Increase the affordable housing supply	• The GROW community and Ferncliff Village are two projects that have been developed using the HDDP process. • The HDDP is presently the only tool the City has to incent the provision of affordable housing and green building practices. It does so by providing for density increases and modification of dimensional standards. • The HDDP expires at the end of 2016. The City should consider clarifying the HDDP process and making it a permanent option for innovative housing. **ACTION: adopt ordinance extending**	
7	Increased Floor Area Ratio (FAR) to incent affordable housing as part of mixed use projects	Winslow	• Increase # of housing types • Increase the affordable housing supply	• Increasing the FAR in Winslow could be tied to the provision of affordable housing. A sliding scale of FAR could be established tied to specific levels of affordable housing as part of the mix. • Any increase in FAR would have to be accompanied by appropriate revisions to maximum building height and floor plate in order to accommodate the increased building envelope. • The most appropriate location for increased FAR and larger building envelopes would be the High School Road, Madison, Ferry Terminal and Erickson District **ACTION: craft and adopt code amendment**	

8	Adopt Tiny Houses regulations	Island-wide	• Increase # of housing types • Increase the affordable housing supply	• Much interest has been expressed in "tiny houses" as a specific housing niche. Generally, these are quite small (under 600 square feet or less) which lowers the cost for materials and construction, but likewise limits the household size that can be accommodated. **See Attachment Attachment A6.** • The City could make available a small parcel in Winslow for a demonstration project. **ACTION: refer to staff for study.**	
9	Reduce or eliminate required parking where alternative transportation modes are available	Winslow	• Increase # of housing types	• A key obstacle to infill development is the high cost of parking. Surface level parking is very land intensive and structured parking can cost $40,000 per stall. • A significant Increase in the supply of apartments would be facilitated by reducing or eliminating parking requirements. • The degree of reduction could be tied to the availability of alternative modes of transportation (e.g., transit, walkable distances to services, bicycles, etc.) **ACTION: craft and adopt code amendment**	
10	Reform Accessory Dwelling Units (ADU) standards	Island-wide	• Increase # of housing types • Increase the affordable housing supply	• Over 200 ADUs have been permitted since 1992. • One way to reduce the cost of ADUs would be to enable the sharing of utility meters between the ADU and the larger house. **ACTION: craft and adopt code amendment**	
11	Revisit Zoning requirement for affordable units as a % in new multifamily	Winslow	• Increase the affordable housing supply	• Requiring the provision of affordable housing for detached housing subdivision was problematic. It resulted in very few units and was an administrative burden on the City. • Bainbridge's unsuccessful inclusionary zoning ordinance was repealed. **ACTION: refer to staff for study**	
12	Explore a future housing levy to fund construction of affordable housing	Island-wide	• Increase the affordable housing supply	• Engage a community discussion of the merits and costs of an affordable housing levy on the Island. • COBI should participate in and support conversations about a Kitsap County levy or tax for affordable housing. • Both Seattle and Bellingham have passed affordable housing levies. King and Pierce County are now considering levies. **ACTION: initiate study of options, merits and costs**	

13	Increase resources to the Housing Trust Fund	Island-wide	• Increase the affordable housing supply	• The Housing Trust Fund is the only existing source of public funding to support housing projects on the Island. • Consider a special transfer of funds from the General Fund, to better capitalize new affordable housing projects. • Identify new sources of funding to keep the HTF as a viable means of supporting projects. **ACTION: refer to staff to prepare options**	
14	Streamline the permit process for projects with an affordable housing component	Island-wide	• Increase # of housing types • Increase the affordable housing supply	• Two of the greatest impediments to the viability of any development, including affordable housing projects, are uncertainty and delay. • Increase the viability for affordable housing projects by reducing uncertainty. Adopt clear standards so that a developer can rely on unambiguous requirements, not the vagaries of a discretionary permit process • Eliminate advisory meetings by the planning commission and appeals to the council. Limit appeal to a single open record hearing before the hearing examiner. **ACTION: craft and adopt code amendment**	
15	Waive development and utility fees for projects that have 100% affordable housing	Island-wide	• Increase the affordable housing supply	• The margin of viability for some affordable housing projects is thin, so that any reduction in cost can make an important difference. • Some communities have either waived or reduced planning and development fees and/or water & sewer fees for projects that provide 100% affordable housing. Bainbridge Island should consider expanding fee waivers to include these costs. \ **ACTION: refer to staff to prepare program**	
16	Establish annual targets for addition of market rate and income eligible affordable housing units to the Island supply	Island-wide	• Increase # of housing types • Increase the affordable housing supply	• Numeric targets should be developed for new units built, number of affordable housing units built, vacancy rates, etc. • An annual or semi-annual report should monitor progress, analyze reasons for success or lack of it, and recommend revisions to existing measures or adoption of new measures. **ACTION: refer to staff to prepare program**	

HOUSING ELEMENT

TABLE OF CONTENTS

HOUSING ELEMENT

INTRODUCTION

Decent and safe housing is a basic human need increasingly unavailable to many Americans, including many Bainbridge Island resident and workers. The Washington State Growth Management Act (GMA) provides direction for cities to address these needs in the Housing Element of the Comprehensive Plan. Many of the Plan's Guiding Principles and Policies carry this direction forward to be addressed in various Elements, including Housing. ~~This reality applies increasingly to certain segments of Bainbridge Island's population as well as to many of those who work on the Island.~~

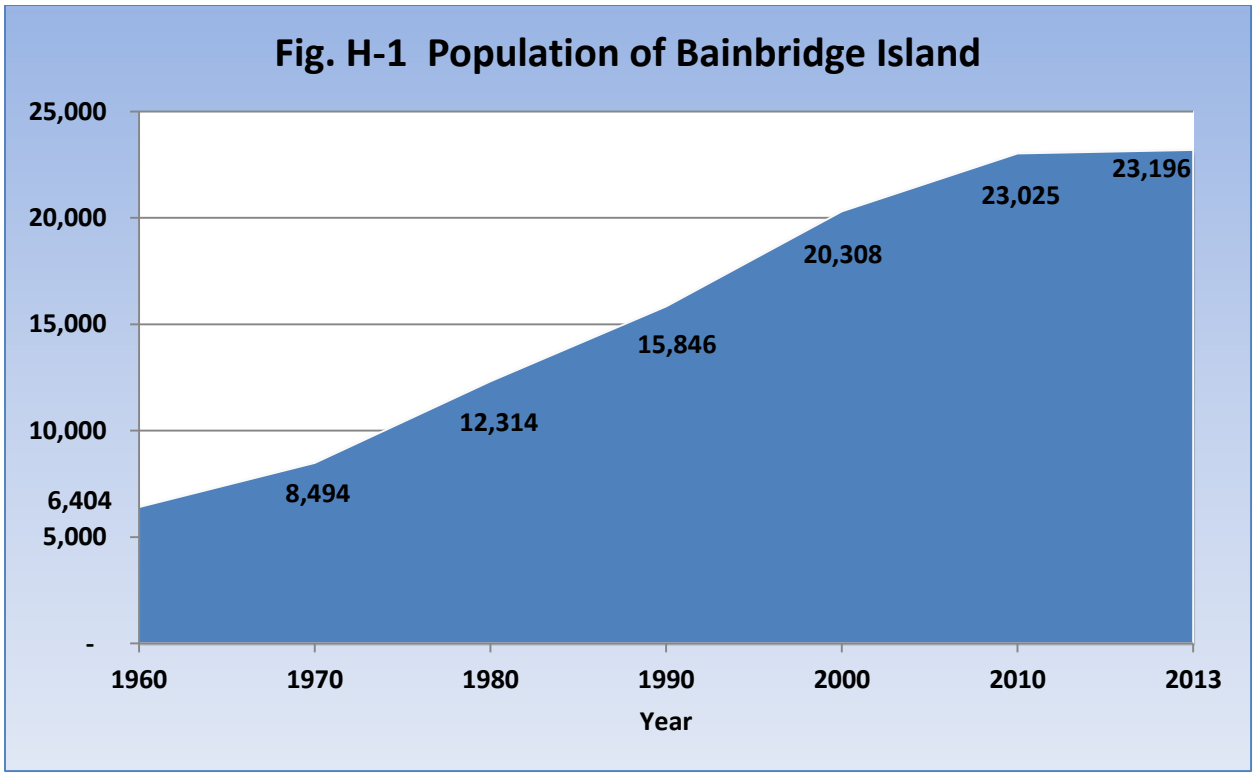
The City's Housing Needs Assessment (HNA) adopted in December of 2015, documents current housing conditions on the Island, and identifies trends and specific needs. Portions of the HNA are excerpted in this Element, while the entire HNA is adopted as an Appendix. The Element follows with goals and policies to address the identified housing needs and concludes with a series of implementation strategies to prioritize action by the City and others.

~~the disparity between Kitsap County TRENDS Reports, which track the average home sale price in Kitsap County, document that between 1990 and 2003 the average Bainbridge Island home price escalated dramatically from $232,687 to $478,000.~~

I. PROFILE: BAINBRIDGE ISLAND POPULATION AND DEMOGRAPHICS

In 2015, Bainbridge Island had a population of 23,300. The 20-year growth target assigned to the Island is an additional 5,635 people, so this comprehensive plan is written to accommodate a population of 28,935 by the year 2036.

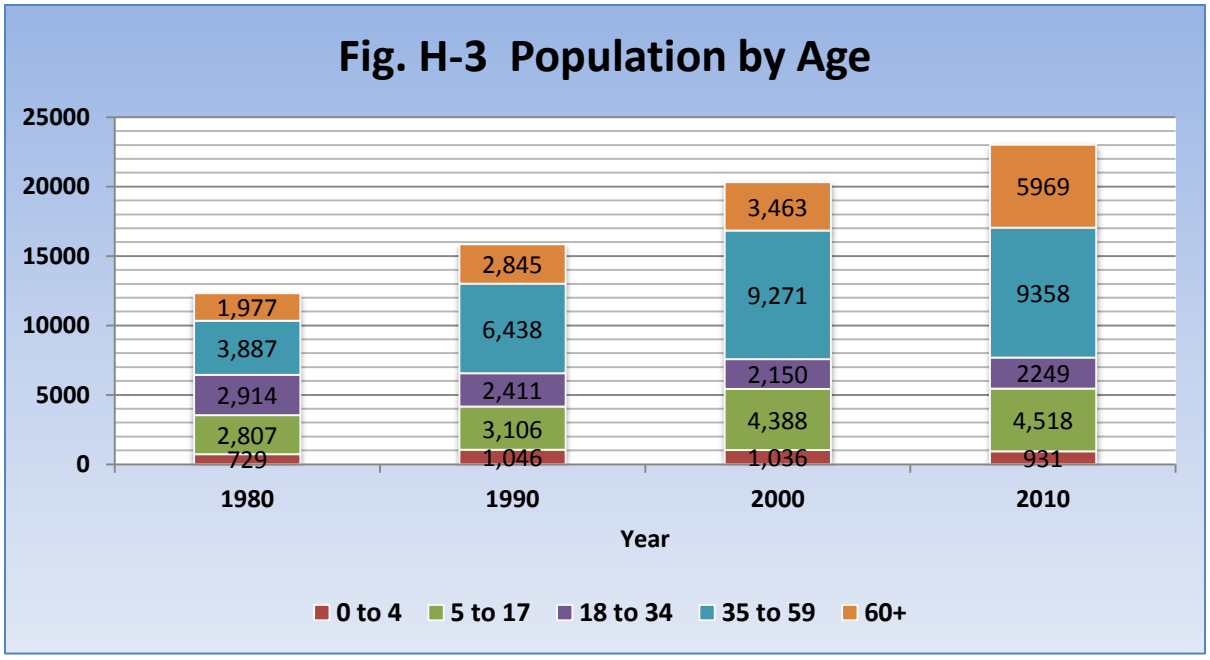
The Island saw significant population increases between 1960 and 2000, which then slowed to a relaxed but still positive rate. The Island's population grew rapidly between 1960 and 1980 by 77.6%. The following two decades showed a consistent rate of growth around 28.5% per decade. Between 2000 and 2010, the 3% annual population growth of the previous decades slowed to an approximate 13.5% increase in population for the whole decade. Population growth between 2010 and 2013 has slowed even further to below 1% percent growth (0.72%). This historical trend is illustrated in Table H-1.



Source: Decennial United State Census (1960 – 2010)

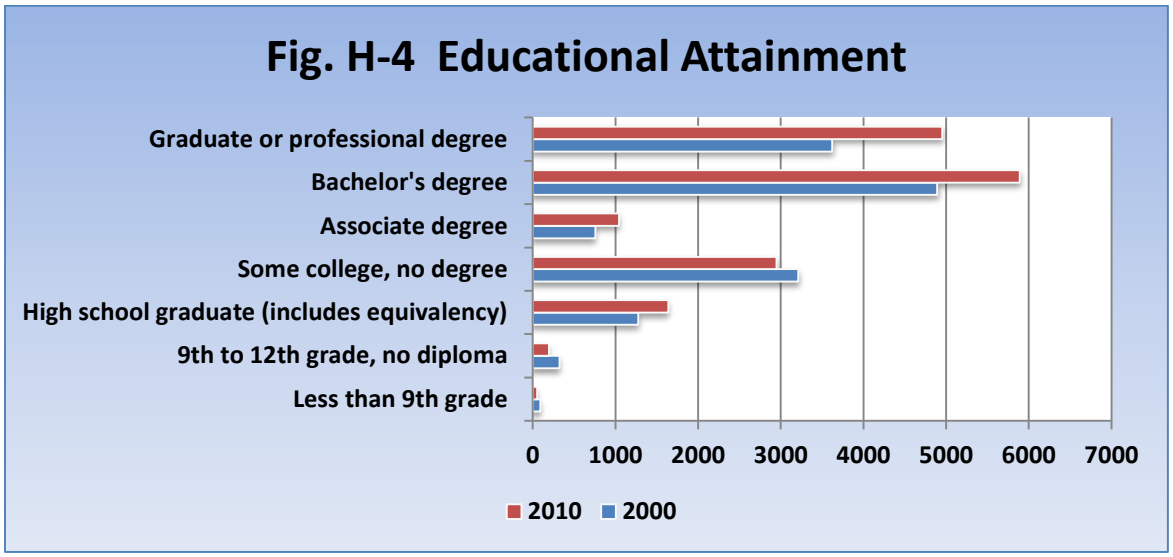
Age Distribution

As shown in Fig. H-3, and detailed in the HNA, the age groups five to seventeen, thirty-five to fifty-nine, and the sixty and over age groups, make up 86% of the population. The "young adult" cohort (18 to 34 years old) makes up less than 10% of the Island's population, which is a decline from 15% in 1990.



Educational Attainment

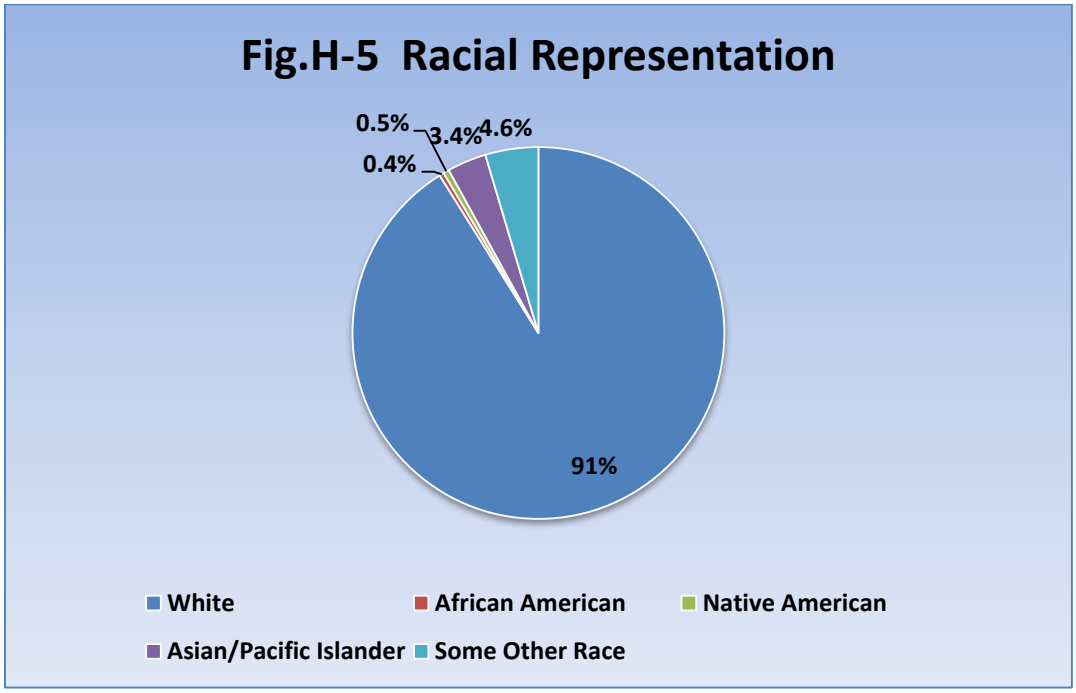
The population of the Island has a relatively high degree of educational attainment, with significant increases between 2000 and 2010 in the numbers of people with advanced degrees.



Source: Decennial United State Census (1980 – 2010

Racial Distribution

Bainbridge Island has a predominantly white population.



Household Income

The Bainbridge Island Median Household Income, according to the 2010 Census, was $92,558.00 compared to the Kitsap County Median Household Income of $61,776.00. Between 2000 and 2010, the Bainbridge Median Income jumped $22,447 compared to Kitsap's increase of $14,802. However, the percentage increase in Median Income was consistent between Bainbridge Island and the rest of Kitsap County.

Poverty Status

Fig. H-6 shows the percentages of families and individuals whose incomes in the last year were below the poverty line in the years 2000 and 2010. Almost every category within the Poverty Status Table was higher in the 2010 census verses the 2000 census, but this seems expected at the height of the recession in 2010.

Fig. H-6

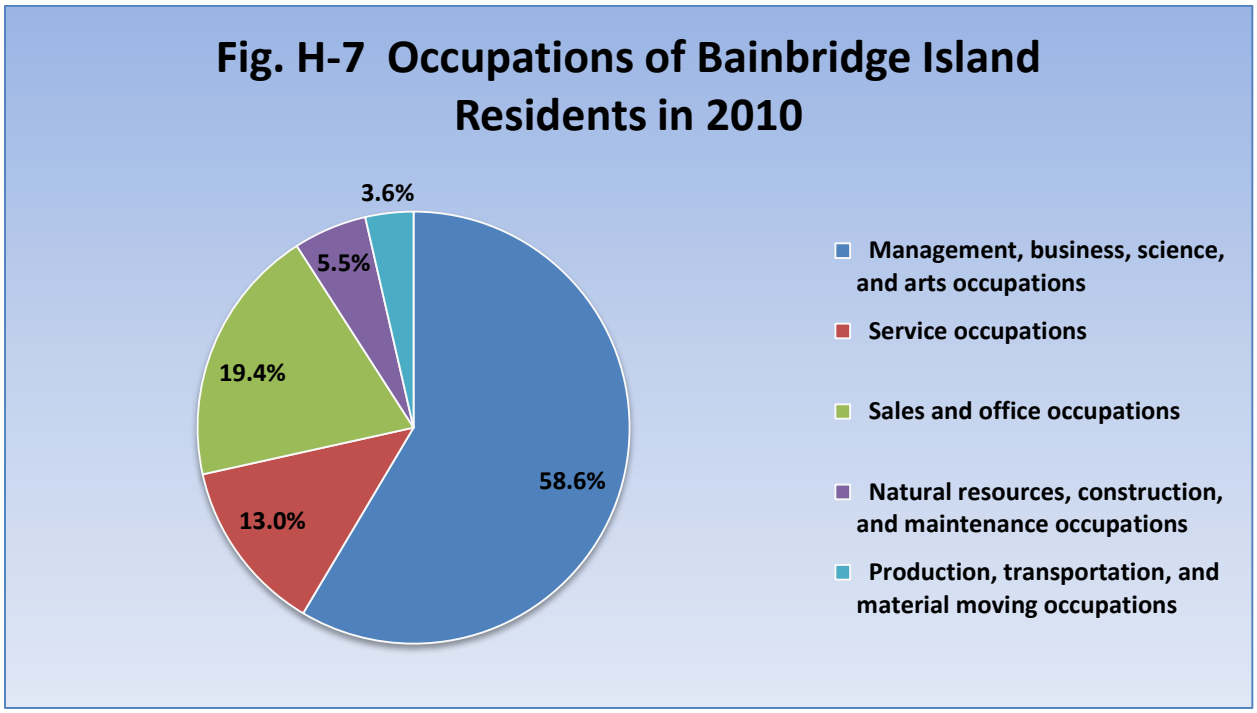
	2000		2010	
	Number	Percent	Number	Percent
All families	171	3%		3.3%
With related children under 18 years	115	3.9%		4.5%
With related children under 5 years only	36	4.1%		10.9%
Married couple families				2.0%
With related children under 18 years				2.6%
With related children under 5 years only				7.5%
Families with female householder, no husband present	72	12.1%		12.9%
With related children under 18 years	55	14%		12.2%
With related children under 5 years only	18	31%		22.9%
All people	896	4.4%		5.4%
Under 18 years				5.9%
Related children under 18 years	206	3.8%		5.4%
Related children under 5 years				14.1%
Related children 5 to 17 years	168	3.9%		3.5%
18 years and over	686	4.7%		5.3%
18 to 64 years				6.2%
65 years and over	81	3.3%		2.1%
People in families				3.4%
Unrelated individuals 15 years and over	362	12.8%		16.5%

Source: Decennial United State Census (2000 – 2010)

The number of employed residents who are sixteen years and over increased from 9,670 in 2000 to 10,284 in 2010. While the majority of occupational categories were consistent, “Natural Resources, Construction, and Maintenance” occupations decreased by a three-fourths and “Production, Transportation, and Material Moving” occupations decreased by nearly half over the decade.

Occupations of Bainbridge Island Residents

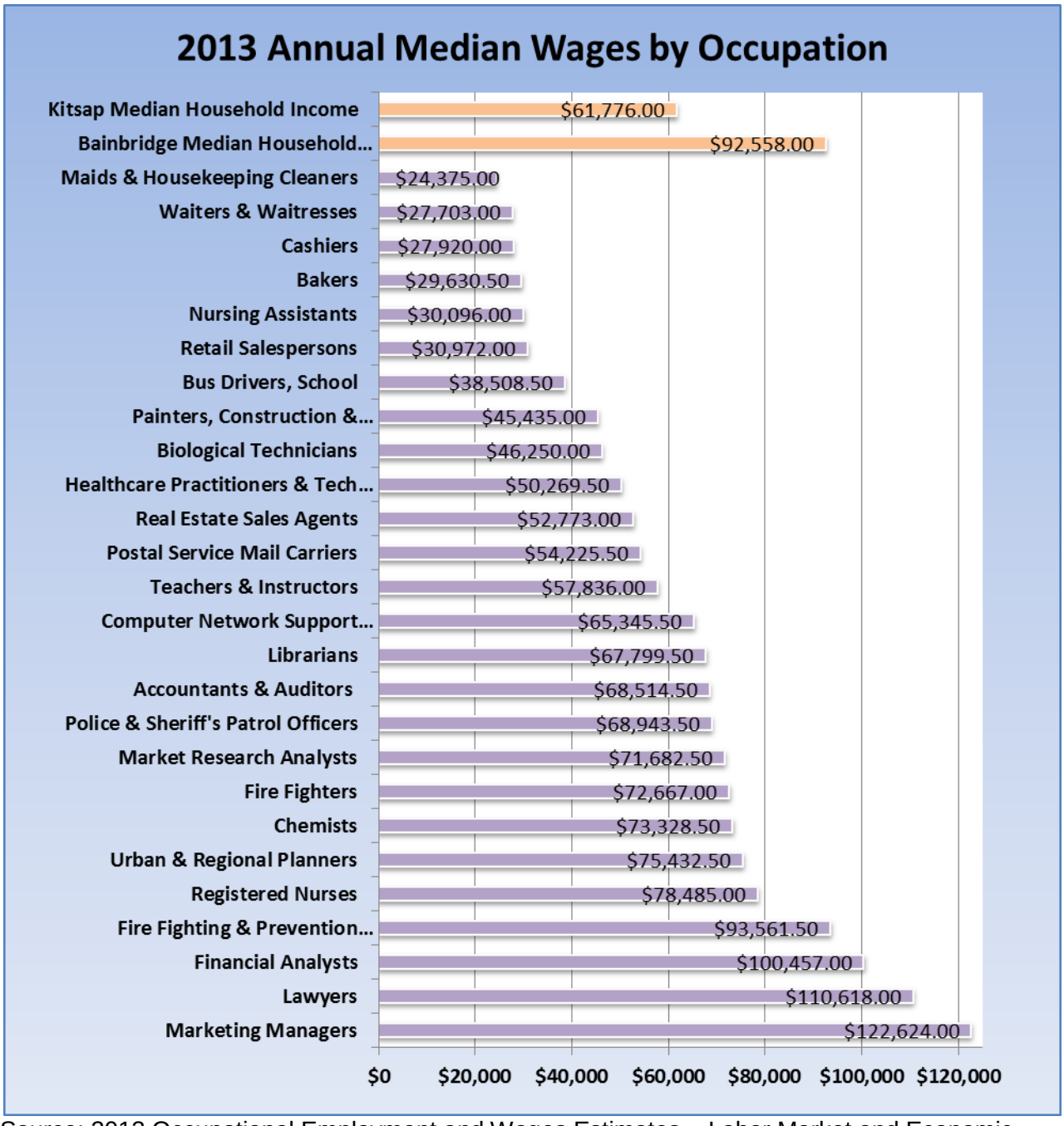
Over half of all Island residents are in management, business, science, and arts occupations. Service, sales and office occupations total almost a third of all Island residents.



Source: Decennial United State Census (2010)

Fig. H-8 compares the Median Household Income of Bainbridge Island and Kitsap County to the Annual Median Wages for a selected range of occupations found on Bainbridge Island. The occupational wages of the Bremerton-Silverdale area and the Seattle-Bellevue-Everett area were averaged per position to better represent the possible wages of individuals on Bainbridge as surveyed by the Washington State Employment Security Department.

Fig. H-8



Source: 2013 Occupational Employment and Wages Estimates – Labor Market and Economic Analysis, June 2013, Washington State Employment Security Department

II. PROFILE: BAINBRIDGE ISLAND HOUSING DATA AND TRENDS

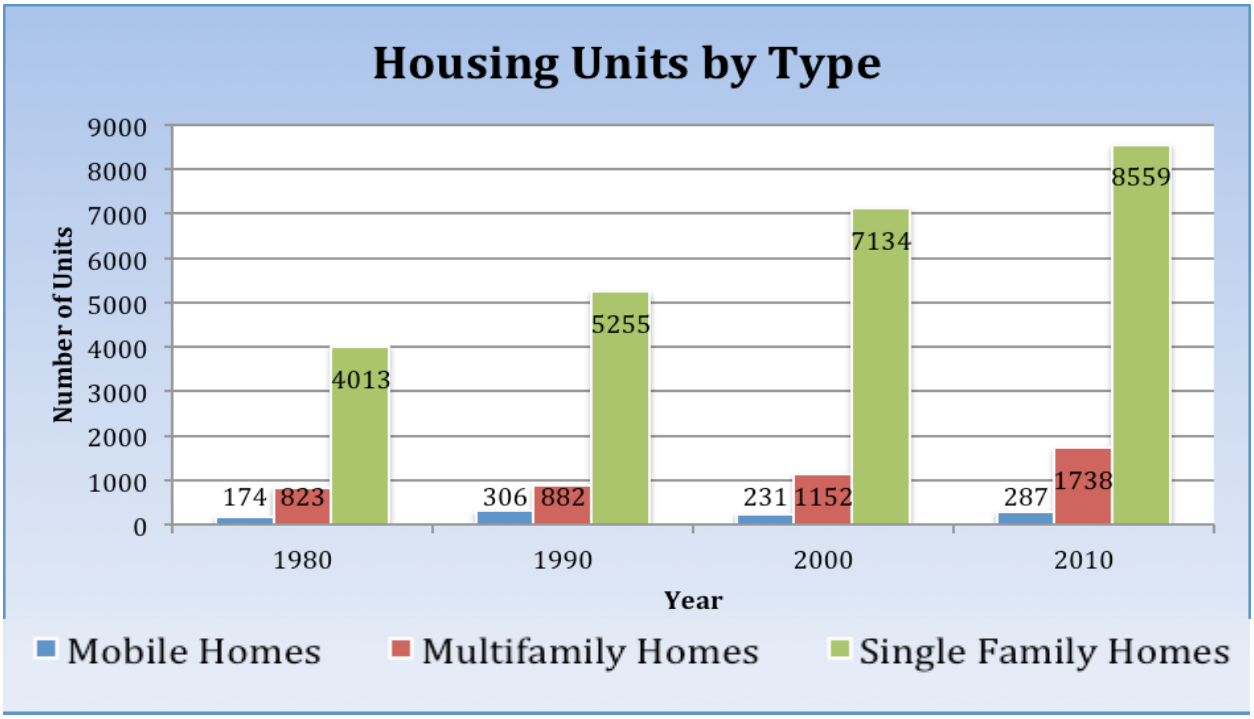


Fig. H-9

Roughly 10,500 households on Bainbridge Island occupy a housing stock that is 80% single-family homes. This form of housing is relatively land intensive, accounting for the low-density land use pattern that characterizes most of the Island. The multifamily units that account for 16% of the housing stock are located in the denser development pattern of *designated centers* such as Winslow and Lynwood Center. Mobile homes constitute less than 3% of the housing units.

Source: Decennial United State Census (1970 – 2010)

Single Family Homes

The average single family home sale prices on Bainbridge Island and in the rest of Kitsap County showed the same signs of being affected by the national housing bubble and subsequent Great Recession that the rest of the United States experienced during the last decade. The average single-family home sale price grew annually to its peak in 2007 of $820,569.00 in Bainbridge Island and $384,119.27 in the rest of Kitsap County. After the bubble burst in 2008, housing prices declined until they were able to stabilize between 2011 and 2012 at average price levels seen in 2004. The average single-family home price on Bainbridge Island in 2014 was $696,519, which is over twice the average for Kitsap County ($262,381.)

Multifamily Homes

Significant increases in the average market rate and rental prices for multifamily home prices have occurred over the last ten years. The vast majority of apartments, being one and two bedroom, show an average increase in rent of around $270.00 for a one bedroom and $473.00 for a two bedroom. Rent-assisted units also show significant increases over the last ten years, but all units showed a smaller percentage increase than market rate. In addition, a qualified individual or family can rent a two bedroom rent-assisted apartment for $150.00 less per month than a market

Fig. H-10 Summary of Multifamily Rents 2002 and 2014

	Unit Type	FY 2002	FY 2014	Change 2002 - 2014	Percent change
Market Rate	Studios	$ 850	$ 944	$ 94	11.1%
	1 BR	$ 713	$ 981	$ 268	37.6%
	2 BR	$ 911	$ 1,384	$ 473	51.9%
	3 BR	$ 1,042	$ 1,744	$ 702	67.4%
Rent Assisted	Studios	$ 528	*	*	*
	1 BR	$ 563	$ 685	$ 122	21.7%
	2 BR	$ 575	$ 834	$ 259	45.1%
	3 BR	$ 916	$ 1,244	$ 328	35.8%

Source: 2003 City of Bainbridge Island Housing Needs Assessment and Phone Survey conducted 10/27/2014 – 10/28/2014

Between 2005 and 2015, there was a 12% increase in rental apartment units on Bainbridge Island. However, rental apartments (market rate and rent assisted) make up less than 7% of the total housing units. Additionally, rent assisted apartments make up 3% of the total housing units in the City. The vast majority of new construction of multifamily housing units was condominiums in the last ten years.

Rent Assisted Housing

Bainbridge Island has eleven rent assisted projects that received funds in whole or in part from Federal, State, and/or local agencies. In exchange for favorable financing terms, the property owner commits to providing the housing to a targeted population for a specific term. Commitments can run from 20 to 50 years depending upon the funding source. Federal funding sources include the U.S Department of Housing and Urban Development and the U.S. Department of Agriculture (USDA).

The City's local financing source is the Housing Trust Fund. The Trust Fund was established by ordinance in 1999. Funds were distributed to local non-profits to fund *affordable housing* projects and programs on the Island. Funding was reduced in

response to the financial challenges the City faced during the Great Recession, but the Trust was maintained to fund affordable housing programs on the Island. Recently the Council decided to appropriate $200,000.00 to the Housing Trust Fund as part of the 2015-16 biennial budget for future housing projects.

Figure H-11 tallies the number of individuals and families desiring *affordable housing* on Bainbridge Island. HRB, Housing Kitsap, and other owners of rent assisted multifamily units maintain a waiting list for individuals and families who contact them for affordable rental housing. The current totals of combined waiting lists contain 149 households (individuals and families).

Fig. H-11 – Demand from Waitlists for Existing Rent Assisted Multifamily Units

HRB Projects	Individuals	Households
Total	24	14
Currently Live on BI	10	4
Currently Work on BI	5	5
Disabled	3	3
Female Head of Household	13	13
Other Housing Assisted Projects		
Finch Place Apt		30
Rhododendron		31
550 Madison		6
Virginia Villa		Unknown
Winslow Arms		36
Island Terrace		8
Total of All Projects	24	125

Source: HRB provided data

Currently, Bainbridge Island has a total number of multifamily rental inventory of 642 units, of which 283 are rent-assisted and 359 are market-rate. One and two-bedroom units make up 92% of the market. Studios and three-bedroom apartment units continue to be in very short supply.

Fig. H-12 – Special Housing: Nursing/Assisted Living/Convalescent Homes

Facility Name	Type	2013 Population	2014 Population	Vacancy Rate
Island Health and Rehabilitation	Nursing Home	49	57	N/A
Messenger House Care Center	Nursing Home	75	77	N/A
Madison Ave Retirement Center	Assisted Living	50	50	5%
Wyatt House	Assisted Living	43	38	9%
Madrona House Assisted Living	Assisted Living, number of units have specific focus for residents with dementia and Alzheimer's	0	52	36%
Subtotal		**217**	**274**	

Source: Phone Survey Conducted 10/27/2014 – 10/28/2014 and COBI's most recent submission of the annual Housing Unit and Population Estimate Report for the Office of Financial Management

III. HOUSING NEEDS

The Housing Element includes an inventory and analysis of existing and projected housing needs. The element should identify the number of housing units necessary to accommodate projected growth, including *housing types,* government-assisted housing, housing for low-income families, manufactured housing, multifamily housing, and group homes and foster care facilities. The 2015 Housing Needs Assessment, adopted by this reference, presents documents these needs in detail. Several of the highlights from that document are excerpted here to identify what actions the City should take to address those needs.

Methods to Assess Housing Needs

Cost Burden Analysis

The US Department of Housing and Urban Development (HUD) defines any household spending more than 30% of household income on housing as "cost burdened." Extremely cost burdened households are defined as households that pay more than 50 percent of income on housing. Households that pay more than 30 percent of their income for housing may face additional financial challenges for purchasing food, education, transportation, and medical care. Extremely cost-burdened low-income

households are at risk of becoming homeless. The percentage of households that are cost burdened, in addition to the percentage that is extremely cost burdened, is an indicator of an existing unmet need for affordable housing.

A cost burden analysis is applied both to renter and owner households. The Washington Administrative Code (WAC) requires jurisdictions to make adequate housing provisions for all economic segments of the community; a cost burden analysis will help determine the existing and projected housing need. Fig. H-13 displays household income, monthly housing costs, and monthly housing costs as a percent of household income for Bainbridge Island in 2012. Each set is divided into total occupied housing units, owner-occupied housing units, and renter-occupied housing units.

The last set in the table shows the percent of residents whose monthly housing costs make up more than 30% of their income, which is Bainbridge Island's cost burden analysis. The table also shows that median household income for owner-occupied housing units ($110,670) was more than double the median household income of renter-occupied units ($46,905). The number of owner-occupied housing units (7,329) is over three-and-a-half times the number of renter-occupied units (1,996).

Fig. H-13 – Cost Burden Analysis: Household Income in 2012

	Total Occupied Housing Units	Owner-Occupied Housing Units	Renter-Occupied Housing Units
Occupied Housing Units	9,325	7,329	1,996
Household Income in the Past Twelve Months (in 2012 Inflation-Adjusted Dollars)			
Less than $5,000	1.6%	1.5%	1.7%
$5,000 to $9,999	1.8%	0.7%	5.9%
$10,000 to $14,999	1.2%	1.3%	0.7%
$15,000 to $19,999	3.2%	1.7%	8.7%
$20,000 to $24,999	3.3%	3.6%	2.3%
$25,000 to $34,999	6.0%	3.5%	15.1%
$35,000 to $49,999	11.1%	9.6%	16.4%
$50,000 to $74,999	13.1%	11.6%	18.2%
$75,000 to $99,999	12.2%	11.4%	15.4%
$100,000 to $149,999	19.1%	21.5%	10.4%
$150,000 or more	27.4%	33.5%	5.2%
Median Household Income	$92,558	$110,670	$46,905

Source: American Community Survey (2008 – 2012)

Fig. H-14

	Occupied housing units		Owner-Occupied Housing Units		Renter-Occupied Housing Units	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Less than $100	0.2%	+/-0.3	0.2%	+/-0.4	0.0%	+/-1.6
$100 to $199	0.7%	+/-0.6	0.8%	+/-0.7	0.7%	+/-1.1
$200 to $299	1.9%	+/-1.1	0.6%	+/-0.5	6.6%	+/-4.8
$300 to $399	0.8%	+/-0.8	1.1%	+/-1.1	0.0%	+/-1.6
$400 to $499	1.7%	+/-0.9	1.6%	+/-0.8	2.4%	+/-2.2
$500 to $599	3.2%	+/-1.3	3.2%	+/-1.2	3.4%	+/-3.7
$600 to $699	2.9%	+/-1.0	2.7%	+/-1.1	3.7%	+/-2.7
$700 to $799	5.2%	+/-1.3	4.8%	+/-1.2	6.8%	+/-3.9
$800 to $899	5.2%	+/-2.0	2.8%	+/-1.1	14.0%	+/-7.0
$900 to $999	3.7%	+/-1.3	3.4%	+/-1.5	4.8%	+/-2.9
$1,000 to $1,499	17.1%	+/-2.4	13.2%	+/-2.3	31.5%	+/-6.8
$1,500 to $1,999	13.3%	+/-2.2	13.7%	+/-2.5	11.7%	+/-4.6
$2,000 or more	43.4%	+/-2.9	52.0%	+/-3.0	11.9%	+/-5.7
No cash rent	0.6%	+/-0.5	(X)	(X)	2.7%	+/-2.1
Median (dollars)	1,800	+/-87	2,079	+/-120	1,089	+/-105

Source: American Community Survey (2008 – 2012)

Fig. H-14 shows the calculation of five different income groups' cost burden. Based on 2012 data, over 35% of all residents at all income levels experience housing cost burden on Bainbridge Island. Almost 34% of individuals and families at all income levels who live in owner-occupied housing units are cost burdened. The majority (around 14%) of these residents have an income of $75,000 or more a year.

Almost 40% of individuals and families at all income levels who live in renter-occupied housing units are cost burdened. The majority (around 28%) of these residents have an annual income between zero and $34,999. This means that as of 2012, 569 renters on the Island that have an income of $34,999 or less are housing cost burdened. This is concerning as lower income cost burdened households are more likely to have to choose between housing costs and other necessities.

Workforce Housing

Workforce housing refers to housing that is affordable to individuals employed in the community, especially housing at affordability levels that are not provided for adequately by the private market. If there is no housing that is affordable to employees at local public and private employers, workers may have longer commutes, undermining goals for transportation and the environment.

Fig. H-15 (excerpted from *Housing Needs Assessment* Table 33) displays selected professions common to citizens of Bainbridge Island, whether they work on the Island or in Seattle. Each position can be compared to the top two measures at the top of the table ('Household Income Needed to Purchase Average Priced Home in 2013: $602,500' and 'Median Income') to see if the income the profession provides meets median income.

Fig. H-15– Workforce Housing Affordability

	Affordable Home Price (30 yr fixed mortgage)	Interest Rate	Max. Monthly Mortgage Payment (Principal & Interest)	Estimate of Monthly Real Estate Taxes/ Insurance	Other Fees (e.g. Ground Lease, HOA)	Available for Annual Mortgage Payment below cost burdened benchmark (30% Monthly Income)	Annual Income
Average Bainbridge Island Single-Family Home Sales Price in 2013: $602,500							
Median Income	*$ 320,357*	*5.50%*	*$1,818.95*	*$375.00*	*$120.00*	*$2,314*	*$92,558*
Marketing Managers	*$ 430,723*	*5.50%*	*$2,445.60*	$500.00	$120.00	*$3,066*	$122,624
Lawyers	*$ 386,667*	*5.50%*	*$2,195.45*	$450.00	$120.00	*$2,765*	$110,618
Financial Analysts	*$ 350,733*	*5.50%*	*$1,991.43*	$400.00	$120.00	*$2,511*	$100,457
Registered Nurses	*$ 262,796*	*5.50%*	*$1,492.13*	$350.00	$120.00	*$1,962*	$78,485
Fire Fighters	*$ 245,985*	*5.50%*	*$1,396.68*	$300.00	$120.00	*$1,817*	$72,667
Police Officers	*$ 229,592*	*5.50%*	*$1,303.60*	$300.00	$120.00	*$1,724*	$68,944
Librarians	*$ 224,555*	*5.50%*	*$1,275.00*	$300.00	$120.00	*$1,695*	$67,800
Teachers & Instructors	*$ 189,489*	*5.50%*	*$1,075.90*	$250.00	$120.00	*$1,446*	$57,836
Postal Service Mail Carriers	*$ 173,594*	*5.50%*	*$985.65*	$250.00	$120.00	*$1,356*	$54,226
Real Estate Sales Agents	*$ 167,197*	*5.50%*	*$949.33*	$250.00	$120.00	*$1,319*	$52,773
Healthcare Practitioner	*$ 156,176*	*5.50%*	*$886.75*	$250.00	$120.00	*$1,257*	$50,270
Bus Drivers, School	*$ 122,004*	*5.50%*	*$692.73*	$150.00	$120.00	*$963*	$38,509
Retail Salesperson	*$ 88,818*	*5.50%*	*$504.30*	$150.00	$120.00	*$774*	$30,972
Nursing Assistants	*$ 84,961*	*5.50%*	*$482.40*	$150.00	$120.00	*$752*	$30,096

	Affordable Home Price (30 yr fixed mortgage)	Interest Rate	Max. Monthly Mortgage Payment (Principal & Interest)	Estimate of Monthly Real Estate Taxes/ Insurance	Other Fees (e.g. Ground Lease, HOA)	Available for Annual Mortgage Payment below cost burdened benchmark (30% Monthly Income)	Annual Income
Cashiers	***$ 75,380***	***5.50%***	***$428.00***	**$150.00**	**$120.00**	***$698***	**$27,920**
Waiters & Waitresses	***$ 74,425***	***5.50%***	***$422.58***	**$150.00**	**$120.00**	***$693***	**$27,703**
Maids & House Cleaners	***$ 59,771***	***5.50%***	***$339.38***	**$150.00**	**$120.00**	***$609***	**$24,375**

Source: 2013 Occupational Employment and Wage Estimates Washington State Employment Security Department Labor Market and Economic Analysis, June 2013

Based on the above numbers, a gap in housing affordable for the workforce on Bainbridge Island has been established. Workers in service professions may be challenged to find affordable housing near their employment, causing them to have to travel longer distances to work. This increase in transportation costs increases their cost burden as well as adding demands on SR 305 and creating greenhouse gas emissions.. The City must implement new programs and regulations in order to create opportunities for more affordable ownership or rental housing. Development incentives used to date to increase housing affordability have not proven successful for providing housing that meets the needs of the workforce.

Jobs/Housing Balance

Jobs/housing balance is a measure that compares the amount of employment vs. the amount of housing in a specific geographic area. Typically, a jobs/housing balance is calculated by dividing jobs within in geography by the number of housing units in that geography.

Providing a balance between jobs and housing ensures that workers have access to housing near their work. Bainbridge Island's jobs/housing balance is .59 jobs for every housing unit in the City, making it a "bedroom community." PSRC suggests that housing-rich neighborhoods can add employment to provide more access for current residents to economic opportunities. Planning to move toward a more balanced distribution of housing and jobs within a jurisdiction can help to achieve a number of transportation and environmental goals as the need to commute long distances by private auto declines.

Special Needs Housing

Special needs housing refers broadly to housing accommodations for individuals with physical and mental disabilities, seniors, veterans, individuals with mental illness, individuals with chronic and acute medical conditions, individuals with chemical dependency, survivors of domestic violence, and adult, youth, and families who are homeless.

Planning for special needs populations is integral to the success of an economically and socially vibrant Puget Sound Region. Both GMA and the WAC specifically require jurisdictions to "address how the county or city will provide for group homes, foster care facilities, and facilities for other populations with special needs" (WAC 365-196-410)

IV. GMA GOAL AND REQUIREMENTS FOR HOUSING

The Growth Management Act (GMA) recognizes the importance of planning for adequate housing by requiring it as an element in Comprehensive Plans. Adequate housing is addressed specifically in one of the 13 major goals:

> "Housing. Encourage the availability of *affordable housing* to all economic segments of the population of this state, promote a variety of densities and *housing types*, and encourage preservation of existing housing stock." RCW 36.70A.020(4)

The requirements for a housing element mandated by the GMA include:

> "A housing element recognizing the vitality and character of established *neighborhoods* that: a) includes an inventory and analysis of existing and projected housing needs; b) includes a statement of goals, policies, and objectives for the preservation, improvement, and development of housing; c) identifies sufficient land for housing, and group homes and foster care facilities; and d) makes adequate provisions for existing and projected needs of all economic segments of the community." RCW 36.70A.070(2)

~~The last item (d) in those requirements is echoed in the Vision for Bainbridge Island:~~

> ~~" … Foremost, Bainbridge Island should preserve the diversity of one of its most precious resources – its people. The Island should remain a place where the business people, artists, farmers, newcomers and long-time residents can all find a place to live."~~

~~and, General Goals (excerpt):~~

- ~~Foster the diversity of the residents of the Island, its most precious resource.~~
- ~~Provide a variety of housing choices for all residents.~~
- ~~Provide affordable housing.~~

III. Comprehensive Plan Framework of Guiding Principles, Goals and Policies

Several of the Guiding Principles and Policies in the Comprehensive Plan speak directly to the priority of identifying and meeting the need for housing, including affordable housing on the Island.

> **Guiding Principle #1** – Preserve the special character of the Island, which includes the small town atmosphere of downtown Winslow, forested areas, meadows, farms, marine views, scenic and winding roads that support all forms of transportation.

Guiding Policy 1.2

Accommodate new growth in central places that meet the Island's identified needs for housing, services and jobs while respecting conservation and environmental protection priorities.

Guiding Policy 1.3
Identify appropriate land use patterns and building form alternatives to achieve the Island's priorities for both conservation and development

Guiding Principle #3 – Foster diversity and meet the human needs of the residents of the Island, its most precious resource.

Guiding Policy 3.1
Ensure a variety of housing choices to meet the needs of present and future residents in all economic segments and promote plans, projects, and proposals to create a significant amount of *affordable housing.*

Guiding Policy #6 – Meet the needs of the present without compromising the ability of future generations to meet their own needs.

Guiding Policy 6.2
Advance social equity on the Island by addressing basic human needs, including *affordable housing*, personal health and safety, mobility, and access to human services.

Several goals and policies in the Land Use Element put housing objectives in the context of the Island-wide Land Use Concept.

LAND USE ELEMENT GOAL LU-4

Focus urban development in designated centers.

Policy LU 4.1
Encourage residential uses in a variety of forms and densities as part of the use mix in Designated Centers.

Policy LU 4.2
Sustainable development and redevelopment will be focused in the centers through a combination of intergovernmental and public-private partnerships, affordable housing incentive programs, "green" capital projects, and low impact development standards.

Policy LU 5.3
The Neighborhood Service Centers of Island Center, Rolling Bay, and Lynwood Center offer small-scale, commercial and service activity outside Winslow.

These Neighborhood Service Centers should be allowed to develop at ~~slightly~~ higher densities to reinforce their roles as small-scale, community centers.

Policy LU 5.8
Applications for development approval on Bainbridge Island should be processed within the timelines established in the City's *development regulations* in order to ensure affordability, fairness and predictability in the land development process.

Policy LU 5.9
To reflect the priorities in the Housing Element to provide for a variety of housing options in areas designated for residential development, including residential open space, *accessory dwelling units* shall be considered allowed uses in all residential zoning districts except R-6.

Also, the Economic Element emphasizes the importance of affordable housing choices to the Island's economic health.

ECONOMIC ELEMENT GOAL EC-5

Provide a variety of *affordable* housing choices so that more people who work on Bainbridge Island can live here.

The Housing Element of the Comprehensive Plan provides several options for the development of *affordable housing* on the Island.

ECONOMIC ELEMENT GOAL EC-9

Grow a healthy service sector to increase employment opportunities, enhance local revenues, and meet emerging needs of the Island's changing demographics.

Policy EC 9.1
Increase availability of housing to enable service sector employees to live on the Island.

~~The main objective in preparing a housing element is to identify and prioritize the community's housing problems and trends, and to develop short and long-term solutions. On Bainbridge Island, residential development is the predominant use of land. In 1992, 38% of all the land on the Island was listed as developed for residential use. In 2003, 41% of the land on the Island was listed as developed for residential use. In addition, housing costs are typically the largest expenditure for most households, while a community's housing stock is its largest long-term capital asset. The costs of land and housing have risen dramatically over the last two decades. The composition of the community in terms of age and income has changed as well. The lack of *affordable housing* has resulted in the need for many people who grew up on~~

~~the Island to look elsewhere. Furthermore, many people who work on the Island cannot afford to live here, and the number of homeless individuals and families is growing.~~

~~The Housing Element provides the citizens of Bainbridge Island with an opportunity to establish goals, policies, and implementation strategies that present solutions to existing problems and provide direction to future housing development without negatively impacting the existing character of the community.~~
~~A major step in the formulation of strategies is to assess our current situation. This is done through a Housing Needs Assessment that includes documentation and analysis of community demographics and trends, existing housing stock and condition, and an estimate of future housing needs, including special needs populations such as homeless, disabled and domestic violence victims. This is followed with a summary of the findings of the data, which give direction to the formation of goals and policies. From these, *implementation* strategies are then developed to direct the provision of adequate housing for all citizens of Bainbridge Island.~~

V. HOUSING NEEDS ASSESSMENT

In 2015 ~~2002~~, the City of Bainbridge Island issued an updated ~~authorized the development of a comprehensive and up-to-date~~ Housing Needs Assessment (**HNA**) for Bainbridge Island, including an description of the amount, location and condition of the Island's housing stock and demographic and economic information about its population. It also includes an in-depth analysis of affordable housing needs across all households. This document~~, *The City of Bainbridge Island Housing Needs Assessment, September 2003*, is~~ included as Appendix A. ~~The 2003 Needs Assessment updated and expanded upon the Housing Needs Assessment completed in 1995, which is included as Appendix B.~~

HOUSING ELEMENT VISION

A broad range of *housing types* is available to accommodate the great diversity of households and income levels on the Island. The Island has balanced and harmonized the equally important goals of environmental stewardship and providing for the basic human needs of housing, health, employment, and access to commercial and social services.

The majority of Island housing opportunities, particularly rental homes, are within the pedestrian friendly, transit-served, mixed-use *designated centers*. Housing opportunities within centers include small homes on small lots, cottage housing in groupings of a dozen homes, townhouses and mixed-use, mid-rise buildings. The residential pattern outside of centers is at a much lower building form, lower density, with a range of lot sizes and clusters of villages within a broad conservation landscape.

HOUSING GOALS AND POLICIES

~~**Discussion**:~~ In accordance with the definition provided in the Growth Management Act *(WAC 365.195-070(6))*, the term "*affordable housing*" as used in the Housing Element refers to "the adequacy of the housing stocks to fulfill the housing needs of all economic segments of the population. The underlying assumption is that the marketplace will guarantee adequate housing for those in the upper economic brackets, but that some combination of appropriately zoned land, regulatory incentives, financial subsidies, and innovative planning techniques will be necessary to make adequate provisions for the needs of middle and lower income persons."

GOAL HO-1

Promote and maintain a variety of housing choices and *housing types* to meet the needs of present and future Bainbridge Island residents at all economic segments, and in all geographic areas in a way that is compatible with the character of the Island, and encourages more socio- economic diversity. ~~The City shall p~~Partner with community non-profit organizations and local and regional private and public entities in carrying out the following policies.

~~H 1.5~~ Policy HO 1.1

~~The City shall e~~Encourage ~~innovate~~ innovative residential development types and zoning regulations that increase the variety of *housing types* and choices suitable to a range of household sizes and incomes in a way that is compatible with the character of existing neighborhoods. Examples of innovate approaches are *cottage housing* development, cluster housing development, stacked or side attached housing, *tiny houses* and *accessory dwelling units*. See Figure H-1 illustrating different *housing types*.

~~H 1.1~~ Policy HO 1.2

~~The City r~~Recognizes ~~it's~~ the City's role in the regional housing market and shall cooperate with the Kitsap Regional Coordinating Council to develop an equitable distribution strategy for affordable housing.

~~H 1.2~~ Policy HO 1.3

~~The City shall t~~Take a proactive role in maintaining and encouraging economic diversity on the Island by providing affordable housing opportunities on Bainbridge Island. Accordingly, the City should designate the appropriate staff effort or organizational entity to assist and advise the community, landowners, and private and public entities about options for affordable housing, financing strategies, and funding sources; develop

and assist with the City's application and approval process for special housing projects; and initiate and support affordable housing strategies ~~opportunities.~~

~~H 1.3~~ Policy HO 1.4

~~The City shall p~~Partner with non-profit organizations, the development community, local lending institutions, elected officials, and the community at large to assist in meeting affordable housing goals and implementing strategies ~~policies~~.

~~H 1.4~~ Policy HO 1.4

~~The City s~~Supports ~~the~~ the efforts of community non-profit housing organizations and local and regional public and private entities in developing and managing affordable housing on Bainbridge Island.

~~H 1.6~~ Policy HO 1.6

~~The City should d~~Develop ~~provisions~~ standards to encourage development ~~and preservation~~ of small to mid-size single-family housing units. These provisions may include a framework to permit small-unit housing development ~~known~~ such as *tiny houses and* cottage housing.

Policy HO 1.7

Expand opportunities for infill in the residential ~~zones included~~ ring neighborhoods of Winslow Master Plan study area (R-4.3, R-3.5, R-2.9) and the Neighborhood Service Centers. Create the flexibility for small lots (e.g., in the 3,000 square foot range) as well as smaller footprint homes (e.g., under 1,200 square feet) and adopt standards ~~shall be developed~~ for *tiny houses, accessory dwelling units* and cottage housing developments. ~~that include, but may not be limited to, maximum allowable size and density and covenants to limit size in perpetuity.~~

GOAL HO-2

Maintain the stock of existing affordable and rent-assisted housing. In partnership with community non-profit organizations and local and regional public and private entities the City shall pursue the following policies:

~~H 2.1~~ Policy HO 2.1

~~The City shall d~~Develop a continuing strategy to maintain the Rural Development Agency and HUD subsidies on existing rent-assisted housing. The primary strategy shall be to support the Kitsap County Consolidated Housing Authority and non-profit agencies to purchase the units through the provisions of the 1990 Housing Act.

~~H 2.2~~ Policy HO 2.2

In the event of the potential loss of privately-owned subsidized housing, ~~the City will~~ work with the appropriate public agencies and local non-profits to pursue the preservation of the subsidized units, or relocation assistance for the residents.

~~H 2.3~~ **Policy HO 2.3**
Water-based housing (live-aboards) is a viable component of the present and future housing stock of Bainbridge Island, and shall be subject to applicable environmental protection, seaworthiness, sanitation and safety standards, and authorized moorage.

~~H 2.4~~ **Policy HO 2.4**
~~The City shall i~~Initiate and support programs that assist low-income homeowners and seniors to repair, rehabilitate, maintain and improve accessibility to and within their homes.

GOAL HO-3

Increase the supply of affordable *multi-family housing* each year through the year ~~2012~~ 2036 with goals based on data provided by the Housing Needs Assessment and the City's housing reports.

~~H 3.1~~ **Policy HO 3.1**
~~The City shall e~~Encourage new *multi-family housing* in a variety of sizes and forms in *designated centers.* ~~areas designated for such use in the Land Use Element. All developments are subject to Health District requirements for water and sewage disposal.~~

Policy HO 3.2
Revise *building envelope* and other development standards for the High School Road portions of the Winslow Area Master Plan to begin its transformation from an auto-oriented, low-rise, homogenous commercial land use district into a pedestrian-friendly, transit-served, mid-rise, mixed-use neighborhood with affordable housing.

Policy HO 3.3
Partner with non-profit or for-profit housing sector to create new *multi-family housing* in *designated centers*, including a percentage of *affordable housing*, through the joint or exclusive use of surplus publicly owned property or air space.

Policy HO 3.4
Partner with the for-profit sector to create *affordable housing* through the targeted use of the multifamily property tax exemptions in *designated centers*.

Policy HO 3.5
Remove barriers to the creation of new *multi-family housing*, particularly *affordable housing* through a variety of actions, through the adoption of regulations that relax or exempt parking requirements and the payment of certain impact fees.

~~H 3.2~~ Policy HO 3.4
Allow ~~A~~accessory dwelling units ~~shall be permitted uses~~ in all residential zones, except at Point Monroe, the Sandspit (R-6). ~~All other~~ Review and revise as appropriate to create reasonable flexibility regarding ~~applicable~~ development standards including lot coverage, setbacks, parking requirements, and Health District requirements for water and sewage ~~must be met.~~

~~H 3.3~~ Policy HO 3.7
~~The City shall e~~Encourage agencies whose mission is to develop *affordable housing* to create new subsidized *multi-family* rental housing by aggressively pursuing Kitsap County Community Development Block Grant Funds, state funds, donations from private individuals and organizations, public revenue sources and other available funding.

GOAL HO-4

Promote and facilitate the provision of the diversity of *affordable housing* stock in all geographic areas of the community.

~~H 4.1~~ Policy HO 4.1
In order to encourage the provision of housing that will remain affordable over time, ~~the City shall~~ pursue effective strategies to reduce the land cost component of for-purchase housing, which may include alternative land use zoning, density bonuses and other incentives.

~~H 4.2~~ Policy HO 4.2
~~The City shall e~~Encourage housing created by utilizing a mechanism such as a community land trust.

~~H 4.3~~ Policy HO 4.3
Allow ~~M~~manufactured homes and *manufactured housing* ~~home~~ developments ~~shall be permitted~~ in all residential districts. A manufactured home development will be subject to all applicable development regulations of the underlying zone in which it is located, including affordable- housing density bonuses.

Policy HO 4.4
Apply the HDDP process in all *designated centers* to promote an increase in the supply, diversity, and access to housing, including *affordable housing.*

Policy HO 4.5
Apply the HDDP process, or alternative mechanisms such as a planned unit development permit process, outside of *designated centers* to promote an increase in the supply, diversity, and access to housing, including *affordable housing.*

Policy HO 4.6
Provide incentives for clustering of *affordable housing* for farm workers on farmlands.

GOAL HO-5

Promote and facilitate the provision of rental and for-purchase housing that is affordable to income-qualified households with a variety of income levels.

~~H 5.1~~ Policy HO 5.1
~~Housing developments where all units are income-qualified to specified income groups should be e~~Exempt from City impact fees and other selected administrative development fees housing developments where all units are income-qualified to specified income groups. Exemptions should be based upon standards that are developed to reflect the income group targeted.

~~H 5.2~~ Policy HO 5.2
~~The City shall dDevelop a program for income-qualified, first-time home buyers to provide assistance in purchasing a home that may include, but is not limited to, down payment or second mortgage assistance, below market-rate loans, guaranteed loans, and tax or utility relief.~~

~~H 5.3~~ Policy HO 5.2
All income-qualified rental housing units created as a result of the policies of this Housing Element shall remain affordable to income-qualified households for a period of not less than ~~30~~ 50 years from the time of first occupancy and shall be secured by recorded agreement and covenant running with the title of the land, binding all the assigns, heirs and successors of the applicant.

~~H 5.4~~ Policy HO 5.3
All income-qualified homeownership units created as a result of this Housing Element shall be sold at a price affordable to income-qualified households. These units may be subject to a mechanism that is specified in an appropriate administrative procedure allowing the City to capture a share of the appreciation if the unit is sold at market rate. The City's share of the proceeds shall be used toward an *affordable housing* program.

GOAL HO-6

Facilitate the siting and development of housing opportunities for *special needs populations*.

~~H 6.1~~ Policy HO 6.1
~~The City shall s~~Support the services of community non-profit organizations and local and regional public or private entities in providing shelter for temporarily homeless singles and families with children, adolescents and victims of domestic violence on Bainbridge Island.

~~H 6.2~~ Policy HO 6.2
~~The City shall s~~Support the development of programs that ensure that the housing needs of the developmentally, physically and emotionally disabled are met within the community.

~~H 6.3~~ Policy HO 6.3
~~The City shall s~~Support programs that provide assistance to low-income, disabled persons to retrofit their homes to be more accessible.

GOAL HO-7

Utilize the City's bonding capacity and other resources to support the creation of *affordable housing*.

~~H 7.1~~ Policy HO 7.1
The City recognizes the need to provide financing assistance for *affordable housing*. Accordingly, the City will actively pursue public and private funds that may include, but are not limited to, real estate excise tax, grants, and other available resources.

~~H 7.2~~ Policy HO 7.2
The City, in partnership with local agencies producing *affordable housing*, may issue a General Obligation Bond to increase the production of housing affordable to households at or below 80% of median income for Kitsap County.

~~H 7.3~~ Policy HO 7.3
~~The City Council may issue~~ Consider the issuance of councilmanic (Limited Tax General Obligation Bonds; also called councilmanic bonds, or non-voted debt) to support the development of housing affordable to households at or below 80% of median income for Kitsap County.

~~H 7.4~~ Policy HO 7.4
~~The City shall eEstablish and m~~ Maintain ~~a~~ the Housing Trust Fund ~~which will be used~~ to support the development and preservation of *affordable housing* on Bainbridge Island.

~~H 7.5~~ Policy HO 7.5
~~The City may purchase and make~~ Consider the options of purchasing and making City-owned land available through long-term leases or other mechanisms for the purpose of creating income-qualified housing, and ~~shall~~ support other public entities that wish to use publicly-owned land for this purpose.

GOAL HO-8

Provide a periodic report on the status of housing on Bainbridge Island and the implementation of the Housing Element in order to assess the effectiveness of the housing goals.

~~H 8.1~~ Policy HO 8.1

~~The City shall m~~Monitor by survey and/or other means, and prepare a report on, the following aspects of housing:

A. Housing in general and the types of housing encouraged in this Element, including affordable *multi-family* and single family, owned and rented; *accessory dwelling units*; subsidized housing; adaptable units; clustered housing and cottage housing.

B. The condition of the local housing market and the number of new housing units, publicly and privately funded.

C. The use of density bonuses and the number of for-purchase housing units provided in new developments.

D. A description of the various initiatives supporting *affordable housing*, including activities of community non-profit organizations and local and regional public or private entities.

E. Programs of housing repair and renovation that improve accessibility.

~~H 8.2~~ Policy HO 8.2

Issue ~~T~~the housing report ~~shall be issued at least~~ every ~~five~~ four years, beginning in 2019, in order to inform the periodic eight-year ~~coordination with state- mandated~~ updates of the Comprehensive Plan, and to measure progress in implementation between the updates. Make the reports ~~shall be made~~ available to the public in various ways, such as notice in the local newspaper, on the City's web page, and on local media outlets.

HOUSING ELEMENT IMPLEMENTATION

High priority actions:

Medium priority actions:

Other priority actions:

GLOSSARY OF HOUSING TERMS

Accessory Dwelling Unit: Separate living quarters contained within or detached from a single-family residence on a single lot.

Affordable Housing: Housing where the occupant pays no more than 30% of gross monthly income for total housing costs, including the cost of taxes and insurance for homeowners and monthly utilities for owners and renters.

Affordable housing is defined according to the interpretation found in the Growth Management Act - Procedural Criteria [WAC365-195-070(6)]. The term "applies to the adequacy of the housing stocks to fulfill the housing needs of all economic segments of the population. The underlying assumption is that the market place will guarantee adequate housing for those in the upper economic brackets but that some appropriately zoned land, regulatory incentives, financial subsidies, and innovative planning techniques will be necessary to make adequate provisions for the needs of middle and lower income persons."

The Department of Housing and Urban Development (HUD) sets household income limits for five income categories based on the local median household income which is determined each year. They are as follows:

Extremely Low Income .....30% or less of median household income
Very Low Income .....31% - 50% of median household income
Low Income.....51% - 80% of median household income

Moderate Income.....81% - 95% of median household income
Middle Income.....96% - 120% of median household income

Assisted Housing: Multifamily rental housing that receives governmental assistance and is subject to use restrictions

Cluster Development: A development design technique that concentrates buildings in specific areas on a site to allow the remaining land to be used for recreation, common open space, and preservation of environmentally sensitive areas. Cluster development allows the reduction of lot sizes below the zoning ordinance's minimum requirements if the remaining land is preserved as permanent open space.

Comprehensive Housing Affordability Strategy (CHAS): A document which is prepared annually to lay out housing affordability strategies that address the needs of homeless, low and moderate income people in ways that promote community and individual stability.

Context Sensitive Design: Site, landscaping, architectural, or engineering design that is compatible with a development's setting, the contours of the land and natural systems on-site and immediately off-site, and that is compatible with the character, location and configuration of improvements and uses on adjacent properties.

Cottage Housing: A grouping of small, single family dwelling units clustered around a common area and developed with a coherent plan for the entire site. Cottage units typically have a shared common area and coordinated design and may allow densities that are somewhat higher than typical in single family neighborhoods. Cottage housing offers a degree of privacy and some of the benefits of single family housing combined with the lower cost and maintenance of attached housing. The clustered arrangement can contribute to a sense of community.

Density: The number of dwelling units allowed in a lot area.

Density Bonus: Additional density provided to a developer to achieve certain policy objectives, such as the construction of affordable housing units. (The developer is allowed to build a certain amount {a percentage} above the base density in exchange for the provision of a certain number of affordable units.)

Designated Centers: Those areas of the Island where the majority of the development and redevelopment should be located over the next fifty years. These include Winslow, Lynwood Center, Island Center, Rolling Bay, Sportsman Triangle and Day Road. See Fig. LU-1 Land Use Concept.

Development Regulation: The controls placed on development or land use activities by a county or city, including, but not limited to, zoning ordinances, critical areas ordinances, shoreline master programs, official controls, planned unit development

ordinances, subdivision ordinances, and binding site plan ordinances together with any amendments thereto.

Dwelling Unit: A building or portion of a building that provides independent living facilities with provision for sleeping, eating and sanitation. The existence of a food preparation area within a room or rooms is evidence of the existence of a dwelling unit.

Fair Share Housing: A quantification of each jurisdiction's "share" of middle and low-income housing needs in a region or county, and a plan for how each jurisdiction will satisfy its obligation to provide for its share of the need.

Flexible Lot Design Subdivision Process: This process permits development flexibility that will encourage a more creative approach than lot-by-lot development, including lot design, placement of buildings, use of open spaces and circulation, and best addresses the site characteristics of geography, topography, size or shape. This method permits clustering of lots, with a variety of lot sizes, to provide open space and protect the Island's natural systems. The criteria for the layout and design of lots, including a minimum percentage of open space and a minimum lot size for each zone, will be set out in the zoning ordinance.

Guiding Principle: A high-rank order value guiding growth, development, and conservation of resources in the community. Guiding principles are derived from and provide extension of the aspirations and values described in the Vision Statement. Guiding Principles provide policy direction to the Goals and Policies of the Elements in the Comprehensive Plan.

Homeless: Persons whose primary nighttime residence is 1) a public or private place not designed for, or ordinarily used for, sleeping accommodations for human beings, or 2) a residence which is a publicly or privately operated shelter designed to provide temporary living accommodations.

Household: One or more related or unrelated persons occupying a housing unit.

Housing types: This term refers to the physical form, configuration or scale of housing, as opposed to an ownership pattern (i.e., rental vs. owned).
The list below groups housing types by the category of whether the housing units are detached, common wall, or stacked:

- **Detached housing**, includes one and two-story houses, ramblers, split-levels, cottages, cabins, accessory dwelling units, mobile homes, and carriage houses (unit over a garage);

- **Common wall housing**, includes duplexes, zero lot line homes, rowhouses and townhouses; and

- **Stacked housing**, includes two or three story garden apartments and mid-rise, mixed-use structures with commercial ground floor uses and two or more stories of residences above.

Impact Fees: Charges levied by the City against a new development for its pro-rata share of the capital costs of facilities necessitated by the development. The Growth Management Act authorizes the imposition of impact fees on new development and sets the conditions under which they may be imposed.

Infill Development: Development usually consisting of either 1) construction on one or more lots in an area already developed or 2) new construction between two existing structures.

Low Impact Development (LID): A stormwater management strategy that emphasizes conservation and use of existing natural site features integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns in residential, commercial, and industrial settings. LID employs principles such as preserving and recreating natural landscape features and minimizing impervious surfaces to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. Practices that adhere to these LID principles include bio-retention facilities, rain gardens, vegetated rooftops, rainwater harvesting (rain barrels and cisterns) and permeable pavements.

Manufactured Housing: A broad term including mobile homes, modular homes and other "factory built" housing. The main distinction is that manufactured housing is created in one or more parts in a factory and is designed and constructed for transportation to a site for installation on a permanent foundation and occupancy when connected to required utilities.

Mixed Use Development: The presence of more than one category of use in a structure, for example, a mixture of residential units and office or retail uses in the same building.

Multifamily: A structure or portion of a structure containing two or more dwelling units.

Neighborhood: A small, predominantly residential area of the Island in which the residents share a common identity which may focus around an elementary school, park, community business center or similar feature.

PUD or Planned Unit Development: A development of land that is under unified control and is planned and developed as a whole in a single development operation or programmed series of development stages. Development through a PUD is a process in addition to the subdivision process, which permits development flexibility that will encourage a more creative approach than lot-by-lot development in design,

placement of buildings, use of open spaces, circulation, and best addresses the site characteristics of geography, topography, size or shape.

Residential Use: Any land use that provides for living space. Examples include single family residence, multi-family residence, special residence mobile home park, boarding house, caretaker's quarters, accessory dwelling.

Special Needs Populations: Individuals or families who require supportive social services in order to live independently for semi-independently.

Subarea Plan: An optional comprehensive plan feature authorized by the Growth Management Act. Subarea plans provide detailed land use policies for a geographic subset of a city.

Subdivision: The division or re-division of land into five or more lots, tracts, parcels, sites or divisions for the purpose of sale, lease or transfer of ownership.

Substandard Housing: A dwelling unit that does not meet the criteria for an acceptable standard of living, through lack of maintenance, age of unit, neglect, lack of plumbing facilities, kitchen facilities, or crowded conditions.

Urban Concentration: An area within the urban growth boundary of Bainbridge Island in which urban level of development with urban levels of public services and facilities are concentrated.

Vision: A Vision is a narrative description of a preferred future, describing desired long-term qualities and characteristics of the community 20 or more years in the future.

Vision 2040: Vision 2040 constitutes the multi-county planning policies for the region consisting of King, Pierce, Snohomish and Kitsap counties and the cities within those counties.

Wetland: Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

GLOSSARY

Accessory Dwelling Unit: Separate living quarters contained within or detached from a single-family residence on a single lot.

Affordable Housing: Housing where the occupant pays no more than 30% of gross monthly income for total housing costs, including the cost of taxes and insurance for homeowners and monthly utilities for owners and renters.

Affordable housing is defined according to the interpretation found in the Growth Management Act - Procedural Criteria [WAC365-195-070(6)]. The term "applies to the adequacy of the housing stocks to fulfill the housing needs of all economic segments of the population. The underlying assumption is that the market place will guarantee adequate housing for those in the upper economic brackets but that some appropriately zoned land, regulatory incentives, financial subsidies, and innovative planning techniques will be necessary to make adequate provisions for the needs of middle and lower income persons."

The Department of Housing and Urban Development (HUD) sets household income limits for five income categories based on the local median household income which is determined each year. They are as follows:

Extremely Low Income .....30% or less of median household income
Very Low Income .....31% - 50% of median household income
Low Income.....51% - 80% of median household income
Moderate Income.....81% - 95% of median household income
Middle Income.....96% - 120% of median household income

Agricultural Land: Land primarily devoted to the commercial production of horticultural, viticultural, floricultural, dairy, apiary, vegetable, or animal products or of berries, grain, hay, straw, turf, seed, Christmas trees, or livestock, and that has long-term (6 years or longer) commercial significance for agricultural production or which has significance for Bainbridge Island.

Agricultural Operation: Any condition, facility, or activity for the production or intent of production for commercial or family use purposes of dairy, apiary, livestock, vegetable or animal products, and crop products including, but not limited to ornamental crops.

Aquatic Resources: Marine nearshore, wetlands, streams, lakes, creeks and associated vegetated areas.

Aquifer: A body of soil or rock that contains sufficient saturated material to conduct groundwater and yield usable quantities of groundwater to springs and wells.

Aquifer Recharge Area: The geological formations in which an aquifer is replenished by the downward percolation of water. Critical recharging areas have the potential to effect potable water where an essential source of drinking water is vulnerable to contamination.

Arterial: A major thoroughfare used mainly for through traffic rather than access to nearby property. Arterials generally have greater traffic carrying capacity than collector or local streets and are designed for continuously moving traffic.

Assisted Housing: Multifamily rental housing that receives governmental assistance and is subject to use restrictions

Average Daily Traffic (ADT): The average number of vehicles passing a point during a 24-hour period.

Base Density: The maximum number of units within an area that can be built under the existing zoning without the use of Transferable Development Rights (TDRs) or a density bonus.

Best Available Science: Current scientific information used in the process to designate, protect, or restore critical areas that is derived from a valid scientific process.

Bicycle Access: An improvement designed to facilitate the use of bicycles, including bicycle trails, bicycle lanes and pedestrian/bicycle trails or pathways.

Bicycle Lane: This facility provides a separate lane for bicycle use. The lane is clearly marked lane of travel on the side of a street or roadway, separated from the automobile by painted strips, curbs or buttons.

Bond and Levy Financing: Local governments can raise revenues by selling tax-exempt municipal bonds or by increasing property taxes through property tax levies. Bonds require a 60 percent voter approval; levies require a simple majority. The City can issue a limited amount of debt without voter approval. This is called limited general obligation or councilmanic debt. Voter approved bonds are retired with property tax revenues.

Capital Facilities Program: A collection of planning and budget policies and documents working in concert to ensure capital projects are identified and prioritized in a manner that meets the needs of a growing population and promotes a safe and healthy community.

Capital Facility: A structure, improvement, piece of equipment or other major asset, including land that has a useful life of at least 10 years. Capital facilities are provided by, and for public purposes and services. For the purposes of the *Capital Facilities Element*, capital facilities are government offices and facilities; fire and

emergency medical services, parks, sewer, water, and storm water utilities, library, and schools.

Capital Improvement: A project to create, expand, or modify a capital facility. The project may include design, permitting, environmental analysis, land acquisition, construction, landscaping, site improvements, initial furnishings and equipment. The project cost must exceed $25,000 and have a useful life of at least 5 years.

Capital Improvement Program (CIP): A six-year plan for future capital expenditures that identifies capital projects packaging, timelines, and funding. The CIP is updated and adopted annually or biennially, along with the City's operating budget.

Carbon sequestration: a term used to describe both natural and deliberate processes by which CO_2 is either removed from the atmosphere or diverted from emission sources and stored in the ocean, terrestrial environments (vegetation, soils, and sediment), and geologic formations.

Carrying Capacity: The level of land use or human activity that can be permanently accommodated without an irreversible change in the quality of air, water, land, or plant and animal habitats. In human settlements, this term also refers to the upper limits beyond which the quality of life, community character, or human health, welfare, and safety will be impaired.

Climate resilience: the capacity for a socio-ecological system to absorb stresses and maintain function in the face of external stresses imposed upon it by climate change.

Climate Change: – Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system. (See www.climate.gov)

Cluster Development: A development design technique that concentrates buildings in specific areas on a site to allow the remaining land to be used for recreation, common open space, and preservation of environmentally sensitive areas. Cluster development allows the reduction of lot sizes below the zoning ordinance's minimum requirements if the remaining land is preserved as permanent open space.

Collector: Roads which collect traffic from local access streets and convey it onto the arterial system.

Commercial Use: An occupation, employment or other enterprise that provides goods or services for compensation.

Community Development Block Grant (CDBG) Program: A federal funding program which provides annual funding for eligible local governments for housing and community development programs targeted primarily to low-income persons and neighborhoods.

Commute Trip Reduction (CTR): Washington State legislation passed in 1992 requiring specified large employers in certain counties to reduce vehicle occupancy according to a specified time frame.

Comprehensive Housing Affordability Strategy (CHAS): A document which is prepared annually to lay out housing affordability strategies that address the needs of homeless, low and moderate income people in ways that promote community and individual stability.

Comprehensive Plan: A generalized coordinated land use policy statement of the governing body of a county or city that is adopted pursuant to this chapter (RCW 36.70A).

Concurrency Requirement: A program to ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards. (Under the GMA, only transportation facilities and services must satisfy the concurrency requirement.)

Conservation Easement: A legal agreement that the property owner enters into to restrict uses of the land for purposes of natural resources conservation. The easement is recorded on a property deed, runs with the land, and is legally binding on all present and future owners of the property.

Context Sensitive Design: Site, landscaping, architectural, or engineering design that is compatible with a development's setting, the contours of the land and natural systems on-site and immediately off-site, and that is compatible with the character, location and configuration of improvements and uses on adjacent properties.

Contract Rezone District: A Contract Zoning District is a distinct area for which a special zoning designation is developed which reflects uses and/or conditions that are unique to that area, and which would affect future development of the land.

Core Area of Winslow: The area within the Mixed Use Town Center District.

Cottage Housing: A grouping of small, single family dwelling units clustered around a common area and developed with a coherent plan for the entire site. Cottage units typically have a shared common area and coordinated design and may allow densities that are somewhat higher than typical in single family neighborhoods. Cottage housing offers a degree of privacy and some of the benefits of single family

housing combined with the lower cost and maintenance of attached housing. The clustered arrangement can contribute to a sense of community.

Cottage Industry: An activity undertaken for gain or profit and carried on in a dwelling or building accessory to the dwelling. See Home Occupation.

Countywide Planning Policies: A series of policies intended to guide the development of city and county comprehensive plans, including, but not limited to, the allocation of population and employment targets to cities. The GMA gives counties the authority to adopt County-wide Planning Policies.

Critical Areas: Aquifer recharge areas, fish and wildlife habitats, frequently flooded areas, geologically hazardous areas, wetlands and streams.

Critical Habitat: Identified by Washington State Department of Wildlife, Ecology and Fisheries or other source recognized by the City as habitat necessary for survival of endangered, threatened, rare, sensitive, monitor species or identified by Bainbridge Island as species of local significance.

Density: The number of dwelling units allowed in a lot area.

Density Bonus: Additional density provided to a developer to achieve certain policy objectives, such as the construction of affordable housing units. (The developer is allowed to build a certain amount {a percentage} above the base density in exchange for the provision of a certain number of affordable units.)

Designated Centers: Those areas of the Island where the majority of the development and redevelopment should be located over the next fifty years. These include Winslow, Lynwood Center, Island Center, Rolling Bay, Sportsman Triangle and Day Road. See Fig. LU-1 Land Use Concept.

Development Regulation: The controls placed on development or land use activities by a county or city, including, but not limited to, zoning ordinances, critical areas ordinances, shoreline master programs, official controls, planned unit development ordinances, subdivision ordinances, and binding site plan ordinances together with any amendments thereto.

Development Standards: Requirements or standards imposed on development by regulation or ordinance under land use and environmental planning legislation.

Downzoning: A change in the zoning classification of land to a classification which requires less intensive development, such as a change from multifamily to single family or from commercial to residential. A change which allows more intensive development is upzoning.

Dwelling Unit: A building or portion of a building that provides independent living facilities with provision for sleeping, eating and sanitation. The existence of a food

preparation area within a room or rooms is evidence of the existence of a dwelling unit.

Endangered Species: A species or subspecies of bird, mammal, fish, amphibian, reptile or invertebrate for which the prospects of survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition or disease.

Environmentally Sensitive Areas or ESAs: Critical areas and their protective buffers and natural resource lands.

Erosion Hazard Area: A landform or soil type subject to being worn away by the action of water, wind, freeze-thaw or ice and classified in accordance with the U.S.D.A. Soil Conservation Service, U.S. Geological Survey or Department of Ecology Coastal Zone Atlas.

Essential Public Facility: Any facility meeting the definition of Essential Public Facility set forth in RCW 36.70A.200(1), now or as hereafter amended, any facility identified on the statewide list maintained by the Office of Financial Management.

Fair Share Housing: A quantification of each jurisdiction's "share" of middle and low-income housing needs in a region or county, and a plan for how each jurisdiction will satisfy its obligation to provide for its share of the need.

Farm: See Agricultural Land

Fish and Wildlife Habitat: A seasonal range or habitat element with which a given species has a primary association, and which, if altered, may reduce the likelihood that the species will maintain and reproduce over the long-term. These include areas of relative density or species richness, breeding habitat, winter range, and movement corridors. These also include habitats of limited availability or high vulnerability to alteration, such as cliffs, streams and wetlands.

Flexible Lot Design Subdivision Process: This process permits development flexibility that will encourage a more creative approach than lot-by-lot development, including lot design, placement of buildings, use of open spaces and circulation, and best addresses the site characteristics of geography, topography, size or shape. This method permits clustering of lots, with a variety of lot sizes, to provide open space and protect the Island's natural systems. The criteria for the layout and design of lots, including a minimum percentage of open space and a minimum lot size for each zone, will be set out in the zoning ordinance.

Forest Land: Land used for growing trees, not including Christmas trees, for commercial purposes (as shown by record of income) that has long-term commercial significance; or unharvested forest land preserved in open space for the environmental benefits and maintenance of rural character.

Frequently Flooded Areas: Lands subject to a one percent or greater chance of flooding in any given year. These areas include, but are not limited to, floodplains adjacent to streams, lakes, coastal areas, and wetlands.

Functional Classification: A technique for assigning categories to transportation facilities based on a facility's role in the overall transportation system.

Functional Plan: Detailed assessments of existing conditions, current and future facility needs, service targets, and projected funding. Such plans adopted by City Council are incorporated by reference into the Comprehensive Plan's Capital Facilities Element. Other local jurisdictions, such as the Bainbridge Island School District, Bainbridge Island Fire District, and Bainbridge Park District also prepare functional plans.

General Obligation Debt: Local governments can raise revenues by selling tax-exempt municipal bonds and incurring debt. General obligation debt carries an unconditional promise by the local government to levy the taxes necessary to make the interest and principal payments required to retire the debt. General obligation debt is distinguished from limited obligation debt (also known as councilmanic bonds), which does not require a vote of the people and is paid from general operating revenues.

Geologically Hazardous Areas: Areas susceptible to erosion, sliding or other geological events and pose a threat to the health and safety of citizens when used as sites for incompatible commercial, residential or industrial development. Geologically hazardous areas include erosion hazard areas, landslide hazard areas, slopes and seismic hazard areas.

Goal: An expression of a general, ultimate ideal to be sought. It reflects basic community values and establishes the basis for formulating policies.

Green Building: A structure and use process that is environmentally responsible and resource efficient throughout a building's life cycle: from siting to design, construction, operation, maintenance, renovation, and demolition. Green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by efficiently using energy, water, and other resources; protecting occupant health and improving employee productivity; and reducing waste, pollution, and environmental degradation.

Greenhouse Gas (GHG): A gas is an atmosphere that absorbs and emits radiation within the thermal infrared range and affects the temperature of the earth. Primary greenhouse gases in the earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. At present, the two primary sources of carbon dioxide emissions are from burning coal used for electricity generation and petroleum used for motor transport.

Green infrastructure: Natural vegetation, landscape design, and engineered techniques that retain, absorb, and often cleanse stormwater runoff. By including such features throughout a community, stormwater and other runoff from wet weather or spring thaws is retained, absorbed, and often naturally filtered. Green infrastructure prevents or reduces the amount of runoff from flowing directly into storm drains where it can overwhelm the sewer system and end up contaminating local waterways.

Groundwater: Subsurface or underground water resource.

Growth Management Act (GMA): A Washington State law requiring urban counties and their cities to adopt comprehensive plans and to adopt development regulations and capital budgets to implement comprehensive plans.

Guiding Principle: A high-rank order value guiding growth, development, and conservation of resources in the community. Guiding principles are derived from and provide extension of the aspirations and values described in the Vision Statement. Guiding Principles provide policy direction to the Goals and Policies of the Elements in the Comprehensive Plan.

High Occupancy Vehicle (HOV): Public transportation vehicles and private vehicles carrying no less than a specified number of passengers (usually set at 2 or 3).

High Occupancy Vehicle Improvement: Facilities or priority treatments, such as preferential signalization or queue bypasses, designed to encourage HOV usage.

High Occupancy Vehicle Lane (HOV Lane): A lane of traffic designated for use by public transit vehicles and high occupancy private vehicles.

Historic Preservation: Includes the protection, rehabilitation, restoration, identification, scientific excavation, and reconstruction of districts, sites, buildings, structures and objects significant in American and Washington state history, architecture, archaeology, or culture. (RCW 27.26.901)

Home Occupation: An activity for gainful employment involving the manufacture, provision, or sale of goods and/or services as an accessory use. The home occupation is carried on in the dwelling unit or building accessory to the dwelling unit.

Homeless: Persons whose primary nighttime residence is 1) a public or private place not designed for, or ordinarily used for, sleeping accommodations for human beings, or 2) a residence which is a publicly or privately operated shelter designed to provide temporary living accommodations.

Household: One or more related or unrelated persons occupying a housing unit.

Housing and Urban Development, Department of HUD: The federal Department of Housing and Urban Development which administers most federally sponsored housing and community development programs.

Housing types: This term refers to the physical form, configuration or scale of housing, as opposed to an ownership pattern (i.e., rental vs. owned).
The list below groups housing types by the category of whether the housing units are detached, common wall, or stacked:

- **Detached housing**, includes one and two-story houses, ramblers, split-levels, cottages, cabins, accessory dwelling units, mobile homes, and carriage houses (unit over a garage);

- **Common wall housing**, includes duplexes, zero lot line homes, rowhouses and townhouses; and

- **Stacked housing**, includes two or three story garden apartments and mid-rise, mixed-use structures with commercial ground floor uses and two or more stories of residences above.

Impact Fees: Charges levied by the City against a new development for its pro-rata share of the capital costs of facilities necessitated by the development. The Growth Management Act authorizes the imposition of impact fees on new development and sets the conditions under which they may be imposed.

Impervious Surface: Any material that substantially reduces or prevents the infiltration of water into previously undeveloped land. It includes surfaces such as compacted sand, limerock, or clay, as well as most conventionally surfaced streets, roofs, sidewalks, parking lots, and other similar surfaces or structures.

Infill Development: Development usually consisting of either 1) construction on one or more lots in an area already developed or 2) new construction between two existing structures.

Infrastructure: A term connoting the physical underpinnings of the built environment including, but not limited to, roads, bridges, transit, waste system, public buildings, and communications networks.

Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA): Legislative initiative by the U.S. Congress restructuring funding for highway and transit programs. ISTEA authorized increased levels of highway and transportation funding and an enlarged role for regional planning commissions/MPOs in funding decisions. The Act also requires comprehensive regional long-range transportation plans extending to the horizon year of 2015.

Island Charter: For purposes of the Bainbridge Island Comprehensive Plan the term is used to describe the special character of the Island - winding, narrow and vegetated roadways and forested areas, meadows, farms, and which contain much

of the Island's wetlands and streams, aquifer recharge areas and fish and wildlife habitat.

Kitsap Regional Coordinating Council (KRCC), formerly known as Kitsap Regional Planning Council (KRPC): A Council formed in 1990 by agreement between Kitsap County and the cities of Bainbridge Island, Bremerton, Port Orchard and Poulsbo. The purposes of the council are 1) to provide a forum for cooperative decision making by the region's elected officials in order to bring about a continuous and comprehensive planning process, 2) to foster cooperation and mediate differences among governments throughout the region and 3) to maintain an ongoing planning program and coordinate actions to make the best use of the region's resources and overcome problems of waste and pollution. In 1991, the Port Gamble S'Klallam Tribe and the Suquamish Tribe became members.

Land Use: A term used to indicate the utilization of any piece of land. The way in which land is being used or may be used.

Land Owner Compacts: Adjacent property owners collectively, aggregate and develop their properties under a unified development plan.

Landslide Hazard Areas: Areas which are potentially subject to risk of mass movement due to a combination of factors, including historic failures, geologic, topographic and hydrologic features as identified in the Department of Ecology Coastal Zone Atlas.

Level-of-Service (LOS): A rating of how well some unit of transportation supply or other facility (e.g., street, intersection, sidewalk, bikeway, transit route, water and sewer, park facilities) serves its current or projected demand.

LIHPRHA: The Low-Income Housing Preservation and Resident Home Ownership Act of 1990, or LIHPRHA, is designed to preserve existing assisted housing for permanent low-income use. It provides incentives for current owners of assisted-housing projects to retain ownership for low-income use or to sell them to new owners who will agree to maintain the housing for low-income occupants for the remainder of its useful life.

Low Impact Development (LID): A stormwater management strategy that emphasizes conservation and use of existing natural site features integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns in residential, commercial, and industrial settings. LID employs principles such as preserving and recreating natural landscape features and minimizing impervious surfaces to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. Practices that adhere to these LID principles include bio-retention facilities, rain gardens, vegetated rooftops, rainwater harvesting (rain barrels and cisterns) and permeable pavements.

Manufactured Housing: A broad term including mobile homes, modular homes and other "factory built" housing. The main distinction is that manufactured housing is created in one or more parts in a factory and is designed and constructed for transportation to a site for installation on a permanent foundation and occupancy when connected to required utilities.

Master Plan: A tool to implement the Comprehensive Plan which details land use and circulation plans for a particular area or particular site using the goals and policies contained in the adopted Comprehensive Plan.

Mineral Resource Lands: Land which is primarily devoted to the extraction of gravel, sand, or valuable metallic substances.

Mixed Use Development: The presence of more than one category of use in a structure, for example, a mixture of residential units and office or retail uses in the same building.

Mode Split: The statistical breakdown of travel by alternate modes, usually expressed as a percentage of travel by auto, transit, etc. Mode split is frequently used to describe the percentage of people using private automobiles versus bus transit or other modes.

Multifamily: A structure or portion of a structure containing two or more dwelling units.

Multi-modal Transportation System: A system in which there is accessibility by a variety of travel modes, typically: pedestrian, bicycle, transit and automobile (Single Occupancy Vehicle and High Occupancy Vehicle - carpool/vanpool) and may include water and air transport as well.

Native Vegetation: Plant species which are indigenous to the Puget Sound region.

Natural Resource Lands: Agricultural, forest and mineral resource lands as defined in this section.

Neighborhood: A small, predominantly residential area of the Island in which the residents share a common identity which may focus around an elementary school, park, community business center or similar feature.

Non-point Source Pollution: Pollution that enters water from dispersed and uncontrolled sources (such as surface runoff) rather than through pipes.

Open Space: Any area of land which provides physical or visual relief from the developed environment. Open space may be essentially unimproved and set aside, designated or reserved for public use or enjoyment, or for the private use and enjoyment of adjacent property owners. Open space may also consist of

undeveloped areas, such as pastures, woodlands, greenbelts, wetlands, pedestrian corridors and other natural areas which provide visual relief from developed areas.

Preservation of open space would 1) conserve and enhance natural or scenic resources, 2) protect streams or water supply, 3) promote conservation of soils, wetlands, beaches or tidal marshes, 4) enhance the value to the public of abutting or neighboring parks, forests, wild preserves, nature reservations or sanctuaries or other open space, 5) enhance recreation opportunities, 6) preserve historic sites, or 7) preserve visual quality along highway, road and street corridors or scenic vistas.

Overlay District: A set of zoning requirements that are described in the ordinance text, are mapped, and subsequently imposed in addition to those of the underlying zone. Development within an overlay zone must conform to the requirements of both zones.

Park-and-Ride: A system in which commuters drive to a common location, park their vehicles, and continue travel to their final destination via public transit or carpooling/vanpooling.

Peak Hour: The hour during which the maximum amount of travel takes place.

Peak Period: The period during which the maximum amount of travel occurs. Usually about 7 to 9 a.m. and 4 to 6 p.m.

Pedestrian-orientation: An area where the location and access to buildings, types of uses permitted on the street level and storefront design are based on the needs of the walking customers and residents. Reduces auto dependence and encourages the use of public transportation.

Peninsula Regional Transportation Planning Organization (PRTPO): The Regional Transportation Planning Organization for Kitsap, Mason, Clallam, and Jefferson Counties. The PRTPO serves as a mechanism for coordinating transportation planning in and among those counties and as a conduit for federal and state transportation funds.

Performance Standards: Regulations which establish standards of performance that are required of any use permitted in a given zoning district. For example, control over the type of a particular development in a particular zone may be accomplished by the establishment of standards which impose maximum levels of smoke, dust, noise, glare, traffic generation or other development impacts which must not be exceeded.

Permeability: The rate at which water moves through undisturbed soil. It depends largely on the texture, structure, porosity and density of the soil.

Policy: An agreed course of action adopted and pursued by decision makers for achieving one or several goals and objectives and which are used to guide the formulation of regulations and programs.

Precautionary principle: An approach to risk management, stating that if an activity carries a threat of causing serious harm to the public or to the environment, the burden of proof that it should not be limited or prohibited falls on proponents of the activity.

Primary Treatment: A wastewater treatment method that uses settling, skimming and usually chlorination to remove solids, floating materials and pathogens from wastewater.

Public Facilities: Use of land which includes streets, roads, highways, sidewalks, street and road lighting systems, traffic signals, domestic water systems, storm and sanitary sewer systems, parks and recreational facilities, and schools.

Public Sewer System: Any system which is owned or operated by the City, political subdivision of the state, or other approved ownership consistent of a collection system and necessary trunks, pumping facilities and a means of final treatment and disposal and under permit from the Department of Ecology.

Public Services: Include fire protection and suppression, law enforcement, public health, education, recreation, environmental protection, and other governmental services.

Public Water System: Any system or water supply intended or used for human consumption or other domestic uses where water is furnished to two or more hookups.

PUD (Planned Unit Development): A development of land that is under unified control and is planned and developed as a whole in a single development operation or programmed series of development stages. Development through a PUD is a process in addition to the subdivision process, which permits development flexibility that will encourage a more creative approach than lot-by-lot development in design, placement of buildings, use of open spaces, circulation, and best addresses the site characteristics of geography, topography, size or shape.

Puget Sound Regional Council (PSRC): Current MPO for the Puget Sound region, including Snohomish, King, Pierce, and Kitsap Counties. The PSRC coordinates transportation planning in those four counties and allocates federal and state transportation funds. The PSRC is also responsible for coordinating transportation planning with air quality emissions requirements.

Pump Station: A facility housing the equipment to pump water from or to a destination to counter gravitational forces. Pumping facilities are also employed to increase the pressure of the water as it travels through the system.

Pumping Station: Used to convey sanitary, wastewater to locations which cannot be reached in a normal downhill gravity collection system.

Purchase of Development Rights (PDRs): A program which would permit an owner of property designated as a TDR "sending area" to sell the right to develop all or the unused zoned capacity of the property to a public entity or non-commercial entity, such as a land trust. In exchange, the seller of the PDR would extinguish the development right on the "sending area" by means of an easement.

Queue Bypass: Route designed to provide a path for transit around traffic queues (or waiting lines), allowing transit to move to the head of traffic flow.

Recharge: The process involved in the absorption and addition of water from the unsaturated zone to groundwater.

Residential Use: Any land use that provides for living space. Examples include single family residence, multi-family residence, special residence mobile home park, boarding house, caretaker's quarters, accessory dwelling.

Right-of-way: Land in which the state, county, city or other governmental entity owns the fee simple title or has an easement dedicated or required for a transportation or utility use. The right-of-way is the right to pass over the property of another. It refers to a strip of land legally established for the use of pedestrians, vehicles or utilities.

Runoff: That portion of precipitation which flows over land surface and enters the storm drainage system during and immediately following a storm. The rapidity of runoff and the amount of water removed are affected by slope, texture (that is the structure and porosity of the soil surface) vegetation and prevailing climate.

Sanitary Sewer: A facility that carries waterborne wastes of household, industrial and commercial users from the point of origin to treatment plant(s) for treatment and disposal.

Secondary Arterial: Roads which link activity centers and convey traffic onto major arterials. Secondary arterials provide both mobility and access.

Secondary Treatment: A wastewater treatment method that usually involves the addition of biological treatment to the settling, skimming and disinfection provided by primary treatment.

Seismic Hazard Areas: Includes areas subject to severe risk of damage as a result of seismic induced ground shaking, slope failure, settlement, slope failure, soil liquefaction or surface faulting. Ground shaking is a primary risk, followed by some unstable slopes causing damage below them. The muck soils of the Island pose a specific risk of settlement and soil liquefaction. These conditions occur in areas where muck soils and other organic deposits are unsuitable for foundations, generally underlain by cohesion-less soils or poorly consolidated sediments usually in association with a shallow groundwater table.

Shoreline Management Act: The Shoreline Management Act of 1971, Chapter 90.58 RCW, as amended.

Shall: The use of the terms “shall” and “should,” determines the level of discretion the City can exercise in making future land use policy, budget, and development regulation decisions. “Shall” means that it is mandatory for the City to carry out the policy, even if a timeframe is not included. The use of “shall” in a policy statement does not convert it into a regulation.

Should: Signifies a slightly less rigid directive than "shall" to be honored in the absence of compelling considerations that require another course of action.

Single Occupant Vehicle (SOV): A vehicle carrying only the driver and no passengers.

Slope: An inclined ground surface, the inclination of which is expressed as a ratio (percentage) of vertical distance to horizontal distance.

Special Needs Populations: Individuals or families who require supportive social services in order to live independently for semi-independently.

Special Planning Area: A Special Planning Area is an area which reflects uses and/or conditions which are unique to that area and would benefit from a local and/or neighborhood planning process. The Special Planning Area Process would address such issues as current use, future mix and location of uses and densities, transportation, public facilities, and services and amenities and protection of natural systems.

Storm Drain: A system of gutters, pipes or ditches used to carry storm water from surrounding lands to streams, lakes or Puget Sound.

Storm Water: Water that is generated by rainfall and is often routed into drainage systems in order to prevent flooding.

Stream: Surface waters, which flow into or become connected with other surface waters generally at least once per year. Streams are classified in accordance with classification system established by the Washington State Department of Natural Resources, as modified by Bainbridge Island.

Subarea Plan: An optional comprehensive plan feature authorized by the Growth Management Act. Subarea plans provide detailed land use policies for a geographic subset of a city.

Subdivision: The division or redivision of land into five or more lots, tracts, parcels, sites or divisions for the purpose of sale, lease or transfer of ownership.

Substandard Housing: A dwelling unit that does not meet the criteria for an acceptable standard of living, through lack of maintenance, age of unit, neglect, lack of plumbing facilities, kitchen facilities, or crowded conditions.

Sustainability: Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Transfer of Development Rights Program (TDRs): A program which would permit an owner of property designated as a TDR "sending area" to sell the right to develop all or the unused zoned capacity of the property to the developer of a TDR "receiving area" who is allowed to add the capacity to the zoned capacity of the site. In exchange, the seller of the TDR would extinguish the development right on the "sending area" by means of an easement.

Transit: Refers to a multiple-occupant vehicle operated on a for-hire, shared-ride basis, including bus, ferry, taxi, shuttle bus, carpool, or vanpool.

Transportation Demand Management (TDM): Policies and programs to motivate people to use public transportation, such as bus pass subsidies, flex-time programs, and limiting free parking.

Transportation System Management (TSM): An array of strategies intended to lead to a reduction in the number of vehicles using the road system while simultaneously serving the same number of travelers.

Threatened Species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Trip: A one-way movement of a person or vehicle between two points for a specific purpose, sometimes called a one-way trip to distinguish it from a round trip.

Trip Assignment: The process of determining route or routes of travel and allocating the zone-to-zone trips to these routes.

Trip Distribution: The process by which the movement of trips between zones is estimated. The data for each distribution may be measured or be estimated by a growth factor process or by synthetic model.

Undeveloped Rights-Of-Way: Any undeveloped portion of a right-of-way legally established for the use of pedestrians, vehicles or utilities.

Universal Design: The designing of products and environments to be usable by all people, to the greatest extent possible, regardless of age, size, or abilities.

Upzoning: A change in the zoning classification of land to a classification allowing more intensive development, such as a change from single-family to multifamily or from residential to commercial.

Urban Concentration: An area within the urban growth boundary of Bainbridge Island in which urban level of development with urban levels of public services and facilities are concentrated.

Vehicle Miles Traveled (VMT): A measurement of forecasting travel demand; equivalent to one car, bus or truck traveling one mile. VMT is the sum of an individual's vehicle trip lengths - in miles - made over a set period, divided by the number of affected individuals driving that period within the household, study area, zone or facility.

Vision: A Vision is a narrative description of a preferred future, describing desired long-term qualities and characteristics of the community 20 or more years in the future.

Vision 2040: Vision 2040 constitutes the multi-county planning policies for the region consisting of King, Pierce, Snohomish and Kitsap counties and the cities within those counties.

Watercourse: The areas to which surface and subsurface waters naturally flow and which form a continuous channel through which water descends to natural outlets. A water course includes: a permanent stream; intermittent stream; river, brook, creek, channel or ditch for water, whether natural or man-made.

Water Re-use: Using treated wastewater in place of drinking water for commercial irrigation and industrial processes. Also called wastewater reclamation.

Watershed: The geographic region within which water drains into a particular river, stream or body of water. A watershed includes hills, lowlands and the body of water into which the land drains.

Wetland: Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.